



**GROUND INVESTIGATION REPORT
PHASE II GEOENVIRONMENTAL SITE INVESTIGATION
AND INTERPRETATIVE REPORT
ON LAND AT
GEORGE LEIGH STREET
MANCHESTER**

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LIST OF ACRONYMS

Acronym	Meaning
BGS	British Geological Survey
BH	Borehole
CDM	Construction Design and Management
CL:AIRE	Contaminated Land: Applications In Real Environments
CLR	Contaminated Land Report
COSHH	Control Of Substances Hazardous to Health
CSM	Conceptual Site Model
DCP	Dynamic Cone Penetrometer
DEFRA	Department for Environment Foods and Rural Affairs
DP	Dynamic Probe
DOE	Department Of Environment
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standards
EA	Environment agency
EQS	Environmental Quality Standards
GAC	Generic Acceptance Criteria
GQA	General Quality Assessment
GQRA	Generic Quantitative Risk Assessment
HP	Hand Pit
HA	Hand Auger
IPPC	Integrated Pollution Prevention and Control
LQM	Land Quality Management
mbgl	Meters Below Ground Level
MP	Mackintosh Probe
NGR	National Grid Reference
OS	Ordnance Survey
PAH	Poly-nuclear Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl's
SGV	Soil Guideline Value
SSV	Soil Screening Value
WSV	Water Screening Value
SPOSH	Significant Possibility of Significant Harm
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
TP	Trial Pit
TPH CWG	Total Petroleum Hydrocarbons Criteria Working Group
TT	Trial Trench
WS	Windowless Sample / Window Sample

1.0 INTRODUCTION

1.1 Instruction

- 1.1.1 GeoCon Site Investigations Ltd (GeoCon) has been commissioned by Forshaw Land & Property Group Ltd (FLPG) to undertake a Phase II Geotechnical Site Investigation of Land at George Leigh Street, Manchester.
- 1.1.2 It is understood that a Phase II Geoenvironmental Site Investigation is required to assist with a planning application for a proposed residential development at the site; to establish the potential for and presence of any contamination at the site, and provide a Generic Quantitative Risk Assessment for the site following the recommendations within a Phase I Preliminary Risk Assessment has carried out by GeoCon in December 2015 referenced F0215 IW (GSI517) P1 Report KJ HO 161215.
- 1.1.3 It is currently proposed to redevelop the site with a new build four storey residential building.

1.2 Scope of Works

- 1.2.1 The scope of the Phase II Site Investigation included the following:

Phase II

- ✚ Two cable percussion boreholes to a nominal depth of 15.00mbgl
- ✚ One day's windowless sampling at approximately three locations to a nominal depth of up to 5.00mbgl or refusal.
- ✚ Insitu geoenvironmental testing and sampling.
- ✚ Full supervision of all works by engineering geologist including sampling and detailed geotechnical descriptions to BS5930, EN ISO 14688-1 EN ISO 14688-2 and EN ISO 14689 of all strata types encountered within the exploratory holes.
- ✚ The installation of three No. combined gas and groundwater monitoring wells. For quotation purposes we have used a nominal depth of 3.00mbgl.
- ✚ Subsequent gas and groundwater monitoring
- ✚ A suite of geotechnical laboratory analysis.
- ✚ A suite of chemical laboratory analysis.
- ✚ Production of an interpretative report.

1.3 Limitations

- 1.3.1 The assessment and interpretation of the factual data obtained as part of this Phase II Site Investigation has been undertaken in accordance with standard consulting practise and with current national and international guidance.
- 1.3.2 This report presents the observations made during the Phase II Site Investigation and the factual data obtained. The conclusions and recommendations in this report are limited to those which can be made based on the findings of the survey and information provided by third parties. GeoCon assumes all third party data to be true and correct. No responsibility can be accepted by GeoCon for inaccuracies in the information provided by any other party.
- 1.3.3 This report is written in the context of an agreed scope of works and should not be used in a different context. Furthermore, new information, improved practises, and changes in legislation may require the reinterpretation of the report in whole or in part after its original issue. GeoCon reserve the right to alter their conclusions and recommendations in the light of further information that may become

available. This report is provided for the sole use of the client and their professional advisers and is confidential to them unless agreed otherwise in writing.

- 1.3.4 Ground conditions can be variable and change rapidly, especially in areas of Made Ground, however it is assumed that the ground conditions encountered and observed are typical and representative of the site as a whole. Most specifically with regard to this limited investigation, the ground conditions have been determined from a limited number of exploratory holes formed across the site, therefore only a small percentage of the total area of the site has been investigated. Interpolation between exploratory holes has enabled a general picture of the subsurface conditions to be produced. Conclusions drawn from the ground investigation should be read in this context. GeoCon cannot accept responsibility for any situations resulting from locally unforeseen ground conditions occurring between exploratory holes.
- 1.3.5 In addition, subsurface conditions including contaminant concentrations and groundwater levels may vary spatially with time. This factor should be given due consideration in the event that the information contained within this report is used after any significant period of time has elapsed.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

- 2.1.1 The site is located on land at George Leigh Street, Manchester at approximate National Grid Reference NGR: 384830:398690 (centre of the site).
- 2.1.2 A site location plan is presented as Drawing No. GSI0517/01 in Appendix A.

2.2 Site Description

- 2.2.1 The site is an irregular shaped piece of land with an approximate area of 0.04Ha.
- 2.2.2 The site is currently partially occupied by existing two and three storey buildings with the exception of the northwest corner of the site which is currently covered by hardcore at the surface. At this stage GeoCon have not had permission to enter the existing buildings.
- 2.2.3 There is evidence of existing / former buried services running across the site which may still be live.
- 2.2.4 The topography of the site is generally flat.
- 2.2.5 The site is bound by George Leigh Street to the northwest, Cotton Street to the southwest, Loom Street to the southeast, and adjacent buildings to the northeast.
- 2.2.6 Access to the site is via Cotton Street from the southwest.

2.3 Site Usage

- 2.3.1 The site is currently derelict.

2.4 Future Site Usage

- 2.4.1 GeoCon understood that it is currently proposed to redevelop the site with a new build four storey residential building.

2.5 Surrounding Area

- 2.5.1 The current surrounding land use to the site is generally city centre mixed residential, commercial and industrial properties in all directions.
- 2.5.2 The topography of the surrounding area is generally flat.

2.6 Site Reconnaissance

- 2.6.1 A site walkover was carried out on 27th November 2015. All details from the site walkover are included in the site description above.
- 2.6.2 There are no further relevant details above those which are already given in this report.

2.7 Previous Investigations

- 2.7.1 GeoCon undertook a Phase 1 Preliminary Risk Assessment, Ref: F0215 IW (GSI517) P1 Report KJ HO 161215, dated December 2015. This report should be read in conjunction with the phase 1 report.

3.0 GROUND INVESTIGATION

3.1 General

- 3.1.1 The intrusive investigation was carried out on the 28th and 29st January 2016.
- 3.1.2 The specification and scope of works for the ground investigation has been recommended by GeoCon based on the information given in the Phase I PRA carried out by GeoCon.
- 3.1.3 The ground investigation has been carried out in accordance with BS5930 and the UK Specification for Ground Investigation Second Edition 2012.
- 3.1.4 All strata descriptions were undertaken in accordance with BS5930 Amendment 1; EN ISO 14688 -1; EN ISO 14688 -2; and EN ISO 14689.
- 3.1.5 The actual ground investigation comprised the formation of:
 - ✚ One day's window sampling at approximately two locations to a maximum depth of 2.00mbgl, including geoenvironmental and geotechnical sampling and insitu testing.
 - ✚ Two Cable Percussion boreholes to a maximum depth of 15.60mbgl.
 - ✚ Full supervision of all works by engineering geologist including sampling and detailed geotechnical descriptions to BS5930, EN ISO 14688-1 EN ISO 14688-2 and EN ISO 14689 of all strata types encountered within the exploratory holes.
 - ✚ The installation of two combined gas and groundwater monitoring wells, with subsequent gas and groundwater monitoring on six occasions over a three month period in accordance with CIRIA 665.
 - ✚ A suite of Contamination Testing
 - ✚ A Suite of Geotechnical testing:
 - ✚ Provision of interpretative report to undertake a Generic Quantitative Risk Assessment (GQRA) and to provide details of the engineering properties of the underlying soils and rocks encountered with subsequent recommendations on suitable foundation solutions.
- 3.1.6 The locations of the exploratory holes were positioned to gain key information from the beneath the proposed development.
- 3.1.7 All locations were checked against buried service plans, scanned with a Cable Avoidance Tool (CAT) prior to excavation and marked out by GeoCon on site who were responsible for issuing a permit to dig at each location. All locations were then checked again with a Cable Avoidance Tool (CAT) by GeoCon prior to excavation; each location was then continued by hand down to a minimum of 1.20mbgl to clear each location of any buried services or other.
- 3.1.8 All access permissions were arranged by Forshaw prior to the ground investigation commencing.
- 3.1.9 Exploratory hole location plans are presented in Appendix A as drawing number GSI0517/02.

3.2 Restrictions

- 3.2.1 It should be noted that the area of exploration was limited to the external area of the site. The remainder of the site is currently occupied by an existing building which was not accessible during this ground investigation.

3.3 Cable Percussion Boreholes

- 3.3.1 Two cable percussion boreholes referenced BH01 and BH02 were drilled at the site in order to facilitate geoenvironmental sampling and insitu testing, and to gain an understanding of the geoenvironmental and geotechnical properties of the soils beneath the site. The boreholes were drilled to a maximum depth of 15.60mbgl.
- 3.3.2 All BH's were commenced in 150mm diameter drilling string to the top of the bedrock in each borehole.
- 3.3.3 Insitu Standard Penetration Tests were carried out at 1.00m intervals in the cable percussion boreholes.
- 3.3.4 The cable percussion borehole logs are presented in Appendix B.

3.4 Windowless Sample Boreholes and Dynamic Probes

- 3.4.1 A total of two windowless sample boreholes referenced WS01 to WS01A were drilled across the site using a tracked windowless sample rig. WS01 was relocated and redrilled as WS01A due to refusal at shallow depth. The windowless sample boreholes achieved depths of 1.00mbgl and 2.00mbgl respectively.
- 3.4.2 WS01 refused at 1.00mbgl due to the nature of the made round and WS01A refused at 2.00mbgl.
- 3.4.3 Due to the windowless sample boreholes refusing, two dynamic probe holes referenced DP02 and DP03 were advanced to a depth of 5.00mbgl. Dynamic probing was carried out using a super heavy dynamic probe machine.
- 3.4.4 Blow counts are recorded for every 100mm of advancement with the rods.
- 3.4.5 Details of the Dynamic Probe are given overleaf in Table 3.1 Dynamic Probe Parameters.

Table 3.1: Dynamic Probe Parameters

Parameter	Detail
Hammer Weight (kg)	63.5
Weight Drop (mm)	750
Rod Width (mm)	22
Cone Width (mm)	22
Cone Angle (°)	90

- 3.4.6 The windowless sample borehole and dynamic probe logs are presented in Appendix C.

3.5 Hand Pitting

- 3.5.1 Two hand pits referenced HP01 and HP02 were excavated in the proposed locations of WS02 and WS03 respectively to depths of between 0.50 and 0.60mbgl, where both locations refused.
- 3.5.2 The hand pitting was carried out as an alternative to the windowless sampling which was unable to penetrate the made ground. The hand pitting was undertaken to facilitate chemical sampling of the made ground and shallow soils for subsequent chemical analysis.
- 3.5.3 The hand pit logs are presented in Appendix D.

3.6 Insitu Sampling and Testing

3.6.1 The sampling and insitu testing regime included the following:

- ✚ Environmental samples for subsequent chemical analysis were taken from the made ground at regular intervals.
- ✚ Small disturbed samples taken from the topsoil, then at 1.00m intervals, and at each strata change.
- ✚ Bulk disturbed samples taken at 1.00m intervals and at each strata change.
- ✚ Undisturbed samples (U100's) taken in suitable cohesive strata where available alternating with the SPT's at 1.00m intervals.
- ✚ SPT's were taken within the cable percussion and windowless sample boreholes at 1.00m intervals.
- ✚ Groundwater samples where available.

3.6.2 Soil samples were collected for geotechnical analysis by the engineering geologist on site based on physical and visual inspection in addition to standard sampling, and were subsequently sampled and transferred to a geotechnical laboratory in prepared bulk bags and plastic tubs.

3.6.3 All samples were stored in pre-chilled cool-boxes prior to immediate dispatch to laboratory.

3.7 Installations and Backfill

3.7.1 The two cable percussion boreholes were installed with combined gas and ground water monitoring standpipes. The details of the gas and ground water monitoring standpipes are summarised overleaf in Table 3.1: Gas and Groundwater Monitoring Standpipe Installations:

Table 3.2: Ground Gas and Groundwater Monitoring Standpipe Installations

BH ID	Installation Depth (mbgl)	Response Zone (mbgl)	Installation Date
BH01	3.00	1.0-3.0	28/02/2016
BH02	4.00	1.0-4.0	29/01/2016

3.7.2 All monitoring standpipes are constructed using 50mm slotted pipe with a Geosock filter and gravel surround medium within the response zone, and 50mm plain pipe with a bentonite seal above the response zone (1.00m thick), and a bentonite seal below the base of the standpipe

3.7.3 The remaining exploratory holes were backfilled with arisings and made level at the surface to a similar condition as prior to the work.

3.7.4 Full details of the installations and backfill are presented on the relevant borehole logs.

3.1 Groundwater

3.1.1 Where groundwater was encountered a waiting period of 20 minutes was allowed to monitor any change (rise or fall) in the levels of each groundwater strike.

3.2 Laboratory testing

3.2.1 Geotechnical laboratory testing was subsequently carried out on selected samples of soil. Further details of the geotechnical laboratory testing are given within section 5.0 – Geotechnical Testing and Results.

3.2.2 Chemical laboratory testing was subsequently carried out on selected samples of soil. Further details of the chemical laboratory testing are given within section 7.0 – Chemical Testing and Results.

4.0 GROUND CONDITIONS

4.1 Published Geology

- 4.1.1 The British Geological Survey (BGS) Open Geoscience shows the site to be underlain by the geological succession outlined below in Table 4.2: Published Geology.

Table 4.1: Published Geology

Geology	Description /strata
Artificial	None Recorded
Superficial	Glacial Till
Bedrock	Chester Pebble Beds Formation

- 4.1.2 There are no know artificial deposits indicated underlying the site.
- 4.1.3 The superficial deposits indicated underlying the site are Glacial Till. No BGS description is available; however, these deposits are generally gravelly clay with cobbles and varying silt sand and gravel content.
- 4.1.4 The bedrock geology beneath the site is shown to be the Chester Pebble Beds Formation which is generally described as '*sandstone, fine- to coarse-grained, commonly pebbly, with conglomerates and sporadic siltstones; cross-stratified*' (BGS general description).

4.2 General

- 4.2.1 The actual ground conditions encountered across the site were generally uniform and comprised made ground overlying glacial till.
- 4.2.2 The general ground conditions encountered have been summarised below:
- 4.2.3 Detailed strata descriptions are presented on the exploratory hole logs presented in Appendix B, C and D.

4.3 Made Ground

- 4.3.1 Made ground was encountered in all exploratory location formed across the site generally from ground level to depths of between 2.60mbgl to 3.60mbgl.
- 4.3.2 The made ground generally comprised hardstanding overlying granular made ground materials, which generally comprised clayey sandy gravel with cobbles.
- 4.3.3 BH01 recorded made ground comprising silty gravel of brick at a depth of 8.00mbgl to 11.20mbgl. The material above recorded no evidence of made ground and appeared to be natural. Therefore, this layer of made ground may be associated with a potential former tunnel or culvert feature.

4.4 Glacial Till

- 4.4.1 Soils considered to represent glacial till were encountered directly beneath the made ground materials and were proven to a maximum depth of 15.45mbgl.
- 4.4.2 The glacial till generally comprised alternating firm to stiff slightly gravelly clay with a layer of slightly gravelly silt in BH02 only.

4.5 Groundwater

- 4.5.1 Groundwater was generally not encountered during this ground investigation with the exception of within a potential tunnel feature at 8.00mbgl within BH01, where groundwater was observed.

4.6 Obstructions

- 4.6.1 The window sample boreholes were terminated at 1.00mbgl and 2.00mbgl due to very dense made ground and the presence of cobbles.

4.7 Voids

- 4.7.1 No voids were encountered during this ground investigation. However, whilst no void was recorded within the potential tunnel feature at 8.00mbgl within BH01, it is possible that voids may be present.

4.8 Contamination

- 4.8.1 No obvious visual or olfactory evidence of contamination was observed during the ground investigation, with the exception of general made ground materials.

5.0 GEOTECHNICAL TESTING AND RESULTS

5.1 General

- 5.1.1 This geotechnical investigation was undertaken to provide details of the ground conditions, soils strengths, engineering properties of the soils and rock beneath the site, and subsequent advice on suitable foundation solutions.
- 5.1.2 It should be noted that GeoCon have not been provided with any further details regarding the structural loading at this stage.

5.2 Geotechnical Testing

- 5.2.1 In-situ Standard Penetration Tests (SPTs) were undertaken in accordance with BS1377 (1990) within the cable tool boreholes. Dynamic probing was also undertaken by the windowless sample drilling rig. A summary of the insitu testing is given below in Table 5.1 Insitu Geotechnical Testing:

Table 5.1: Insitu Geotechnical Testing

Strata	SPT N Value Range	Locations Encountered
Made Ground	4 – 10	All locations
Glacial Till	4 – 37	All locations

- 5.2.2 A programme of geotechnical laboratory testing was undertaken in accordance with BS1377 (1990) 'Methods of tests for soils for civil engineering purposes. The geotechnical testing regime has been summarised below in Table 5.2 Geotechnical Laboratory Analysis.

Table 5.2: Geotechnical Laboratory Analysis

BS 1377 Test Number	Test Description	Quantity Analysed
BS 1377 1990: Part 2. Clause 3.2	Moisture content	4
BS 1377 1990: Part 2. Clause 4.3, 5.3 & 5.4	Atterberg Limits	4
BS 1377 1990: Part 3. Clause 5.3 & BRE CP2/79	BRE SD 1	5
BS 1377 1990: Part 7. Clause 8	Quick Undrained Triaxial	4

- 5.2.3 The results of the geotechnical laboratory testing are presented in Appendix E.

Plasticity Index

- 5.2.4 Atterberg limit testing was carried out on selected samples of cohesive soils taken from the site to establish the plasticity index of the clay beneath the site. The results of this testing is presented below in Table 5.3 Atterberg Limits Testing Results.

Table 5.3: Atterberg Limits Testing Results

Test	Range
Moisture Content (%)	18 – 22
Liquid Limit (%)	29 – 42
Plastic Limit (%)	16 – 21
Plasticity Index (%)	13 – 21
Modified plasticity index (%)	11.57 – 19.53

- 5.2.5 Based on these results the clay beneath the site can be classed as low to intermediate plasticity.
- 5.2.6 Chapter 4.2 'Building near Trees' of the NHBC standards indicates that from the testing results the clay beneath the site is of low volume change potential.

BRE SD 1

- 5.2.7 Four soil samples were analysed for BRE SD 1 reduced suite to assess the risk to buried concrete at the site, which includes total sulphate, water soluble sulphate, pH and total sulphur. The results of the testing are summarised below in table 5.4 Summary of BRE SD 1 Results.

Table 5.4: Summary of BRE SD 1 Results

Test	Soil Test - Results Range
Total sulphate (%)	0.04 -0.11
Water soluble sulphate (mg/l)	51 – 340
Total sulphur (%)	0.08 – 0.23
pH	8.4 – 9.0
Total Potential Sulphate (%)	0.24 – 0.69
Potential amount of Oxidisable Sulphate Present (%)	0.13 – 0.65

- 5.2.8 Design/mix of buried concrete should be undertaken in accordance with the “Aggressive Chemical Environment for Concrete” (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground).
- 5.2.9 The above results indicate that pyrite may be present within the soils beneath the site.
- 5.2.10 A review of the pH and sulphate concentrations indicates that all concrete used in the foundations at this site should be designed to “Design Sulphate Class” DS-3, and the “Aggressive Chemical Environment for Concrete” (ACEC) class AC-3.

Triaxial Testing

- 5.2.11 Four samples were analysed for Unconsolidated Undrained Triaxial Tests. The results are summarised below in Table 5.5: Triaxial Testing Results.

Table 5.5: Triaxial Testing Results

Test	Range
Moisture content %	16 – 18
Bulk Density (mg/m ³)	2.13 – 2.20
Dry Density (mg/m ³)	1.81 – 1.90
Shear Strength (kPa)	69 – 127

6.0 GEOTECHNICAL ASSESSMENT

6.1 General

- 6.1.1 It is understood that the proposed development will comprise the retention of existing buildings at the site, as well as a four storey extension to one of the buildings and a new three storey standalone building.
- 6.1.2 The recommendations given below assume that ground levels intended for the redevelopment will be similar to those existing at present. If ground levels are subject to significant change as part of the proposed development, then the recommendations in this report may require reinterpretation.

6.2 Geotechnical Model

- 6.2.1 Two cable percussion boreholes (BH01 and BH02), one windowless sample borehole (WS01/WS01A) and two hand dug pits (HP01 and HP02) with dynamic probe follow on (DP02 and DP03) were formed at the site.
- 6.2.2 The ground conditions encountered within the exploratory holes are summarised below in Table 6.1: Summary of Ground Conditions.

Table 6.1.1: Summary of Ground Conditions

Stratum	Depth Range to Base of Stratum (bgl) (Thickness Range)	Strength/Consistency	Notes
Topsoil and Made Ground			
Made Ground/Surface Hardstanding	2.60-3.20m (2.60-3.20m) 11.20m (3.20m) comprising second layer of Made Ground within natural strata, possible former infilled tunnel)	SPT N values in the range 3-10	Surface Made Ground comprised clayey sandy gravel with cobbles. Possible tunnel / culvert infill (BH01 from 8.00mbgl-11.20mbgl) comprised dark grey / black silty gravel of brick.
Natural Strata			
Glacial Till	15.60m + 4.40-9.95m +	SPT N values in the range 6 - 37. N values showed an overall increase with depth. The Made Ground within the Till from 8.00m bgl-11.20mbgl in BH01 may have caused some softening of the overlying Till	Described in the field as firm to stiff sandy slightly gravelly clay. Localised bands of firm silt were recorded in BH02 between 4.00mbgl and 8.00mbgl.

- 6.2.3 Groundwater was only encountered in BH01 at 8.00mbgl. This appeared to be associated with the possible tunnel structure recorded at this depth.

6.3 Foundations

- 6.3.1 The made ground would not be suitable for the construction of shallow foundations due to the risk of unacceptable total and differential settlement occurring. As the upper made ground was encountered

to a maximum depth of 3.20mbgl; and of even greater significance, the presence of possible tunnel infill from 8.00m to 11.20mbgl in BH01, it is considered that shallow spread foundations would not be suitable for this site. Consequently, any redevelopment of the site would require the use of piled foundations.

- 6.3.2 Piled foundations should be designed by a competent designer, with the design verified on site by means of static pile load tests.
- 6.3.3 Of particular concern for the construction of piled foundations would be the presence of the possible former tunnel in BH01 from 8.00m to 11.20mbgl. This should be brought to the attention of the pile designer / construction manager. The choice of a suitable piling technique to enable piling through this feature would require careful consideration. Also, possible liaison with stakeholders should be considered to determine whether there are any other issues relating to the tunnel's presence, e.g. utility providers, archaeologists etc. Choice of piling techniques would also need to consider noise / vibration issues in relation to nearby buildings and infrastructure.
- 6.3.4 In addition to the constructability concerns relating to piling through the possible former tunnel, the pile design would need to take into account the tunnel's presence. No positive skin friction should be allowed in the pile design for the glacial till above the tunnel. The possibility of the loosely consolidated tunnel infill causing overlying materials to exert negative skin friction on the piles would need to be considered.
- 6.3.5 As an alternative to piling through the possible former tunnel, it may be desirable to determine its location on site by means of probe drilling. Once mapped out, a suitable easement could be determined and the possibility of designing foundations to avoid or span the former tunnel could be considered. It is still likely that piled foundations would be required for the site, due to the depth of surface Made Ground in BH01 and BH02. Also, within influencing distance of the former tunnel, piled foundations should still be designed without including skin friction resistance for the Glacial Till above the tunnel, and the possibility of negative skin friction would still need to be considered.
- 6.3.6 Piling platform design should be undertaken in accordance with the procedures given in the BRE publication: Working platforms for tracked plant.

6.4 Floor Slabs

- 6.4.1 A suspended floorslab would be required in conjunction with the piled foundations.

6.5 Concrete

- 6.5.1 A review of the pH and sulphate concentrations indicates that all concrete used in the foundations at this site should be designed to "Design Sulphate Class" DS-3, and the "Aggressive Chemical Environment for Concrete" (ACEC) class AC-3.

6.6 Groundwater and Excavations

- 6.6.1 An adequate risk assessment should be undertaken by a competent person and suitable checks made to ensure the safety of all operatives working within excavations. Shallow excavations (typically <1.0m) are likely to be appropriate for piled foundations, and these may be suitable for battering back to a suitable angle of repose if sufficient space is available on site. However, deeper excavations would require suitable support. Excavation support advice can be found within CIRIA Report 97 entitled 'Trenching Practice'.
- 6.6.2 Perched water may be encountered within the Made Ground in shallow excavations. These should be adequately controllable by open sump pumping techniques. Advice on de-watering is given in CIRIA

Report No C515: Groundwater Control. If deeper excavations, for example deep sewers are proposed, then further advice should be sought.

- 6.6.3 Under no circumstances should operatives be allowed to enter unsupported excavations.

6.7 Road Pavement

- 6.7.1 Any new pavements will require assessment of the existing sub grade in terms of its California Bearing Ratio (CBR) to facilitate the actual pavement design.
- 6.7.2 It is recommended that CBR testing is carried out at the site along any proposed access roads prior to construction to confirm the CBR design value.

6.8 Sustainable Drainage

- 6.8.1 In accordance with PPS25 (2007) the Planning Authority are likely to insist that surface water drainage from any new-build or redevelopment complies with current design practices for Sustainable Urban Drainage (SUD's), with the construction of separate drainage systems for foul and surface water.
- 6.8.2 Based on the ground conditions encountered it is unlikely that sustainable drainage would be suitable at the site. If sustainable drainage is to be considered, it is recommended that soak-away testing is carried out in accordance with BRE 365 at the site to establish the sites suitability for sustainable drainage.

6.9 Existing structures

- 6.9.1 Where relict foundations / structures are present, they would need to be grubbed out within foundation excavations and some pre-boring or digging may be required at pile positions.
- 6.9.2 As previously mentioned, the possible tunnel recorded in BH01 from 8.00m to 11.20mbgl would require special consideration.

7.0 CHEMICAL TESTING AND RESULTS

7.1 General

7.1.1 All samples were sent to a UCAS accredited chemical testing laboratory, and MCERTS were used where available. The analytical strategy focussed on a general suite of potential contaminants and the analytical suites are summarised in Table 5.1 Summary of Chemical Testing Suite below. Chemical results have been screened against current guideline values where applicable for the current residential end use.

7.1.2 All chemical testing results are presented in Appendix F.

Table 7.1: Summary of Chemical Testing Suite

Testing	Comment	No. of soil samples analysed
General metals suite including: Arsenic, cadmium, chromium, copper, cyanide, lead, mercury, nickel, phenol, selenium, zinc, pH, and water soluble sulphate	General analysis of made ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	3
Speciated PAH	General analysis of made ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	3
TPH CWG	General analysis of made ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	3
Asbestos	General analysis of made ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	3
PCB's	General analysis of made ground within the area previously not accessible to achieve general site coverage, and targeting former uses on site and off site within influencing distance	3

8.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

8.1 Criteria for interpretation

- 8.1.1 The regime for contaminated land was set out in Part IIA of the Environmental Protection Act (EPA) 1990, as inserted by S.57 of The Environment Act 1995 and came into effect in England on 1st April 2000 as The Contaminated Land (England) Regulations 2000 (SI 2000/227). These regulations were subsequently updated with the provision of The Contaminated Land (England) Regulations 2006 (SI 2006/1380), which consolidated the previous regulations and amendments and added in provisions regarding radioactive contaminated land. These regulations came into force on 4th August 2006. This modified the wording for “Contaminated Land” under Part IIA of the EPA. Section 78A (2) defines contaminated land as “land which appears to be in such a condition, by reason of substances in, on or under the land, that:

- ✚ significant harm is being caused, or there is a significant possibility of significant harm being caused (SPOSH);

8.2 Human Health Receptors

- 8.2.1 An initial Generic Quantitative Risk Assessment (GQRA) for human health has been undertaken by comparison of the soil analytical results with published guidance criteria. These can be classified as Generic Assessment Criteria (GAC) and are widely referred to by consultants, Regulatory Authorities and other professionals within the industry and include the following:

- ✚ Current published Soil Guideline Values (SGVs) published by the Environmental Agency (EA).
- ✚ Land Quality Management (LQM) have published a series of GACs via the CLEA v1.04 software which are applicable to the UK for common determinands. The GAC's can be applied to a wide range of land contamination problems, which can be used as initial screening criteria in order to assess potentially contaminated land.
- ✚ ATRISK Soil SSV's (Soil Screening Values) at 1% SOM for a sand soil derived by Atkins in line with the Environment Agency 2009 guidance (SR2, SR3, SR4, SR7) using the CLEA v1.04 and CLEA v1.06 software; and WSV's (Water Screening Values) for Human Health using the RBCA v2.5 software. The modelling inputs were made compliant with the SR3 residential conceptual site model and follow the guidance provided within SR3 where possible.
- ✚ Contaminated Land: Applications in Real Environments (CL:AIRE) 'The Soil Generic Assessment Criteria for Human Health Risk Assessment' GAC's via the CLEA v1.06 software (updated version of the v1.04 update after the release of LQM GAC's).

- 8.2.2 It should be noted that the above guidance criteria is generally restricted with depth i.e. the values quoted with reference to human health are generally only applicable in the top 1.00m of soil and do not (dependant on the conceptual site model and conditions identified on site) necessarily identify significant harm. Further detailed quantitative risk assessment (DQRA) may be required.

- 8.2.3 All chemical results have initially been compared against screening criteria for a residential end use.

- 8.2.4 A list of the screening criteria used for soils is presented in Appendix G.

8.3 Risks to Human Health

- 8.3.1 In relation to a residential end use with and without plant uptake the majority of determinants fall below the screening values with the following exception outlined below in Table 8.1: Exceedances in Screening Values:

Table 8.1: Exceedances of Screening Value

Determinand	Recorded concentrations mg/kg	Screening value mg/kg	Number of tests	Number of exceedances
Lead	91-973	200-310	3	1
benzo(a)anthracene	3.08-17.3	4.52	3	2
benzo(a)pyrene	2.87-16.7	5.0	3	2
benzo(b)fluoranthene	3.48-19.4	7.7	3	2
indeno(123-cd)pyrene	2.02-10.1	7.3	3	1
naphthalene	0.16-1.20	0.58	3	2

- 8.3.2 Three samples were analysed for asbestos screen. Fibres were detected in all of the samples, described as amosite and chrysotile fibres from loose insulation.
- 8.3.3 With respect to the elevated concentrations above, a potential risk is only likely to be posed where future end users of the site come into contact with exposed site soils. As such where permanent hardstand is present, this will effectively break the contaminant pathway. In landscaped area the provision of a suitable capping layer will again serve to break any potential contaminant pathway.
- 8.3.4 An outline remedial strategy is discussed further in Section 12.0.

8.4 Risks to Controlled Waters

- 8.4.1 There are no surface water courses recorded within 250m of the site.
- 8.4.2 The underlying superficial deposits are classified as unproductive strata, whilst the underlying aquifer is classified as a Principal Aquifer. However, the site does not lie within a source protection zone and no abstractions are recorded within 1000m of the site.
- 8.4.3 Therefore, based on the above, the results of the chemical analysis, the ground conditions encountered, and given that natural attenuation, dilution and dispersion will take place, the risks to controlled waters are considered to be very low to negligible.

8.5 Plants and Native grasses

- 8.5.1 Any plants that may be grown at the site in areas of landscaping may potentially be at risk from phytotoxic elements in any artificial soils beneath the site.

8.6 Buried Services and Utilities

- 8.6.1 Any organic contamination present in the soils or groundwater beneath the site would pose a risk of premature failure to below ground services via chemical reaction. Based on the chemical analysis carried out during this ground investigation, the risks to buried services and pipelines are considered to be low to medium.
- 8.6.2 It is the responsibility of the utility providers to confirm the risk status and determine what materials should be used in the provision of any newly proposed buried services and utilities based on the results of the chemical analysis with this report. A copy of this report should therefore be provided to the utility contractors.

- 8.6.3 Further chemical analysis of samples taken from the location of any proposed utilities should be taken for confirmation prior to the installation of any buried utilities at the site.

9.0 GROUND GAS RISK ASSESSMENT

9.1 General

- 9.1.1 To date hazardous ground gas monitoring has been carried out at the above site on three occasions. A further three gas monitoring visits are ongoing.
- 9.1.2 The following ground gas risk assessment was carried out in accordance with CIRIA 665, CIRIA 149 and BS 8485.
- 9.1.3 The full results of the gas monitoring regime are presented in Appendix H, and are summarised below.
- 9.1.4 Methane concentrations were recorded at a maximum of 0.0 % v/v; carbon dioxide concentrations ranged between 0.1 and 0.3% v/v; oxygen concentrations ranged between 20.9 and 21.4% v/v; and flows were recorded at below the limit of detection of the instrument (0.0l/hr) during the monitoring period.
- 9.1.5 Hydrogen sulphide concentrations were recorded at 0 ppm.
- 9.1.6 Carbon monoxide concentrations were recorded at 0 ppm.
- 9.1.7 Based on these recorded values a Gas Screening Values (GSVs) for methane were calculated at 0.0000 l/hr; and GSVs for carbon dioxide were calculated at 0.0000 l/hr.
- 9.1.8 Therefore, based on the information gathered to date, the site has been categorised as falling under CIRIA 149 Characteristic Situation (CS) 1; therefore, provided the remaining monitoring is consistent with that recorded to date it is likely that no special precautions are required.
- 9.1.9 The full period of gas monitoring will be required to confirm this conclusion.
- 9.1.10 On completion of the monitoring, it is recommended that the above conclusions are agreed with the local Authority to gain their approval prior to commencing with the construction of the new development.

10.0 UPDATED CONCEPTUAL SITE MODEL (CSM)

10.1.1 On the basis of the above assessment the following refined conceptual model is shown in table 10.2 below:

Table 10.1 Refined Conceptual Site Model

Potential Sources	Potential Receptor	Potential Pathway	Likelihood	Severity	Significant Pollutant Linkage	Risk Classification	Action / Mitigation
Heavy metals, sulphates and inorganics	Human health animals and plants: Including current site users, future site users, neighbouring residents and constructions workers	Ingestion Inhalation of dust Dermal Contact	Possible	High	Possibly Active	Low to high	Lead and PAH levels recorded on site exceed screening values for a residential end use. However, this is dependent upon a physical pathway existing between the current site soils and future end users of the sit post development. Remediation/mitigation required within any proposed landscaped areas.
	Local water courses and associated Flora and fauna.	Contaminants leaching, into water bodies, downward and lateral migration via permeable strata and features.	Unlikely	High	Considered inactive	Very Low to negligible	No further action.
	Secondary Undifferentiated Aquifer and Principle Aquifer	Contaminants leaching, into water bodies, downward and lateral migration via permeable strata and features	Unlikely	High	Considered inactive	Very Low to negligible	No further action.
Phytotoxic elements	Plants and vegetation	Plant uptake	Unlikely	High	Possibly Active	Low to high	Remediation/mitigation required within any proposed landscaped areas.
Hazardous ground gases and vapours (off site and on site sources)	Human health animals and plants: Including current site users, future site users, neighbouring residents and constructions workers	Inhalation	Unlikely	High	Considered inactive	negligible	No special precautions currently deemed necessary. Further gas monitoring required to confirm current conclusions.
	Buildings	Explosion	Unlikely	High	Considered inactive	negligible	

Asbestos	Human health animals and plants: Including current site users, future site users, neighbouring residents and constructions workers	Inhalation	Unlikely	High	Considered inactive	Very Low to negligible	Results of the site investigation confirm that asbestos fibres were recorded in the samples analysed from the site.
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11.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

11.1 Waste Soils Characterisation

- 11.1.1 Any excavation works may potentially produce waste soils for which appropriate waste management will be required. Any off-site disposal of soil requires careful management and due consideration of appropriate legislation, guidance and Duty of Care responsibilities.
- 11.1.2 Waste Acceptance Criteria (WAC) testing should be carried out samples from any materials that require off-site disposal to confirm their waste category. The results of the WAC testing should then be presented to the landfill operator for their confirmation.

11.2 Imported Fill

- 11.2.1 Any imported fill will be subject to specific quality requirements, particularly in any proposed areas of landscaping. Allowance should be made for the testing of imported fill materials prior to emplacement to ensure suitability should the materials be delivered with no testing certification.

11.3 Construction Activities

- 11.3.1 Due consideration should be given to the suppression of noise, dust and vibration emissions from the site during construction

12.0 OUTLINE REMEDIAL RECOMMENDATIONS

- 12.1.1 The investigation and assessments undertaken above indicate a potential contaminant pathway could be introduced at the proposed development whereby site derived soils are exposed at the surface within a residential setting.
- 12.1.2 Where redevelopment includes for 100% cover of hardstanding and no site derived soils are present at the surface, no contaminant pathway is likely to exist and no specific remedial measures required to render the development suitable for use.
- 12.1.3 GeoCon have not been provided with any proposed landscaping plan.
- 12.1.4 Should area of landscaping be proposed, these will require imported subsoil's/topsoil's.
- 12.1.5 Any soils imported to site will require chemical validation to determine they are suitable for the proposed use and that they are installed to a suitable depth to provide a sufficient 'capping' layer provide adequate protection to underlying contaminants and to provide sufficient rooting depth for the intended landscaping.
- 12.1.6 A potable water supply pipeline risk assessment is likely to be required for the site to establish the design specification of pipework within the site.
- 12.1.7 Construction workers could come in to contact with contaminants and asbestos from the shallow made ground soils at the site. It is therefore recommended that suitable consideration is given to health and safety in line with current legislation and guidance.
- 12.1.8 The above assessment and recommendations should be agreed with the Local Planning Authority.

13.0 REFERENCES

-  AGS: *A clients guides and tool kit*
-  Atkins: *AtRisk Soil Screening Values and Water Screening Values*
-  British Geological Survey (BGS): *1:50'000 geological maps of the area*
-  British Geological Survey (BGS): *Open geoscience online mapping tool*
-  BS 5930: *code of Practise for Site Investigation Amendment 2*
-  BS 10175: *Code of Practise for the Investigation of Potentially Contaminated Sites*
-  BRE 211 Radon: *Guidance on protective measures for new buildings*
-  CIRIA 552: *Contaminated Land Risk Assessment; A Guide to Good Practise 2001*
-  CIRIA 665: *Assessing the Risks Posed by Hazardous Ground Gases for Buildings 2007*
-  Coal Authority: *Coal authority mining report and Cheshire brine subsidence report*
-  Contaminated Land: *Applications in Real Environments (CL:AIRE): 'The Soil Generic Assessment Criteria for Human Health Risk Assessment' GAC's.*
-  David Norbury: *Soil and Rock Descriptions in Engineering Practise*
-  Department of the Environment: *DOE industry profiles*
-  EN ISO 14688-1: *Geotechnical investigation and testing -- Identification and classification of soil -- Part 1: Identification and description*
-  EN ISO 14688-2: *Geotechnical investigation and testing -- Identification and classification of soil -- Part 2: Principles for a classification*
-  EN ISO 14689: *Geotechnical investigation and testing -- Identification and classification of rock -- Part 1: Identification and description*
-  Environment Agency (EA): *EA Online & What's in my back yard*
-  Environment Agency (EA): *Soil Guideline Values (SGVs)*
-  Land Quality Management (LQM): *Generic Screening Criteria (GACs)*
-  Landmark: *Envirocheck report and Envirocheck analysis online historical mapping tool.*
-  Ordnance survey: *OS Landranger map for the area; OS open data online mapping tool*
-  Planning Policy 23: *Planning and Pollution Control, Office of The Deputy Prime Minister 2004*
-  R&D Publication CLR 8: *Assessment of risks to human health from land contamination.*
-  R&D Publication CLR 10: *The Contaminated Land Exposure Model (CLEA)*
-  R&D Publication CLR 11: *Model Procedure for the Management of Contaminated Land DEFRA 2004*
-  UK Specification for Ground Investigation Second Edition 2012

APPENDIX A

DRAWINGS



General
Site
Location



GeoCon Site Investigations Ltd
Suite 8 Marple House,
39 Stockport Road,
Marple,
Stockport,
SK6 6BD.
Tel: 0844 504 3901, Fax: 0844 504 3902,
Email: info@geoconsiteinvestigations.com
Web: www.geoconsiteinvestigations.com

SITE NAME/CONTRACT
George Leigh Street, Manchester

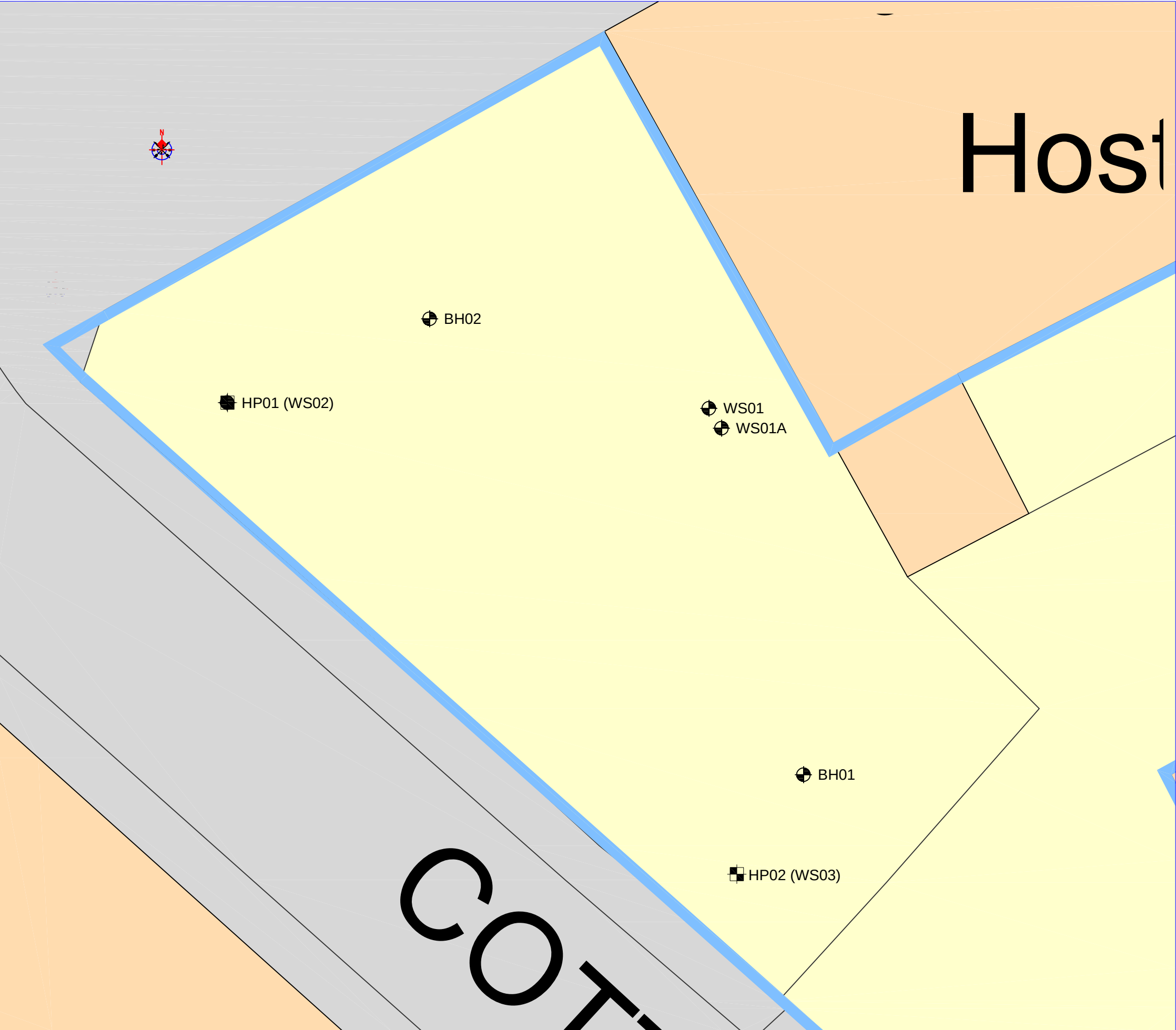
TITLE
Site Location Plan

DRAWING NO.
GSI0517/01

DATE
March 2016

SCALE
N.T.S

DRAWN BY
IW



- LEGEND:
- = North Indicator
 - = Cable Percussion Borehole Location
 - = Window Sample Borehole and Dynamic Probe Location
 - = Hand Pit Location

No.	DATE	AMENDMENT DETAILS	CHECKED BY	DRAWN BY
REVISIONS				
GeoCon Site Investigations Ltd Suite 8 Marple House, 39 Stockport Road, Marple, Stockport. SK6 6BD Tel: +44 (0) 844 504 3901 Fax: +44 (0) 844 504 3902 Email: info@geoconsiteinvestigations.com Web: www.geoconsiteinvestigations.com				
Engineering Geologists				
PROJECT TITLE		GEORGE LEIGH STREET MANCHESTER		
DRAWING TITLE		EXPLORATORY HOLE LOCATION PLAN		
DRAWN BY		IW	PROJECT No.	GSI0517
CHECKED BY		N/A	DRAWING No.	GSI0517/02
DATE		MARCH_2016		
SCALE		NTS	SHEET No.	1
CLIENT		FORSHAW LAND & PROPERTY		

APPENDIX B

CABLE PERCUSSION BOREHOLE LOGS



CABLE PERCUSSION BOREHOLE LOG

Project George Leigh Street, Manchester.				BOREHOLE No BH01	
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument & Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.30 0.50	ES ES						MADE GROUND: Light greyish blue stone over, Brown mottled red to greyish brown clayey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick concrete and mixed lithology. Cobbles are very angular to subangular of brick and concrete.	MG	
1.00 1.20-1.65	ES SB	N3				(2.60)			
1.90 2.00-2.45	ES SB	N6				2.60	Firm to stiff slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of mixed lithology. (TILL) 3.00 Becomes stiff below 3.00 mbgl. 4.00 Becomes firm below 4.00 mbgl. 5.00 Becomes firm to stiff below 5.00 mbgl. 6.50 Becomes soft to firm below 6.50 mbgl.	TILL	
2.60-2.80 2.70	B ES	N11							
3.00-3.45	SB								
4.00-4.45	SB	N6							
5.00-5.45	SB	N10				(5.40)			
6.50-6.95	SB	N9					MADE GROUND: Dark blackish grey very silty GRAVEL. Gravel is angular to subangular fine to coarse of brick. (Possible unmarked tunnel?)	MG	
8.00-8.45	SB	N4				8.00			
9.50-9.95	U100	15 blows				(3.20)			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
All dimensions in metres Scale 1:62.5		Client				Method / Plant Used Dando 150					Logged By Sam Gough



CABLE PERCUSSION BOREHOLE LOG

Project George Leigh Street, Manchester.				BOREHOLE No BH01	
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()		
Contractor				Sheet 2 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument & Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
10.00	B						MADE GROUND: Dark blackish grey very silty GRAVEL. Gravel is angular to subangular fine to coarse of brick. (Possible unmarked tunnel?) (continued)	MG	
11.00-11.45	SB	N29				11.20	Stiff slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium of mixed lithology. (TILL)	TILL	
12.50-12.95	U100	120 blows					12.00 becomes very stiff below 12.00 mbgl.		
12.95-13.10	D					(4.40)			
14.00-14.45	SB	N33							
15.00-15.45	U100	120 blows				15.60			
15.45-15.60	D								

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
			10.70	150.00							
All dimensions in metres Scale 1:62.5						Client			Method / Plant Used Dando 150		Logged By Sam Gough

CABLE PERCUSSION BOREHOLE LOG

Project George Leigh Street, Manchester.				BOREHOLE No BH02
Project ID GSI 0517	Date 29-01-16 29-01-16	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 2

SAMPLES & TESTS			STRATA					Geology	Instrument & Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.30 0.50 0.50	ES B ES						MADE GROUND: Light greyish blue stone over, Dark brown mottled red to greyish brown slightly clayey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick concrete clinker and charcoal and mixed lithology. Cobbles are very angular to subangular of brick and concrete.	MG	
1.00 1.20-1.65	ES SB	N10				(3.20)			
2.00 2.00-2.45	ES SB	N6						TILL	
3.00 3.00-3.45 3.40	ES SB ES	N14				3.20 (0.80) 4.00	Firm to stiff slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of mixed lithology. (TILL)		
4.00-4.45	SB	N10				(1.00)	Firm slightly gravelly SILT. Gravel is angular to subrounded fine to medium of mixed lithology. (TILL)	TILL	
5.00-5.45	SB	N9				(1.00) 6.00	Firm to stiff slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of mixed lithology. (TILL)	TILL	
6.50-6.95 6.95-7.10	U100 D	80 blows				(2.00) 8.00	Firm to stiff slightly gravelly SILT. Gravel is angular to subrounded fine to medium of mixed lithology. (TILL)	TILL	
8.00-8.45	SB	N18					Firm to stiff slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of mixed lithology. (TILL)	TILL	
9.50-9.95	U100	80 blows							

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
			9.00	150.00		2.60	2.80	00.45			
All dimensions in metres Scale 1:62.5						Client		Method / Plant Used Dando 150			Logged By Sam Gough

Exploratory hole cleared of buried services. Hand pit excavated to 1.20 mbgl. No groundwater encountered.

CABLE PERCUSSION BOREHOLE LOG

Project George Leigh Street, Manchester.				BOREHOLE No BH02
Project ID GSI 0517	Date 29-01-16 29-01-16	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 2 of 2

[illegible]

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											Exploratory hole cleared of buried services. Hand pit excavated to 1.20 mbgl. No groundwater encountered.

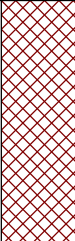
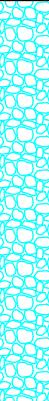
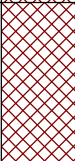
All dimensions in metres Scale 1:62.5	Client	Method / Plant Used Dando 150	Logged By Sam Gough
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APPENDIX C

WINDOW SAMPLE BOREHOLE & DYNAMIC PROBE LOGS

WINDOWLESS SAMPLE BOREHOLE LOG

Project George Leigh Street, Manchester.				WINDOWLESS SAMPLE BOREHOLE No WS01
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1

SAMPLES & TESTS			STRATA					Geology	Instrument & Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.30	ES					(0.60) 0.60	MADE GROUND: Light greyish blue stone over, Brown mottled red clayey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick concrete and mixed lithology. Cobbles are very angular to subangular of brick.	MG	
0.80	ES					(0.40) 1.00	MADE GROUND: Red to brownish grey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick and concrete. Cobbles are very angular to subangular of brick and concrete.	MG	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											Exploratory hole cleared of buried services. Hand pit excavated to 0.40 mbgl. Hand pit terminated due to ground conditions. No groundwater encountered. WS terminated at 1.00 mbgl due to ground conditions.

All dimensions in metres Scale 1:18.75	Client	Method / Plant Used Competitor Dart	Logged By Sam Gough
---	--------	--	------------------------



WINDOWLESS SAMPLE BOREHOLE LOG

Project George Leigh Street, Manchester.				WINDOWLESS SAMPLE BOREHOLE No WS01A	
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()		
Contractor				Sheet 1 of 2	

SAMPLES & TESTS			STRATA					Geology	Instrument & Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.50	ES					(0.70)	MADE GROUND: Light greyish blue stone over, Brown mottled red clayey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick concrete and mixed lithology. Cobbles are very angular to subangular of brick.	MG	
0.90	ES					0.70	MADE GROUND: Red to brownish grey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick and concrete. Cobbles are very angular to subangular of brick and concrete.	MG	
1.50	ES					(1.30)			
						2.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Depth	From	To	Hours	From	To	
All dimensions in metres Scale 1:12.5			Client			Method / Plant Used Competitor Dart					Logged By Sam Gough



Project George Leigh Street, Manchester.				WINDOWLESS SAMPLE BOREHOLE No WS01A
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 2 of 2

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Depth	From	To	Hours	From	To	
											Exploratory hole cleared of buried services. No groundwater encountered. WS terminated at 2.00 mbgl due to ground conditions.

Logged By
Sam Gough

DYNAMIC PROBE LOG

Project George Leigh Street, Manchester.				DYNAMIC PROBE No DP02
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	3 3 6 5 3 2 3 3 4 2 2 3 3 2 1 1 4 3 3 3 1 0 0 6 7 4 2 2 4 4 3 5 3 4 2 2 2 3 2 2 2 3 2 6 4								
2									
3									
4									
5									

Hammer Wt (kg)	63.5		GENERAL REMARKS DP02 to replace WS02. Exploratory hole cleared of buried services. No groundwater encountered.
Hammer Drop (mm)	750		
Cone Dia (mm)	22		
Cone Type	SHDP		
Damper			
All dimensions in metres Scale 1:37.5	Client	Method / Plant Used Competitor Dart	Logged By Sam Gough



DYNAMIC PROBE LOG

Project George Leigh Street, Manchester.				DYNAMIC PROBE No DP03
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1

Depth (m)	Readings (blows/100mm)	Diagram (N100 Values)						Torque (Nm)	Remarks
		5	10	15	20	25	30		
1	1 6 6 4 2 2 3 2 1 1 0								
2	1 2 4 2 2 2 2 3 2 5 3 3								
3	1 4 5 3 2 2 3 4 4 5 5 4								
4	2 3 4 4 3 5 5 4 2 2 1 2								
5	2 2 2 2 2 2 2 2 2 2 2 2								

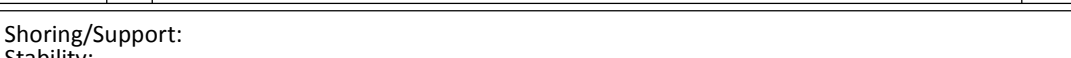
Hammer Wt (kg)	63.5		GENERAL REMARKS DP03 to replace WS03. Exploratory hole cleared of buried services. No groundwater encountered.
Hammer Drop (mm)	750		
Cone Dia (mm)	22		
Cone Type	SHDP		
Damper			
All dimensions in metres Scale 1:37.5	Client	Method / Plant Used Competitor Dart	Logged By Sam Gough

APPENDIX D
HAND PIT LOGS

HAND PIT LOG

Project George Leigh Street, Manchester.				HAND PIT No
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()	HP01 (WS02)
Contractor				
				Sheet 1 of 1

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.50		MADE GROUND: Light greyish blue stone over, brown mottled red very sandy very gravelly CLAY with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick concrete and mixed lithology. Cobbles are very angular to subangular of brick.	0.20	ES	
			0.40	ES	
0.50-0.60		MADE GROUND: Red to brownish grey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick and concrete. Cobbles are very angular to subangular of brick and concrete.			

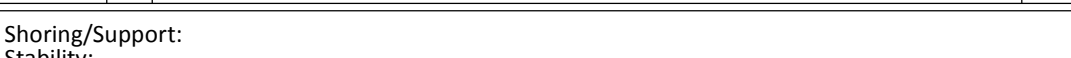
Shoring/Support: Stability:  The diagram shows a rectangular excavation pit. The top horizontal dimension is labeled 'A'. The right vertical dimension is labeled 'B'. The bottom horizontal dimension is labeled 'C'. To the left of the rectangle is a vertical dimension line labeled 'D'. To the right of the rectangle is a north arrow pointing upwards, labeled 'N'.	GENERAL REMARKS HP01 to replace WS02. Exploratory hole cleared of buried services. Hand pit excavated to 0.60 mbgl. Hand pit terminated due to ground conditions.
---	--

All dimensions in metres Scale 1:12.5	Client	Method / Plant Used Hand Digging Equipment	Logged By Sam Gough
--	--------	---	------------------------

HAND PIT LOG

Project George Leigh Street, Manchester.				HAND PIT No
Project ID GSI 0517	Date 28-01-16 28-01-16	Ground Level (m)	Co-Ordinates ()	HP02 (WS03)
Contractor				
				Sheet 1 of 1

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.35		MADE GROUND: Light greyish blue stone over, brown mottled red very sandy very gravelly CLAY with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick concrete and mixed lithology. Cobbles are very angular to subangular of brick.	0.20	ES	
0.35-0.50		MADE GROUND: Red to brownish grey very sandy GRAVEL with abundant cobbles. Gravel is very angular to subangular fine to coarse of brick and concrete. Cobbles are very angular to subangular of brick and concrete.	0.45	ES	

Shoring/Support: Stability: 	GENERAL REMARKS HP02 to replace WS03. Exploratory hole cleared of buried services. Hand pit excavated to 0.50 mbgl. Hand pit terminated due to ground conditions.
---	--

All dimensions in metres Scale 1:12.5	Client	Method / Plant Used Hand Digging Equipment	Logged By Sam Gough
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APPENDIX E

GEOTECHNICAL TESTING RESULTS



LABORATORY REPORT



4043

Contract Number: PSL16/0518

Report Date: 17 February 2016
Client's Reference: GSI0517
Client Name: Geocon Site Investigations Ltd
Suite 8 Marple House
39 Stockport Road
Marple, Stockport
SK6 6BD

For the attention of: Ian Walker

Contract Title: George Leigh Street, Manchester
Date Received: 05/02/2016
Date Commenced: 05/02/2016
Date Completed: 17/02/2016

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)

R Berriman
(Quality Manager)

D Lambe
(Senior Technician)

S Royle
(Senior Technician)

W Allen
(Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

PSL
Professional Soils Laboratory

Checked / Approved		Date	17/02/16	Contract No:
George Leigh Street, Manchester				PSL16/0518
				Client Ref:
				GSI 0517

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**



PSL
Professional Soils Laboratory

Checked / Approved



Date _____

17/02/16

Contract No:

PSL16/0518

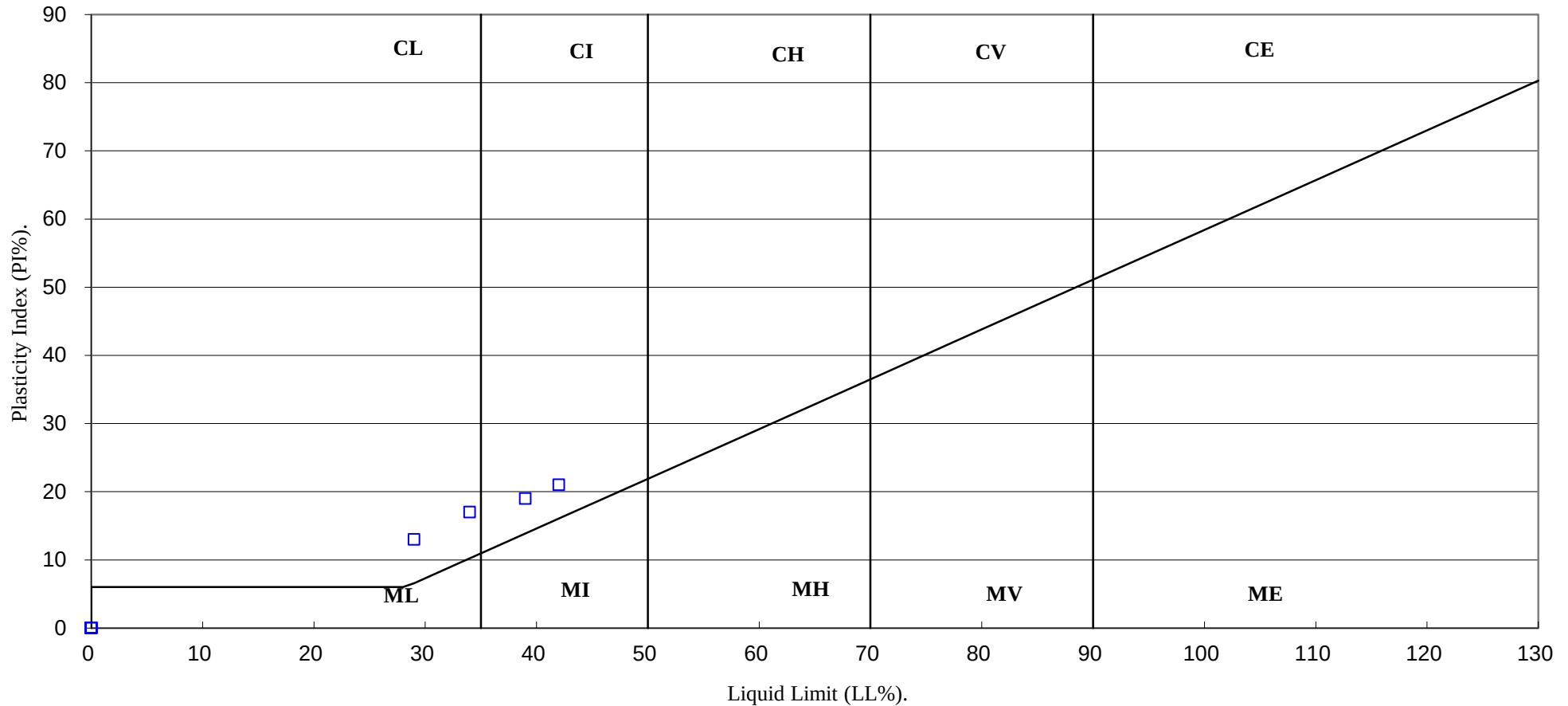
Client Ref:

GSI 0517

George Leigh Street, Manchester

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



PSL
Professional Soils Laboratory

Checked /Approved

[Signature]

Date

17/02/16

Contract No:

PSL16/0518

Client Ref:

GSI 0517

George Leigh Street, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

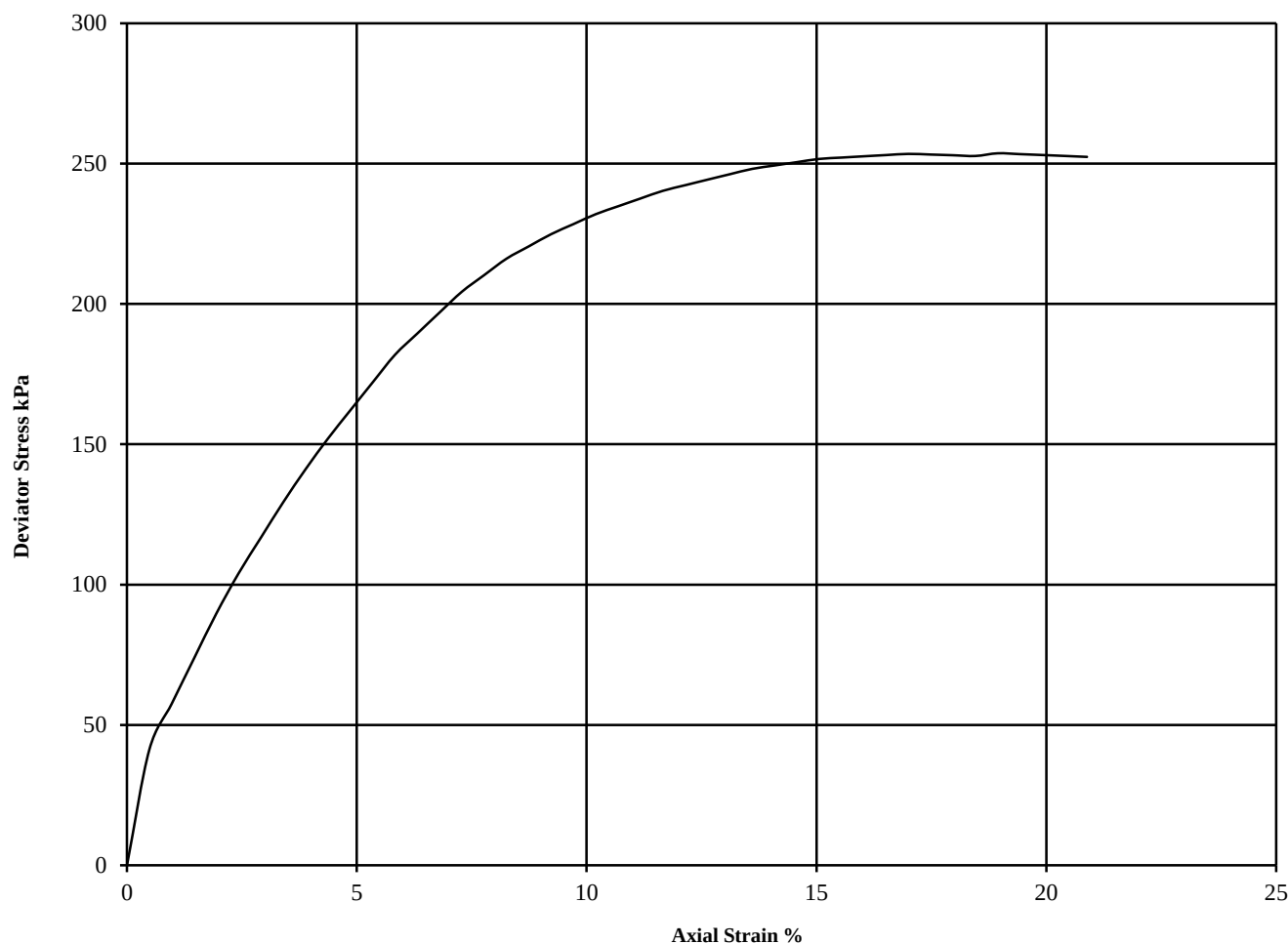
Hole Number: BH01

Top Depth (m): 12.50

Sample Number:

Base Depth (m):

Sample Type U100



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell	Corr. Max.	Shear	Failure Strain (%)	Mode of Failure	Undisturbed Sample
				Pressure	Deviator	Strength			Sample taken from top of tube
				(kPa)	Stress	Cu			Rate of strain = 2 %/min
				(kPa)	(kPa)				Latex Membrane used 0.2 mm thick,
				θ_3	$(\theta_1-\theta_3)_f$	$^{1/2}(\theta_1-\theta_3)_f$			Correction applied 0.34
1	16	2.20	1.90	250	254	127	18.9	Plastic	See summary of soil descriptions.



Checked / Approved	Date	Contract No:
	17/02/16	PSL16/0518
George Leigh Street, Manchester		Client Ref:
		GSI 0517

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

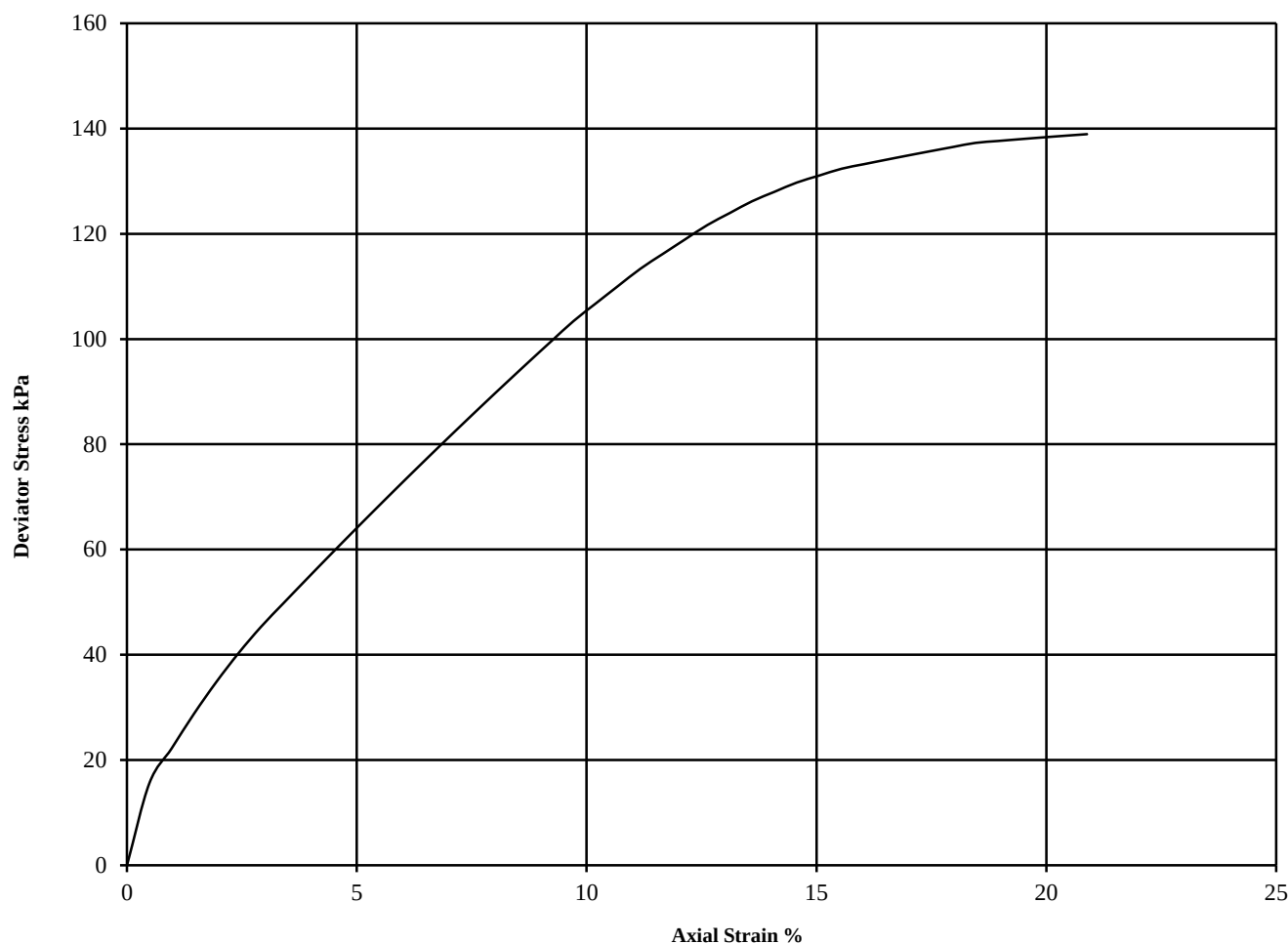
Hole Number: BH02

Top Depth (m): 6.50

Sample Number:

Base Depth (m):

Sample Type U100



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	18	2.13	1.81	130	139	69	20.9	Plastic	



Checked / Approved

Date

17/02/16

Contract No:

PSL16/0518

Client Ref:

GSI 0517

George Leigh Street, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

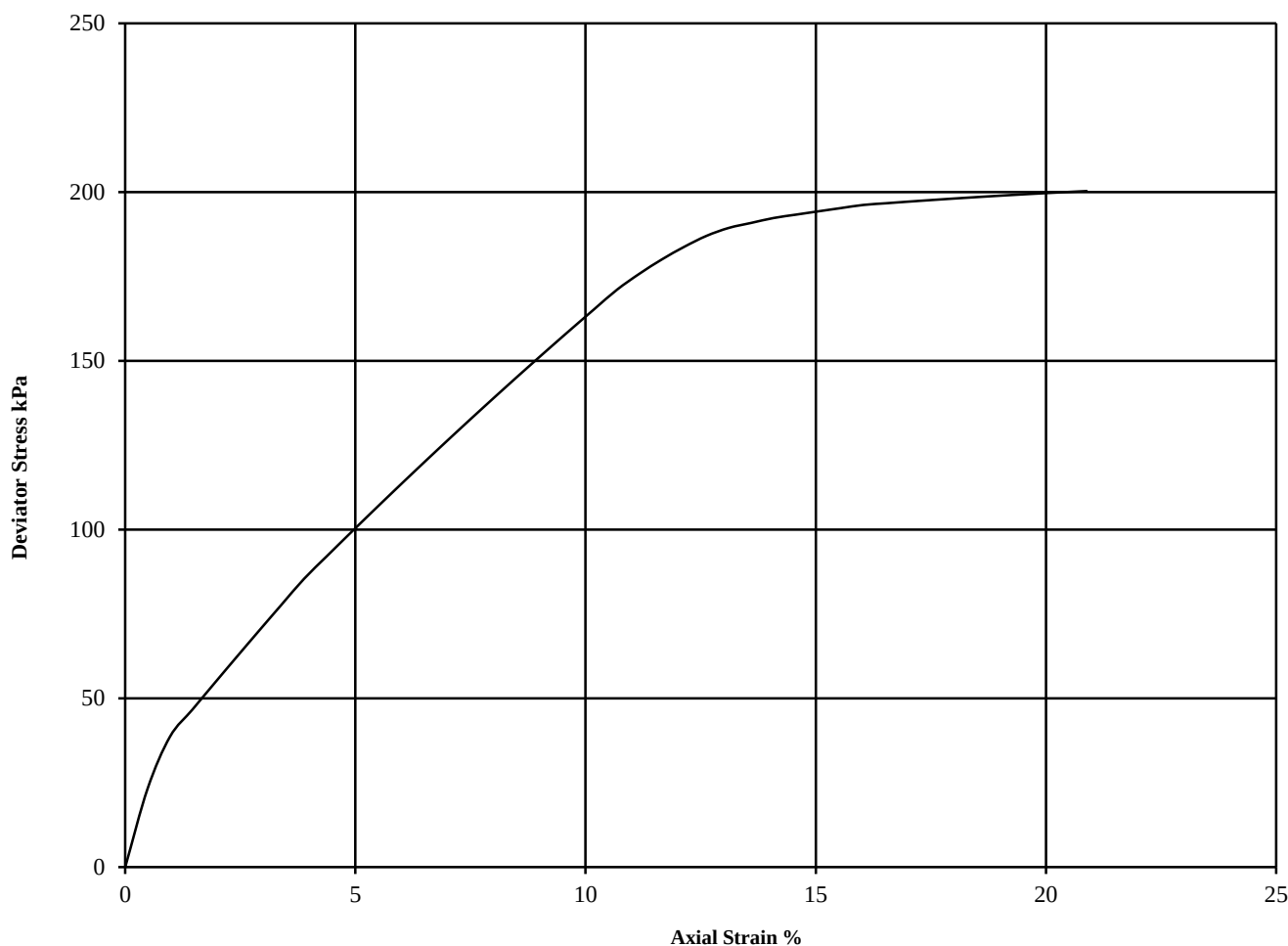
Hole Number: BH02

Top Depth (m): 9.50

Sample Number:

Base Depth (m):

Sample Type U100



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	17	2.14	1.83	190	200	100	20.9	Plastic	



Checked / Approved

(Signature)

Date

17/02/16

Contract No:

PSL16/0518

Client Ref:

GSI 0517

George Leigh Street, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

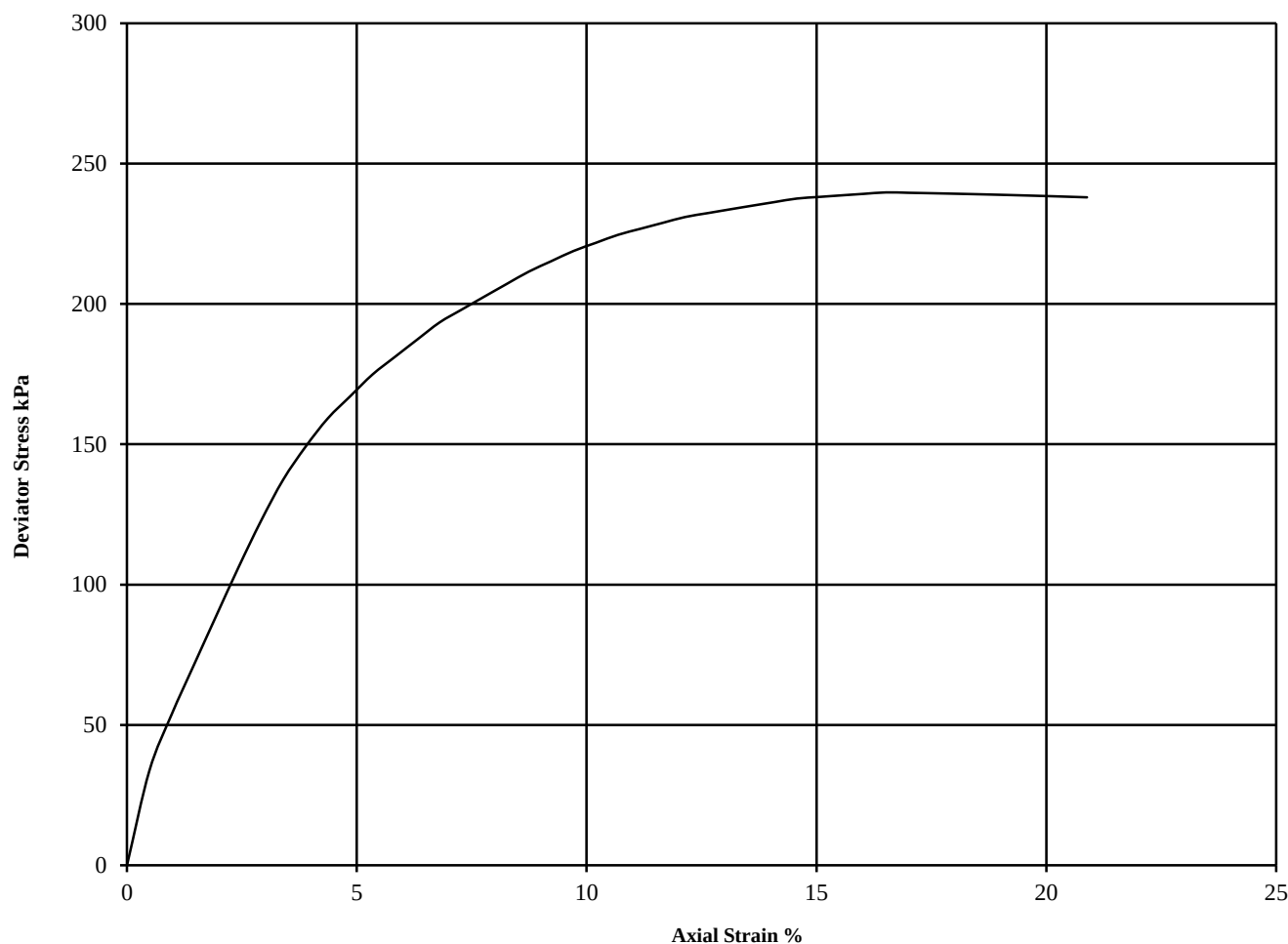
Hole Number: BH02

Top Depth (m): 12.50

Sample Number:

Base Depth (m):

Sample Type U100



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell	Corr. Max.	Shear	Failure Strain (%)	Mode of Failure	Undisturbed Sample
				Pressure	Deviator	Strength			Sample taken from top of tube
				(kPa)	Stress	Cu			Rate of strain = 2 %/min
				(kPa)	(kPa)				Latex Membrane used 0.2 mm thick,
				θ_3	$(\theta_1-\theta_3)_f$	$^{1/2}(\theta_1-\theta_3)_f$			Correction applied 0.34
1	17	2.18	1.87	250	240	120	16.5	Plastic	See summary of soil descriptions.



Checked / Approved



Date

17/02/16

Contract No:

PSL16/0518

George Leigh Street, Manchester

Client Ref:

GSI 0517



Certificate of Analysis

Certificate Number 16-57851

16-Feb-16

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 16-57851

Client Reference PSL16/0518

Order No (not supplied)

Contract Title George Leigh Street, Manchester

Description 4 Soil samples.

Date Received 10-Feb-16

Date Started 10-Feb-16

Date Completed 16-Feb-16

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read 'Rob Brown'.

Rob Brown
Business Manager



Summary of Chemical Analysis Soil Samples

Our Ref 16-57851

Client Ref PSL16/0518

Contract Title George Leigh Street, Manchester

Lab No	940101	940102	940103	940104
Sample ID	BH01	BH02	BH02	BH02
Depth	9.50	0.50	4.00	8.00
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	11	14	14	< 10
Inorganics							
pH	DETSC 2008#			8.4	8.4	9.0	8.5
Chloride Aqueous Extract	DETSC 2055	1	mg/l	18	14	9.8	11
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	< 1.0	1.4	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	140	140	340	51

Information in Support of the Analytical Results

Our Ref 16-57851
Client Ref PSL16/0518
Contract George Leigh Street, Manchester

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
940101	BH01 9.50 SOIL		PT 500ml	Sample date not supplied	
940102	BH02 0.50 SOIL		PT 500ml	Sample date not supplied	
940103	BH02 4.00 SOIL		PT 500ml	Sample date not supplied	
940104	BH02 8.00 SOIL		PT 500ml	Sample date not supplied	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months



Certificate of Analysis

Certificate Number 16-57851-1

01-Mar-16

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 16-57851-1

Client Reference PSL16/0518

Order No (not supplied)

Contract Title George Leigh Street, Manchester

Description 4 Soil samples.

Date Received 10-Feb-16

Date Started 10-Feb-16

Date Completed 01-Mar-16

Test Procedures Identified by prefix DETSn (details on request).

Notes This report supersedes 16-57851. Extra testing.

Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read 'Rob Brown'.

Rob Brown
Business Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 16-57851-1

Client Ref PSL16/0518

Contract Title George Leigh Street, Manchester

Lab No	940101	940102	940103	940104
Sample ID	BH01	BH02	BH02	BH02
Depth	9.50	0.50	4.00	8.00
Other ID				
Sample Type	SOIL	SOIL	SOIL	SOIL
Sampling Date	n/s	n/s	n/s	n/s
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	11	14	14	< 10
Inorganics							
pH	DETSC 2008#			8.4	8.4	9.0	8.5
Chloride Aqueous Extract	DETSC 2055	1	mg/l	18	14	9.8	11
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0	< 1.0	1.4	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	140	140	340	51
Sulphur as S, Total	DETSC 2320	0.01	%	0.12	0.14	0.08	0.23
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.06	0.06	0.11	0.04

Information in Support of the Analytical Results

Our Ref 16-57851-1
Client Ref PSL16/0518
Contract George Leigh Street, Manchester

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
940101	BH01 9.50 SOIL		PT 500ml	Sample date not supplied	
940102	BH02 0.50 SOIL		PT 500ml	Sample date not supplied	
940103	BH02 4.00 SOIL		PT 500ml	Sample date not supplied	
940104	BH02 8.00 SOIL		PT 500ml	Sample date not supplied	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time and/or inappropriate containers are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX F

CHEMICAL TESTING RESULTS

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 16/00642
Issue Number: 1

Date: 10 February, 2016

Client: Geocon Site Investigations Ltd
15 Belmont Drive
Marple Bridge
Stockport
UK
SK6 5EA

Project Manager: Ian Walker
Project Name: George Leigh Street, Manchester
Project Ref: GSI0517
Order No: PO 16/0059
Date Samples Received: 03/02/16
Date Instructions Received: 04/02/16
Date Analysis Completed: 10/02/16

Prepared by:



Kate Ellison
Administrative Assistant

Approved by:



Lianne Bromiley
Senior Client Manager

Envirolab Job Number: 16/00642

Client Project Name: George Leigh Street, Manchester

Client Project Ref: GSI0517

Lab Sample ID	16/00642/1	16/00642/9	16/00642/12	16/00642/16					Units	Method ref
Client Sample No										
Client Sample ID	WS01	HP02 (WS03)	BH01	BH02						
Depth to Top	0.30	0.20	0.50	0.30						
Depth To Bottom										
Date Sampled	28-Jan-16	28-Jan-16	28-Jan-16	29-Jan-16						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AB	5AB	5ABE	5AB						
% Stones >10mm _A [#]	<0.1	-	14.2	<0.1					% w/w	A-T-044
pH _D ^{M#}	8.54	-	8.43	9.95					pH	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	-	0.04	0.12					g/l	A-T-026s
Cyanide (total) _A ^{M#}	<1	-	<1	<1					mg/kg	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	-	<0.2	<0.2					mg/kg	A-T-050s
Arsenic _D ^{M#}	9	-	5	4					mg/kg	A-T-024s
Cadmium _D ^{M#}	1.0	-	0.7	<0.5					mg/kg	A-T-024s
Copper _D ^{M#}	40	-	45	30					mg/kg	A-T-024s
Chromium _D ^{M#}	22	-	22	15					mg/kg	A-T-024s
Lead _D ^{M#}	973	-	111	91					mg/kg	A-T-024s
Mercury _D	0.32	-	0.28	0.41					mg/kg	A-T-024s
Nickel _D ^{M#}	19	-	30	15					mg/kg	A-T-024s
Selenium _D	2	-	2	1					mg/kg	A-T-024s
Zinc _D ^{M#}	202	-	93	58					mg/kg	A-T-024s

Envirolab Job Number: 16/00642

Client Project Name: George Leigh Street, Manchester

Client Project Ref: GSI0517

Lab Sample ID	16/00642/1	16/00642/9	16/00642/12	16/00642/16					Units	Method ref
Client Sample No										
Client Sample ID	WS01	HP02 (WS03)	BH01	BH02						
Depth to Top	0.30	0.20	0.50	0.30						
Depth To Bottom										
Date Sampled	28-Jan-16	28-Jan-16	28-Jan-16	29-Jan-16						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AB	5AB	5ABE	5AB						
Asbestos in Soil (inc. matrix)										
Asbestos in soil _A [#]	Amosite	Chrysotile	-	Chrysotile						A-T-045
Asbestos Matrix (microscope) _A	Loose insulation	Loose insulation	-	Loose insulation						A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	-	N/A						Gravimetry

Envirolab Job Number: 16/00642

Client Project Name: George Leigh Street, Manchester

Client Project Ref: GSI0517

Lab Sample ID	16/00642/1	16/00642/9	16/00642/12	16/00642/16					Units	Method ref
Client Sample No										
Client Sample ID	WS01	HP02 (WS03)	BH01	BH02						
Depth to Top	0.30	0.20	0.50	0.30						
Depth To Bottom										
Date Sampled	28-Jan-16	28-Jan-16	28-Jan-16	29-Jan-16						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AB	5AB	5ABE	5AB						
PAH 16										
Acenaphthene _A ^{M#}	0.56	-	4.14	2.50					mg/kg	A-T-019s
Acenaphthylene _A ^{M#}	0.05	-	0.19	0.18					mg/kg	A-T-019s
Anthracene _A ^{M#}	1.02	-	7.33	4.50					mg/kg	A-T-019s
Benzo(a)anthracene _A ^{M#}	3.08	-	17.3	8.84					mg/kg	A-T-019s
Benzo(a)pyrene _A ^{M#}	2.87	-	16.7	8.05					mg/kg	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	3.48	-	19.4	8.70					mg/kg	A-T-019s
Benzo(ghi)perylene _A ^{M#}	1.91	-	9.54	4.09					mg/kg	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	1.25	-	6.43	3.72					mg/kg	A-T-019s
Chrysene _A ^{M#}	3.13	-	17.1	9.36					mg/kg	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.40	-	2.42	1.04					mg/kg	A-T-019s
Fluoranthene _A ^{M#}	6.78	-	38.9	20.4					mg/kg	A-T-019s
Fluorene _A ^{M#}	0.44	-	3.38	2.28					mg/kg	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	2.02	-	10.1	4.39					mg/kg	A-T-019s
Naphthalene _A ^{M#}	0.16	-	1.13	1.20					mg/kg	A-T-019s
Phenanthrene _A ^{M#}	4.02	-	26.2	17					mg/kg	A-T-019s
Pyrene _A ^{M#}	6.28	-	35.6	19.3					mg/kg	A-T-019s
PAH (total 16) _A ^{M#}	37.5	-	216	116					mg/kg	A-T-019s

Envirolab Job Number: 16/00642

Client Project Name: George Leigh Street, Manchester

Client Project Ref: GSI0517

Lab Sample ID	16/00642/1	16/00642/9	16/00642/12	16/00642/16					Units	Method ref
Client Sample No										
Client Sample ID	WS01	HP02 (WS03)	BH01	BH02						
Depth to Top	0.30	0.20	0.50	0.30						
Depth To Bottom										
Date Sampled	28-Jan-16	28-Jan-16	28-Jan-16	29-Jan-16						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AB	5AB	5ABE	5AB						
Speciated PCB-EC7										
PCB BZ 28 _A ^{M#}	<0.002	-	<0.002	<0.002					mg/kg	A-T-004s
PCB BZ 52 _A ^{M#}	<0.002	-	<0.002	<0.002					mg/kg	A-T-004s
PCB BZ 101 _A ^{M#}	<0.004	-	<0.004	<0.004					mg/kg	A-T-004s
PCB BZ 118 _A ^{M#}	<0.007	-	<0.007	<0.007					mg/kg	A-T-004s
PCB BZ 138 _A ^{M#}	<0.006	-	<0.006	<0.006					mg/kg	A-T-004s
PCB BZ 153 _A ^{M#}	<0.004	-	<0.004	<0.004					mg/kg	A-T-004s
PCB BZ 180 _A ^{M#}	<0.004	-	<0.004	<0.004					mg/kg	A-T-004s
PCB Total of EC7 _A ^{M#}	<0.007	-	<0.007	<0.007					mg/kg	A-T-004s

Envirolab Job Number: 16/00642

Client Project Name: George Leigh Street, Manchester

Client Project Ref: GSI0517

Lab Sample ID	16/00642/1	16/00642/9	16/00642/12	16/00642/16					Units	Method ref
Client Sample No										
Client Sample ID	WS01	HP02 (WS03)	BH01	BH02						
Depth to Top	0.30	0.20	0.50	0.30						
Depth To Bottom										
Date Sampled	28-Jan-16	28-Jan-16	28-Jan-16	29-Jan-16						
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES						
Sample Matrix Code	5AB	5AB	5ABE	5AB						
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Ali >C6-C8 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Ali >C8-C10 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Ali >C10-C12 _A [#]	<0.1	-	1.7	1.8					mg/kg	A-T-023s
Ali >C12-C16 _A [#]	0.5	-	8.4	9.8					mg/kg	A-T-023s
Ali >C16-C21 _A [#]	9.1	-	10.4	20.6					mg/kg	A-T-023s
Ali >C21-C35 _A [#]	178	-	49.5	126					mg/kg	A-T-023s
Total Aliphatics _A	188	-	70.0	158					mg/kg	A-T-022+23s
Aro >C5-C7 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Aro >C7-C8 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Aro >C8-C9 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Aro >C9-C10 _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
Aro >C10-C12 _A [#]	1.4	-	1.8	3.6					mg/kg	A-T-023s
Aro >C12-C16 _A [#]	12.9	-	36.9	53.8					mg/kg	A-T-023s
Aro >C16-C21 _A [#]	44.6	-	124	178					mg/kg	A-T-023s
Aro >C21-C35 _A [#]	223	-	399	557					mg/kg	A-T-023s
Total Aromatics _A	282	-	562	792					mg/kg	A-T-022+23s
TPH (Ali & Aro) _A	470	-	632	950					mg/kg	A-T-022+23s
BTEX - Benzene _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Toluene _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
BTEX - o Xylene _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s
MTBE _A [#]	<0.01	-	<0.01	<0.01					mg/kg	A-T-022s

REPORT NOTES

Notes - Soil chemical analysis

All results are reported as dry weight (<40 °C).

For samples with Matrix Codes 1 - 6 natural stones and brick and concrete fragments >10mm are removed or excluded from the sample prior to analysis and reported results corrected to a whole sample basis. For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis.

Notes - General

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Subscript "A" indicates analysis performed on the sample as received. "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve, unless asbestos is found to be present in which case all analysis is performed on the sample as received.

All analysis is performed on the dried and crushed sample for samples with Matrix Code 7 and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos and/or if they are from outside the European Union and this supercedes any "D" subscripts.

Superscript "M" indicates method accredited to MCERTS.

If results are in italic font they are associated with an AQC failure. These are not accredited and are unreliable.

A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

TPH analysis of water by method A-T-007

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Asbestos in soil

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if present as discrete fibres/fragments. Stones etc. are not removed from the sample prior to analysis.

Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample. Samples with Matrix Code 7 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

IS indicates Insufficient sample for analysis.

NDP indicates No Determination Possible.

NAD indicates No Asbestos Detected.

N/A indicates Not Applicable.

Superscript # indicates method accredited to ISO 17025.

Analytical results reflect the quality of the sample at the time of analysis only. Opinions and interpretations expressed are outside the scope of our accreditation.

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Geocon Site Investigations Ltd, 15 Belmont Drive, Marple Bridge, Stockport, UK, SK6 5EA

Project No:

16/00642

Date Instructions Received: 04/02/2016 (am)

Project: George Leigh Street, Manchester

Clients Project No: GSI0517

NO DEVIATIONS IDENTIFIED

APPENDIX G

CHEMICAL SCREENING CRITERIA



GeoCon Site Investigations Ltd

November 2015

GENERIC SCREENING CRITERIA FOR GENERIC QUANTITATIVE RISK ASSESSMENT

GeoCon Screening Values For a Residential End Use Without Consumption of Home Grown Vegetables at 1% SOM

November 2015

Compound	SSV's Residential With Consumption of Home Grown Vegetables		WSV's Residential		DWS		EQS	
	mg/kg	Ref	mg/l	Ref	µg/l	Ref	µg/l	Ref
Metals								
Antimony	113	E	-	-	-	-	-	-
Arsenic	32	E	-	-	10	F	50	G
Barium	43.4	E	-	-	-	-	-	-
Beryllium	60.3	E	-	-	-	-	-	-
Boron	291	B	-	-	-	-	-	-
Cadmium (pH 6, 7, 8)	10	E	-	-	5	F	5	G
Chromium III	627	B	-	-	-	-	-	-
Chromium VI	4.3	B	-	-	50	F	5	G
Copper	3970	E	-	-	2000	F	1	G
Lead	130 - 330	H	-	-	25	F	4	G
Mercury (elemental)	0.0607	E	0.428	E	-	-	-	-
Mercury (Inorganic)	170	E	-	-	-	-	-	-
Mercury (methyl)	6.28	E	5660	E	1	F	1	G
Molybdenum	74.6	E	-	-	-	-	-	-
Nickel	130	E	-	-	20	F	50	G
Selenium	350	E	-	-	10	F	-	-
Vanadium	113	E	-	-	-	-	-	-
Zinc	16900	E	-	-	5000	F	75	G
Non-Metals								
Free-Cyanide (Total)	34	E	-	-	50	F	-	-
Phenol and Chlorophenols								
Phenol	162	E	269000	E	0.5	F	-	-
Chlorophenols	0.87	B	-	-	-	-	-	-
Pentachlorophenol	0.55	B	-	-	-	-	-	-
Poly Aromatic Hydrocarbons (PAH) (1.0% SOM)								
Acenaphthene	588	E	-	-	-	-	-	-
Acenaphthylene	170	B	-	-	-	-	-	-
Anthracene	8270	E	-	-	-	-	-	-
Benzo(a)anthracene	4.52	E	-	-	-	-	-	-
Benzo(a)pyrene	2.7 - 5.1	H	-	-	-	-	-	-
Benzo(b)fluoranthene	7.72	E	-	-	-	-	-	-
Benzo(ghi)perylene	96.2	E	-	-	0.01	F	-	-
Benzo(k)fluoranthene	84.4	E	-	-	-	-	-	-
Chrysene	585	E	-	-	-	-	-	-
Dibenzo(ah)anthracene	0.838	E	-	-	-	-	-	-
Fluoranthene	822	E	-	-	-	-	0.02	G
Fluorene	615	E	-	-	-	-	-	-
Indeno(123-cd)pyrene	7.31	E	-	-	-	-	-	-
Napthalene	0.585	E	99.8	E	-	-	-	-
Phenanthrene	92	B	-	-	-	-	-	-
Pyrene	563	E	-	-	-	-	-	-

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GSV's Residential WCHGV 1% SOM



GeoCon Site Investigations Ltd

November 2015

GENERIC SCREENING CRITERIA FOR GENERIC QUANTITATIVE RISK ASSESSMENT

Compound	SSV's Residential With Consumption of Home Grown Vegetables		WSV's Residential		DWS		EQS	
	mg/kg	Ref	mg/l	Ref	µg/l	Ref	µg/l	Ref
Total PAH	-		-	-	0.2	F	-	-
Petroleum Hydrocarbons (TPH CWG)								
MTBE	20	E	-	-	-	-	-	-
Bezene	0.0493	E	8.46	E	-	-	-	-
Toluene	86.9	E	9090	E	-	-	-	-
Ethylbenzene	38.2	E	1250	E	-	-	-	-
o-Xylene	18.9	E	503	E	-	-	-	-
m-Xylene	17.9	E	413	E	-	-	-	-
p-Xylene	17.2	E	432	E	-	-	-	-
TPH Aliphatic EC5-6	30.1	E	198	E	-	-	-	-
TPH Aliphatic EC6-8	69.8	E	144	E	-	-	-	-
TPH Aliphatic EC8-10	9.79	E	2.9	E	-	-	-	-
TPH Aliphatic EC10-12	1390	E	2.23	E	-	-	-	-
TPH Aliphatic EC12-16	5100	E	-	-	-	-	-	-
TPH Aliphatic EC16-35	145000	E	-	-	-	-	-	-
TPH Aliphatic EC35-44	45000	B	-	-	-	-	-	-
TPH Aromatic EC5-7	0.0493	E	8.46	E	-	-	-	-
TPH Aromatic EC7-8	86.9	E	9090	E	-	-	-	-
TPH Aromatic EC8-10	14.8	E	96.5	E	-	-	-	-
TPH Aromatic EC10-12	57.3	E	380	E	-	-	-	-
TPH Aromatic EC12-16	142	E	-	-	-	-	-	-
TPH Aromatic EC16-21	272	E	-	-	-	-	-	-
TPH Aromatic EC21-35	888	E	-	-	-	-	-	-
VOC and SVOC								
1,1,1-Trichloroethane	2.23	E	1270	E	-	-	-	-
1,1,1,2-Tetrachloroethane	0.353	E	96.7	E	-	-	-	-
1,1,2,2-Tetrachloroethane	0.695	E	650	E	-	-	-	-
1,2-Dichloroethane	0.00190	E	3.54	E	-	-	-	-
1,1,2 Trichloroethane	0.258	E	208	E	-	-	-	-
1,1-Dichloroethane	0.827	E	1110	E	-	-	-	-
1,1-Dichloroethene	0.0857	E	65.6	E	-	-	-	-
1,2,4-Trimethylbenzene	0.906	E	9.83	E	-	-	-	-
1,2-Dichloropropane	0.00784	E	11.1	E	-	-	-	-
2-Chloronaphthalene	1.42	E	62.7	E	-	-	-	-
2-Methylphenol	78.1	E	-	-	-	-	-	-
2,4-Dichloro-o-cresol	31.1	E	-	-	-	-	-	-
2,4-Dimethylphenol	17.2	E	30900	E	-	-	-	-
2,4-Dinitrotoluene	1.41	E	-	-	-	-	-	-
2,4,6-Trinitrotoluene	1.6	B	-	-	-	-	-	-
2,6-Dinitrotoluene	0.751	E	-	-	-	-	-	-
2,6-bis(1,1-dimethyl)-4-(1-methylpropyl)-phenol	21.7	E	-	-	-	-	-	-
3-Methylphenol	77.4	E	-	-	-	-	-	-
4-Methylphenol	76.8	E	-	-	-	-	-	-
Biphenyl	82.8	E	-	-	-	-	-	-
Bis (2-ethylhexyl) phthalate	282	E	-	-	-	-	-	-

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November 2015

GENERIC SCREENING CRITERIA FOR GENERIC QUANTITATIVE RISK ASSESSMENT

Compound	SSV's Residential With Consumption of Home Grown Vegetables		WSV's Residential		DWS		EQS	
	mg/kg	Ref	mg/l	Ref	µg/l	Ref	µg/l	Ref
Bromobenzene	0.319	E	87.7	E	-	-	-	-
Bromodichloromethane	0.00598	E	6.82	E	-	-	-	-
Bromoform	1.4	E	1770	E	-	-	-	-
Butyl benzyl phthalate	1410	E	-	-	-	-	-	-
Carbon disulphide	0.0739	E	-	-	-	-	-	-
Carbon tetrachloride	0.00656	E	3.31	E	-	-	-	-
Chlorobenzene	3.49	E	1300	E	-	-	-	-
Chloroethane	3.05	E	4180	E	-	-	-	-
Chloroform / Trichloromethane	0.307	E	-	-	-	-	-	-
Chloromethane	0.00301	E	5.5	E	-	-	-	-
Cis 1,2 Dichloroethene	0.0393	E	54.6	E	-	-	-	-
DDD	26.3	E	-	-	-	-	-	-
Dibromochloromethane	0.0623	E	38.7	E	-	-	-	-
Dichloromethane	0.382	E	1500	E	-	-	-	-
Diethyl Phthalate	108	E	-	-	-	-	-	-
Di-n-butyl phthalate	12.9	E	-	-	-	-	-	-
Di-n-octyl phthalate	2250	E	-	-	-	-	-	-
Dinoseb	0.0477	E	>52	E	-	-	-	-
Formaldehyde	1.89	E	2360	E	-	-	-	-
Hexachlorobutadiene	0.21	B	-	-	-	-	-	-
Hexachloroethane	0.0735	E	>50	E	-	-	-	-
HMX	5.7	B	-	-	-	-	-	-
Isopropylbenzene	34.4	E	389	E	-	-	-	-
Methyl tert-butyl ether	20	E	33800	E	-	-	-	-
Nicotine	0.0916	E	58900	E	-	-	-	-
Prochloraz	8.49	E	-	-	-	-	-	-
Propylbenzene	85.6	E	1100	E	-	-	-	-
RDX	3.5	B	-	-	-	-	-	-
Styrene	9.42	E	3530	E	-	-	-	-
Tetrachloroethene	0.455	E	174	E	-	-	-	-
Total Cresols (2-, 3- and 4-methylphenol)	80	D	-	-	-	-	-	-
Trans 1,2 Dichloroethene	0.0671	E	65.7	E	-	-	-	-
Tributyl tin oxide	0.248	E	54.5	E	-	-	-	-
Trichloroethene	0.0382	E	20.7	E	-	-	-	-
Trichloromethane	0.018	B	369	E	-	-	-	-
Trichloromethylbenzene	0.000157	E	-	-	-	-	-	-
Vinyl chloride	0.000202	E	0.249	E	-	-	-	-
Pesticides								
Aldrin	1.7	B	-	-	-	-	-	-
Dieldrin	0.69	B	-	-	-	-	-	-
Atrazine	0.24	B	-	-	-	-	-	-
Dichlorvos	0.29	B	-	-	-	-	-	-
Alpha-Endosulfans	2.9	B	-	-	-	-	-	-
Beta-Endosulfans	2.8	B	-	-	-	-	-	-
Alpha-Hexachlorocyclohexane	19	B	-	-	-	-	-	-
Beta-Hexachlorocyclohexane	1.7	B	-	-	-	-	-	-

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GENERIC SCREENING CRITERIA FOR GENERIC QUANTITATIVE RISK ASSESSMENT

Compound	SSV's Residential With Consumption of Home Grown Vegetables		WSV's Residential		DWS		EQS	
	mg/kg	Ref	mg/l	Ref	µg/l	Ref	µg/l	Ref
Polychlorinated Biphenols (PCB)								
Sum of PCDDs, PCDFs and dioxin-like PCBs	8	A	-	-	-	-	-	-
Chlorobenzenes								
Chlorobenzene	0.33	B	-	-	-	-	-	-
1,2-Dichlorobenzene	16	B	-	-	-	-	-	-
1,3-Dichlorobenzene	0.29	B	-	-	-	-	-	-
1,4-Dichlorobenzene	30	B	-	-	-	-	-	-
Hexachlorobenzene	0.59	B	-	-	-	-	-	-
Pentachlorobenzene	5.2	B	-	-	-	-	-	-
1,2,3-Trichlorobenzene	1.0	B	-	-	-	-	-	-
1,2,4-Trichlorobenzene	1.8	B						
1,3,5-Trichlorobenzene	0.23	B						
1,2,3,4-Tetrachlorobenzene	12	B						
1,2,3,5-Tetrachlorobenzene	0.49	B	-	-	-	-	-	-
1,2,4,5-Tetrachlorobenzene	0.3	B	-	-	-	-	-	-

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GSV's Residential WCHGV 1% SOM



GeoCon Site Investigations Ltd
GENERIC SCREENING CRITERIA
FOR
GENERIC QUANTITATIVE RISK ASSESSMENT

November 2015

Screening Criteria Reference Guide:

Soil GAC Source Reference	
A	UK (CLEA) Soil Guideline Value 2009
B	LQM GAC Values 2015
C	UK (CLEA) Soil Guideline Value 2002
D	CL:AIRE GAC Values December 2009
E	AtRisk Soil Screening Values and Water Screening Values Produced by Atkins 2011
F	UK Drinking Water Standards (DWS)
G	Environment Agency, Environmental Quality Standards (EQS)
H	Defra C4SL's 2014
Abbreviations	
SOM	Soil Organic Matter
N/P	No pathway - no risk is posed by this substance under the specific land-use scenario
MTBE	Methyl Tertiary Butyl Ether - a petroleum fuel additive which is a common groundwater contaminant

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References

APPENDIX H
GAS MONITORING RESULTS