

Oldham Road, Newton Heath

Ground Investigation

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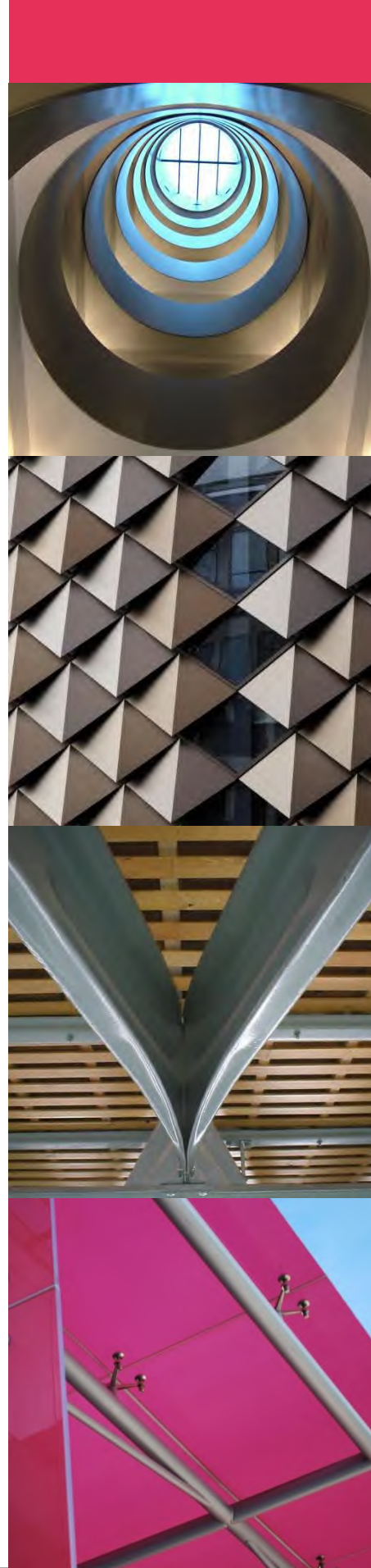
Client Name: One Manchester

Client Address: Lovell House, Archway 6, Hulme, Manchester, M15 5RN

Site Address: Land either side of YES GROUP, 1290 – 1328, Oldham Road, Newton Heath, Manchester

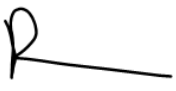
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Rev	Description	Issued by	Checked	Date
V02	Updated following additional intrusive works in October 2020	PN	SH	15 January 2021
V03	Update of allowable bearing pressures for residential housing	SH	RA	16 March 2021
V04	Review and update of allowable bearing pressures for residential housing	JL	RA	23 January 2023

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Executive Summary

Appointment	<p>In September 2019 Curtins were instructed by One Manchester to undertake a Ground Investigation for Due Diligence purposes of land off Oldham Road, Newton Heath, Manchester, M40 1HB. A second phase of investigation was instructed in October 2020 to refine the ground model for Site 1 in the area of the YES Group Warehouse that was previously inaccessible. The site is centred on NGR SD880006 and covers an area of approximately 1.25 Ha.</p> <p>The site investigation aims to characterise the geo-environmental and geotechnical conditions prior to the proposed development comprising 100 apartments within two blocks up to six storeys and 15 low-rise residential houses to the west of Newton Street (Site 1) and 24 low-rise residential houses to the east of Newton Street (Site 2), with associated areas of soft landscaping and car parking.</p>
Current Site Status	<p>The site is divided by Newton Street running north to south. To the west of Newton Street, Site 1 is currently occupied by a vacant warehouse present in the north with an associated hardstanding car parking to the south. The area west of the warehouse is undulating scrubland. Site 2 east of Newton Street is a grassed area open to the public with trees present in the north.</p>
Summary of Phase 1	<p>The earliest mapping (1848) shows the site was fully developed, occupied by mostly unspecified buildings as well as a bowling green in the south west corner. From 1893 terraced houses along with a school are mapped, with various streets crossing the site but from 1990 two of these are no longer mapped. Heath Street is mapped adjacent to the southern boundary. An Engineering Works was located 10m to the south which later in the 1930's became Albany Works. From 1908 the bowling green and the Monsall Dye Works was in the south west of the site. By 1979 all structures on-site were demolished with Apley and Benjamin Streets no longer mapped by 1990. By 2006 a large warehouse was built in the north part of the western site.</p> <p>The surrounding site area has historically seen the development and demolition of mills, works, heavy industry, commercial, mixed used buildings and residential housing.</p> <p>Based on the site's historical land use, Made Ground is anticipated. BGS mapping indicates superficial deposits generally comprise Glacial Till, underlain by bedrock noted as the Collyhurst Sandstone Formation. The site is underlain by a Principal Aquifer within the bedrock formation and a Secondary Undifferentiated Aquifer within the superficial deposits. The nearest surface water feature is the Rochdale Canal, located 56m south of the site. There are no water abstraction points recorded within 1km of the site.</p> <p>Primary potential risks to be investigated during this report, as well as establishing ground conditions for geotechnical design, included; potential for land gas and risks to human health from Made Ground soils.</p>
Fieldworks Undertaken	<p>Due Diligence site investigation works were undertaken between the 30th September and 3rd October 2019 and comprised fourteen window sample boreholes. Ground gas and groundwater monitoring standpipes were installed within nine of the window sample boreholes, three on Site 1 and six on Site 2. Selected soil samples were subjected to laboratory analysis and four gas monitoring visits were undertaken.</p> <p>A supplementary site investigation was undertaken between 27th October and 2nd November 2020 at Site 1 and comprised three cable percussive boreholes and five window sample boreholes. Selected soil samples were subject to chemical and geotechnical analysis. An additional four ground gas monitoring visits were undertaken across both Site 1 and 2.</p>
Encountered Ground Conditions	<p>Made ground deposits comprised a surface covering of topsoil/asphalt or concrete overlying predominantly granular Made Ground. Made Ground was encountered to a maximum depth of 3.50m bgl in CP102. Topsoil recorded within WS06 was much deeper from ground level to 0.80m bgl due to being located on a slight mound. It generally consisted of a dark brown, silty sandy clay with frequent rootlets and anthropogenic fragments of brick recorded within WS06.</p> <p>The Made Ground underlying topsoil/asphalt or concrete typically comprised grey brown sandy gravel, light grey brown gravelly silty clayey fine to medium sand, and grey clayey sandy fine to coarse gravel. Gravel typically comprised brick, coal, clinker, sandstone, concrete, slate and limestone. Within WS02b, WS02c, WS04, WS04c, WS05, WS09, CP101, CP102 and CP103, black/grey slightly clayey sandy ashy gravel and brown/black slightly clayey slightly gravelly ashy medium to coarse sand was encountered.</p> <p>Cohesive Made Ground was encountered in most locations, (except WS01, WS02, WS06 – WS08, WS12 – WS13 and WS201 – WS205) and typically comprises dark brown sandy silty gravelly clay, light brown/orange sandy gravelly clay. In WS04C, grey sandy very gravelly clay was encountered and in CP101, WS05 and WS09, grey/brown mottled black, sandy ashy gravelly clay with moderate ash content. Gravel typically comprised brick, concrete, sandstone, limestone, coal, clinker, slag, mudstone and siltstone.</p> <p>The Made Ground was underlain by glacial till which typically comprised cohesive material with occasional granular material. Cohesive deposits typically comprised soft brown with occasional orange mottling silty sandy clay, firm grey sandy very silty clay, firm to very stiff brown with frequent grey mottling slightly silty gravelly clay.</p>

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	<p>Gravel is fine to medium, rounded to sub-rounded of mudstone, siltstone and sandstone. Occasional/frequent roots were noted within some of the exploratory hole positions close to trees (WS08, WS10 and WS13).</p> <p>Granular deposits were encountered in WS05, CP101 – CP103. Shallow granular deposits encountered in WS05 described as medium dense brown clayey gravelly fine to coarse sand. In CP101 – CP103, loose to medium dense silty coarse sand was encountered. The base of the glacial till deposit was not encountered.</p> <p>Groundwater strikes were noted in the Made Ground between 0.20m – 0.60m bgl and in glacial till at 4.00m bgl. Post investigation groundwater monitoring showed the groundwater levels to vary from 0.20m to 2.79m bgl.</p>
Environmental Laboratory Testing and Ground Gas Monitoring Results	<p><u>Site 1 – Two apartment blocks and low-rise residential housing</u></p> <p>Site 1 is split into three zones relating to their proposed end uses, with GAC thresholds exceeded for human health in each zone for the proposed end-use:</p> <ul style="list-style-type: none"> • <i>Zone 1 – Residential without home grown produce</i> – lead and TPH (Aro C21-C35) and PAH exceedances; • <i>Zone 2 – Residential with home grown produce</i> – slight lead exceedance in one borehole; and • <i>Zone 3 – Public open space near residential housing</i> – TPH (Aro C16-C35) and PAH exceedances. <p>Asbestos containing material (chrysotile cement) was identified in WS02b in Site 1 at 0.45m bgl, with asbestos quantification analysis of the sample as 0.959%</p> <p>Concentrations of methane (CH₄) have been recorded at or below the instruments limit of detection site wide during the 2019 and 2020 monitoring visits.</p> <p>For the apartment blocks in Site 1, a maximum carbon dioxide concentration of 8.2% was recorded. Evaluation of the 'representative' scenario records a maximum Qhg of 0.3198 l/hr for carbon dioxide with the highest steady flow rate of 3.9 l/hr.</p> <p>For the low-rise residential housing in Site 1, a maximum carbon dioxide concentration of 2.3% was recorded over eight monitoring visits.</p> <p><u>Site 2 – Low-rise residential housing</u></p> <p>With respect to the proposed end-use of Site 2 (<i>Residential with home grown produce</i>) Tier 1 thresholds for human health have been exceeded for Lead within WS08, WS09 and WS13. This is likely indicative of the historical uses across the site previously.</p> <p>A maximum carbon dioxide concentration of 4.2% has been recorded over eight monitoring visits. Concentrations of methane (CH₄) has been recorded at or below the instruments limit of detection. Carbon monoxide (CO) was recorded at a maximum of 41ppm in WS11.</p>
Ground Contamination and Ground Gas Assessment	<p><u>Site 1 – Two apartment blocks and low-rise residential housing</u></p> <p>A Moderate risk rating is identified to end-users from direct contact, inhalation and ingestion of contaminants within Made Ground soils on Site 1 which recorded exceedances of Lead, PAHs and Aromatic TPHs within Made Ground soils from WS01, WS04c, WS06 and CP101.</p> <p>A Moderate/Low risk is posed to site end-users, construction/maintenance workers and adjacent residents from dust migration and inhalation from asbestos Chrysotile Cement of 0.959% identified in WS02b at 0.45m bgl.</p> <p>For the apartment blocks and low-rise residential housing, a Moderate and a Low risk is identified respectively to site end-users from ground gas migration and inhalation from soils at Site 1. For the apartment block, this corresponds to BS8485 CS2 gas regime requiring gas protection measures and for the low-rise residential housing, this correspond with NHBC Green requiring no gas protection measures.</p> <p><u>Site 2 – Low-rise residential housing</u></p> <p>A Moderate risk rating is identified to end-users from direct contact and ingestion of contaminants within Made Ground soils on Site 2, due to elevated Lead concentrations in a number of locations.</p> <p>A Low risk is identified to site end-users from ground gas migration and inhalation from soils on Site 2. This corresponds with an NHBC Green gas regime not requiring ground gas protection measures.</p>
Geotechnical Assessment	<p><u>Site 1 – Two apartment blocks and low-rise residential housing</u></p> <p>Given the proposed 6-storey and 5-storey apartment blocks, it is anticipated that a piled foundation solution is adopted to transfer the loads to the deeper firmer cohesive deposits encountered below 16.50m bgl. The carrying capacity of the piles depends not only on their size and the ground conditions but also the method of installation.</p> <p>Based on observations on site combined with laboratory tests, it is recommended that a consideration be given to a suspended ground floor slab.</p>

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Recommendations

For the low-rise residential housing, it is considered that 1.00m wide strip foundation at 2.00m bgl is adopted in the cohesive superficial deposits with an allowable bearing capacity of 150kPa accounting for an estimated settlement of <25mm.

Based on observations on site combined with laboratory tests, it is recommended that consideration be given to suspended ground floor slabs.

Site 2 – Low-rise residential housing

For low-rise residential housing, it is considered at a 2.00m wide shallow spread foundations at 2.00m bgl is adopted in the firm to very stiff cohesive deposits with an allowable bearing capacity of 150kPa accounting for estimated settlement of <25mm. Foundations should be locally deepened beneath soft clay deposits specifically in WS09.

It should be noted that the fluctuating groundwater levels during groundwater monitoring indicates flowing water. As a result, the allowable bearing capacity of the founding stratum was halved to account for the groundwater regime on site.

Made Ground and areas of soft/loose compressible material, at foundation level must be removed and replaced with suitable compacted granular fill, in accordance with Series 600 Specification for Highways Works (SHW).

Based on observations on site combined with laboratory tests, it is recommended that a consideration be given to a suspended ground floor slab.

Laboratory test results indicate a Design Sulphate Class for concrete may be taken as DS-1 and ACEC class of AC-1s would be appropriate for Made Ground and glacial till deposits.

Based on the findings of the ground investigation, the following recommendations are made:

- 1) Due to the elevated concentrations of Lead, PAHs and TPHs in Made Ground soils across Site 1 and Site 2, within WS08, WS09 and WS13 on Site 2 within the Made Ground samples, a suitable thickness of clean and inert capping engineered capping and geotextile membrane is recommended in all areas of soft landscaping and private gardens;
- 2) Handpicking and the careful removal of visible ACMs from the affected soils in Site 1 (WS02b) by a specialist Asbestos Contractor should groundworks be proposed in that area;
- 3) CS-2 ground gas protection measures should be included for the apartment blocks within Site 1.
- 4) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results.

A Remediation Strategy and Verification report will be required to detail and validate the above measures.

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- Appendix B - Exploratory Hole Logs
- Appendix C - Chemical Laboratory Testing Results
- Appendix D - Geotechnical Laboratory Testing Results
- Appendix E - Ground Gas Monitoring Results
- Appendix F - GAC Screening Thresholds
- Appendix G - Risk Assessment Methodology

1.0 Introduction

1.1 Project Background

In September 2019 Curtins were instructed by One Manchester to undertake a Ground Investigation for Due Diligence purposes of two sites, hereinafter referred to as Site 1 and Site 2, off Oldham Road, Newton Heath, Manchester, M40 1HB. The site is centred on National Grid Reference SD880006 and covers an area of approximately 1.25 Ha.

The site is divided into two plots separated by Newton Street, Site 1 to the west and Site 2 to the east. The site location plan and sub-division is presented in *Figure 2.1a*. A Due Diligence Investigation of Site 1 and Site 2 was undertaken in October 2019 comprising window sample boreholes; environmental testing of soils; in-situ and laboratory geotechnical testing of soils; and 4no ground gas monitoring visits.

A second phase of investigation was instructed for Site 1 in October 2020 by One Manchester in support of design requirements and included ground gas monitoring of the entire site to confirm the ground gas regime in line with planning requirements. This 2020 investigation comprised cable percussion boreholes in the area of the apartments; and window sample boreholes in the area of the former YES Group Warehouse, which was inaccessible at the time of the 2019 investigation.

The Due Diligence investigation was previously reported within Version 1 of this report, dated 17th Dec 2019. The report has now been updated to include the supplementary 2020 investigation results from Site 1 and the completed ground gas monitoring visits from across Site 1 and Site 2.

1.2 Scope of Services

This investigation aims to characterise the geo-environmental and geotechnical conditions for the proposed development. Site 1 comprises 100 apartments within two blocks up to six-storeys and 15 low-rise residential houses and Site 2 comprises 24 low-rise residential houses. Both sites have associated areas of soft landscaping and car parking, with the low-rise residential houses also having private gardens.

The current development plans for the site can be referred to within *Appendix A* of this report.

Specifically, the Phase 2 report is intended to determine:

- a) If there is a risk of the proposed end user being adversely impacted upon by potential contamination in shallow site soils that may be present on the site due to its known current, recent and historical use;
- b) If there is a risk of groundwater and/or surface water being adversely impacted upon by potential contamination that may be present on the site due to its known current, recent and historical use;

- c) If there is a risk to the end user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide;
- d) Likelihood of the proposed works being adversely impacted by potential geo-hazards across the site.

In addition, recommendations on foundation solutions for the proposed structures will be provided.

Detailed flood risk assessment, ecology and archaeological studies are outside of the scope of this report.

2.0 Phase 1 Preliminary Site Assessment Summary

This section presents a summary of the current site setting, history, geology and hydrogeology/hydrology, previously detailed in the Curtins Phase 1 Report (Ref.1). As such it is advised that this report is read in conjunction with the Phase 1 Report (Ref.1). A summary of the pertinent Phase 1 Preliminary Risk Assessment Report information is presented in the following sub-sections.

This information will feed into the geotechnical assessment (refer to *Section 10.0*) and geo-environmental risk assessment (refer to *Section 7.0*).

2.1 Current Setting

The site is divided into two by Newton Street running north to south.

To the west of Newton Street, referred to as Site 1 in this report and seen in Figure 2.1a, the site is currently occupied by a warehouse present in the north with hardstanding forming carparking for the warehouse in the south. To the west of the warehouse is grassed with denser vegetation. The whole of the western area is fenced off to the public. The site east of Newton Street, referred to as Site 2 in this report and seen in Figure 2.1a, is grassed with a few trees present in the north and is open to the public.

The site is relatively flat topographically to the west of Newton Street and to the east is slightly raised in the west of the grassed area and flat to the east.



Figure 2.1a – Site Location Plan (Site 1 and 2)

2.2 Surrounding Area Details

The following information denotes the surrounding area details.

Table 2.2 – Surrounding Land Uses

Surrounding Area	N	Oldham Road, industrial/commercial units, residential housing and railway line 150m north.
	E	Droylsden Road, supermarket, residential housing and warehouses.
	S	Holyoak Street, supermarket and industrial/commercial units, with Rochdale Canal 56m south.
	W	Dulverton Street, residential housing and a disused building.

2.3 Previous Site Use

A review of the available historical mapping information for the site, as presented within the Curtins Phase 1 Report (Ref. 1) has been undertaken with specific reference to potential sources of contamination and geo-hazards.

From 1848 to 1893 the site is fully developed, occupied by mostly unspecified buildings as well as a bowling green in the south west corner of the site. Newton Silk Mill is located adjacent to the southern site boundary.

From 1893 terraced houses along with a school are mapped, along with Newton Street which runs through the centre of the site north to south, to the east of this runs Allen Street and to the west of Newton Street runs, Mount Pace and Benjamin Street. Heath Street is mapped adjacent to the southern boundary and Oldham Road is on the northern boundary. 10m south of the site development of an Engineering Works which later in the 1930's turns into an Albany Works.

From 1908 the site remains the same, apart from the addition of two Inn's, one in the north west of the site and the other in the north east. The bowling green and the Monsall Dye Works is located in the south west of the site with an addition of Woodman Street in the west of the site. By 1908 the bowling green is no longer mapped and the Monsall Dye Works is marked onsite until 1931.

From 1931 a small building in the north of the site is no longer mapped as the school extends and Mount Place (street) has now changed to Otley Street.

From 1951 to 1969 the majority of the site remains the same, with two small buildings in the central southern area of the site no longer mapped. The two Inns in the north of the site are no longer mapped although the building footprints are still in place. The addition of several small buildings in the south west corner of the site. A shirt factory is mapped approximately 30m south of the site along with an electrical substation approximately 50m south east of the site.

From 1979 all buildings have been demolished on site and the site is vacant. Three streets still run across the site aligned north-south, Benjamin street, Newton Street and Apley Street (formally Allen St).

From 1990 Apley Street and Benjamin Street are no longer mapped.

From 2006 a large warehouse in built in the north part of the central site, west of Newton St. The warehouse was still in use at the time of the 2019 intrusive investigation; however was vacant and awaiting demolition by the end of 2020.

2.4 Published Geology

A review of the Curtins Phase 1 (Ref. 1), BGS borehole records and the British Geological Survey (BGS) 1:50,000 mapping records (Solid and Drift Editions) for Manchester (Sheet 085) indicates the following geological succession underlying the site:

- Glacial Till, Devensian;
- Collyhurst Sandstone Formation.

BGS records a borehole located 80m east of the site, SD80SE76, a water well advanced in 1895. The details of this are given in *Table 2.4*.

Table 2.4 – Historical Borehole Record from Surrounding Area

Borehole Ref.	Location (Easting, Northing)	Details (depth to top of strata/lithology)	
SD80SE76	80m east (388241, 400733)	1.52m bgl	No Record
		12.19m bgl	CLAY
		19.81m bgl	QUICKSAND
		23.16m bgl	Blue CLAY
		33.52m bgl	Yellow CLAY
		35.25m bgl	CLAY and GRAVEL
		36.88m bgl	Red SANDSTONE
		45.72m bgl	Red MARL
		107.89m bgl	Red SANDSTONE
		107.89m bgl borehole termination	

2.4.1 Made Ground Deposits

Made Ground deposits are not recorded to be present on site but are considered likely to be present due to the historical development and geographical location.

2.4.2 Superficial Deposits

Superficial geological deposits are recorded as Devensian age Glacial Till consisting of, usually sandy, silty clay with pebbles, but can contain gravel-rich, or laminated sand layers; varied in colour and consistency.

2.4.3 Bedrock Deposits

Bedrock deposits are recorded as the Collyhurst Sandstone Formation comprising of, a soft red sandstone with abundant beds of "millet seed" sand grains alternating with beds of fine-grained sharp sand, some interbedded grey sandstones locally.

2.4.4 Mining and Quarrying

The Coal Authority's online interactive mapping confirms that the site is in a coal mining reporting area, however it is not within a Development High Risk Area or within an area of Abandoned Mines Catalogue. The closest mine entries are approximately 860m north of the site. Coal outcrops and probable workings are mapped approximately 1.3km north and southwest of the site. As such, the risk to the development from coal mine workings is Low and therefore it has not been considered further.

The Phase 1 report (Ref. 1) confirms that there are eight recorded BGS mineral sites within 1km of the site. All of these are now ceased and were for opencast mining of clay, shale and sand. The nearest BGS recorded mineral site is located 334m south west of the site and was associated with Mitchell Street Brickworks which extracted clay and shale.

2.4.5 Other Ground Stability Issues

The Curtins Phase 1 Report (Ref. 1) confirms that there **is no hazard to very low risk** from the following ground stability hazards on and around the site;

- Running sands;
- Collapsible and compressible ground;
- Shrinking or swelling clay;
- Landslides; and
- Ground dissolution.

There is a **moderate** risk from compressible ground stability hazards on and around the site.

2.4.6 Ground Gas

There is potential for ground gas from twenty historically infilled land (water) within 500m of the site. All the following historically infilled land are associated with the potential fill of infilled water features. The following are mapped dating 1848; 1) on site, 2) 76m north, 3) 120m west, 4) 122m north, 5) 215m north, 6) 256m west, 7) 273m north east, 8) 328m west, dating mapped 1894; 9) 41m south east, 10) 43m south, 11) 177m east, dating mapped 1923; 12) 96m north east, 13) 101m north, 14) 147m north east, 15) 431m north, 16) 460m north, 17) 500m south west, dating mapped 1956; 18) 407m north, 19) 428m north and 20) 495m north east.

There are no BGS recorded landfills within 500m of the site, however there is one historical landfill within 250m of the site located 153m south west of the site.

The Curtins Phase 1 Report (Ref. 1) confirms the site is situated in a lower probability radon area where <1% of homes are above the radon action level. On this basis radon protection measures are not considered necessary in the construction of new dwellings or extensions.

Where the new development incorporates a basement the advice of a specialist Radon assessor must be obtained.

2.5 Hydrogeology and Hydrology

The Devensian Till is classed as a Secondary Undifferentiated Aquifer, defined as:

“This designation is assigned in cases where it is not considered appropriate to classify as either Secondary A or Secondary B. This is usually due to the variable characteristics of the material.”

The Collyhurst Sandstone Formation bedrock is classified as a Principal Aquifer, defined as:

“Layers of rock or drift deposits that have high intergranular and/or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.”

The nearest surface water feature is the Rochdale Canal 56m to the south of the site. This has a river quality B. There are no groundwater or active surface water abstraction points located within 1km of the site boundary. The site is not within a Source Protection Zone.

2.6 Unexploded Ordnance (UXO) Risk Assessment

Military activities including those conducted as part of both the First and Second World Wars have resulted in a legacy of unexploded ordnance (UXO) being present within the shallow soils of the UK.

UXO result from various sources including both allied (military training) and German (bombing raids) with a guide figure of approximately 10% of all munitions failing to function as designed.

The likelihood of UXO being encountered on a development site is influenced by a number of factors including; the proximity to strategic targets, the nature of the development works being undertaken and evidence of local damage in the post-war periods amongst others. In order to determine the likelihood of UXO being present on a site, a step-wise risk assessment process is followed. This process is outlined within CIRIA C681 Unexploded Ordnance: A Guide for the Construction Industry.

Risk Mapping for UXO's has placed the site in a Moderate Risk area. Moderate risk areas are those that show a bomb density of 11-50 bombs per 1000 acres and may contain WWII targets.

A review of the historical maps from the Curtins Phase 1 report (Ref.1) shows there are two ruins noted approximately 40m south of the site from 1951 to 1953.

However, analysis of historical bomb mapping from the University of Manchester (*Figure 2.6*) shows the area surrounding the site has no recorded bombs, targets or damaged buildings. No fire bombs (red circles) hit the site or the surrounding area according to the Manchester WWII bomb damage maps.

Considering the above and given the demolition of all structures post-war and that the site was occupied throughout the war period, the risk of encountering potential UXO as part of future intrusive works is considered **Low**. As such no Detailed UXO Report is required.



Figure 2.6: Site boundary shown in red dated 1931.

2.7 Summary of Phase 1 PSCM

A summary of potential pollutant linkages at the development site identified in the Curtins Phase 1 Report (Ref. 1) presented in *Table 2.7*, were identified as requiring further investigation to enable the safe redevelopment of the site.

Table 2.7 – Preliminary Conceptual Site Model

Source	Pathway	Receptor	Risk
<p>Significant on-site sources of contamination:</p> <ul style="list-style-type: none"> Made Ground of unknown composition from uncontrolled deposition during construction and demolition of housing, unspecified buildings, inns, a school and roads on site. <p>Significant off-site sources of contamination:</p> <ul style="list-style-type: none"> Made Ground of unknown composition from uncontrolled deposition of the construction and demolition of housing, unspecified buildings, Works, Mills and Tramway which was removed. Contamination arising from Dye Works, Electrical Engineering Works and Miner Water Works all located within 100m south of the site 	Direct contact/ ingestion and inhalation	Site End Users (Residential)	Moderate
<p>Significant sources of ground gas:</p> <ul style="list-style-type: none"> Potential ground gas generation from Made Ground or superficial deposits containing organic/putrescible content on site. Historically infilled land on site and within 250m of the site. Historical landfill located 153m south west of the site. 	Vertical and horizontal migration through the superficial and bedrock deposits	Site End Users (Residential)	Moderate / Low

Potential contaminants of concern associated with any Made Ground present include, amongst others; broad range aliphatic and aromatic hydrocarbons present within any fuel oils; inorganic compounds including heavy metals; and asbestos present in discarded building materials.

The qualitative risk assessment determined the above risks associated with the proposed development of the site warrant further investigation.

It was recommended that a ground investigation is conducted to both confirm this assessment and provide data in support of the structural and civil engineering design. The scope of the investigation undertaken in detailed in *Section 3.0*.

The risks presented to controlled waters (groundwater and surface water) were identified as **Low**. As such, the risks have not been considered further at this stage. In the event unexpected ground conditions are encountered during the investigation, water samples should be obtained with subsequent chemical analysis to re-assess the risk to controlled waters.

3.0 Phase 2 Investigation Scope of Works

Due Diligence site investigation works were undertaken at Site 1 and Site 2 between 30th September and 3rd October 2019 and comprised window sample boreholes only. The second phase of ground investigation works, in Site 1, were undertaken between 27th October and 2nd November 2020 and comprised additional window sample boreholes and deeper cable percussion boreholes.

At the time of the 2019 investigation, the YES Group warehouse was still in use and inaccessible for the investigation. By the time of the 2020 supplementary investigation, the warehouse was vacant and awaiting demolition.

The scope of the ground investigation was designed in general accordance with current UK guidance including:

- CLR11 (Ref. 2);
- BS10175 (Ref. 3);
- BS5930:2015+2020 (Ref. 4); and
- BSEN1997-2:2007 Eurocode 7 (Ref. 5).

A summary of the scope and rationale are summarised in *Table 3.0* below.

Table 3.0 – Scope and Rationale of Fieldwork Undertaken

	Exploratory Hole Type	Site Reference	Exploratory Hole Reference	Exploratory Hole Depth (m bgl)	Rationale
Due Diligence GI 2019	Window Sample Boreholes	Site 1	WS01	0.37	Confirm shallow ground conditions. Collect soil samples for chemical and geotechnical analysis. Undertake in-situ testing. Gas and groundwater level monitoring in 9 No. boreholes.
			WS02	0.60	
			WS02a	0.55	
			WS02b	0.67	
			WS02c	0.45	
			WS03	2.45	
			WS04	0.80	
			WS04a	0.86	
			WS04b	0.36	
			WS04c	3.45	
			WS05	4.25	
			WS06	3.45	
			WS07	3.45	
		Site 2	WS08	4.45	
			WS09	4.45	
			WS09a	0.80	
			WS10	5.45	
			WS11	4.05	
			WS11a	0.60	
			WS12	5.45	
			WS13	5.45	

	Exploratory Hole Type	Site Reference	Exploratory Hole Reference	Exploratory Hole Depth (m bgl)	Rationale
Supplementary GI 2020	Window Sample Boreholes	Site 1	WS201 WS202 WS203 WS204 WS204A WS205	5.45 4.45 0.50 0.80 1.00 5.45	Confirm shallow ground conditions. Collect soil samples for chemical and geotechnical analysis. Undertake in-situ testing. Gas and groundwater level monitoring in 3 No. boreholes.
	Cable Percussive Boreholes		CP101 CP102 CP103	20.00 25.95 24.24	Confirm deeper ground conditions. Collect soil samples for chemical and geotechnical analysis. Undertaken in-situ testing.

A number of exploratory holes encountered obstructions and therefore they were relocated. This is detailed further in *Section 5.4*.

A copy of the exploratory hole plan for the investigation is included in *Appendix A*.

3.1 Soil Logging and Sampling

Exploratory borehole arisings were logged on site by a qualified Engineer. All exploratory holes were logged in accordance with the requirements of BS5930:2015 (Ref. 4) including recording observed visual and olfactory indications of contamination. Exploratory hole logs are provided in *Appendix B*.

Exploratory hole locations were not surveyed upon completion.

3.2 Monitoring Well Installations

Ground gas and groundwater monitoring slotted 50 mm diameter were installed within 12 No. window sample boreholes (WS03, WS04c, WS06, WS08 to WS13, WS201, WS202 and WS205).

A bentonite seal was placed above and below the screened section of the borehole to minimise potential for downward migration of contaminants and the creation of a preferential migratory pathway. A gravel aggregate surround was installed in the annulus between the sides of the borehole and the slotted sections of pipe.

The 50 mm diameter monitoring wells were primarily designed to assess the potential for ground gas in the window sample boreholes and to record groundwater levels within the boreholes. The screened sections therefore focused on the Made Ground across the site most likely to be producing ground gas, but where this was only minimal superficial deposits were installed.

A summary of the response zones is presented in *Table 3.2* below.

Table 3.2 – Monitoring Well Response Zones

Site Ref.	Borehole Ref.	Response Zone(s) (m bgl)	Strata Description(s)
Site 1	WS03	1.00 – 2.00	Glacial Till
	WS04c	1.00 – 2.00	Made Ground
	WS06	1.00 – 2.00	Made Ground
	WS201	1.00 – 4.00	Glacial Till
	WS202	1.00 – 4.00	Glacial Till
	WS205	0.50 – 2.00	Made Ground
Site 2	WS08	1.00 – 3.00	Glacial Till
	WS09	1.00 – 1.50	Made Ground
	WS10	1.00 – 4.00	Glacial Till
	WS11	1.00 – 4.00	Glacial Till
	WS12	1.00 – 4.00	Glacial Till
	WS13	1.00 – 4.00	Glacial Till

Copies of borehole logs can be referred to in *Appendix B* of this report.

3.3 Restrictions

At the time of the 2019 investigation, Site 2 was council owned and a permit was required to carry out any works on this land. The YES Group warehouse was also still in use at that time and the area of the warehouse inaccessible for an intrusive investigation.

3.4 Post-Investigation Monitoring

3.4.1 Ground Gas and Groundwater Monitoring

Four ground gas and groundwater level monitoring visits were completed between 11/10/2019 and 14/11/2019 to assess ground gas conditions as identified in the Preliminary Conceptual Site Model in the Phase 1 Preliminary Site Assessment (Ref. 1) and the groundwater conditions.

An additional four rounds of ground gas and groundwater monitoring visits were completed between 10/11/2020 and 16/12/2020. The visits included the boreholes installed in the first and second phase of site investigations.

The calibration certificates for the gas monitoring used during the 2019 and 2020 monitoring visits are included within *Appendix E* for reference.

No groundwater samples were collected from any of the boreholes on the site, as no unexpected ground conditions were encountered during the ground investigation that would indicate contamination of groundwater.

4.0 Laboratory Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide a characterisation of the Made Ground and natural strata encountered. Selected soil samples were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited) and for geotechnical testing were Structural Soils (UKAS accredited).

Given the lack of any obvious sources of potential contamination the sampling positions were generally located in a non-targeted, systematic array to give adequate and representative coverage of the site's proposed end use and the immediate environmental setting, concentrating in the Made Ground.

4.1 Soil Analysis

The contaminants of concern potentially present on the site were considered to include, amongst others; organic matter, fill, hydrocarbons (e.g. fuel/oils) the extent of which is captured by the broad environmental testing suite listed in *Table 4.1* below.

Table 4.1 – Environmental Chemistry Analysis Suite: Soils

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, pH and Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Nickel, Boron (water soluble), Cyanide	1 mg/kg
	Zinc	5 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.17 mg/kg
	Sulphate (total)	10 mg/kg
	Phenols (screen)	0.1 mg/kg
	PAHs (USEPA 16)	0.1 – 0.07 mg/kg
	TPH (Aro/Alk Split)	0.01 – 1 mg/kg

In total twenty soil samples were tested from within the Made Ground and four from the top of the natural ground from the boreholes across Sites 1 and 2 and tested for Curtins Suite A.

Copies of the environmental chemistry testing certificates are presented in *Appendix C*.

4.2 Geotechnical Analysis

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref.6). The following geotechnical tests were carried out:

Table 4.2 – Geotechnical Testing

Test Type	Quantity	Standard
Moisture Content	36	BS1377 1990, Part 2 (clause 3.2)
Atterberg Limit	37	BS1377 1990, Part 2 (clause 4.5, 5.3 & 5.4)
Particle Size Distribution (3.35mm – 2µm) Sedimentation by Pipette	2	BS1377 1990 Part 2 (clause 9.4 & 9.5)
Particle Size Distribution – Wet Sieve Method	3	BS1377 1990 Part 2 (clause 9.2)
Multistage Quick Undrained Triaxial Test	5	BS1377 1990 Part 7 (clause 9)
pH	19	BS1377 1990, Part 3 (clause 9.4 & 9.5)
Water Soluble Sulphate 2:1 SO ₄	19	BS1377 1990, Part 3 (clause 5.3 & 5.5)

The results of the geotechnical testing are summarised in *Section 6.0* of this report. Copies of the geotechnical testing certificates are presented in *Appendix D*.

4.3 Quality Assurance and Quality Control

Soil chemical analysis was conducted by Envirolab, a UKAS accredited laboratory. Geotechnical analysis was undertaken by Structural Soils, a UKAS accredited laboratory. All samples were delivered in appropriate containers for the suites tested and analysed within the recommended holding times. No deviations were recorded at the time of analysis.

5.0 Encountered Ground Conditions

The ground conditions across the site, determined during the Curtins ground investigation works, generally comprised granular made ground overlying predominantly cohesive glacial till.

5.1 General

A summary of the ground conditions encountered during the site investigation works is presented in *Table 5.1*, with detailed information presented in the exploratory hole logs included in *Appendix B*.

Table 5.1 – Summary of Ground Conditions Encountered

Strata	Depth to Top of Strata		Depth to Bottom of Strata		Thickness	
	Min (m bgl)	Max (m bgl)	Min (m bgl)	Max (m bgl)	Min (m bgl)	Max (m bgl)
Topsoil	0.00	0.00	0.05	0.36 ²	0.05	0.36 ²
Made Ground	0.00	0.00	0.37 ¹	3.50	0.29	3.50
Glacial Till	0.60	5.00	2.45	25.95 ¹	1.45 ¹	22.55 ¹

¹ - Thickness not proved

² – WS06 recorded Made Ground Topsoil to a maximum depth of 0.80m bgl

5.2 Made Ground

The Made Ground typically comprised a surface covering of topsoil/asphalt or concrete overlying predominantly granular Made Ground. Made Ground was encountered to a maximum depth of 3.50m bgl in CP102.

The base of the deposit was not encountered in WS01, WS02 – WS02C, WS04 – WS04B, WS203, WS204-204B, WS09A and WS11A due to borehole termination, termination was due to either obstructions (*Section 5.4*) or ingress of perched water.

Across Site 1, the base of the Made Ground was encountered at depths of generally 1.50-2.00m bgl, a maximum depth of 3.50m bgl was recorded within CP102 with natural superficial deposits encountered at 0.70m bgl in WS03. Across Site 2, the base of the Made Ground was encountered at depths of generally 0.60-0.95m bgl, with 1.90m thickness of Made Ground encountered in WS09.

5.2.1 Topsoil/Surface Covering

Topsoil was encountered in all exploratory holes, excluding WS01, WS03, WS201-WS205, CP101 and CP102, from ground level to depths between 0.05m and 0.36m bgl. In WS06, topsoil was encountered to a maximum depth of 0.80m bgl attributed to its location on a slight mound.

Topsoil typically comprises brown to dark brown silty sandy slightly gravelly clay with frequent rootlets. Gravel comprised brick and ceramic.

Concrete was encountered from ground level to a depth of 0.08m bgl in WS01 and between 0.24m – 0.27m bgl within WS201 – WS203 located in the former warehouse.

Asphalt was encountered from ground level to depths between 0.06m and 0.09m bgl in WS204 and WS205.

5.2.2 Granular Made Ground

Granular Made Ground were encountered underlying the topsoil/surface covering in all exploratory holes, excluding WS05, WS09A, WS10, WS11, WS11A. It typically comprised grey brown sandy gravel, light grey brown gravelly silty clayey fine to medium sand; and grey clayey sandy fine to coarse, sub-angular to angular gravel. Gravel typically comprised brick, coal, clinker, sandstone, concrete, slate and limestone.

Within WS02b, WS02c, WS04, WS04c, WS05, WS09, CP101, CP102 and CP103 at the base of the Made Ground black/grey slightly clayey sandy ashy gravel and brown/black slightly clayey slightly gravelly ashy medium to coarse sand.

5.2.3 Cohesive Made Ground

Cohesive Made Ground deposits were encountered in CP101, CP102, WS03, WS04, WS04A, WS04C, WS05, WS09, WS09A, WS10, WS11 and WS11A.

In WS05, WS09A, WS10, WS11 and WS11A, dark brown sandy silty gravelly clay was encountered underlying the topsoil from depths of 0.05m – 0.25m to depths between 0.60m – 1.20m bgl.

In WS03, WS04, WS04A and WS05, light brown/orange brown sandy gravelly clay was encountered from depths of 0.20m to 0.40m bgl. In WS05, the deposit was encountered from 1.20m to 1.40m bgl.

In WS04C, grey sandy very gravelly clay was encountered between 0.20m to 0.40m bgl.

In CP101 (0.79m – 1.40m bgl), WS05 (1.40m – 1.95m bgl) and WS09 (0.90m – 1.90m bgl), grey/brown mottled black, sandy ash gravelly clay was encountered with a moderate ash content.

Gravel typically comprised brick, concrete, sandstone, limestone, coal, clinker, slag, mudstone and siltstone.

Reworked soil was encountered in CP102 (2.20m – 3.50m bgl) described as soft brown mottled grey sandy clay with occasional roots. The deposit was underlain by a sandstone flag, thought to be a former floor.

5.3 Glacial Till

Glacial till deposits were encountered underlying the base of the Made Ground in all exploratory holes, excluding WS01, WS02 – WS02C, WS04- WS04B, WS203, WS204-204B, WS09A and WS11A. The glacial till deposits encountered were predominantly cohesive. In CP101- CP103 granular glacial till deposits were encountered interbedded with the cohesive soils.

Glacial till deposits were encountered to depths of between 2.45m and 22.55m bgl. The base of the deposit was not encountered.

5.3.1 Cohesive Glacial Till

Cohesive glacial till deposits were predominantly encountered as soft brown mottled orange silty sandy clay, firm grey slightly sandy silty gravelly clay and firm to very stiff brown occasionally mottled laminated grey slightly silty slightly gravelly clay.

Gravel is typically rounded to subrounded, fine to coarse of mudstone, siltstone and sandstone.

In CP101 between 12.00m and 14.70m bgl, soft brown sandy clayey silt was encountered.

5.3.2 Granular Glacial Till

Granular glacial till deposits were encountered in WS05, CP101, CP102 and CP103.

Shallow granular deposits were encountered in WS05 between 1.95m to 2.00m bgl and 3.00m and 3.10m bgl described as medium dense brown clayey gravelly fine to coarse sand.

The granular deposits were encountered in CP101 (7.30m – 11.00m bgl), in CP102 (7.40m – 10.50m bgl, 11.80m – 15.50m bgl, 17.50m – 22.0m bgl) and in CP103 (7.70m – 8.80m bgl, 9.40m – 12.20m bgl, 13.00 – 16.50m bgl). The deposits were typically described as loose to medium dense slightly clayey, slightly gravelly, slightly silty fine to coarse sand.

5.4 Obstructions Encountered

A concrete obstruction was encountered within the hand pit of WS01 at 0.37m bgl.

Tiles overlying a concrete obstruction were encountered within WS02b at 0.66m bgl. An unknown obstruction was encountered within WS04 at 0.80m bgl. Reviewing the historical maps for the site, potentially WS04 was originally advanced on top of the historic Woodman Street. WS04a-WS04c were therefore located further south to try and avoid this obstruction.

A sandstone flag was encountered within CP101 at 3.50m – 3.60m bgl and no recovery was recorded between 3.60m to 5.00m bgl thought to be a former basement. Obstructions are summarised within *Table 5.4*.

Table 5.4 – Summary of Obstructions Encountered

Borehole Ref	Depth (m bgl)	Obstruction encountered	Action taken
WS01	0.36	Concrete obstruction within hand pit	Terminated
WS02b	0.67	Concrete obstruction in hand pit	Moved 3m south west to WS02c
WS04	0.80	Obstruction within hand pit	Moved 2m south to WS04b
WS04a	0.86	Obstruction within hand pit	Moved 2m north to WS04
WS09a	0.80	Obstruction within hand pit	Moved 3m west to WS09
WS11a	0.60	Obstruction within hand pit	Moved 1m east to WS11
WS203	0.50	Concrete slab within hand pit	Terminated
WS204	0.80	Concrete obstruction within hand pit	Moved 3m north to WS204A
WS204A	1.00	Concrete obstruction within hand pit	Terminated

5.5 Groundwater

A summary of the groundwater levels recorded during the siteworks is presented in *Table 5.5a*. With the exception of WS10, the majority of the groundwater was encountered at 0.20-0.60m bgl within the Made Ground, as perched groundwater sitting on top of the glacial till.

Table 5.5a – Groundwater Noted During Site Investigation

Site Ref.	Borehole Ref.	Strike Depth (m bgl)	Strata	Notes
Site 1	WS02	0.60	Made Ground	Stable. Borehole terminated due to standing water in hand pit.
	WS02a	0.55	Made Ground	Stable. Borehole terminated due to standing water in hand pit.
	WS02c	0.45	Made Ground	Stable. Borehole terminated due to standing water in hand pit.
	WS03	0.20	Made Ground	Stable
	WS04b	0.20	Made Ground	Stable. Borehole terminated due to standing water in hand pit.
Site 2	WS08	0.60	Made Ground	Stable
	WS09a	0.60	Made Ground	Stable. Borehole terminated due to standing water in hand pit.
	WS10	4.00	Glacial Till	Stable
	WS11	0.60	Made Ground	Stable

Four rounds of groundwater level monitoring were undertaken between 11th October and 14th November 2019. An additional four rounds were undertaken following the second phase of investigation between 10th November and 16th December 2020, the results of which are presented in *Table 5.5b* below.

Table 5.5b – Groundwater Monitoring Results

Site Ref.		Borehole Ref.	Installation Strata	Depth (m bgl)							
				2019 Due Diligence GI				2020 Supplementary GI			
				11/10/19	22/10/19	06/11/19	14/11/19	10/11/20	24/11/20	08/12/20	16/12/20
Site 1	2019 GI	WS03	Clay	- ¹	0.50	0.41	0.21	- ²	- ²	- ²	- ²
		WS04c	Made Ground	- ¹	0.45	0.37	0.50	0.55	0.49	0.62	0.71
		WS06	Made Ground	- ¹	Dry	Dry	Dry	- ²	- ²	- ²	- ²
	2020 GI	WS201	Clay	-	-	-	-	Dry	Dry	3.70	3.79
		WS202	Clay	-	-	-	-	Dry	Dry	Dry	Dry
		WS205	Made Ground	-	-	-	-	Dry	Dry	3.92	Dry
Site 2	2019 Due Diligence GI	WS08	Clay	0.48	0.70	0.52	0.53	0.73	0.73	0.66	0.73
		WS09	Made Ground	Dry	Dry	Dry	Dry	- ²	- ²	- ²	- ²
		WS10	Clay	0.26	0.27	0.27	0.20	0.58	0.47	0.42	0.36
		WS11	Clay	0.29	0.64	0.28	0.30	- ²	- ²	- ²	- ²
		WS12	Clay	0.47	1.27	0.54	0.50	0.69	0.68	0.70	0.67
		WS13	Clay	2.79	0.25	0.94	0.90	1.07	1.05	0.99	1.04

1) Borehole inaccessible on first monitoring visit

2) Unable to locate borehole

5.6 Observed Potential Contamination

Olfactory and visual indicators of contamination noted during the site works is summarised in *Table 5.6* below.

Blackish grey ashy granular Made Ground material with clinker was observed in WS02b, WS02c, WS04, WS04a, WS04c, WS07, WS08 and WS09 from depths of between 0.10-0.50m bgl. Black dark brown ashy clay Made Ground was recorded in WS05 (1.40-1.95m bgl). This ash and clinker in Made Ground soils is indicative of PAH contamination recorded in the soils and is likely associated with historic land use, including as a mill, heavy industry, dye works and other commercial and mixed-use buildings. Full details of contamination within site soils is discussed in *Section 7.0*.

Table 5.6 – *Olfactory & Visual Indicators of Contamination Identified*

Exploratory Hole Ref.	Depth (m bgl)	Description
WS205	0.72 – 2.00	Slight hydrocarbon odour.

6.0 Ground Model

6.1 Made Ground

Made Ground was encountered within all exploratory locations to depths of between 0.00m and 3.50m bgl. Concrete was encountered in WS01 from ground level to 0.08m bgl and within the former warehouse (WS201-WS203) from ground level to 0.27m bgl as a concrete floor slab.

Made Ground was encountered from ground level to a maximum depth of 3.50m bgl in CP102 identified as reworked ground.

Due to the variable nature of Made Ground, this layer is not deemed a suitable founding stratum. As such, parameters have not been derived for the Made Ground.

Table 6.1 – Summary of geotechnical test results – Made Ground

Parameter	No. of tests	Minimum	Maximum
pH	22	6.76	12.94
Water Soluble Sulphate (mg/l)	22	10	510
SPT 'N' Value	9	2	12

6.2 Glacial Till

Glacial till deposits were recorded underlying the Made Ground, typically recorded as cohesive and granular material.

6.2.1 Cohesive Glacial Till Deposits

The geotechnical tests recorded within the cohesive deposits are summarised in *Table 6.2.1a*.

Table 6.2.1a – Summary of geotechnical test results – Glacial Till

Parameter	No. of tests	Minimum	Maximum
Moisture Content (%)	34	9	31
Liquid Limit (%)	34	24	48
Plastic Limit (%)	34	14	23
Plasticity Index (%)	34	10	27
Modified Plasticity Index (%) ⁽¹⁾	34	9	26
pH	34	7.48	8.71
Water Soluble Sulphate (mg/l)	34	26	125
Undrained Shear Strength from Undrained Triaxial Test (kPa)	3	67	242

Parameter	No. of tests	Minimum	Maximum
SPT 'N' Value ⁽²⁾	61	3	45

(1) Modified plasticity index is the plasticity of components <425µm.

(2) Only includes SPTs tests in which full penetration was achieved.

The Atterberg Test results indicate a clayey soil with low to intermediate plasticity. The Plasticity Indices were generally between 10% and 27% with a decrease in plasticity index from 80.00m AOD. A high moisture content, liquid limit and plasticity index were recorded in WS05 at 2.50m bgl. The results of Atterberg Limits are presented on *Figure 6.2.1a* and *Casagrande graphs* are presented in *Appendix D*.

The SPT 'N' results indicates variable stratum comprising soft to very stiff deposits. A typical increase in stiffness is observed with depth, *Figure 6.2.1b*.

A moderately conservative unit weight of 19kN/m³ is deemed suitable for firm to stiff cohesive soils in accordance with BS8002:2015 (ref. 7).

The Undrained Shear Strength (C_u) of the Devensian Till Deposits (Cohesive) has been determined from the relationship between SPT N values and the Plasticity Indices (PI), after Stroud, 1975, (Ref. 8) as presented in *Equation 1*:

$$C_u = f_1 \times \text{SPT N} \quad \text{Equation 1}$$

Where:

C_u is the Undrained Shear Strength

f_1 is the Stroud Factor determined from *Figure 1.5* (Ref. 9)

A f_1 value of 5.4 is deemed suitable for the average PI of 19, determined from Atterberg test results. Therefore, C_u values of between 16.2 kPa to 280.8 kPa are calculated, corresponding with the borehole log description of soft to very stiff clay. The C_u values, shown in *Figure 6.2.1*, indicate lateral and vertical variability, particularly in shallow soils. Three Unconsolidated Quick Undrained Triaxial Compression Tests were taken on U100 samples recording C_u values between 67kPa and 242kPa correlating with calculated values, *Figure 6.2.1c*.

A moderately conservative Coefficient of Consolidation, M_v , of the cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 8) described by Equation 2:

$$M_v = 1/(f_2 \times \text{SPT N}) \quad \text{Equation 2}$$

Where:

M_v is the coefficient of consolidation

f_2 is the Stroud Factor determined from *Figure 1.5* (Ref. 9)

SPT N is Characteristic Standard Penetration Test Result

Using an f_2 factor of 0.54 for an average plasticity index of 19%, M_v values typically range between 0.036 and 0.61 m^2/MN indicating very low to high compressibility. The high compressibility material are recorded in shallow soils. Most results indicate a low to medium compressibility clay, *Figure 6.2.1d*.

The Angle of Shearing Resistance, ϕ' , for the cohesive Glacial Till has been derived from the correlation with Plasticity Indices (Ref. 10). The values are shown in *Figure 6.2.1e*.

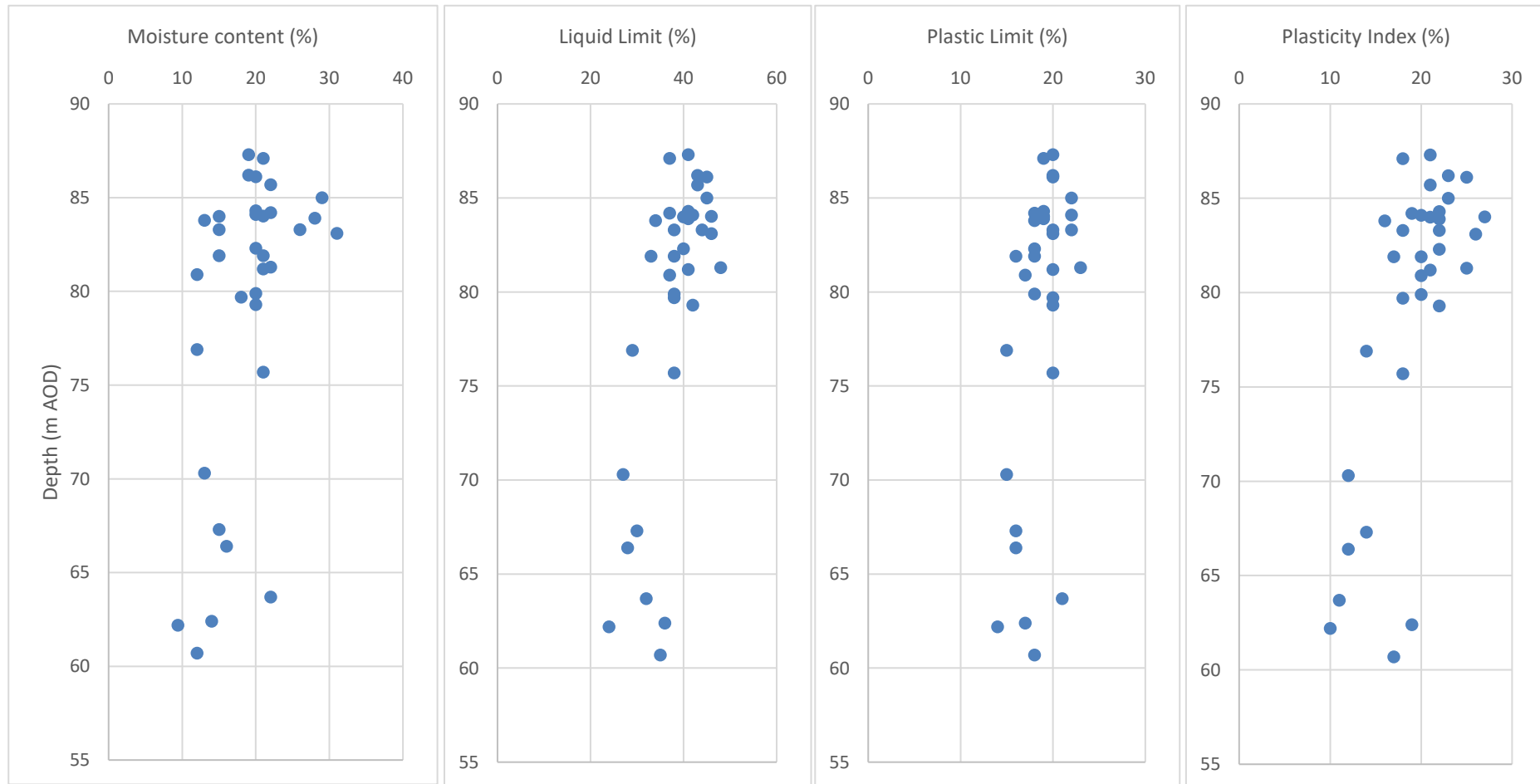


Figure 6.2.1a – Summary of Atterberg Test Results

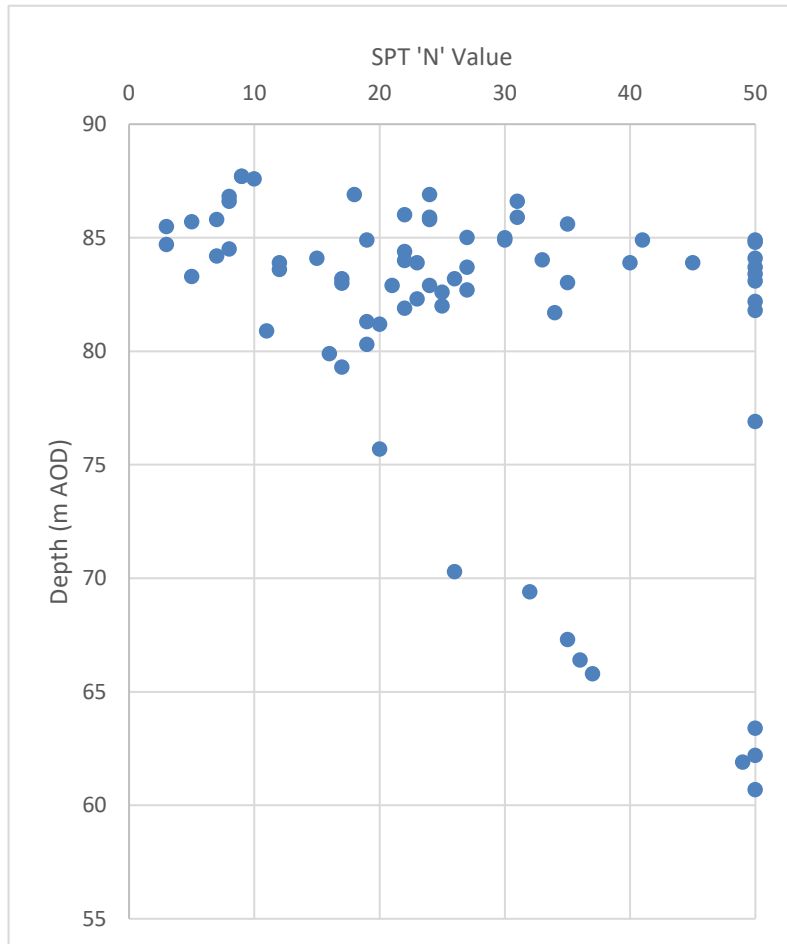


Figure 6.2.1b – Standard Penetration Test vs. Depth

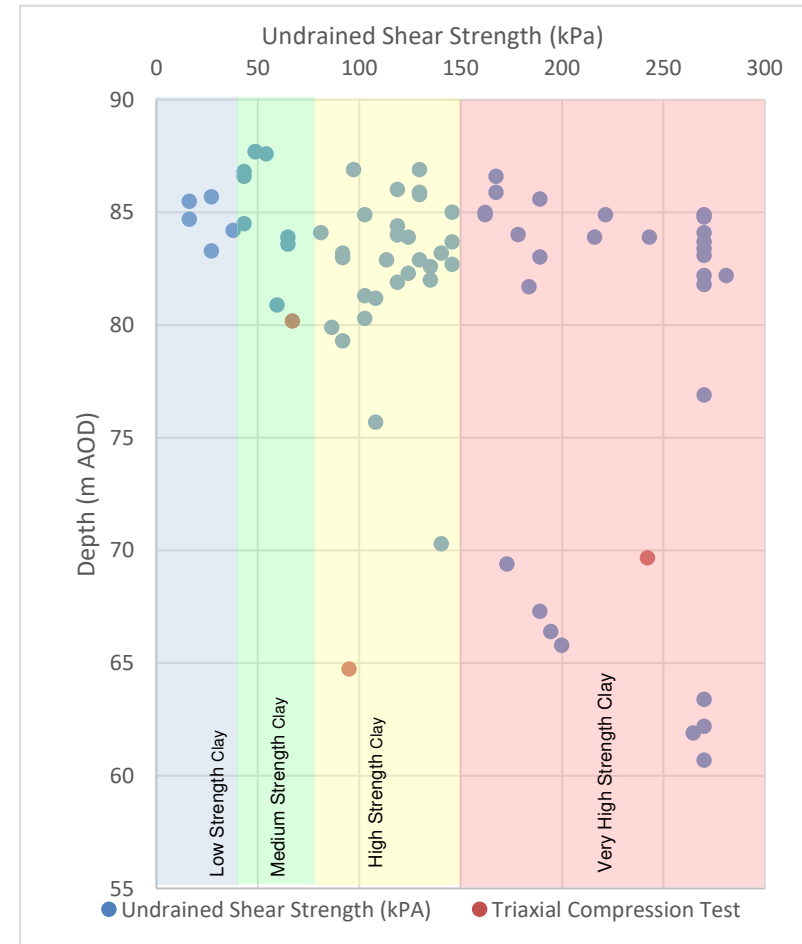
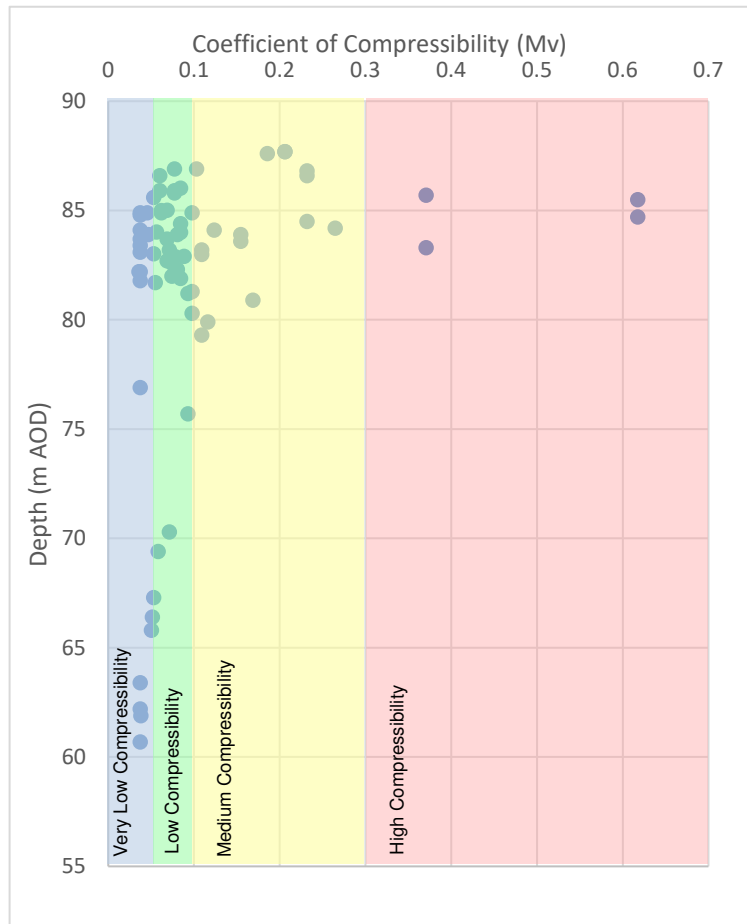
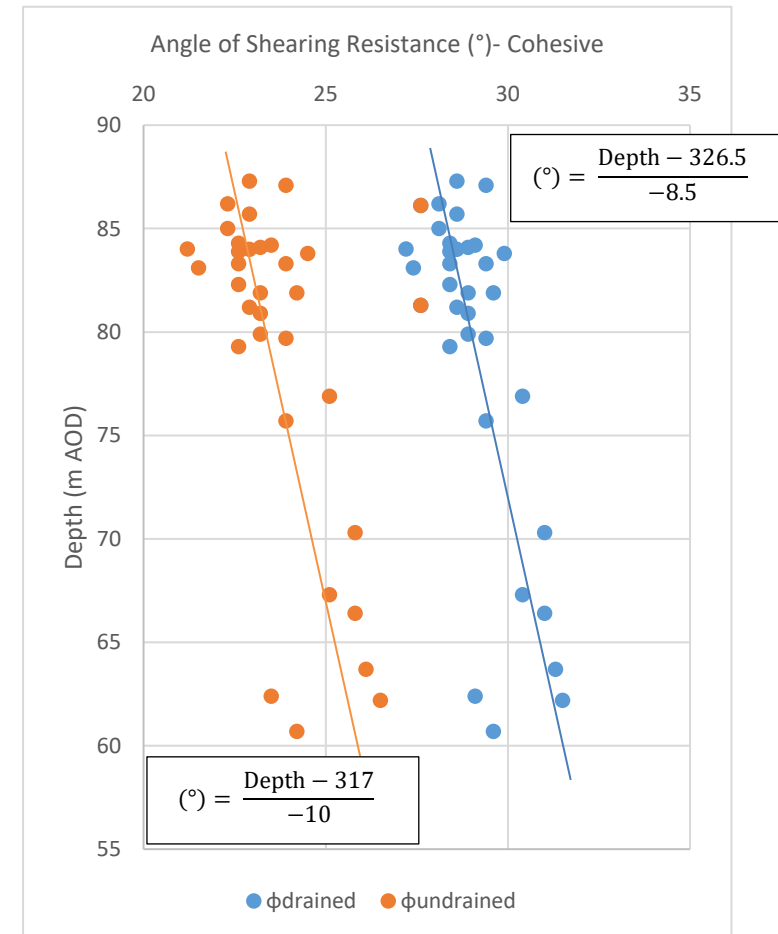


Figure 6.2.1c – Estimated Undrained Shear Strength vs Depth

**Figure 6.2.1d** – Estimated Volume Compressibility Coefficients (M_v) vs Depth**Figure 6.2.1e** – Angle Shearing Resistance (Cohesive) vs Depth

6.2.2 Granular Glacial Till Deposits

The geotechnical test results recorded within the granular deposits are summarised in *Table 6.2.2*.

Table 6.2.2 – Summary of granular geotechnical test results

Parameter	No. of tests	Minimum	Maximum
pH	4	8.65	9.07
Water Soluble Sulphate (mg/l)	4	10	60
PSD (%)	4	0	0
Cobbles		0	1
Gravel		20	92
Sand		7	80
Silt/Clay			
SPT 'N' Value Granular ⁽¹⁾	14	6	31

Fourteen SPT 'N' values were recorded in the granular strata, ranging between 6 and 31. The SPT 'N' values indicate loose to dense deposits identifying variable ground conditions across the site. The results are shown in *Figure 6.2.2a*.

A moderately conservative characteristic unit weight of 17kN/m³ above the water table and of 19kN/m³ below the water table is deemed suitable for loose to dense granular deposits in accordance with BS8002:2015 (Ref. 7)

A moderately conservative characteristic Angle of Shearing Resistance (ϕ') has been derived from correlation with SPT N values (Peck et al, 1967, Ref 11) and a review of published values. The results are shown in *Figure 6.2.2b*.

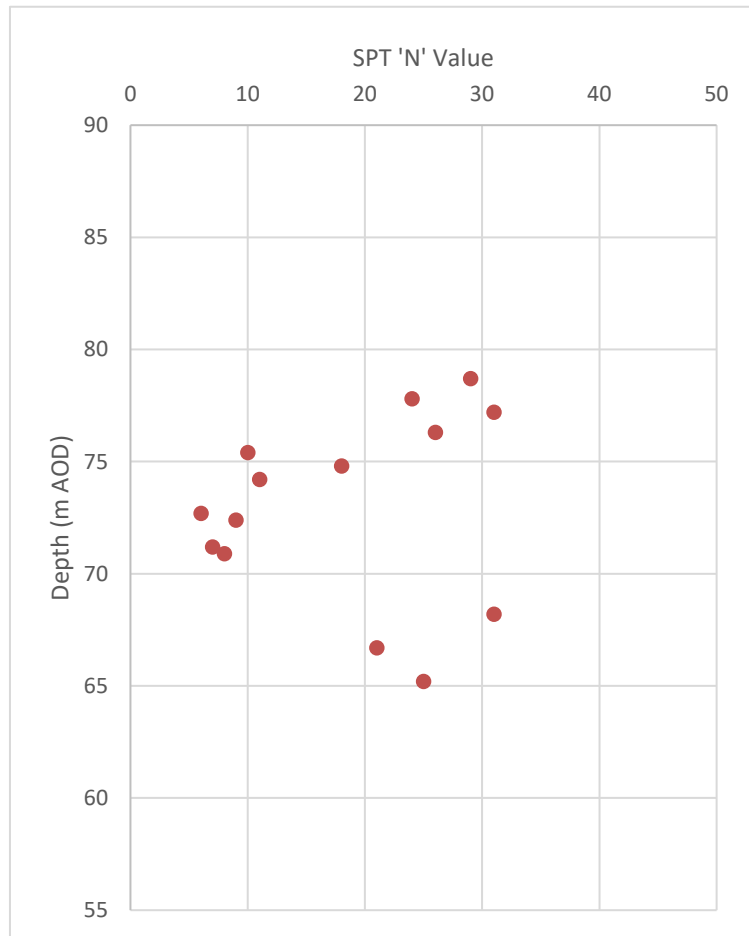


Figure 6.2.2a – Standard Penetration Test vs. Depth

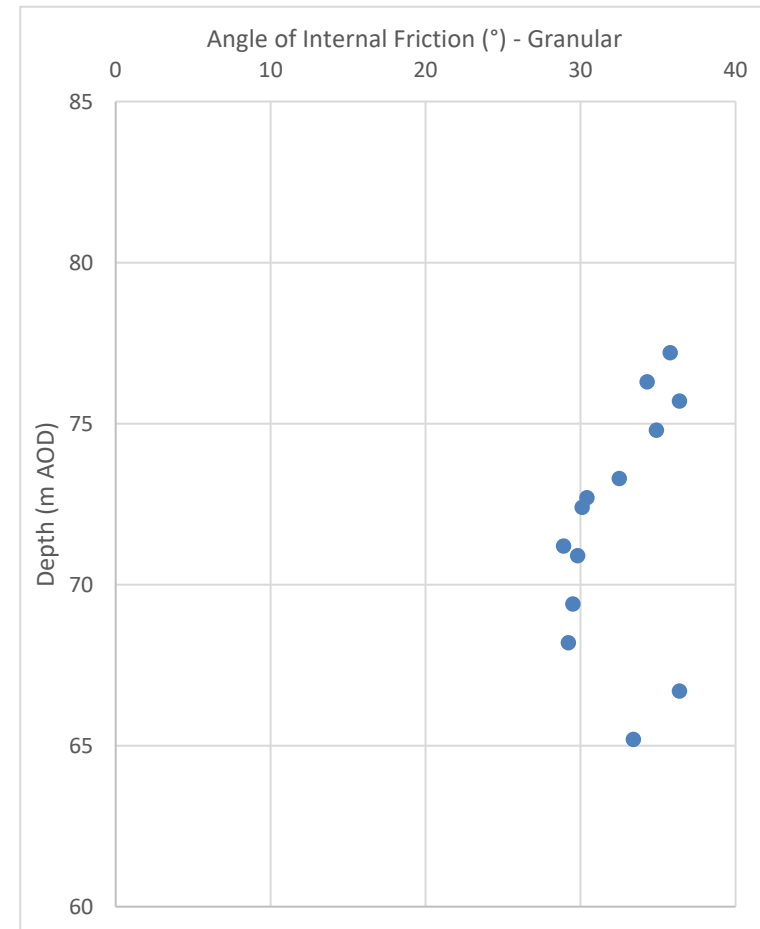


Figure 6.2.2b – Angle of Internal Friction (Granular) vs Depth

6.3 Aggressive Ground Conditions

The classification of the site (Sites 1 and 2) in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd Edition of 2005 (Ref.12). A summary of the results obtained are summarised in *Table 6.3a*, and *Table 6.3b* details the classification.

Table 6.3a – Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Test Type	Range
Made Ground	pH	6.76 – 12.94
	Water Soluble Sulphate (mg/l)	10 – 510
Glacial Till	pH	7.48 – 9.07
	Water Soluble Sulphate (mg/l)	10 - 125

Table 6.3b – Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Design Sulphate Class	ACEC Class ⁽¹⁾
Made Ground	DS-1	AC-1
Glacial Till	DS-1	AC-1

(1) ACEC assessment was based on the *mobile* groundwater condition in a *brownfield* scheme area

7.0 Ground and Groundwater Contamination Assessment

This section of the report includes the assessment of the potential contamination, solid, liquid and gas, identified on the subject site which may present a risk to the proposed end users, associated utilities and the wider environment.

In guidance published by the Environment Agency, the risk to human health or controlled waters is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (Ref. 13).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site by site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the first tier (Tier 1) of this approach otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment presented in the Phase 1 Desk Study (Ref. 1) conjunction with observations made during the ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in *Section 9.0* of this report.

The following sections present more detail on the risk assessment methodology rationale for the main receptors.

7.1 Human Health GQRA

Detailed guidance on human health risk assessment is available within several documents, published by both the Environment Agency and Defra. Guidance includes Contaminated Land Exposure Assessment (CLEA) v1.071 model (Ref. 14) Report SC050021/SR2: Human Health Toxicological Assessment of Contaminants in Soil (Ref. 15) and Report SC059921/SR3: Updated Technical Background to the CLEA Model (Ref. 16).

A generic quantitative risk assessment (GQRA) has been carried out for the Potential Contaminant Linkages (PCLs) investigated by screening of soil contamination data against relevant Generic Assessment Criteria (GAC) where available, including:

- i) **Soil Guideline Values (SGVs):** These have been published by the Environment Agency and are trigger values for screening out low risk areas of land contamination. SGV's give an indication of representative average concentrations of chemicals in soil, below which long-term health risks

are likely to be minimal. SGVs have been published for several contaminants including arsenic, cadmium, mercury, nickel, selenium, BTEX, phenols and dioxins, furans and dioxin-like PCB substances for land uses including residential, allotments and commercial. The SGVs have been developed for a sandy loam soil with 6% soil organic matter (SOM) content;

- ii) **Supplementary Screening Values (SSVs):** In addition to the SGVs developed by the EA, other third-party organisations have derived SSVs for a wider range of contaminants and land uses using the CLEA Model. Curtins have adopted these numbers where applicable, including those developed by Atkins AtriskSoil™, the LQM/CIEH Suitable for Use Levels (S4UL) and EIC/AGS/CL:AIRE published thresholds;
- iii) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium and lead. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 (Ref. 17) in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). C4SLs are not representative of significant possibility of significant harm (SPoSH) and are low risk levels which, and therefore where the C4SLs are not exceeded, land can be demonstrated to be in Category 4 and cannot be determined as contaminated land.

7.1.1 Adopted Soil Human Health GACs Screening Methodology

Site 1

The proposed end-use comprises three distinct areas of development:

- 100 apartments within two blocks up to six-storeys on the western and northern boundaries; analogous with a '*Residential without home-grown produce*' scenario;
- 11No. 3-bedroom houses and 4No. 2-bedroom houses all with private gardens analogous with '*Residential with home-grown produce*'; and
- The associated proposed car parking in the south of Site 1 is most analogous with '*Public open space near residential housing*'.

These distinct areas, or zones, are detailed further in *Section 7.1.2* and shown in Curtins drawing ref. 074031-00-XX-DR-GE-80005-P01, contained within *Appendix A*.

Assessment has been undertaken against the following GACs, in order of preference for the development:

1. Environment Agency Soil Guideline Values,
2. CL:AIRE, AGS, EIC. Soil Generic Assessment Criteria for Human Health Risk Assessments,
3. LQM/CIEH 2015 S4ULs for Human Health Risk Assessment, and
4. DEFRA Category 4 Screening Levels.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for the Made Ground site soils ranged from 0.6% to 35.8% and natural site soils was 1.1%. The high organic content encountered in the soils is representative of the Made Ground, noted to contain ash, coal and clinker.

With consideration for a calculated geometric average, Made Ground soils determine a SOM of 9.1% for the apartments, 2.48% for the houses and 4.69% for the proposed car parking.

As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM of 6% for '*Residential without home grown produce*', a conservative SOM of 1% for '*Residential with home grown produce*' and a SOM of 2.5% for '*Public open space near residential housing*' end-use have been adopted for Made Ground. The adopted GAC's are listed in *Appendix F*.

Site 2

The proposed end-use of 24 low-rise residential houses with private gardens to the east of Newton Street; is most analogous with a '*Residential with home-grown produce*' scenario and so assessment has been undertaken against the following GACs, in order of preference for the above developments across the two sites:

1. Environment Agency Soil Guideline Values,
2. CL:AIRE, AGS, EIC. Soil Generic Assessment Criteria for Human Health Risk Assessments,
3. LQM/CIEH 2015 S4ULs for Human Health Risk Assessment, and
4. DEFRA Category 4 Screening Levels.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for the site soils ranged from 0.8% to 11.8%.

With consideration of a calculated geometric average for Made Ground soils a SOM of 6.06% is determined. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM of 6% for '*Residential with home ground produce*' end-use has been adopted. With consideration of a geometric average for natural soils an SOM of 0.98% is determined.

As such, a SOM of 1% for '*Residential with home grown produce*' end-use has been adopted for natural soils. The adopted GAC's are listed in *Appendix F*.

7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix C*, with testing undertaken on a total of fourteen soil samples across the two development sites in 2019 and nine soil samples in Site 1 in 2020.

Site 1

Site 1 has been split into three zones relating to their proposed end uses;

- Zone 1 = 'Residential without home grown produce';
- Zone 2 = 'Residential with home grown produce'; and
- Zone 3 = 'Public open space near residential housing'.

The boreholes, where environmental samples were obtained, included in those areas and SOM values used are detailed in *Table 7.1.2a* below. The proposed end use zones and associated boreholes are shown in Curtins drawing ref. 074031-00-XX-DR-GE-80005-P01, contained within *Appendix A*.

Table 7.1.2a – Proposed End Use Zones, Associated Boreholes and Adopted SOM

Zone Number	Proposed End Use	Exploratory Holes Include with Proposed End Use Area	Calculated SOM (%)	Adopted SOM (%)
1	Residential without Home Grown Produce	WS04, WS05, WS06, WS07, CP101, CP102 and CP103	9.10	6
2	Residential with Home Grown Produce	WS201, WS202 and WS205	2.48	1
3	Public Open Space near residential housing	WS01, WS02b, WS03, WS203 and WS204	4.69	2.5

• Zone 1, 'Residential without home grown produce'

With respect to Zone 1, 'Residential without home grown produce' end use, PAH, TPHs and lead exceedances were recorded, detailed in *Table 7.1.2b*.

Table 7.1.2b – Soil GAC Exceedances for a Residential without home grown produce End-Use

Determinand	6% GAC threshold (mg/kg)	Concentration (mg/kg)			
		WS04c (0.70m bgl)	WS06 (0.90m bgl)	CP101 (0.25m bgl)	CP101 (0.60m bgl)
Lead	310	427	749	438	-
Benzo(a)pyrene	3.2	6.83	-	-	3.93
Benzo(b)fluoranthene	4.0	7.44	-	-	4.96

Determinand	6% GAC threshold (mg/kg)	Concentration (mg/kg)			
		WS04c (0.70m bgl)	WS06 (0.90m bgl)	CP101 (0.25m bgl)	CP101 (0.60m bgl)
Dibenzo(ah)anthracene	0.32	0.56	-	-	0.45
TPH Aro >C21-C35	1900	2760	-	-	-

• **Zone 2, 'Residential with home grown produce'**

With respect to Zone 2, 'Residential with home grown produce' end use, a single Lead exceedance was recorded in the Made Ground of WS202 as detailed in *Table 7.1.2c*.

Table 7.1.2c – Soil GAC Exceedances for a Residential with home grown produce End-Use

Determinand	1% GAC threshold (mg/kg)	Concentration (mg/kg)
		WS202 (0.70m bgl)
Lead	200	221

• **Zone 3, 'Public Open Space near residential housing'**

With respect to Zone 3, 'Public open space near residential housing' end use, PAH and TPH exceedances were recorded in WS01 as detailed in *Table 7.1.2d*. WS01 is located with the former car park for the warehouse. It is likely these exceedances are due to a localised spill / leak within the car park; likely diesel given the heavier TPH fractions encountered.

Table 7.1.2d – Soil GAC Exceedances for a Public open space near residential housing End-Use

Determinand	2.5% GAC threshold (mg/kg)	Concentration (mg/kg)
		WS01 (0.15 bgl)
Benzo(a)anthracene	29	554
Benzo(a)pyrene	5.7	485
Benzo(b)fluoranthene	7.2	586
Benzo(k)fluoranthene	190	195
Chrysene	57	531
Dibenzo(ah)anthracene	0.58	90.5
Indeno(123-cd)pyrene	82	374
TPH Aro >C16-C21	3800	8110
TPH Aro >C21-C35	3800	48500

Selected soil samples were screened for asbestos. No suspected asbestos containing materials (ACMs) were identified in the exploratory hole logs.

However, laboratory screening identified asbestos cement in WS02b, in Zone 3, at 0.45m bgl, identified as chrysotile cement with a % soil composition of 0.959% w/w.

Mercury was encountered in Zone 1 in WS04C (0.70m bgl), CP101 (0.25m bgl) and CP102 (0.60m bgl) and in Zone 2 in WS201 (0.40m bgl) between 1.26mg/kg and 2.24mg/kg above the GAC of 1.00mg/kg. Although the values are recorded exceedances, the site's historic land use as terraced housing, inns, a bowling green and a dye works would not be indicative sources of elemental Mercury and therefore it is considered likely that the Mercury detected within the soils is inorganic. The likelihood that >1 mg/kg of elemental mercury is present within the sample is considered to be very low.

Site 2

With respect to the proposed '*Residential with home grown produce*' end use of the site, Lead exceedances are noted within 3 No. recovered Made Ground soil samples, commonly ashly gravel or sand strata. The exceedances are detailed in *Table 7.1.2e*.

Table 7.1.2e – Soil GAC Exceedances for a Residential housing with home grown produce End-Use

Determinand	6% GAC threshold (mg/kg)	Concentration (mg/kg)		
		WS08 (0.55m bgl)	WS09 (0.65m bgl)	WS13 (0.80m bgl)
Lead	200	455	588	987

A Mercury concentration of 1.16 mg/kg was recorded within the Made Ground soils from WS09 at 0.65m bgl. Although this is above the GAC for elemental mercury, the site's historical land use as terraced housing, inns, a bowling green and a dye works would not be indicative sources of elemental Mercury and therefore it is considered likely that the Mercury detected within the soils is inorganic. The likelihood that >1 mg/kg of elemental mercury is present within the sample is considered to be very low.

No exceedances were recorded within the two natural soil samples when compared against '*Residential with home grown produce*' 1% GACs.

8.0 Ground Gas Assessment

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA (Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (Ref. 18), BSI Publication Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2015 (Ref. 19) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 20).

The ground gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within the Phase 1 Preliminary Site Assessment and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

8.1 Ground Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk standpipe installations were incorporated within nine borehole locations as detailed in *Section 3.2*.

All four gas monitoring visits have been undertaken at the site and reviewed. The Phase 1 highlighted a **Moderate/Low** risk from ground gases potentially arising from organic / putrescible content in Made Ground soils.

The gas monitoring visits have been undertaken between 11th October 2019 and 14th November 2019, with barometric pressure recorded between 988mb and 1012mb. Steady barometric pressure was recorded on the first and second visit (11/10 and 22/10), falling barometric pressure was recorded on the third visit (06/11) and rising barometric pressure was recorded on the fourth visit (14/11).

An additional four gas monitoring visits have been undertaken between 10th November and 16th December 2020, with barometric pressure recorded between 970mb and 1011mb. Steady barometric pressure was recorded on the sixth and eighth visit (24/11 and 16/12), falling barometric pressure was recorded on the seventh visit (10/12) and rising pressure was recorded on the fifth visit (10/11).

The results log sheets are contained within *Appendix E* and summarised in *Table 8.1a* (Site 1) and *Table 8.1b* (Site 2), with all installs under the footprint of the proposed development.

Site 1

On the first monitoring visit, it was not possible to monitor the three boreholes due to them being inaccessible. Methane (CH₄), carbon monoxide (CO) and hydrogen sulphide (H₂S) were recorded at or below the instrument's detection limit within all the monitoring wells.

Elevated concentrations of carbon dioxide above 5% were only recorded in two boreholes, WS03 and WS04c, with a maximum concentration was recorded at 8.2% in WS03 on the third monitoring visit. Both of these boreholes are located within the area of the apartment blocks. Maximum gas flow rates

ranged between <0.1l/hr and -7.7l/hr. The greatest flow rate was recorded in WS04C on the second monitoring visit.

In the proposed area to be occupied by low-rise residential housing, the maximum carbon dioxide (CO₂) concentration was recorded at 2.3% in WS205 on the fifth monitoring visit. Maximum flow rate was recorded at -0.2 l/hr was recorded in WS205 on the fifth monitoring visit.

Table 8.1a – Summary of Ground Gas Monitoring Results Site 1 – Installs Located within the Proposed Development Footprints

Site Ref.	Exploratory Hole ID	Maximum Peak Carbon Dioxide Concentration (%)	Maximum Steady State Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Gas Flow (l/hr)	Steady State Gas Flow (l/hr)
Zone 1	WS03	8.2	8.2	18.8	4.0	3.7
	WS04c	6.1	6.1	1.3	-7.7	-3.9
	WS06	1.8	1.7	18.4	0.3	0.2
Zone 2	WS201	1.7	1.7	18.9	-0.9	-0.8
	WS202	1.5	1.5	18.8	<0.1	<0.1
	WS205	2.3	2.3	18.7	<0.1	<0.1

The proposed end use zones and associated boreholes are shown in Curtins drawing ref. 074031-00-XX-DR-GE-80005-P01, contained within *Appendix A*.

Site 2

Methane and hydrogen sulphide concentrations were recorded at or below the instrument's detection limit within all the monitoring wells.

No elevated carbon dioxide concentrations above 5% were recorded across Site 2 during the eight monitoring visits, with a maximum carbon dioxide concentration recorded at 4.1% in WS13 on the eighth monitoring visit. Other peak carbon dioxide concentrations generally ranged between 1.7% in WS09 and WS121 and 3.6% in WS08.

Carbon monoxide was generally recorded at or below the limit of detection of the monitoring instrument, however WS10 and WS11 recorded concentrations of between 1ppm and 41ppm.

Gas flow was recorded at a maximum peak flow rate of 25.1 l/hr in WS11 (Site 2) on the first visit 11th October 2019. The greatest steady state gas flow rate (6.0l/hr) was recorded in WS11 on the third monitoring visit.

Table 8.1b – Summary of Ground Gas Monitoring Results Site 2 – Installs Located within the Proposed Development Footprints

Exploratory Hole ID	Maximum Peak Carbon Dioxide Concentration (%)	Maximum Steady State Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Gas Flow (l/hr)	Steady State Gas Flow (l/hr)
WS08	3.6	2.9	16.4	-14.6	-1.0
WS09	1.7	1.6	18.5	0.1	<0.1
WS10	3.0	3.0	14.9	-16.8	-1.3
WS11	2.9	2.9	16.6	25.1	10
WS12	1.7	1.7	18.0	-1.2	-1.2
WS13	4.2	4.2	15.5	16.4	0.9

8.2 Ground Gas Assessment

The Conceptual Site Model presented within the Phase I Preliminary Risk Assessment identified Made Ground as a potential sources of ground gas generation. The report suggests no records of organic rich drift deposits (e.g. peat) being present. Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane and hydrogen sulphide. The Phase 1 identified a **Moderate/Low Risk**.

Made Ground soils consisting of dark brown, brown silty sandy clay with frequent rootlets to depths of up to 0.80m bgl. Underlying Made Ground of clay, sand and gravel to a maximum depth of 2.00m bgl and included anthropogenic constituents of brick, coal, ash, clinker, slate, concrete, sandstone and limestone. Natural deposits were exclusively glacial till to the maximum depth of the investigation, from between 0.60m bgl to 2.00m bgl to a depth of 5.45m bgl.

Current development plans indicate that Site 1 will comprise 100 apartments within two blocks up to six-storeys and low-rise residential housing so the assessment has been undertaken in accordance with guidance within BS8485:2019 (Ref. 19) and NHBC guidance within NHBC Report 04 (Ref. 21) for Zones 1 and 2 respectively.

Site 2 is noted to comprise low rise residential housing and as such the assessment has been undertaken in accordance with NHBC guidance within NHBC Report 04 (Ref.21)

Should development plans indicate a change in proposed end use, reassessment of the ground gas regime pertaining to each site may be required.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas

monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

8.2.1 Ground Gas Assessment for Site 1

Apartment Blocks

The gas monitoring data has been assessed in line with BS8485:2015 (Ref. 19). WS03, WS04C and WS06 are located within the proposed footprint of the apartment blocks. In total, 8no monitoring visits have been undertaken following the Due Diligence 2019 investigation and 2020 Supplementary investigation.

As methane was not detected above the monitor's limit of detection throughout the monitoring period, the risk to site end users from methane is considered Low and is therefore not considered further.

Characteristic Situation

In accordance with BS8485:2015 (Ref.19), consideration of the recorded soil gas flow rates, presented above, enables hazardous gas flow rates (Q_{hg}) to be evaluated. Q_{hg} can be derived for both 'representative' and 'worst case' scenarios and a comparison made in support of an appropriate assessment of ground gas risk.

As a total of eight monitoring visits have been undertaken, it is considered that the gas monitoring results recorded do represent the site's ground gas regime and so the 'worst case' scenario has not been assessed further.

For a 'representative' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) steady state flow rates and peak gas concentrations are adopted.

Installs WS03 and WS04c recorded significantly elevated peak flow rates of 4.0l/hr and -7.7l/hr respectively. From a review of groundwater level monitoring (*Table 5.5*) and response zones of the monitoring wells (*Table 3.2*), it can be seen the response zones were flooded during the monitoring period. It is considered that high flow rates in these boreholes is likely to be linked to rising shallow groundwater in the solid section of the well installation causing an increase in internal pressure within the pipework, which is released, and subsequently equalised, when the valve tap is opened resulting in the high observed peak flows preceding lower steady flow. This effect is detailed within BS8485:2015 (Ref.20), CL:AIRE Research Bulletin 17 (Ref 24) and 'A Pragmatic Approach to ground gas risk assessments for the 21st century' (Ref. 25).

Considering the above, and using professional judgement, the elevated peak flow readings from WS03 and WS04C have been omitted for the calculations use in the assessment of gas risk on site, with remaining flow and carbon dioxide readings considered to give a more representative

Evaluation of the 'representative' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) records a maximum Q_{hg} of 0.3198 l/hr for carbon dioxide with the highest steady flow rate of 3.9 l/hr in WS4C.

In accordance with BS8485:2015 the 'representative' GSV indicates a Characteristic Situation 2 (CS2) gas regime requiring ground gas protection measures for the apartment buildings.

Low-rise residential housing

The gas monitoring data collected has been assessed in line with NHBC guidance (Ref. 21). WS201, WS202 and WS205 are located with the footprints of the low-rise residential properties.

NHBC Characterisation

Consideration of the recorded soil gas flow rates, presented above, enables Gas Screening Values (GSVs) to be evaluated in accordance with NHBC Report 04 (Ref. 21).

As detailed in the summarised gas monitoring results in *Table 8.1a* and the details monitoring results in *Appendix E*, the highest steady state carbon dioxide concentration (2.3%) was recorded in WS205 during Visit 5, with a corresponding steady state flow of below LOD (taken as 0.1 l/hr).

For the assessment of carbon dioxide, guidance indicates that maximum steady state flow rate and a maximum steady state carbon dioxide concentration should be utilised, giving a GSV of 0.0023 l/hr for carbon dioxide using the above data for WS205.

Based on a maximum steady state recorded carbon dioxide concentration of 2.3% and a GSV of 0.0023 l/hr, in accordance with an assessment by CIRIA C665 (Ref.18) classification for low rise housing with a ventilated underfloor void (minimum 150mm), indicates Green gas regime not requiring gas protection measures for the low-rise housing on Site 1.

8.2.2 Ground Gas Assessment for Site 2

The gas monitoring data for Site 2 has been assessed in line with NHBC guidance (Ref. 21) in line with the proposed low-rise residential housing planned for this area.

As methane was not detected above the monitor's limit of detection, the risk to site end users from methane is considered to be Low and is therefore not considered further.

NHBC Characterisation

Consideration of the recorded soil gas flow rates, presented above, enables Gas Screening Values (GSVs) to be evaluated in accordance with NHBC Report 04 (Ref.21).

As detailed in the summarised gas monitoring results in *Table 8.1b* and the details monitoring results in *Appendix E*, the highest steady state carbon dioxide concentration (4.2%) for Site 2

was recorded in WS13 during Visit 6, with a corresponding steady state flow of below LOD (taken as 0.1 l/hr).

For the assessment of carbon dioxide, guidance indicates the maximum steady state flow rate and maximum steady state carbon dioxide concentrations should be utilised, giving a GSV of 0.0042 l/hr for carbon dioxide using the above data for WS13.

Based on a maximum steady state recorded carbon dioxide concentration of 4.2% and a GSV of 0.0042 l/hr, in accordance with an assessment by CIRIA C665 (Ref.18) classification for low rise housing with a ventilated underfloor void (minimum 150mm), indicates Green gas regime for carbon dioxide not requiring gas protection measures for the low-rise housing on Site 2.

9.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented in the Phase 1 Report (Ref.1) and discussed in *Section 2.7* of this report has been revised following the GQRA in *Section 7.0* above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552 (Ref. 22) which is summarised within *Appendix G*.

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Risks presented by Mining are discussed and assessed within *Section 2.4.4*.

Risks presented by Unexploded Ordnance are discussed and assessed in *Section 2.6*.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (Ref. 23) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk.

It has been assumed that any future construction works on site will be undertaken in compliance with these requirements and therefore construction workers involved in the building works at the site have been discounted as a human receptor in the conceptual site model.

Reference should be given to the environmental testing results discussed within *Section 7.0* and presented within *Appendix C*.

Qualitative Risk
AssessmentGeneric
Quantitative Risk
AssessmentDetailed
Quantitative Risk
Assessment or;
Remedial Action

- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.

Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating		
Site 1 Site 1 recorded elevated levels of Lead, PAHs and Aromatic TPHs within WS04c, WS06 and CP101 above 'Residential without home grown produce'. WS01 exceedances of PAHs and Aromatic TPHs above 'Public open space near residential end-use'. WS202 exceedances of lead above 'Residential with home grown produce'	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation	Site end-users Residential and public open space near residential	Medium	Likely	Moderate	Made Ground soil samples from across Site 1 recorded elevated concentration above they respective GAC thresholds with respect to Lead, PAHs and Aromatic TPHs C16-C35 in WS01. Likelihood of direct contact with these soils containing the exceedances is considered Likely due to anticipated cut and fill exercise for the site moving soils site-wide.	Suitable thickness of clean and inert capping in all areas of soft landscaping and private gardens to break the source-pathway-receptor linkage between Made Ground soils on site containing Lead, PAHs and TPHs. No action required within the building footprint and areas of hard standing as these will break the source-pathway-receptor linkage between Made Ground soils and site end users.
	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation	Construction and maintenance workers	Mild Standard Health & Safety precautions likely to be used by workers	Likely	Moderate / Low		Standard Health & Safety precautions likely to be used by workers.
	Soil dust ingestion/inhalation produced during construction	Adjacent residents	Medium	Low	Moderate / Low		Suitable environmental controls likely to be employed by construction contractors.
Asbestos Chrysotile Cement of 0.959% identified in WS02b (Site 1) at 0.45m bgl	Dust and migration inhalation	Site end-users Residential	Medium	Likely	Moderate	Laboratory screening identified Asbestos ACMs in soil sample taken and tested at 0.45m bgl from WS02b	The areas of hard standing in the location of WS02b will break the source-pathway-receptor linkage across this area of the site where Asbestos was identified within the soil sample.
		Construction and maintenance workers	Mild (Standard Health & Safety precautions likely to be used by workers)	Likely	Moderate / Low		Should groundworks be undertaken within this area, handpicking and careful removal of ACMs from the affected soils should be undertaken
		Adjacent residents	Medium	Low	Moderate / Low		Suitable environmental controls likely to be employed by construction contractors.



Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating		
Organic matter and/or contamination as source material for the generation of ground gas in remaining parts of the site. Historically infilled land on site and within 250m of the site. Historical landfill located 153m south west of the site.	Ground gas & vapour migration and inhalation	<u>Site 1 Zone 1</u> Site end-users Residential apartments	Medium	Likely	Moderate	For the 5 and 6 storey apartment blocks, the Carbon Dioxide ground gas assessment records maximum concentrations of 8.2 % v/v within WS03 and 6.1% v/v in WS04c, The GSV for carbon dioxide is calculated to be 0.3198. Methane (CH ₄) and Hydrogen Sulphide (H ₂ S) were recorded at or below the instrument's detection limit within all the monitoring wells.	The apartment blocks require Characteristic Situation 2 (CS2) gas protection measures, according to BS8485:2015.
		<u>Site 1 Zone 2</u> Site end-users Low-rise Residential Housing		Unlikely	Low	For the low-rise residential housing in Site 1, the carbon dioxide ground gas assessment records a maximum concentration of 2.3% v/v in WS205. Methane (CH ₄) and Hydrogen Sulphide (H ₂ S) were recorded at or below the instruments limit of detection within all the monitoring wells.	The low-rise residential housing is NHBC Green – not requiring gas protection measures.
		<u>Site 2</u> Site end-users Low-rise Residential Housing		Unlikely	Low	For Site 2, low-rise residential housing the Carbon Dioxide ground gas assessment records a maximum concentration of 4.2% v/v in WS13. Methane (CH ₄) and Hydrogen Sulphide (H ₂ S) were recorded at or below the instrument's detection limit within all the monitoring wells.	Site 2 is NHBC Green – not requiring gas protection measures.

10.0 Engineering Assessment and Recommendations

10.1 Introduction

This section will assess the relevant geotechnical issues for the proposed development spread over two adjacent plots to the west (Site 1) and east (Site 2) of Newton Street. Site 1 comprises 100 apartments and 15 low-rise residential houses with soft landscaping and parking and Site 2 comprises 24 low-rise houses with soft landscaping and driveways. The proposed development plan is contained within *Appendix A*.

The engineering assessment considers foundation design, bearing capacity, settlement, excavations, ground floor slabs and pavement design for the site. Structural details and loadings have not yet been provided. It should be noted that detail may change in the development of designs beyond the issue of this Phase 2 Report and the Construction Designer should satisfy themselves regarding the adequacy of their design and proposed approach to construction by reference to the on-going project design proposals, the site investigation information and their own examination of the site.

10.2 Summary of Ground Conditions

10.2.1 Site 1

The ground conditions at the site generally comprised topsoil/asphalt/concrete overlying predominantly granular Made Ground. The Made Ground was underlain by cohesive glacial till comprising firm grey slightly sandy gravelly clay overlying stiff dark brown slightly silty slightly gravelly clay. Deeper glacial till deposits, encountered in CP101-CP103 in Site 1, comprised loose to dense slightly clayey sand and soft brown sandy silt/silty clay underlain by stiff to very stiff slightly silty, slightly sandy, slightly gravelly clay.

10.2.2 Site 2

The ground conditions at the site generally comprised topsoil overlying granular and cohesive Made Ground. The Made Ground was underlain by cohesive glacial till comprising firm light brown/orange silty clay overlying stiff to very stiff brown slightly gravelly silty clay.

10.3 Excavations

Based on observations on site, together with the results of in-situ and laboratory tests, it is considered that excavations to <1.20m bgl should stand unsupported in the short term. Side support for safety purposes should of course be provided to all excavations which appear unstable, and those >1.20m deep, in accordance with Health and Safety Regulations.

Suitable side slope angles must be checked and provided by a suitably qualified temporary works contractor for any excavations.

Groundwater may be encountered as seepages in shallow excavations for foundations or services as perched water present, with an overall high monitored water level within the majority of the exploratory boreholes. It is considered that groundwater inflows, if encountered, may be controlled by pumping from sumps.

Excavation through layers of Made Ground and Glacial Till encountered across the site should be feasible using conventional site plant. Following periods of heavy rainfall, the use of a tracked excavator may be required to the west of Newton Street to prevent plant subsidence.

10.4 Foundation Design

The proposed development is spread across two adjacent plots to the west (Site 1) and east (Site 2) of Newton Street. Site 1 comprises apartment blocks and low-rise residential housing and Site 2 comprises exclusively low-rise residential housing. As such, the ground conditions and founding solutions have been subdivided for Site 1 and Site 2.

A summary of the potential founding solutions proposed are summarised in the section below.

10.4.1 General

Made Ground and areas of soft/loose compressible material at foundation level must be removed and replaced with suitable compacted granular fill, in accordance with Series 600 Specification for Highways Works to achieve required levels.

Perched groundwater is likely to be encountered across Site 1 and groundwater is likely to be encountered across Site 2 and must not be discounted. The contractor should be aware perched groundwater/groundwater may ingress into foundation excavations. The water must be removed, and the affected formation shall be treated prior to placement of the foundations.

A qualified engineer ground engineer must inspect the founding stratum of all foundation formations prior to the commencement of construction zones.

10.4.2 Site 1 – Two apartment blocks and low-rise residential housing

Apartment blocks

Available development plans indicate the proposed construction of one 6-storey apartment block and one 5-storey apartment block in the north and west of the site. The loads of the proposed structures are not known at the time of writing. The loads will predetermine the suitability of foundations to be adopted in this zone.

The relevant exploratory holes to these buildings have been reviewed. Soft clays have been recorded locally to 3.0m bgl and Made Ground is recorded to a maximum depth of 5.0m bgl. As discussed, the Made Ground and the soft/loose compressible natural deposits do not provide a suitable founding stratum, as such if shallow foundations were to be adopted, they would have to be taken down to the firm clays. A likely achievable allowable bearing capacity of 100kN/m² on firm clays and approximately 150kN/m² on stiff clays have been estimated for an acceptable <25mm settlement. However, these deposits are anticipated to be encountered at depths of around 3m bgl to north of this area and about 2m bgl to the south, with the exception of area around CP101 where these will be anticipated at >5m bgl, below the made ground. It must be noted that lateral extents of the deeper made ground has not been recorded. In addition, locally deeper foundation excavations may be required to remove the soft compressible ground and any deeper made ground, due to variability of the ground conditions encountered site-wide.

Due to the proposed storeys of the structures, it is anticipated that shallow foundations on existing ground may not be adequate for the anticipated imposed loads.

In addition, due to presence of soft clays, ground improvement techniques vibro stone columns are considered high risk and therefore not likely to be adequate. Dig and replacement could be considered, subject to further investigation and testing, however the risk associated with the underlying cohesive deposits must be considered further.

It is likely that a piled foundation may be used to transfer the loads to the deeper suitable ground.

The carrying capacity of piles depends not only on their size and the ground conditions but also on their method of installation.

Pile design and installation are continually evolving processes, it is recommended that specialist piling contractors are contacted as to the suitability and carrying capacity of the piles in the ground conditions pertaining to the site.

Low-rise residential housing

Available development plans indicate proposed construction of four 2B3P houses, three 3B5P houses and seven 3B4P houses along the north east and east of the site. The loads of the proposed structures are not known at the time of writing however, it is likely the load will be relatively low. The loads will pre-determine the suitability of foundations adopted.

Ground conditions comprised Made Ground to depths of 0.65m – 0.80m bgl underlain by cohesive glacial till deposits to depths of 5.45m bgl. Firm to very stiff clay was encountered at depths between 2.00m (WS202) and 2.40m bgl (WS201). Foundations should be depended locally to found beneath any soft clay deposits, such as those encountered within WS201 at 0.80m – 2.40m bgl and WS202 at 2.00m – 2.40m bgl.

Groundwater was not encountered during the investigation. Subsequent groundwater level monitoring recorded the wells as dry.

An allowable bearing capacity of 150kPa is deemed appropriate for a maximum 1.0m wide strip foundations, founded within stiff cohesive superficial soils anticipated at around 2.00m bgl underlying the Made Ground / soft compressible deposits accounting for an estimated settlement of <25 mm. Locally deeper soft/loose compressible deposits could be encountered.

All unsuitable deposits must be removed and replaced with a Series 600 Specification for Highways Works (SHW) compliant granular fill placed in accordance with the requirements of the Series 600 SHW.

Foundations should be placed outside the zone of influence of trees at the minimum founding depth of 0.75m based on typical low volume change potential of the clay in accordance with the NHBC guidance.

The settlement and allowable bearing capacity are dependent on foundation dimension, shape, embedment and founding depth. As such a dynamic design and consultation with an experienced geotechnical engineer is required once this information is available. It should be noted if the foundations increase in width, the settlement will increase as the zone of influence increases.

10.4.3 Site 2 – Low-rise residential housing

Available development plans indicate proposed construction of one 3B5P house, ten 2B3P houses and thirteen 3B4P houses. The loads of the proposed structures are not known at the time of writing however, it is likely the load will be relatively low. The loads will pre-determine the suitability of foundations adopted.

Soft cohesive deposits have been recorded to depths of between 1.2m and 3.0m bgl and Made Ground is present to 2.0m bgl. These deposits do not provide a suitable founding stratum and must be removed.

Groundwater was encountered in WS08, WS09A and WS11 in the Made Ground at 0.60m bgl and in WS10 in the glacial till at 4.00m bgl. Subsequent groundwater level monitoring identified groundwater levels between 0.26m and 2.79m bgl.

An allowable bearing capacity of 150kPa is deemed appropriate for a maximum of 1.0m widespread strip of pad foundations, founded on stiff cohesive glacial till at typically 2.00m bgl accounting for an estimated settlement of <25mm. However, the suitable ground of stiff cohesive glacial till may be encountered locally deeper, such as that encountered in WS09 at 3.0m bgl. All unsuitable deposits must be removed and replaced with a Series 600 SHW compliant granular fill placed in accordance with the requirements of the Series 600 SHW.

The settlement and allowable bearing capacity are dependent on foundation dimension, shape, embedment and founding depth. As such a dynamic design and consultation with an experienced geotechnical engineer is required once this information is available. It should be noted if the foundations increase in width, the settlement will increase as the zone of influence increases.

Foundations should be placed outside the zone of influence of trees at the minimum founding depth of 0.75m based on typical low volume change potential of the clay in accordance with the NHBC guidance.

A qualified experienced engineer must inspect the founding stratum prior to commencement of the construction works.

10.5 Ground Floor Slabs

The design of the ground floor slab will be dependent upon the foundation method adopted.

10.5.1 Site 1

It is recommended that consideration is given to suspended floor slabs within this area due to presence of soft/loose compressible materials and deep Made Ground.

10.5.2 Site 2

It is recommended that consideration is given to suspended floor slabs within this area due to presence of soft/loose compressible materials and deep Made Ground.

10.6 Chemical Attack on Buried Concrete

The site (Sites 1 and 2) has been classified in accordance with BRE Special Digest (Ref. 7) and laboratory testing undertaken accordingly in *Section 6.3*. Based on the laboratory test results it is considered that for Made Ground and glacial till a Design Sulphate Class may be taken as DS-1 and an ACEC class for the site of AC-1s would be appropriate.

11.0 Conclusions & Recommendations

11.1 Conclusions

A revised tabulated revised Conceptual Site Model has been derived following the findings on the Generic Quantitative Risk Assessment risk assessment and is presented in *Section 9.0*.

11.1.1 Ground Contamination

Site 1 has been split into three zones according to the proposed end-users. The environmental chemistry soil results have been compared with Tier 1 criteria for *soils with respect to human health against; Residential without home grown produce* (Zone 1), *'Residential with home grown produce'* (Zone 2) and *'Public Open Space near residential housing'* (Zone 3).

In Zone 1, with respect to the proposed end-use of the site, Tier 1 thresholds for Lead, PAHs and Aromatic TPHs thresholds were exceeded in WS04C, WS06 and CP101.

In Zone 2, with respect to the proposed end-use of the site, Tier 1 thresholds for lead were exceeded within WS202.

In Zone 3, with respect to the proposed end-use of the site, Tier 1 thresholds for PAHs and Aromatic TPHs were exceeded within WS01. It is likely the exceedances relate to a localised spill (likely diesel given the heavier TPH fractions encountered) in the existing car park.

For Site 2, environmental chemistry results have been compared against Tier 1 criteria for soils with respect to human health against *'Residential with home grown produce'* thresholds. With respect to this, exceedances of Lead have been exceeded within WS08, WS09 and WS13, likely indicative of the historical uses across the site.

A **Moderate** risk rating is identified to end-users from direct contact, inhalation and ingestion of contaminants within Made Ground soils on Site 1 and Site 2 which recorded exceedances of Lead, PAHs and Aromatic TPHs within Made Ground soils from WS01, WS04c, WS06, WS08, WS09, WS13 and CP101.

11.1.2 Ground Gas Assessment

Eight ground gas monitoring visits have been undertaken across the two sites. Site 1 is split into apartment blocks and low-rise residential housing and Site 2 is solely low-rise residential housing. Maximum carbon dioxide concentrations of 8.2% for the apartment block area; 2.3% for the low-rise residential housing within Site 1; and 3.7% for Site 2 low-rise residential housing areas were recorded. The risk to the end-user the development from soil gases is therefore

considered to be **Moderate** for the apartment blocks (CS2) and **Low** for the low-rise residential housing on both Site 1 Site 2 (Green).

The Curtins Phase 1 Report (Ref. 1) confirms the site is situated in a lower probability radon area where <1% of homes are above the radon action level. On this basis radon protection measures are not considered necessary in the construction of new dwellings or extensions.

11.2 Recommendations

Based on the findings of the ground investigation, the following recommendations are made:

- 1) Due to the elevated concentrations of Lead, PAHs and TPHs in Made Ground soils across Site 1 and Site 2, a suitable thickness of clean and inert capping is recommended in all areas of soft landscaping and private gardens;
- 2) Handpicking and the careful removal of visible ACMs from the affected soils in Site 1 (WS02b) by a specialist Asbestos Contractor should groundworks be proposed within that area;
- 3) CS-2 ground gas protection measures should be included for the apartment blocks within Site 1; and
- 4) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within *Appendix C*.

A Remediation Strategy and Verification report will be required to detail and validate the above measures.

12.0 References

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15. **Environment Agency**. (2009) *Human Health Toxicological Assessment of Contaminants in Soil* (report no. SC050021/SR2)
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20. **Wilson S, Card G and Haines S. Ground Gas Handbook**. Caithness: Whittles Publishing, (2009).
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22. **CIRIA C552**. (2001) Contaminated Land Risk Assessment. A Guide to Good Practice.
23. **CITB**. (2015) Construction (Design and Management) Regulations.
24. **CL:AIRE** (2012) *A Pragmatic Approach to Ground Gas Risk Assessment*. Research Bulletin 17.

25. **Card G & Wilson S** (2011) *A Pragmatic Approach to Ground Gas Risk Assessment for the 21st Century*.

Appendix A – Drawings

- TP Bennett (2020) *Proposed Site Plan for Residential Development at Newton Heath, Manchester*, ref. T7130-D-0-020-P3
- Curtins (2020) *Exploratory Hole Location Plan for Oldham Road, Newton Heath Manchester*, ref. 074031-CUR-00-XX-DR-GE-80004-P01
- Curtins (2020) *Generic Assessment Criteria (GAC) Screening Zoning Plan for Oldham Road, Newton Heath Manchester*, ref. 074031-CUR-00-XX-DR-GE-80005-P01



1 Proposed Site Plan
1:400

NOTE: All dimensions are approximate only

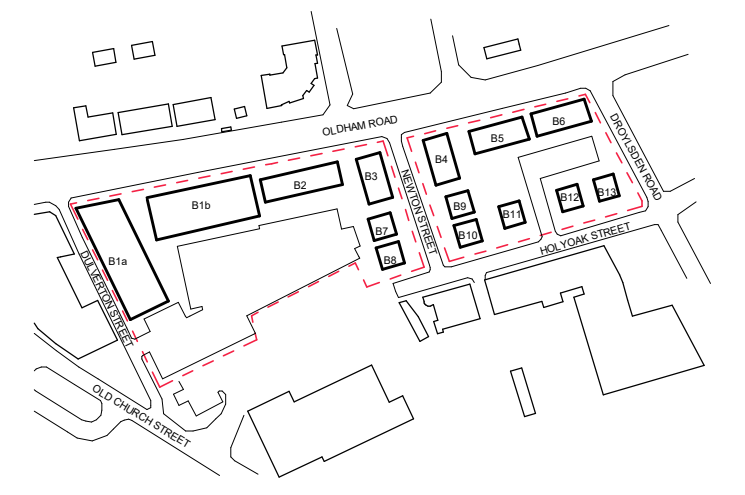
CLIENT
One Manchester

STRUCTURAL ENGINEER
Curtins Consulting

SERVICES ENGINEER
PSD Limited

CONSULTANT
Wilkinson Cowan Partnership Ltd

KEY PLAN



NOTES:
DO NOT SCALE. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING. CHECK DIMENSIONS ON SITE AND REPORT DISCREPANCIES TO THE ARCHITECT.
THIS DRAWING IS PROTECTED BY COPYRIGHT.
ALL AREAS HAVE BEEN MEASURED FROM CURRENT DRAWINGS. THEY MAY VARY BECAUSE OF (EG) SURVEY, DESIGN DEVELOPMENT, CONSTRUCTION TOLERANCES, STATUTORY REQUIREMENTS OR RE-DEFINITION OF THE AREAS TO BE MEASURED.

Accommodation = 139 Holmes		
Apartments	Houses	100
		39
Apartment 1 1b2p 50m²		41 (41%)
Apartment 2 2b3p 61m²		59 (59%)
TH Type 1 3b4p 2.5 Storey 95.1m² (39.9m²/floor + 15.3m² loft)		21no.
House Type 2 2b3p 2 Storey 70.6m² (35.3m²/floor)		14no.
TH Type 3 3b5p 3 Storey 106.8m² (35.5m²/floor)		4no.

P3	25-02-2020	Re-issue For Planning	JMG	AJL
P2	13-02-2020	General Revisions	JMG	AJL
P1	16-01-2020	Issue for planning	JMG	AJL

No.	Date	Comments	Drawn	Checked
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Revisions

Issue Status

Preliminary

tp bennett
architecture
interiors
planning

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Project
**Residential Development
Newton Heath
Manchester**

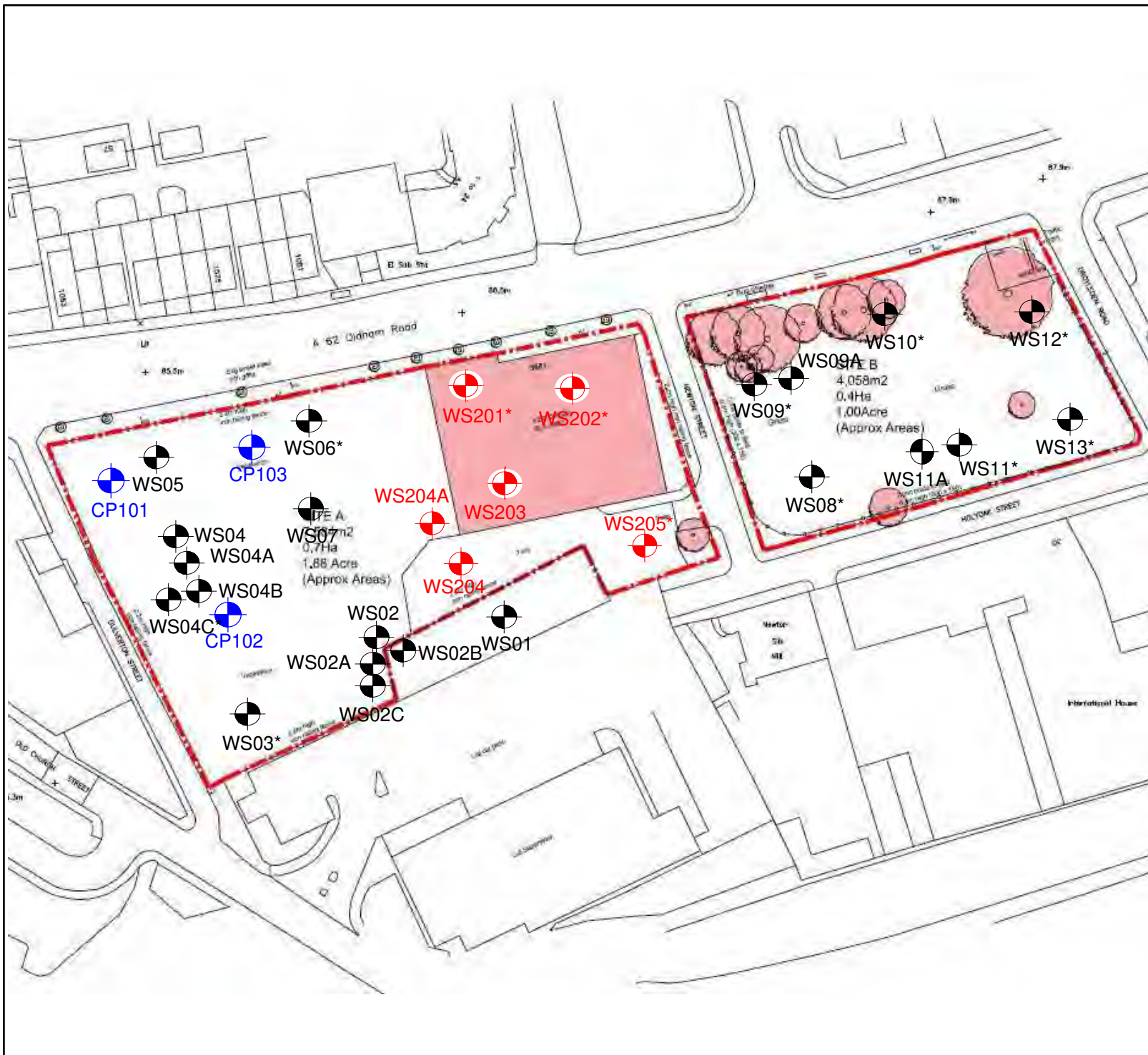
Drawing Title
Proposed Site Plan

Drawn	Date	Scale @ A1	Alt. Ref.
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AJL	10/04/2019	1:400	
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tp benett Project No.	Series	Zone	Drawing Number	Rev.
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T8130	D	0	020	P3
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PROPOSED LOCATIONS FOR SITE INVESTIGATION

-  2019 WINDOW SAMPLE BOREHOLE LOCATIONS
-  CABLE PERCUSSIVE BOREHOLE LOCATIONS
-  WINDOW SAMPLE BOREHOLE LOCATIONS

NOTES:
 * Denotes ground gas/groundwater monitoring standpipe installed within exploratory hole. See exploratory hole logs for installation details.

Rev:	Description:	Date:	By:	Chkd:
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Structures - Civils - Environmental - Infrastructure - Transport Planning - Sustainability - Expert Advisory Services
 Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status: INFORMATION

Project: **OLDHAM ROAD, NEWTON HEATH, MANCHESTER**

Drg Title: **EXPLORATORY HOLE LOCATION PLAN**

Scale: NTS	Size: A3	First Issue: 23/10/2020	Drawn: RT	Checked: SH
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Drg No: 074031-CUR-00-XX-DR-GE-80004	Rev: P01
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PROPOSED LOCATIONS FOR SITE INVESTIGATION

-  2019 WINDOW SAMPLE BOREHOLE LOCATIONS
-  CABLE PERCUSSIVE BOREHOLE LOCATIONS
-  WINDOW SAMPLE BOREHOLE LOCATIONS
-  RESIDENTIAL WITHOUT PLANT UPTAKE
-  RESIDENTIAL WITH PLANT UPTAKE
-  PUBLIC OPEN SPACE NEAR RESIDENTIAL HOUSING

NOTES:

* Denotes ground gas/groundwater monitoring standpipe installed within exploratory hole. See exploratory hole logs for installation details.

Rev:	Description:	Date:	By:	Chk:
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Birmingham - Bristol - Cardiff - Douglas - Edinburgh - Kendal - Leeds - Liverpool - London - Manchester - Nottingham

Status:

INFORMATION

Project:

**OLDHAM ROAD, NEWTON HEATH,
MANCHESTER**

Drg Title:

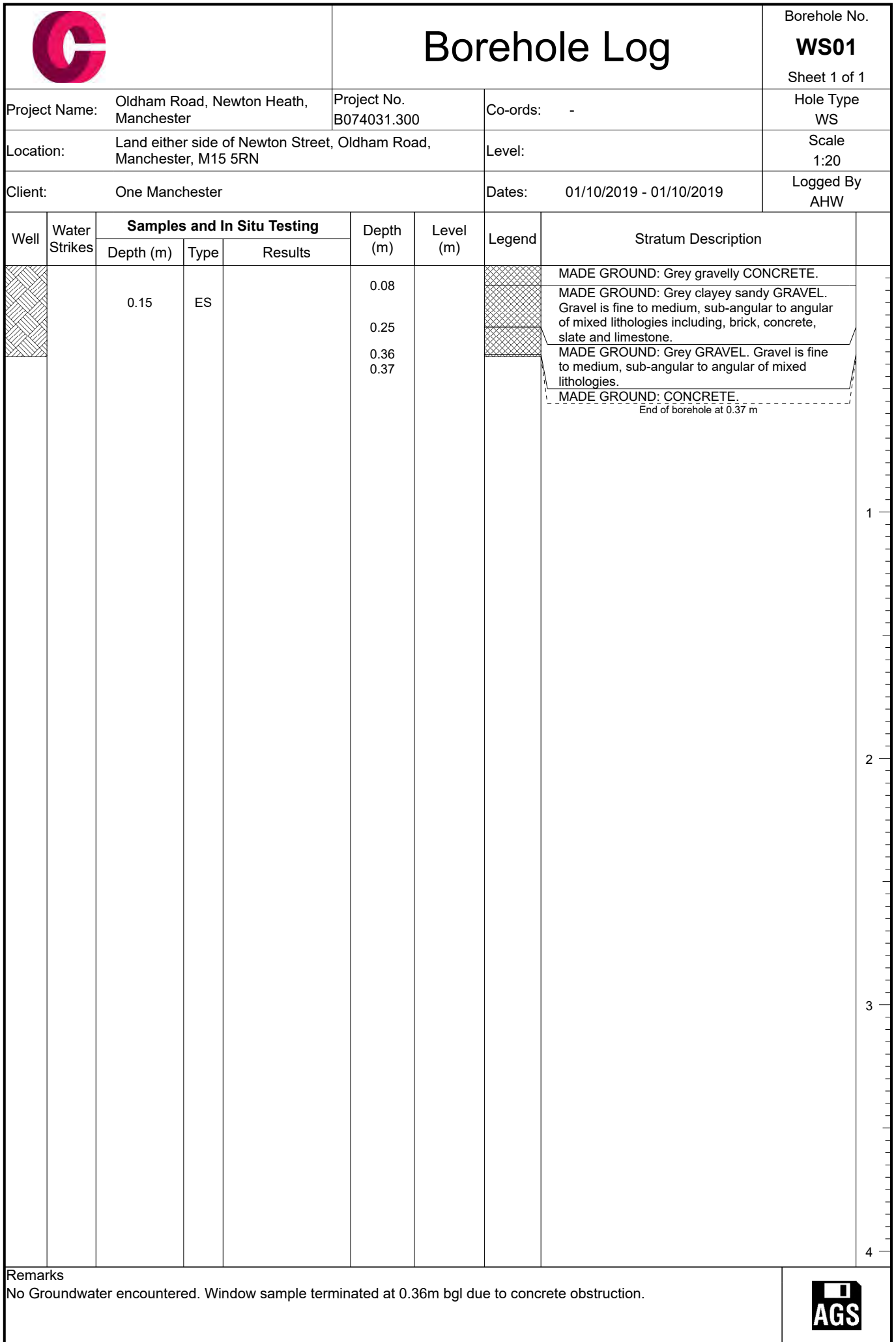
**GENERIC ASSESSMENT CRITERIA SCREENING
ZONING PLAN**

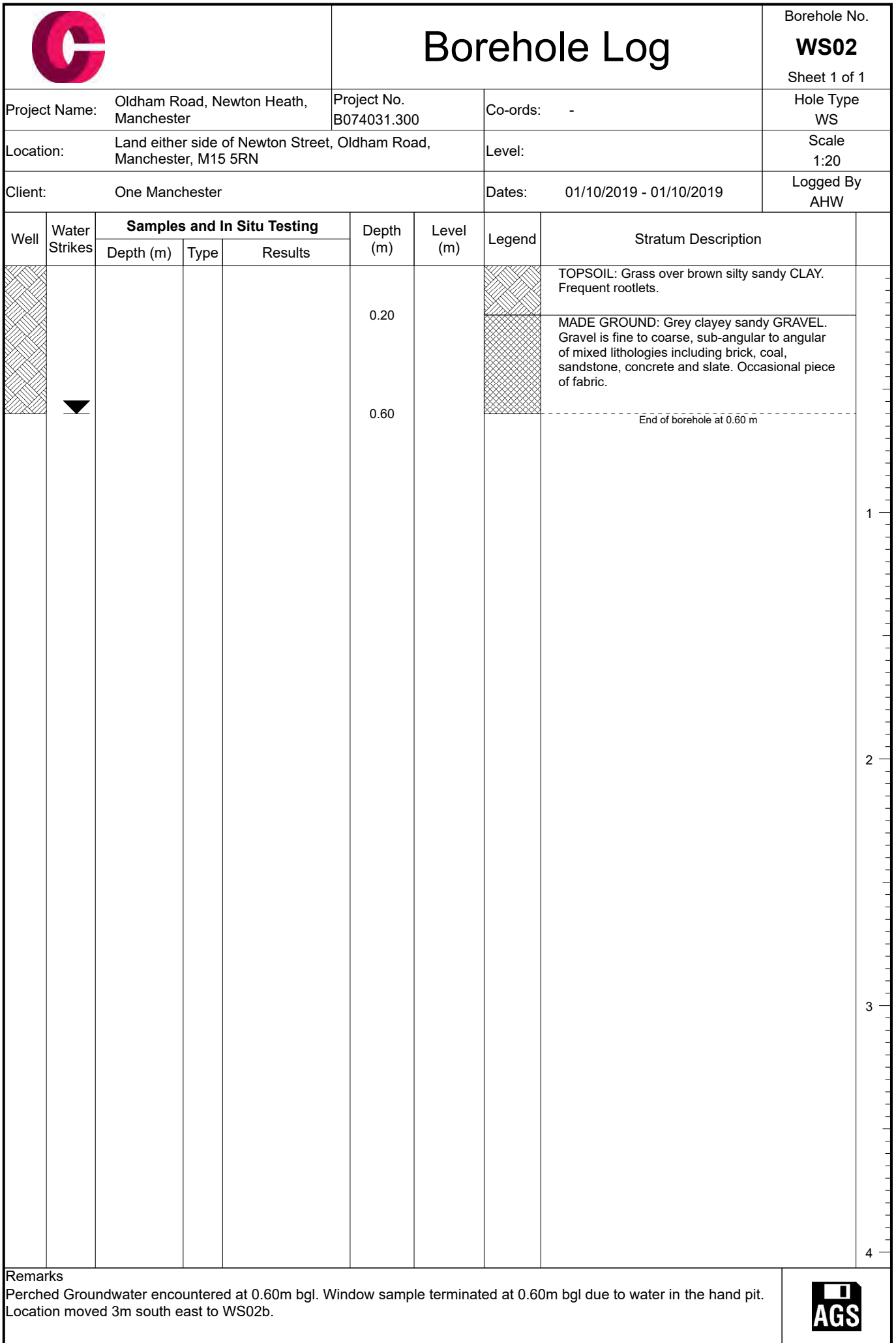
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NTS	A3	13/11/2020	PN	SH

Drg No:	Rev:
074031-CUR-00-XX-DR-GE-80005	P01

Appendix B – Exploratory Hole Logs

- 2019 Due Diligence GI Exploratory Borehole logs.
 - Window Sample Boreholes
- 2020 Supplementary GI Exploratory Borehole logs.
 - Cable Percussion Boreholes
 - Window Sample Boreholes







Borehole Log

Borehole No.

WS02a

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

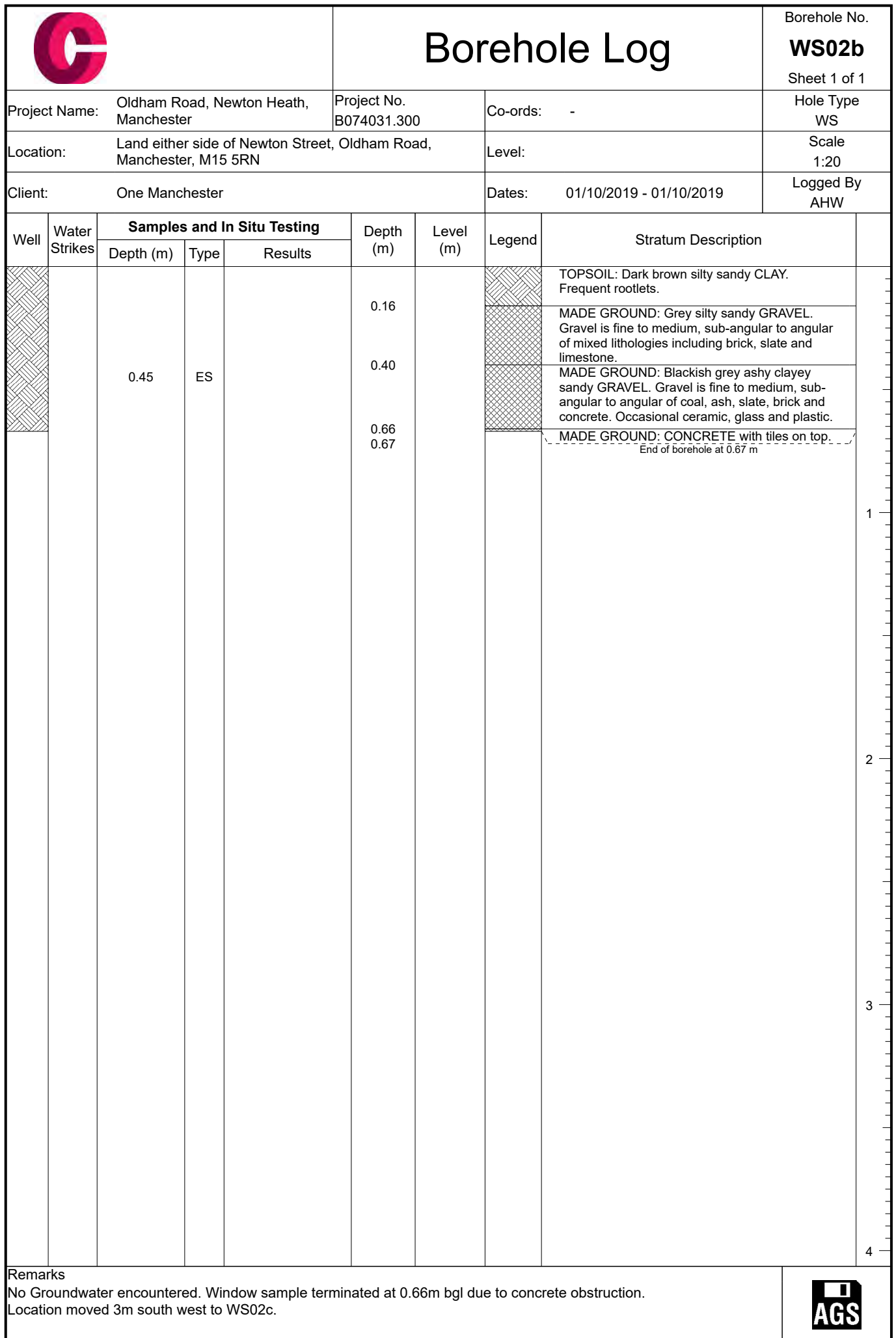
Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			TOPSOIL: Grass over brown silty sandy CLAY. Frequent rootlets.	
					0.55			MADE GROUND: Grey clayey sandy GRAVEL. Gravel is fine to coarse, sub-angular to angular of mixed lithologies including brick, coal, sandstone, concrete and slate. Occasional piece of fabric.	
								----- End of borehole at 0.55 m	
									1
									2
									3
									4

Remarks

Groundwater encountered at 0.55m bgl. Window sample terminated due to water in hand pit.
Location moved 2m north to WS02.





Borehole Log

Borehole No.

WS02c

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.10			TOPSOIL: Grass over dark brown silty sandy CLAY. Frequent rootlets.	
					0.45			MADE GROUND: Dark grey clayey ashy sandy GRAVEL. Gravel is fine to medium, sub-angular to angular of mixed lithologies including, coal, ash, clinker, concrete, brick and slate. Occasional cobbles of concrete and brick.	
								End of borehole at 0.45 m	
									1
									2
									3
									4

Remarks

Groundwater encountered at 0.45m bgl. Window sample terminated at 0.45m due to water in the hand pit.





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20			0.20			MADE GROUND: Grass and vegetation over greyish brown sandy gravelly CLAY. Gravel is fine to medium, sub-angular to angular of mixed lithologies including limestone, and concrete.	
		0.40			0.40			MADE GROUND: Orangish brown slightly gravelly CLAY. Gravel is fine, rounded to sub-rounded of mudstone and siltstone.	
		0.60	ES		0.75			MADE GROUND: Blackish brown silty clayey fine to medium SAND. Occasional fragments of ceramic, brick and coal.	
		1.00			1.00			Soft brown with occasional orange mottling silty sandy CLAY.	
		1.20		N=8 (2,2/2,2,2,2)	1.50			Firm becoming stiff brown with frequent grey mottling slightly silty gravelly CLAY. Gravel is fine to medium, rounded to sub-rounded of mixed lithologies including, mudstone, sandstone and siltstone.	1
		1.50	ES		2.00				2
		2.00		N=50 (5,5/50 for 255mm)	2.45				
		2.45	D		2.45			End of borehole at 2.45 m	3
									4

Remarks

Groundwater encountered at 0.20m bgl.

Hand pit excavated from ground level to 1.20m bgl.





Borehole Log

Borehole No.

WS04

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	ES		0.20			TOPSOIL: Grass over brown silty sandy CLAY. Frequent rootlets.	
					0.40			MADE GROUND: Light brown with occasional orange mottling sandy gravelly CLAY. Occasional fragments of glass.	
					0.80			MADE GROUND: Blackish brown sandy ashy clayey GRAVEL. Gravel is fine to medium, sub- angular to angular of mixed lithologies including, brick, limestone, sandstone, ash, coal and clinker.	
								End of borehole at 0.80 m	
									1
									2
									3
									4

Remarks

No Groundwater encountered. Window sample terminated due to obstruction at 0.80m bgl.
Location moved 2m south to WS04b.



Borehole Log

Borehole No.

WS04a

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			TOPSOIL: Grass over brown silty sandy CLAY. Frequent rootlets.	
					0.40			MADE GROUND: Light brown with occasional orange mottling sandy gravelly CLAY. Occasional fragments of glass.	
					0.86			MADE GROUND: Blackish brown sandy ashy clayey GRAVEL. Gravel is fine to medium, sub- angular to angular of mixed lithologies including, brick, limestone, sandstone, ash, coal and clinker.	
								----- End of borehole at 0.86 m	1
									2
									3
									4

Remarks

No Groundwater encountered. Window sample terminated due to obstruction at 0.86m bgl.
Location moved 2m north to WS04.



Borehole Log

Borehole No.

WS04b

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	▼				0.36			TOPSOIL: Grass over dark brown silty sandy CLAY. Frequent rootlets. Occasional cobbles of brick.	
								End of borehole at 0.36 m	
									1
									2
									3
									4

Remarks

Groundwater encountered at 0.20m bgl. Window sample terminated at 0.36m bgl due to water in the hand pit.
Location moved 2m west to WS04c.





Borehole Log

Borehole No.

WS04c

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.20			TOPSOIL: Grass over dark brown silty sandy CLAY. Frequent rootlets. Occasional fragments of brick.	1
		0.40					MADE GROUND: Grey sandy very gravelly CLAY. Gravel is fine to coarse, sub-angular to angular of mixed lithologies including, brick, slate and coal. Frequent cobbles of brick. Occasional fragments of plastic and ceramic.		
		0.70					MADE GROUND: Black sandy ashy clayey GRAVEL. Gravel is fine, sub-angular to angular of mixed lithologies including, ash, coal, clinker and brick. Occasional fragments of glass.		
		1.20	N=8 (1,1/2,2,3,1)	1.20		POSSIBLE MADE GROUND: Dark grey with black mottling silty sandy gravelly CLAY. Gravel is fine, sub-rounded to angular of brick, mudstone, siltstone and sandstone.	2		
		2.00			N=17 (1,2/3,4,5,5)	2.00			Stiff to very stiff brown slightly gravelly silty CLAY. Gravel is fine, rounded to sub-rounded of mudstone, siltstone and sandstone.
		2.90	D	N=52 (7,9/52 for 255mm)	2.90				3
		3.00			3.00				
					3.45		End of borehole at 3.45 m		
									4

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS05

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.10	ES	N=8 (3,4/2,2,2,2)	0.05			TOPSOIL: Grass over dark brown sandy gravelly CLAY. Frequent rootlets. MADE GROUND: Dark brown sandy gravelly CLAY. Gravel is fine to medium, rounded to angular of mixed lithologies including, brick, concrete, sandstone, limestone, coal and clinker. Occasional cobbles of brick, sandstone and concrete. Rare piece of clay pipe. Rare fragments of glass.	1	
		1.20	ES		1.20					MADE GROUND: Orangish brown sandy gravelly CLAY. Gravel is fine to medium, sub-angular to angular of mixed lithologies including, brick, concrete, and sandstone. Occasional fragments of coal.
		1.50			1.40					MADE GROUND: Black dark brown sandy ashy gravelly CLAY. Gravel is fine to medium, sub-angular to angular of mixed lithologies including brick, coal, clinker, ash, slag, concrete, mudstone and siltstone.
		2.00	D	N=12 (3,3/3,3,3,3)	1.95 2.00		Brown clayey gravelly fine to medium SAND. Gravel is fine, rounded to sub-rounded of mixed lithologies including sandstone and quartz. Firm grey sandy very silty CLAY.	2		
		2.50		2.30	Firm light brown with occasional grey mottling silty CLAY.					
					2.70		Firm to stiff brown with occasional grey mottling slightly gravelly silty CLAY. Gravel is fine, rounded to sub-rounded of sandstone, mudstone and siltstone. Occasional roots throughout.			
		3.00	D	N=25 (3,4/4,6,7,8)	3.00 3.10		Medium dense brown clayey gravelly fine to medium SAND. Stiff to very stiff brown with occasional grey mottling slightly gravelly silty CLAY. Gravel is fine, rounded to sub-rounded of sandstone, mudstone and siltstone. Occasional roots throughout.	3		
		3.70 3.80		N=50 (7,9/50 for 250mm)						
									Continued on next sheet	4

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS05

Sheet 2 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					4.25			End of borehole at 4.25 m	
									5
									6
									7
									8

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS06

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.90	ES	N=2 (1,0/0,1,1,0)	1.30			TOPSOIL: Grass over dark brown slightly silty CLAY. Occasional fragments of brick. Occasional rootlets.	1
								MADE GROUND: Reddish brown clayey silty sandy GRAVEL. Gravel is fine to coarse, sub-rounded to angular of brick, limestone, slate and coal. Occasional cobbles of brick. Rare piece of fabric. Occasional fragments of ceramic and plastic.	
								MADE GROUND: grey silty sandy GRAVEL. Gravel is fine to medium, sub-rounded to angular of concrete, limestone and brick. Occasional cobbles of brick.	
		2.00		N=15 (2,4/4,3,4,4)	2.00			Stiff to very stiff brown slightly gravelly silty CLAY. Gravel is fine, rounded to sub-rounded of mudstone, siltstone and sandstone.	2
		2.60	ES						
		2.80	D						
		3.00	N=50 (7,9/50 for 255mm)						
3.45									
							End of borehole at 3.45 m		
									4

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS07

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 30/09/2019 - 30/09/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.05			TOPSOIL: Grass over dark brown clayey silty fine to coarse SAND. Occasional rootlets. MADE GROUND: Grey silty sandy GRAVEL. Gravel is fine coarse, sub-angular to angular of mixed lithologies including, limestone, sandstone, brick and igneous lithologies. Occasional cobbles of sandstone.	1
					0.50				
					1.20				
		1.20	N=3 (1,0/0,1,1,1)		1.20		MADE GROUND: Dark brown slightly gravelly sandy CLAY. Occasional fragments of brick, ceramic and siltstone. Rare coarse gravel of brick.	2	
					1.50				
					2.00				
		2.60	D		2.00		Stiff to very stiff brown with occasional grey mottling silty gravelly CLAY.	3	
					2.60				
					3.00				
							3.45		End of borehole at 3.45 m

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS08

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.20			TOPSOIL: Grass over silty dark brown slightly gravelly clayey SAND. Gravel is fine, sub-rounded to angular of brick and coal. Frequent rootlets.	1
		0.55			0.60			MADE GROUND: Brown clayey gravelly fine to coarse SAND. Gravel is fine to medium, sub-angular to angular of brick, sandstone, coal, clinker, slate and ash. Occasional cobbles of brick. Occasional pieces of plastic.	
		0.80						MADE GROUND: Reddish brown sandy GRAVEL. Gravel is fine to medium, sub-angular to angular of brick, slate and coal.	
		1.20	ES	N=8 (1,1/1,2,2,3)	1.50			Soft to firm orangish brown with frequent grey mottling sandy silty CLAY. Occasional finem rounded to sub-rounded gravel of mudstone and siltstone. Occasional pieces of wood throughout.	
		1.80						Stiff becoming very stiff greyish brown with frequent brown mottling slightly gravelly silty sandy CLAY. Gravel is fine to medium. Rounded to sub-angular of mudstone, siltstone and sandstone. Occasional roots throughout.	2
		2.00							
		3.00							
		3.70	D	N=50 (9,10/10,12,14,14)					
		3.80							
								Continued on next sheet	4

Remarks

Perched Groundwater encountered at 0.60m bgl.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS08

Sheet 2 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					4.45			End of borehole at 4.45 m	
									5
									6
									7
									8

Remarks

Perched Groundwater encountered at 0.60m bgl.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS09

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.65	ES	N=12 (2,2/3,3,3,3)	0.30			TOPSOIL: Grass over dark brown gravelly clayey fine to medium SAND. Gravel is fine to medium, sub-angular to angular of brick, slate and coal. Frequent rootlets. <u>At 0.05m bgl plastic bag.</u>	1		
					0.70			MADE GROUND: Blackish dark brown clayey ashy gravelly fine to coarse SAND. Gravel is fine to medium, subangular to angular of brick, slate, sandstone, coal, clinker and ash. Rare piece of ceramic clay pipe.			
					0.90			MADE GROUND: BRICK.			
					1.20			MADE GROUND: Blackish dark brown sandy ashy gravelly CLAY. Gravel is fine to medium, sub-angular to angular of mixed lithologies including, brick, slate coal, ash and clinker. Occasional cobbles of brick. Rare piece of glass. <u>At 0.90m bgl rare piece of metal.</u>			
		2.00	N=7 (1,2/2,2,2,1)	1.90			Soft brown with orangish brown mottling CLAY.	2			
				2.50			Soft becoming stiff brown with frequent grey mottling slightly gravelly CLAY. Gravel is fine to medium, rounded to sub-angular of mixed lithologies including sandstone, siltstone and mudstone.				
				2.90	D	N=26 (6,6/6,7,6,7)	3.00			Stiff to very stiff brown slightly gravelly silty CLAY. Gravel is fine, rounded to sub-rounded of mudstone, siltstone and sandstone.	3
		3.00							4		
		Continued on next sheet									

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS09

Sheet 2 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

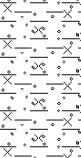
Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		4.00		N=50 (7,9/10,13,14,13)					
					4.45			End of borehole at 4.45 m	
									5
									6
									7
									8

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.





Borehole Log

Borehole No.

WS09a

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 01/10/2019 - 01/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			TOPSOIL: Grass over dark brown slightly gravelly fine to coarse SAND. Frequent rootlets. Occasional fragments of coal and plastic.	
					0.60			MADE GROUND: Brown gravelly silty CLAY. Gravel is fine, sub-rounded to angular of brick.	
					0.80			Grey clayey sandy GRAVEL. Gravel is fine to coarse, sub-angular to angular of mixed lithologies including, brick, slate and sandstone. Frequent cobbles of brick.	
								End of borehole at 0.80 m	
									1
									2
									3
									4

Remarks

Perched Groundwater encountered at 0.60m bgl. Window sample terminated at 0.60m bgl due to water in the hand pit and obstruction at 0.80m bgl.
Location moved 3m west to WS09.





Borehole Log

Borehole No.

WS10

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15	ES	N=8 (1,1/2,2,2,2)	0.15			TOPSOIL: Grass over dark brown silty gravelly fine to medium SAND. Gravel is fine, sub-rounded to angular of mixed lithologies including brick. Frequent rootlets.	1
		0.40			0.65			MADE GROUND: Dark brown sandy gravelly CLAY. Gravel is fine to medium, sub-rounded to angular of mixed lithologies including, brick and slate. Occasional pieces of plastic and glass.	
		1.20			1.20			Soft to firm orangish brown with light grey mottling silty sandy CLAY.	
		1.90	D	N=22 (3,4/4,6,6,6)	1.60			Firm brown with occasional grey and orange mottling silty sandy CLAY. Occasional roots throughout.	2
		2.00						Stiff to very stiff brown with occasional grey mottling slightly gravelly silty CLAY. Gravel is fine, rounded to sub-rounded of mudstone, sandstone and siltstone, Frequent roots throughout.	
		3.00	D	N=27 (5,6/6,7,7,7)				Continued on next sheet	3
		4.00							4

Remarks

Groundwater encountered at 4.00m bgl.

Hand pit excavated from ground level to 1.20m bgl.





Borehole Log

Borehole No.

WS10

Sheet 2 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		4.00		N=33 (5,6/7,8,9,9)	5.45				5
		5.00		N=35 (6,8/8,8,9,10)					
								End of borehole at 5.45 m	6
									7
									8

Remarks

Groundwater encountered at 4.00m bgl.
Hand pit excavated from ground level to 1.20m bgl.



Borehole Log

Borehole No.

WS11

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

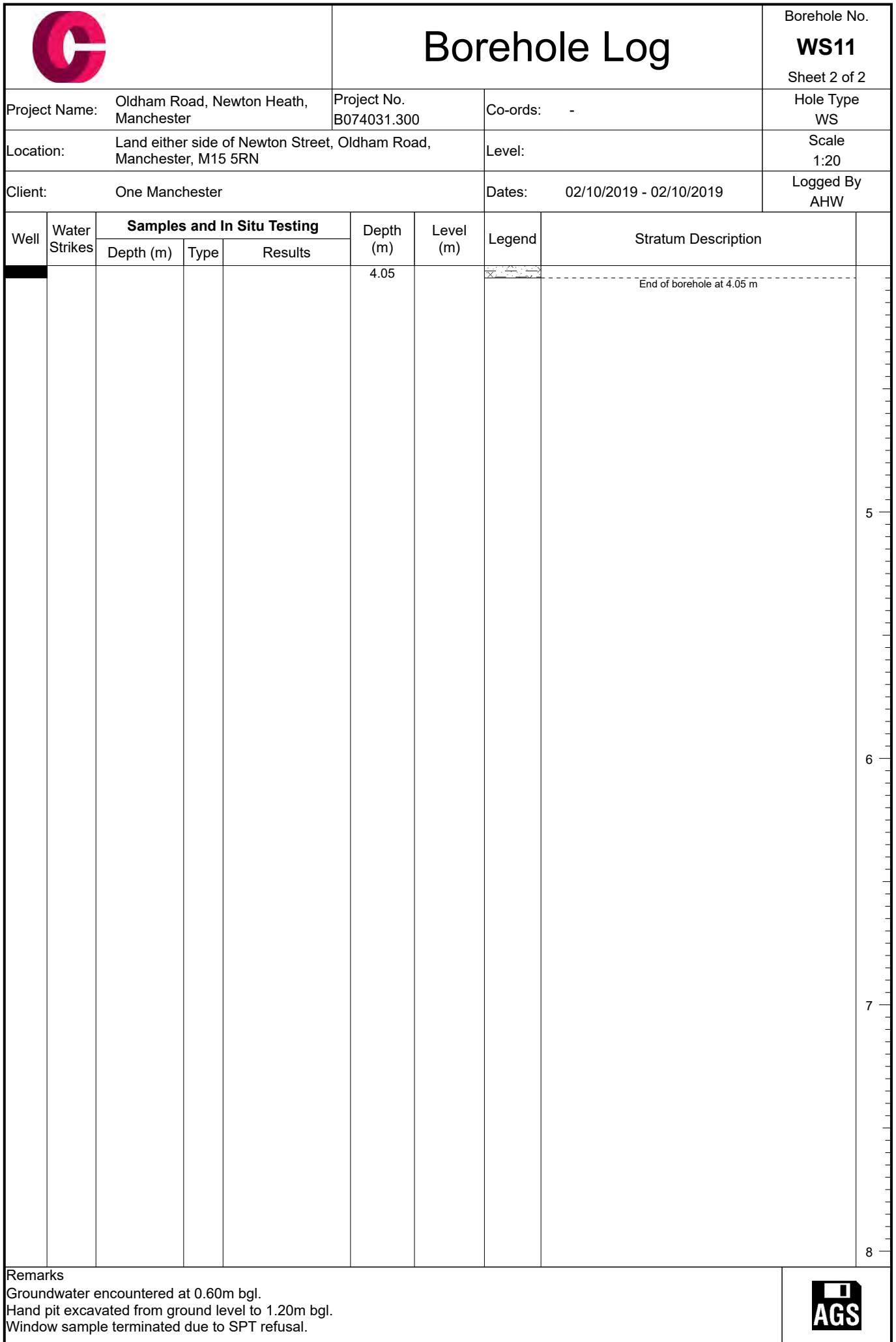
Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.05	ES					TOPSOIL: Grass over dark brown silty gravelly fine to medium SAND. Frequent rootlets. Rare piece of metal.	
					0.20			MADE GROUND: Dark brown sandy gravelly CLAY. Gravel is fine to medium, sub-rounded to angular of mixed lithologies including, brick, slate and coal. Rare cobbles of brick. Rare piece of metal.	
					0.60			Soft to firm light brown with occasional orange mottling silty CLAY.	
		1.00		N=10 (1,1/2,2,3,3)					1
					1.20				
		1.50	D					Firm to very stiff brown with frequent grey mottling silty sandy CLAY. Occasional fine rounded to sub-rounded gravel of mudstone, siltstone and sandstone.	
		2.00		N=31 (5,7/7,8,8,8)					2
		3.00		N=35 (5,6/7,7,9,12)					3
		3.70		N=50 (8,9/50 for 260mm)					4
Continued on next sheet									

Remarks

Groundwater encountered at 0.60m bgl.
Hand pit excavated from ground level to 1.20m bgl.
Window sample terminated due to SPT refusal.







Borehole Log

Borehole No.

WS11a

Sheet 1 of 1

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.16			TOPSOIL: Grass over dark brown silty gravelly fine to medium SAND. Frequent rootlets, Occasional fragments of brick.	
					0.60			MADE GROUND: Dark brown sandy silty gravelly CLAY. Gravel is fine to medium, sub-rounded to angular of mixed lithologies including brick and slate.	
								End of borehole at 0.60 m	
									1
									2
									3
									4

Remarks

No Groundwater encountered. Window sample terminated at 0.60m bgl due to obstruction.
Location moved 1m east to WS11.





Borehole Log

Borehole No.

WS12

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.16			0.16			TOPSOIL: Dark brown silty gravelly fine to medium SAND. Gravel is fine to medium, sub-rounded to angular of brick and coal.	
		0.65			0.65			MADE GROUND: Dark brown silty clayey gravelly fine to medium SAND. Gravel is fine to medium, sub-angular to angular of mixed lithologies including, brick, slate, coal, clinker and sandstone. Occasional fragments of ceramic, glass and wood.	
		1.00	ES					Soft to firm orangish brown with occasional light grey mottling silty sandy CLAY.	1
		1.20		N=9 (1,2/2,2,2,3)				Stiff to very stiff brown with occasional grey mottling slightly gravelly silty CLAY. Gravel is fine to medium, rounded to sub-rounded of mudstone, sandstone and siltstone.	
		1.40			1.40			Stiff to very stiff brown with occasional grey mottling slightly gravelly silty CLAY. Gravel is fine to medium, rounded to sub-rounded of mudstone, sandstone and siltstone.	
		1.80	D						
		2.00		N=24 (4,5/5,5,7,7)					2
		3.00		N=31 (6,6/7,8,8,8)					3
		4.00		N=30 (6,6/7,7,8,8)					4

Continued on next sheet

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.



Borehole Log

Borehole No.

WS12

Sheet 2 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 02/10/2019 - 02/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		5.00		N=40 (6,7/7,10,11,12)					5
					5.45			End of borehole at 5.45 m	6
									7
									8

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.



Borehole Log

Borehole No.

WS13

Sheet 1 of 2

Project Name: Oldham Road, Newton Heath, Manchester

Project No.
B074031.300

Co-ords: -

Hole Type
WS

Location: Land either side of Newton Street, Oldham Road, Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 03/10/2019 - 03/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.16			0.16			TOPSOIL: Grass over dark brown silty gravelly fine to medium SAND. Gravel is fine to medium, sub-rounded to angular of brick and coal. Frequent rootlets.	
		0.80	ES		0.95			MADE GROUND: Dark brown silty sandy clayey GRAVEL. Gravel is fine to coarse, sub-angular to angular of mixed lithologies including, brick, slate, coal, sandstone and clinker. Occasional fragments of glass and wood. Rare cobbles of brick.	
		1.20		N=9 (1,2/2,2,2,3)	1.30			At 0.90m bgl clay pipe. Soft to firm orangish brown with occasional light grey mottling silty sandy CLAY. Frequent roots throughout.	1
		2.00		N=18 (2,2/3,5,5,5)				Stiff to very stiff brown with occasional grey mottling slightly gravelly silty CLAY. Gravel id fine to medium, rounded to sub-rounded of mudstone, siltstone and sandstone, Rare fragments of coal. Occasional roots throughout.	2
		2.70	D						
		3.00		N=24 (4,5/5,6,6,7)					3
		4.00		N=41 (6,7/9,9,10,13)					4

Continued on next sheet

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.



Borehole Log

Borehole No.

WS13

Sheet 2 of 2

Project Name: Oldham Road, Newton Heath,
ManchesterProject No.
B074031.300

Co-ords: -

Hole Type
WSLocation: Land either side of Newton Street, Oldham Road,
Manchester, M15 5RN

Level:

Scale
1:20

Client: One Manchester

Dates: 03/10/2019 - 03/10/2019

Logged By
AHW

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		4.60	D					From 4.00m bgl no roots within the clay strata.	
		5.00		N=45 (7,8/10,10,12,13)					5
					5.45			End of borehole at 5.45 m	
									6
									7
									8

Remarks

No Groundwater encountered.
Hand pit excavated from ground level to 1.20m bgl.



Borehole Log

Borehole No.

CP101

Sheet 1 of 2

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 85.30

Scale
1:50

Client: One Manchester

Dates: 27/10/2020 - 27/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.25	ES					MADE GROUND: Grass over brown/black slightly clayey slightly gravelly medium to coarse sand with high ash content. Gravel is angular to subangular, fine to coarse including brick, concrete and ceramic. Frequent intact bricks.	
		0.85	ES		0.79	84.51		MADE GROUND: Grey mottled black slightly gravelly clay with moderate ash content. Gravel is angular to subrounded, fine to medium including brick and ceramic.	1
		1.20 1.20 - 1.65	D	N=5 (1,0/1,1,1,2)	1.40	83.90		Soft grey mottled orange/brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded, fine to coarse of mixed lithologies.	2
		2.00 2.00 - 2.45	D	N=5 (1,1/1,1,1,2)					
		3.00 3.00 - 3.45	D	N=23 (2,3/4,5,6,8)	3.00	82.30		Stiff dark brown slightly silty slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse including coal, sandstone and mudstone.	3
		4.00 4.00 - 4.45	D	N=19 (3,4/4,5,5,5)	4.00	81.30		Firm grey slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subangular to subrounded, fine to coarse of mixed lithologies.	4
		5.00 5.00 - 5.45	D	N=19 (3,4/5,4,5,5)				Stiff dark brown slightly silty slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse including coal, sandstone and mudstone.	5
		6.00 6.00 - 6.45	D	N=17 (3,4/4,4,4,5)					6
		7.00 - 7.45	D						7
		7.50		N=24 (4,5/5,5,6,8)	7.30	78.00		Dense lightly brown slightly clayey medium to coarse SAND.	8
		9.00 9.00 - 9.45	D	N=26 (2,4/4,6,8,8)					9
									10

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP101

Sheet 2 of 2

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 85.30

Scale
1:50

Client: One Manchester

Dates: 27/10/2020 - 27/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50 - 10.95	B	N=18 (2,3/3,3,5,7)	10.30	75.00		Medium dense silty fine to medium SAND.	
					11.00	74.30		Firm brown silty CLAY.	11
		12.00 12.00 - 12.45	B	N=7 (1,2/2,1,2,2)	12.00	73.30		Soft brown sandy clayey SILT	12
									13
		13.50		N=4 (1,1/1,1,1,1)					14
					14.70	70.60			
		15.00 15.00 - 15.45	D	N=26 (2,4/5,6,7,8)				Stiff to very stiff brown slightly gravelly sandy laminated CLAY. Sand is fine. Gravel is subangular to subrounded, fine to coarse including sandstone, mudstone and coal.	15
									16
		16.50 - 16.95	U	Ublow=70					17
		18.00 18.50 - 18.95	D	N=35 (4,5/7,9,9,10)				Becoming very stiff	18
		19.50		N=37 (5,8/8,9,10,10)					19
					20.00	65.30		End of borehole at 20.00 m	20

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP102

Sheet 1 of 3

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.20

Scale
1:50

Client: One Manchester

Dates: 28/10/2020 - 29/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.60	ES		0.50	85.70		MADE GROUND: Red sandy angular to subangular, fine to coarse gravel of brick. Sand is medium to coarse. Frequent intact bricks.	1
		1.20 1.20 - 1.65	D	N=2 (1,0/1,0,1,0)				MADE GROUND: Black slightly clayey sandy subangular, fine to coarse gravel with moderate ash content. Sand is medium to coarse. Gravel is brick.	
		2.00 2.00 - 2.45	D	N=7 (1,0/0,2,2,3)	2.20	84.00		Soft brown mottled grey sandy CLAY with occasional roots. Sand is medium to coarse. (Possible reworked material).	2
		3.00 - 3.45	U	Ublow=36					3
					3.50 3.60	82.70 82.60		SANDSTONE FLAG (Basement floor) No recovery (Basement)	4
		5.00 5.00 - 5.45	ES	N=20 (3,4/5,5,5,5)	5.00	81.20		Stiff brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is angular to subrounded, fine to coarse including sandstone, mudstone and siltstone.	5
		6.00 - 6.45	U	Ublow=36					6
		7.50 7.50 - 7.95	B	N=29 (4,5/6,7,8,8)	7.40	78.80		Dense brown slightly gravelly clayey fine to medium SAND.	7
		9.00		N=31 (4,5/6,8,8,9)					8
									9
									10

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Borehole terminated at 26.00m bgl due to two consecutive SPT refusals. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP102

Sheet 2 of 3

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.20

Scale
1:50

Client: One Manchester

Dates: 28/10/2020 - 29/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50 - 10.95	D	N=10 (1,2/2,2,3,3)	10.50	75.70		Soft brown slightly gravelly sandy laminated CLAY. Sand is fine to medium. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.	11
		12.00 12.00 - 12.45	D	N=11 (1,2/2,3,3,3)	11.80	74.40		Loose silty fine to medium SAND.	12
		13.50 13.50 - 13.95	D	N=6 (1,2/1,2,1,2)					13
		15.00 15.00 - 15.45	D	N=7 (1,1/1,2,2,2)	15.50	70.70			14
		16.50 - 16.95	U	Ublow=61					15
		18.00 18.00 - 18.45	D	N=31 (5,6/7,8,8,8)	17.50	68.70		Dense light brown very silty medium to coarse SAND.	16
		19.50 19.50 - 19.95	D	N=21 (4,4/5,5,6,5)	19.40	66.80		Medium dense brown fine to medium SAND with frequent silt and clay bands	17
								Continued on next sheet	18
									19
									20

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Borehole terminated at 26.00m bgl due to two consecutive SPT refusals. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP102

Sheet 3 of 3

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.20

Scale
1:50

Client: One Manchester

Dates: 28/10/2020 - 29/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		21.00 21.00 - 21.45	D	N=25 (5,6/6,7,6,6)	22.00	64.20		Stiff brown/grey slightly gravelly sandy laminated CLAY. Sand is fine. Gravel is subangular to subrounded, fine to coarse of sandstone and mudstone.	21	
		22.50	D						22	
		24.00 24.00 - 24.45	B	50 (8,10/50 for 210mm)	23.50	62.70		Very stiff brown slightly silty slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse including mudstone, sandstone and siltstone.	23	
		25.50 25.50 - 25.95	D	45 (8,12/45 for 185mm)	25.50 25.70 25.95	60.70 60.50 60.25			Dense brown slightly silty fine to medium SAND.	24
								Very stiff brown slightly silty slightly gravelly CLAY. Gravel is subangular to subrounded, fine to coarse including mudstone, sandstone and siltstone.	25	
		End of borehole at 25.95 m								26
										27
										28
										29
										30

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Borehole terminated at 26.00m bgl due to two consecutive SPT refusals. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP103

Sheet 1 of 3

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 85.90

Scale
1:50

Client: One Manchester

Dates: 29/10/2020 - 30/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.13			0.13	85.77		TOPSOIL: Grass over drark brown slightly silty slightly gravelly clay with frequent rootlets. Gravel is angular to subrounded, fine to coarse including brick and ceramic.	
		0.45	ES					MADE GROUND: Red/black brown slightly clayey gravelly sand with moderate ash content. Gravel is angular to subrounded, fine to coarse including brick, glass, plastic and ceramic.	1
		2.00 2.00 - 2.45	D	N=12 (1,1/2,3,3,4)	1.90	84.00		Firm brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subrounded, fine to coarse including sandstone and mudstone.	2
		3.00 3.00 - 3.45	D	N=21 (3,3/4,4,6,7)	3.00	82.90		Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to rounded, fine to coarse including sandstone and coal.	3
		4.00 4.00 - 4.45	D	N=22 (1,3/4,5,6,7)					4
		5.00 5.00 - 5.45	D	N=11 (2,2/2,2,3,4)					5
		6.00 6.00 - 6.45	D	N=16 (2,3/4,3,4,5)					6
		7.50 - 7.95	U		7.70	78.20		Medium dense light brown silty fine SAND.	8
		8.80 - 9.00 9.00	D	50 (7,5/50 for 210mm)	8.80	77.10		Very stiff brown slightly gravelly sandy CLAY. Sand is fine. Gravel is subangular to rounded, fine to coarse including sandstone and coal.	9
		9.00 - 9.45	D		9.40	76.50		Medium dense brown slightly silty fine to medium SAND.	
		10.00 - 10.50	B					Continued on next sheet	10

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Borehole terminated at 24.45m bgl due to two consecutive SPT refusals. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP103

Sheet 2 of 3

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 85.90

Scale
1:50

Client: One Manchester

Dates: 29/10/2020 - 30/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 10.50 - 10.95	D	N=10 (1,2/2,2,3,3)	10.50	75.40		Loose brown silty fine to medium SAND with frequent clay bands.	11
		12.00 - 12.45	D		12.20	73.70		Soft grey/brown silty CLAY.	12
		13.00 - 13.50	B		13.00	72.90		Loose grey/brown silty SAND.	13
		13.50 13.50 - 13.95	D	N=9 (1,1/2,2,2,3)					14
		15.00 15.00 - 15.45	D	N=8 (1,2/1,2,2,3)				Very stiff brown slightly gravelly CLAY with occasional moist sand bands. Sand is medium to coarse. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone and siltstone.	15
		16.50 16.50 - 16.95	D	N=32 (4,5/7,7,8,10)	16.50	69.40			16
		18.00 - 18.45	U	Ublow=100					17
		19.50 19.50 - 19.95	D	N=36 (4,5/8,8,8,12)					18
								Continued on next sheet	20

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Borehole terminated at 24.45m bgl due to two consecutive SPT refusals. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

CP103

Sheet 3 of 3

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

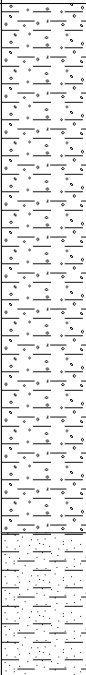
Level: 85.90

Scale
1:50

Client: One Manchester

Dates: 29/10/2020 - 30/10/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		21.00 - 21.45	U	Ublow=130					21
		22.50		N=50 (3,5/50 for 275mm)					22
		23.50	D						23
		24.00		49 (25 for 145mm/49 for 210mm)					24
					23.50	62.40		Very stiff brown sandy CLAY. Sand is fine to medium.	
					24.45	61.45		End of borehole at 24.45 m	
									25
									26
									27
									28
									29
									30

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Borehole terminated at 24.45m bgl due to two consecutive SPT refusals. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

WS201

Sheet 1 of 1

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.70

Scale
1:50

Client: One Manchester

Dates: 02/11/2020 - 02/11/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.24			0.24	86.46		CONCRETE SLAB	
		0.40	ES					MADE GROUND: Light grey/brown slightly sandy medium to coarse gravel. Sand is medium to coarse. Gravel is angular to subangular of limestone/aggregate.	
		1.20		N=3 (1,1/0,1,1,1)				Soft dark brown mottled black/grey slightly gravelly sandy CLAY. Gravel is angular to subrounded, fine to coarse including sandstone and brick. (Possible reworked ground)	1
		1.70 - 1.90	D						
		2.00		N=3 (0,0/0,0,1,2)					2
		2.60 - 2.80	D		2.40	84.30		Stiff brown mottled dark brown slightly silty slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse including sandstone and mudstone.	
		3.00		N=27 (3,3/5,6,8,8)	3.00	83.70		Stiff dark brown mottled dark grey slightly gravelly laminated CLAY. Gravel is subangular to subrounded, fine to coarse including sandstone and mudstone.	3
		3.50 - 3.70	D						
		4.00		N=27 (4,4/5,6,8,8)					4
		4.40 - 4.60	D						
		5.00		N=34 (6,6/6,8,10,10)				Becoming very stiff	5
					5.45	81.25		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

Concrete corer used to break through slab. Service inspection pit hand excavated from 0.24 to 1.20m bgl. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

WS202

Sheet 1 of 1

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.90

Scale
1:50

Client: One Manchester

Dates: 02/11/2020 - 02/11/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.24			0.24	86.66		CONCRETE	
		0.70	ES		0.65	86.25		MADE GROUND: Light grey/brown slightly sandy medium to coarse gravel. Sand is medium to coarse. Gravel is angular to subangular of limestone/aggregate.	
		1.20		N=5 (1,2/1,1,1,2)	1.00	85.90		Sof dark brown slightly silty slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse including brick, ceramic, sandstone and concrete (Possible reworked ground)	1
		1.30 - 1.50	D					Firm brown mottled grey gravelly sandy CLAY. Gravel is angular to subrounded, fine to coarse including sandstone and mudstone.	
		2.00		N=19 (2,2/3,5,5,6)	2.00	84.90		Stiff dark brown slightly silty slightly gravelly laminated CLAY. Gravel is angular to subrounded, fine to coarse including sandstone and mudstone.	2
		2.50 - 2.70	D						
		3.00		N=23 (3,5/5,6,6,6)					3
		3.20 - 3.40	D						
		4.00		N=24 (6,6/6,6,6,6)					4
					4.45	82.45		End of borehole at 4.45 m	5

Remarks

Concrete corer used to break through slab. Service inspection pit hand excavated from 0.24 to 1.20m bgl. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

WS203

Sheet 1 of 1

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.80

Scale
1:50

Client: One Manchester

Dates: 02/11/2020 - 02/11/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.27 0.28 0.50	86.53 86.52 86.30		CONCRETE SLAB with REBAR	
								BLACK MEMBRANE	
								MADE GROUND: Light grey/brown slightly sandy medium to coarse gravel. Sand is medium to coarse. Gravel is angular to subangular of limestone/aggregate.	1
								End of borehole at 0.50 m	
									2
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

Breaker used to break through slab. Borehole terminated at 0.50m bgl due to concrete slab. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

WS204

Sheet 1 of 1

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

Level: 86.80

Scale
1:50

Client: One Manchester

Dates: 02/11/2020 - 02/11/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.45	ES		0.05 0.18 0.40 0.62 0.80	86.75 86.62 86.40 86.18 86.00		ASPHALT MADE GROUND: Grey brown sandy GRAVEL with low cobble content. Gravel is fine to coarse sub-angular to sub-rounded gravel of limestone, occasional sandstone. Cobbles are limestone. (sub-base). MADE GROUND: Light grey/brown gravelly fine to medium sand. Gravel is angular to subrounded, fine to coarse including concrete, slate and brick. MADE GROUND: Brown slightly gravelly fine to medium sand. Gravel is angular to subrounded, fine to coarse of mixed lithologies. MADE GROUND: Orange brown slightly gravelly medium to coarse sand. Gravel is subangular to subrounded, fine to coarse including brick, concrete and clinker. End of borehole at 0.80 m	1 2 3 4 5 6 7 8 9 10

Remarks

Service inspection pit hand excavated from GL to 0.80m bgl. Borehole terminated at 0.80m bgl due to concrete slab. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

WS204A

Sheet 1 of 1

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

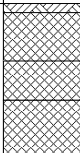
Level: 86.90

Scale
1:50

Client: One Manchester

Dates: 02/11/2020 - 02/11/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES		0.06	86.84		<div>TOPSOIL: Grass over drark brown slightly silty slightly gravelly clay with frequent rootlets. Gravel is angular to subrounded, fine to coarse including brick and ceramic.</div> <div>MADE GROUND: Light grey slightly clayey slightly sandy gravel with frequent cobbles. Sand is medium to coarse. Gravel is angular to subrounded, fine to coarse of limestone. Cobbles are angular of concrete.</div> <div>MADE GROUND: Brown slightly gravelly fine to medium sand. Gravel is angular to subrounded, fine to coarse of mixed lithologies.</div> <div>MADE GROUND: Black/brown gravelly medium to coarse sand with moderate ash content. Gravel is angular to subrounded, fine to coarse including brick and concrete.</div> <div>End of borehole at 1.00 m</div>	1
					0.38	86.52			
					0.64	86.26			
					1.00	85.90			
									2

Remarks

Service inspection pit hand excavated from GL to 1.00m bgl. Borehole terminated at 1.00m bgl due to concrete slab. Groundwater not encountered. Levels estimated from topographic survey.





Borehole Log

Borehole No.

WS205

Sheet 1 of 1

Project Name: Newton Heath Supplementary Investigation

Project No.
074031.301

Co-ords: -

Hole Type
WS

Location: Newton Heath, Manchester

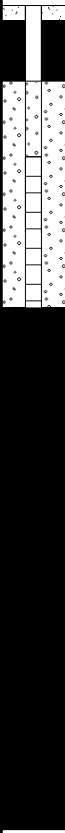
Level: 87.00

Scale
1:50

Client: One Manchester

Dates: 02/11/2020 - 02/11/2020

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.09			0.09	86.91		ASPHALT	
		0.35	ES		0.28	86.72		MADE GROUND: Grey brown sandy GRAVEL with low cobble content. Gravel is fine to coarse sub-angular to sub-rounded gravel of limestone, occasional sandstone. Cobbles are limestone. (sub-base).	
		0.80	ES		0.72	86.28		MADE GROUND: Black mottled brown slightly gravelly clay. Gravel is angular to subrounded, fine to coarse including coal, brick, ceramic and clinker.	1
		1.20		N=7 (1,1/1,2,2,2)				Soft grey mottled orange slightly silty laminated CLAY. Slight hydrocarbon odour. Slightly organic with wood fragments.	
		1.60 - 1.80	D					Very stiff brown slightly gravelly CLAY. Gravel is angular to subrounded, fine to coarse of sandstone, mudstone and siltstone.	2
		2.00		N=30 (4,4/4,6,8,12)	2.00	85.00			
		2.40 - 2.60	D						
		3.00		N=22 (2,2/4,4,7,7)	3.00	84.00		Stiff brown occasionally mottled grey slightly gravelly laminated CLAY with low cobble content. Gravel is subangular to rounded, fine to coarse including sandstone and coal. Cobbles are subrounded of sandstone.	3
		3.20 - 3.40	D						
		4.00		N=17 (3,3/3,4,5,5)					4
		5.00		N=25 (6,6/7,6,6,6)					5
					5.45	81.55		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

Service inspection pit hand excavated from GL to 1.20m bgl. Groundwater not encountered. Levels estimated from topographic survey.



Appendix C – Chemical Laboratory Testing Results

- 2019 Due Diligence GI
 - Envirolab, Final Analytical Test Report 19/09250
 - Envirolab, Final Analytical Test Report 19/09360
- 2020 Supplementary GI
 - Envirolab, Final Analytical Test Report 20/09398

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/09250
Issue Number: 1

Date: 14 October, 2019

Client: Curtins Consulting
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Amber Hatch-Walling
Project Name: Newton Heath, Manchester
Project Ref: B074031.300
Order No: EBMA2112
Date Samples Received: 03/10/19
Date Instructions Received: 03/10/19
Date Analysis Completed: 14/10/19

Prepared by:

A handwritten signature in black ink, appearing to read "D Brierley", with a long horizontal flourish extending to the right.

Danielle Brierley
Client Manager

Approved by:

A handwritten signature in black ink, appearing to read "R Wong", with a long horizontal flourish extending to the right.

Richard Wong
Client Manager

Envirolab Job Number: 19/09250

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09250/1	19/09250/8	19/09250/9	19/09250/10	19/09250/11			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS07	WS08	WS08	WS09	WS05					
Depth to Top	0.30	1.80	0.55	0.65	1.50					
Depth To Bottom										
Date Sampled	30-Sep-19	01-Oct-19	01-Oct-19	01-Oct-19	30-Sep-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	5A	4ABE	4ABE	5ABE					
% Stones >10mm _A	<0.1	<0.1	18.4	19.2	9.1			% w/w	0.1	A-T-044
pH _D ^{M#}	8.92	8.08	8.23	7.92	8.22			pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.01	0.06	<0.01	0.02	0.02			g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	1	<1	<1	1			mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2			mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	1.4	1.2	8.8	8.4	14.7			% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	2	4	13	21	18			mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	1.3	<1.0	<1.0	<1.0			mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.6	0.6	0.9	1.5	1.0			mg/kg	0.5	A-T-024s
Copper _D ^{M#}	8	15	61	98	42			mg/kg	1	A-T-024s
Chromium _D ^{M#}	17	20	16	19	19			mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1			mg/kg	1	A-T-040s
Lead _D ^{M#}	13	9	455	588	165			mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	0.22	1.16	<0.17			mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	20	33	16	24	26			mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1			mg/kg	1	A-T-024s
Zinc _D ^{M#}	42	41	144	172	42			mg/kg	5	A-T-024s

Envirolab Job Number: 19/09250

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09250/1	19/09250/8	19/09250/9	19/09250/10	19/09250/11			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS07	WS08	WS08	WS09	WS05					
Depth to Top	0.30	1.80	0.55	0.65	1.50					
Depth To Bottom										
Date Sampled	30-Sep-19	01-Oct-19	01-Oct-19	01-Oct-19	30-Sep-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	5A	4ABE	4ABE	5ABE					
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD					A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A					A-T-045

Envirolab Job Number: 19/09250

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09250/1	19/09250/8	19/09250/9	19/09250/10	19/09250/11			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS07	WS08	WS08	WS09	WS05					
Depth to Top	0.30	1.80	0.55	0.65	1.50					
Depth To Bottom										
Date Sampled	30-Sep-19	01-Oct-19	01-Oct-19	01-Oct-19	30-Sep-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	5A	4ABE	4ABE	5ABE					
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	0.02	0.02	<0.01			mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	<0.01	<0.01			mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.02	<0.02	0.05	0.04	<0.02			mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.20	<0.04	0.27	0.27	0.07			mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.17	<0.04	0.26	0.25	0.06			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.22	<0.05	0.39	0.37	0.09			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.09	<0.05	0.18	0.17	<0.05			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.08	<0.07	0.15	0.12	<0.07			mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.21	<0.06	0.32	0.32	0.09			mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04			mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.29	<0.08	0.50	0.43	<0.08			mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	0.01	<0.01	<0.01			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.12	<0.03	0.19	0.19	0.03			mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03			mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.11	<0.03	0.25	0.20	0.12			mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.28	<0.07	0.49	0.42	0.09			mg/kg	0.07	A-T-019s
Total PAH-16MS_A^{M#}	1.79	<0.08	3.08	2.80	0.55			mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/09250

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09250/1	19/09250/8	19/09250/9	19/09250/10	19/09250/11			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS07	WS08	WS08	WS09	WS05					
Depth to Top	0.30	1.80	0.55	0.65	1.50					
Depth To Bottom										
Date Sampled	30-Sep-19	01-Oct-19	01-Oct-19	01-Oct-19	30-Sep-19					
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	7	5A	4ABE	4ABE	5ABE					
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	<1	1			mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	<1	<1			mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	1	<1	2			mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	2	2	2			mg/kg	1	A-T-055s
Ali >C21-C35 _A	2	<1	11	12	4			mg/kg	1	A-T-055s
Total Aliphatics _A	2	<1	15	14	11			mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	<1	2	4	2			mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	1	<1	2	2	2			mg/kg	1	A-T-055s
Aro >C12-C16 _A	2	<1	4	8	6			mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	3	<1	7	8	8			mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	13	4	41	46	20			mg/kg	1	A-T-055s
Total Aromatics _A	21	4	57	69	38			mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	23	4	72	83	49			mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.05			mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

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.

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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

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.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

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 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable 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.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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

<p>Client: Curtins Consulting, Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG</p> <p>Project: Newton Heath, Manchester</p> <p>Clients Project No: B074031.300</p>	<p>Project No: 19/09250</p> <p>Date Received: 03/10/2019 (am)</p> <p>Cool Box Temperatures (°C): 16.3, 17.0, 15.5</p>
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NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/09360
Issue Number: 1

Date: 11 October, 2019

Client: Curtins Consulting
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Amber Hatch-Walling
Project Name: Newton Heath, Manchester
Project Ref: B074031.300
Order No: EBMA2110
Date Samples Received: 03/10/19
Date Instructions Received: 07/10/19
Date Analysis Completed: 11/10/19

Prepared by:

A handwritten signature in blue ink that reads "M Marshall".

Melanie Marshall
Laboratory Coordinator

Approved by:

A handwritten signature in black ink that reads "D Brierley".

Danielle Brierley
Client Manager

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/1	19/09360/2	19/09360/3	19/09360/4	19/09360/5	19/09360/6	19/09360/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02b	WS04C	WS11	WS10	WS12	WS13			
Depth to Top	0.15	0.45	0.70	0.05	0.40	1.00	0.80			
Depth To Bottom										
Date Sampled	01-Oct-19	01-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	03-Oct-19			
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	7	5AB	5AB	6AE	5ABE	3E	4ABE			
% Stones >10mm _A	<0.1	<0.1	6.6	14.6	3.1	<0.1	4.5	% w/w	0.1	A-T-044
pH _D ^{M#}	9.93	9.12	8.07	6.76	8.33	7.76	8.26	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.51	0.07	0.12	<0.01	<0.01	0.03	<0.01	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	6.4	5.6	35.8	9.1	4.5	0.8	11.8	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	1	7	35	14	7	3	21	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	1.3	<1.0	2.1	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.7	0.9	1.6	0.9	1.0	1.1	3.5	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	21	27	127	38	26	17	88	mg/kg	1	A-T-024s
Chromium _D ^{M#}	29	15	16	13	18	28	20	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	40	176	427	82	57	11	987	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	1.75	<0.17	<0.17	<0.17	0.19	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	30	17	43	14	16	25	28	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	2	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	51	90	130	59	84	44	247	mg/kg	5	A-T-024s

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/1	19/09360/2	19/09360/3	19/09360/4	19/09360/5	19/09360/6	19/09360/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02b	WS04C	WS11	WS10	WS12	WS13			
Depth to Top	0.15	0.45	0.70	0.05	0.40	1.00	0.80			
Depth To Bottom										
Date Sampled	01-Oct-19	01-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	03-Oct-19			
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	7	5AB	5AB	6AE	5ABE	3E	4ABE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	Chrysotile	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos Matrix (microscope) _D	-	Cement	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	No	N/A	N/A	N/A	N/A	N/A			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) _D	-	0.959	-	-	-	-	-	% w/w	0.001	A-T-054

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/1	19/09360/2	19/09360/3	19/09360/4	19/09360/5	19/09360/6	19/09360/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02b	WS04C	WS11	WS10	WS12	WS13			
Depth to Top	0.15	0.45	0.70	0.05	0.40	1.00	0.80			
Depth To Bottom										
Date Sampled	01-Oct-19	01-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	03-Oct-19			
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	7	5AB	5AB	6AE	5ABE	3E	4ABE			
PAH-16MS										
Acenaphthene _A ^{M#}	242	0.26	3.15	0.07	<0.01	<0.01	0.24	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	10	0.04	0.65	0.03	<0.01	<0.01	0.02	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	308	0.51	5.92	0.17	<0.02	<0.02	0.47	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	554	1.58	8.81	0.59	<0.04	<0.04	1.93	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	485	1.49	6.83	0.49	<0.04	<0.04	1.76	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	586	1.80	7.44	0.58	<0.05	<0.05	2.16	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	293	0.77	2.08	0.21	<0.05	<0.05	0.74	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	195	0.67	2.55	0.21	<0.07	<0.07	0.71	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	531	1.83	9.05	0.70	<0.06	<0.06	2.23	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	90.5	0.21	0.56	0.06	<0.04	<0.04	0.21	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1320	3.43	24	1.08	<0.08	<0.08	4.49	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	201	0.20	4.68	0.10	<0.01	<0.01	0.15	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	374	1.10	2.71	0.30	<0.03	<0.03	1.05	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	233	0.06	6.19	0.18	<0.03	<0.03	0.09	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	1110	2.19	27.5	0.90	<0.03	<0.03	2.79	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1160	3.07	24.5	1.05	<0.07	<0.07	3.93	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	7690	19.2	137	6.72	<0.08	<0.08	23	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/1	19/09360/2	19/09360/3	19/09360/4	19/09360/5	19/09360/6	19/09360/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS01	WS02b	WS04C	WS11	WS10	WS12	WS13			
Depth to Top	0.15	0.45	0.70	0.05	0.40	1.00	0.80			
Depth To Bottom										
Date Sampled	01-Oct-19	01-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	03-Oct-19			
Sample Type	Solid	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	7	5AB	5AB	6AE	5ABE	3E	4ABE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<5	<1	<5	1	<1	<1	1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	316	<1	<5	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	1630	1	16	2	1	<1	2	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	2320	4	18	2	1	<1	2	mg/kg	1	A-T-055s
Ali >C21-C35 _A	33100	18	64	8	3	<1	8	mg/kg	1	A-T-055s
Total Aliphatics _A	37400	23	97	13	6	<1	14	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	368	1	7	4	2	<1	2	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	684	1	53	2	1	<1	2	mg/kg	1	A-T-055s
Aro >C12-C16 _A	3050	5	352	5	5	2	5	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	8110	19	1110	11	10	1	16	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	48500	92	2760	35	23	4	57	mg/kg	1	A-T-055s
Total Aromatics _A	60500	119	4290	56	41	7	83	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	97900	142	4380	70	48	7	96	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/8	19/09360/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS06	WS03								
Depth to Top	0.90	0.60								
Depth To Bottom										
Date Sampled	30-Sep-19	30-Sep-19								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5ABE	6E								
% Stones >10mm _A	7.9	1.9						% w/w	0.1	A-T-044
pH _D ^{M#}	8.42	7.84						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.05						g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	5.1	6.1						% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	9	18						mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.7	0.8						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	24	43						mg/kg	1	A-T-024s
Chromium _D ^{M#}	17	16						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	749	125						mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	12	19						mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Zinc _D ^{M#}	111	52						mg/kg	5	A-T-024s

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/8	19/09360/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS06	WS03								
Depth to Top	0.90	0.60								
Depth To Bottom										
Date Sampled	30-Sep-19	30-Sep-19								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5ABE	6E								
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD								A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A								A-T-045

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/8	19/09360/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS06	WS03								
Depth to Top	0.90	0.60								
Depth To Bottom										
Date Sampled	30-Sep-19	30-Sep-19								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5ABE	6E								
PAH-16MS										
Acenaphthene _A ^{M#}	0.28	0.58						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.02	0.04						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.36	0.54						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.92	1.40						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.63	1.20						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.79	1.46						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.26	0.54						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.28	0.50						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	1.11	1.67						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.08	0.14						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	2.26	3.01						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.23	0.36						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.36	0.74						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.16	1.36						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	2.22	2.99						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	2.07	2.73						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	12	19.3						mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/09360

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09360/8	19/09360/9								
Client Sample No										
Client Sample ID	WS06	WS03								
Depth to Top	0.90	0.60								
Depth To Bottom										
Date Sampled	30-Sep-19	30-Sep-19								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5ABE	6E								
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1						mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	1	4						mg/kg	1	A-T-055s
Ali >C21-C35 _A	9	14						mg/kg	1	A-T-055s
Total Aliphatics _A	11	16						mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	1	2						mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	2	2						mg/kg	1	A-T-055s
Aro >C12-C16 _A	3	4						mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	9	14						mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	43	58						mg/kg	1	A-T-055s
Total Aromatics _A	60	82						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	70	98						mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

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.

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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

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.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

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 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable 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.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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:	Curtins Consulting, Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	19/09360
Project:	Newton Heath, Manchester	Date Received:	07/10/2019 (am)
Clients Project No:	B074031.300	Cool Box Temperatures (°C):	11.0, 12.0

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/09398
Issue Number: 1
Date: 11 November, 2020

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Philippa Neesham/Siobhán Hyde
Project Name: Newton Heath, Manchester
Project Ref: B074031.301
Order No: EBMA2573
Date Samples Received: 30/10/20
Date Instructions Received: 05/11/20
Date Analysis Completed: 10/11/20

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Sophie France
Client Service Manager

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/1	20/09398/2	20/09398/3	20/09398/4	20/09398/5	20/09398/6	20/09398/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101	CP102	CP103	WS201	WS202	WS203	WS205			
Depth to Top	0.25	0.60	0.45	0.40	0.70	0.30	0.35			
Depth To Bottom										
Date Sampled	27-Oct-20	28-Oct-20	29-Oct-20	02-Nov-20	02-Nov-20	02-Nov-20	02-Nov-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6ABE	4AB	6ABE	5A	5A	4A	5A			
% Stones >10mm _A	0.4	12.1	10.8	29.3	<0.1	46.6	1.1	% w/w	0.1	A-T-044
pH _D ^{M#}	8.18	7.94	8.27	12.08	8.54	12.94	7.99	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.04	0.03	0.03	0.10	0.19	0.07	<0.01	g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	10.2	20.8	6.5	0.6	5.7	6.1	10.1	% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	15	30	11	<1	7	<1	15	mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0	<1.0	<1.0	1.5	<1.0	1.6	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	2.6	2.7	1.5	0.9	1.5	<0.5	1.3	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	77	118	70	49	38	2	58	mg/kg	1	A-T-024s
Chromium _D ^{M#}	26	16	18	18	19	5	17	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	438	282	182	30	221	5	99	mg/kg	1	A-T-024s
Mercury _D	1.93	1.26	0.55	2.24	0.44	2.30	0.61	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	23	36	21	14	19	2	18	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	2	<1	1	1	1	2	mg/kg	1	A-T-024s
Zinc _D ^{M#}	324	264	172	33	61	12	91	mg/kg	5	A-T-024s

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/1	20/09398/2	20/09398/3	20/09398/4	20/09398/5	20/09398/6	20/09398/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101	CP102	CP103	WS201	WS202	WS203	WS205			
Depth to Top	0.25	0.60	0.45	0.40	0.70	0.30	0.35			
Depth To Bottom										
Date Sampled	27-Oct-20	28-Oct-20	29-Oct-20	02-Nov-20	02-Nov-20	02-Nov-20	02-Nov-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6ABE	4AB	6ABE	5A	5A	4A	5A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/1	20/09398/2	20/09398/3	20/09398/4	20/09398/5	20/09398/6	20/09398/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101	CP102	CP103	WS201	WS202	WS203	WS205			
Depth to Top	0.25	0.60	0.45	0.40	0.70	0.30	0.35			
Depth To Bottom										
Date Sampled	27-Oct-20	28-Oct-20	29-Oct-20	02-Nov-20	02-Nov-20	02-Nov-20	02-Nov-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6ABE	4AB	6ABE	5A	5A	4A	5A			
PAH-16MS										
Acenaphthene _A ^{M#}	0.05	1.37	0.09	<0.01	0.08	<0.01	0.14	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.03	0.16	0.04	<0.01	0.02	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.11	1.74	0.22	<0.02	0.13	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.61	4.65	0.97	0.06	0.41	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.69	3.93	1.16	0.06	0.36	<0.04	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.99	4.96	1.50	0.09	0.51	<0.05	0.11	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.60	1.80	0.83	<0.05	0.23	<0.05	0.06	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.32	1.72	0.52	<0.07	0.16	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.70	5.10	1.00	0.06	0.43	<0.06	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.11	0.45	0.15	<0.04	0.05	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.15	10.7	1.84	0.10	0.85	<0.08	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.03	1.16	0.08	<0.01	0.06	<0.01	0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.61	1.98	0.87	0.05	0.25	<0.03	0.06	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.04	0.65	<0.03	<0.03	0.08	<0.03	1.79	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.54	10.1	0.90	0.06	0.79	<0.03	0.06	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.07	10.6	1.82	0.10	0.83	<0.07	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	7.65	61.1	12	0.58	5.24	<0.08	2.23	mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/1	20/09398/2	20/09398/3	20/09398/4	20/09398/5	20/09398/6	20/09398/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101	CP102	CP103	WS201	WS202	WS203	WS205			
Depth to Top	0.25	0.60	0.45	0.40	0.70	0.30	0.35			
Depth To Bottom										
Date Sampled	27-Oct-20	28-Oct-20	29-Oct-20	02-Nov-20	02-Nov-20	02-Nov-20	02-Nov-20			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6ABE	4AB	6ABE	5A	5A	4A	5A			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	1	1	<1	<1	1	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	4	1	3	<1	<1	1	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	9	2	4	2	2	1	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	38	23	13	8	29	2	2	mg/kg	1	A-T-055s
Total Aliphatics _A	52	27	23	10	32	6	2	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	4	2	3	2	71	1	57	mg/kg	1	A-T-055s
Aro >C10-C12 _A	1	2	4	<1	<1	1	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	5	5	33	2	1	3	<1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	17	12	97	8	5	4	2	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	38	40	232	38	6	9	4	mg/kg	1	A-T-055s
Total Aromatics _A	66	62	370	50	83	18	63	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	118	89	393	59	114	24	65	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/8	20/09398/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS205	WS204								
Depth to Top	0.80	0.45								
Depth To Bottom										
Date Sampled	02-Nov-20	02-Nov-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4A								
% Stones >10mm _A	<0.1	28.4						% w/w	0.1	A-T-044
pH _D ^{M#}	8.15	10.18						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.11	0.26						g/l	0.01	A-T-026s
Cyanide (total) _A ^{M#}	<1	<1						mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2						mg/kg	0.2	A-T-050s
Organic matter _D ^{M#}	1.1	1.7						% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Boron (water soluble) _D	1.1	1.1						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.5	0.9						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	23	12						mg/kg	1	A-T-024s
Chromium _D ^{M#}	33	13						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	17	35						mg/kg	1	A-T-024s
Mercury _D	<0.17	1.00						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	23	12						mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	1						mg/kg	1	A-T-024s
Zinc _D ^{M#}	40	46						mg/kg	5	A-T-024s

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/8	20/09398/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS205	WS204								
Depth to Top	0.80	0.45								
Depth To Bottom										
Date Sampled	02-Nov-20	02-Nov-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4A								
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD								A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A								A-T-045

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/8	20/09398/9						Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS205	WS204								
Depth to Top	0.80	0.45								
Depth To Bottom										
Date Sampled	02-Nov-20	02-Nov-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4A								
PAH-16MS										
Acenaphthene _A ^{M#}	0.16	0.06						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.07						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	0.23						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.22						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	0.33						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.14						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	0.12						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.25						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	0.51						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.05	0.05						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.16						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.09	0.03						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	0.38						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.46						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	0.30	3.01						mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/09398

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09398/8	20/09398/9								
Client Sample No										
Client Sample ID	WS205	WS204								
Depth to Top	0.80	0.45								
Depth To Bottom										
Date Sampled	02-Nov-20	02-Nov-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	5A	4A								
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1						mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1						mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	13	<1						mg/kg	1	A-T-055s
Total Aliphatics _A	13	<1						mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	3	<1						mg/kg	1	A-T-055s
Aro >C10-C12 _A	14	2						mg/kg	1	A-T-055s
Aro >C12-C16 _A	7	<1						mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	3	<1						mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	16	2						mg/kg	1	A-T-055s
Total Aromatics _A	44	3						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	57	3						mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01						mg/kg	0.01	A-T-022s

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

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.

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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

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.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

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 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable 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.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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:	Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	20/09398
Project:	Newton Heath, Manchester	Date Received:	05/11/2020 (am)
Clients Project No:	B074031.301	Cool Box Temperatures (°C):	6.3 & 9.7

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Appendix D – Geotechnical Laboratory Testing Results

- 2019 Due Diligence GI
 - Envirolab, Final Analytical Test Report 19/09522
 - Structural Soils Ltd, Test Report 784160r1
- 2020 Supplementary GI.
 - Final Analytical Test Report 20/09769
 - Structural Soils Ltd, Test Report 584382r1

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/09522
Issue Number: 1

Date: 25 October, 2019

Client: Curtins Consulting
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Amber Hatch-Walling
Project Name: Newton Heath, Manchester
Project Ref: B074031.300
Order No: EBMA2111
Date Samples Received: 03/10/19
Date Instructions Received: 10/10/19
Date Analysis Completed: 25/10/19

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Iain Haslock
Analytical Consultant

Envirolab Job Number: 19/09522

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09522/1	19/09522/2	19/09522/3	19/09522/4	19/09522/5	19/09522/6	19/09522/8	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS07	WS06	WS05	WS05	WS03	WS08	WS04c			
Depth to Top	2.60	2.80	2.50	3.70	1.50	3.80	2.90			
Depth To Bottom										
Date Sampled	30-Sep-19	30-Sep-19	30-Sep-19	30-Sep-19	30-Sep-19	01-Oct-19	02-Oct-19			
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D			
Sample Matrix Code		5A	5A		5A					
% Stones >10mm _A	-	<0.1	<0.1	-	<0.1	-	-	% w/w	0.1	A-T-044
pH BRE _D ^{M#}	-	8.44	7.56	-	7.48	-	-	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	-	60	84	-	34	-	-	mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	Appended	Appended	Appended	Appended	Appended	Appended		0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	Appended	Appended	Appended	Appended	Appended	Appended		1	Subcon SS

Envirolab Job Number: 19/09522

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.300

Lab Sample ID	19/09522/9	19/09522/10	19/09522/11	19/09522/12	19/09522/13	19/09522/14		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS11	WS10	WS10	WS12	WS13	WS13				
Depth to Top	1.50	1.90	4.00	1.60	2.70	4.60				
Depth To Bottom										
Date Sampled	02-Oct-19	02-Oct-19	02-Oct-19	02-Oct-19	03-Oct-19	03-Oct-19				
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D				
Sample Matrix Code		5AE			5A					
% Stones >10mm _A	-	<0.1	-	-	<0.1	-		% w/w	0.1	A-T-044
pH BRE _D ^{M#}	-	7.96	-	-	8.64	-		pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	-	53	-	-	45	-		mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	Appended	Appended	Appended	Appended	Appended			0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	Appended	Appended	Appended	Appended	Appended			1	Subcon SS

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

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.

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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

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.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

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 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable 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.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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:	Curtins Consulting, Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG	Project No:	19/09522
Project:	Newton Heath, Manchester	Date Received:	10/10/2019 (am)
Clients Project No:	B074031.300	Cool Box Temperatures (°C):	17.0, 11.0

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.



STRUCTURAL SOILS LTD
TEST REPORT



Report No. 784160 r1

Date 25-October-2019 Contract 19/09522

Client Envirolab Ltd
Address Units 7 & 8 Sandpits Business Park
Mottram Road
Hyde
SK14 3AR

For the Attention of Iain Haslock

Samples submitted by client 10/10/2019
Testing Started 16/10/2019
Testing Completed 25/10/2019

Client Reference 19/09522
Client Order No. PO741081
Instruction Type Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests Undertaken

Moisture Content (oven drying method) BS1377:Part 2:1990,clause 3.2
Liquid Limit (one point method) BS1377:Part 2:1990,clause 4.4
Liquid Limit (definitive method) BS1377:Part 2:1990,clause 4.3
Plastic Limit BS1377:Part 2:1990,clause 5.3
Plasticity Index Derivation BS1377:Part 2:1990,clause 5.4

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

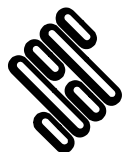
Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail luke.fisher@soils.co.uk

SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425um	Description of Sample
WS03	19/09522/5	D	1.50	22	37	18	19	99	Brown slightly sandy slightly gravelly CLAY
WS04c	19/09522/8	D	2.90	20	40	18	22	96	Brown slightly sandy slightly gravelly CLAY
WS05	19/09522/3	D	2.50	31	46	20	26	97	Brown slightly sandy slightly gravelly CLAY
WS05	19/09522/4	D	3.70	21	38	18	20	96	Brown slightly sandy slightly gravelly CLAY
WS06	19/09522/2	D	2.80	15	38	20	18	92	Brown slightly sandy slightly gravelly CLAY
WS07	19/09522/1	D	2.60	13	34	18	16	93	Dark brown slightly sandy slightly gravelly CLAY
WS08	19/09522/6	D	3.80	15	40	19	21	95	Brown slightly sandy slightly gravelly CLAY
WS10	19/09522/10	D	1.90	20	45	20	25	97	Brown slightly sandy slightly gravelly CLAY



**STRUCTURAL
SOILS LTD**

Contract:

19/09522

Contract Ref:

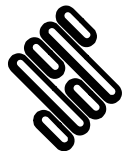
784160



SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425um	Description of Sample
WS10	19/09522/11	D	4.00	21	46	19	27	96	Brown grey slightly sandy slightly gravelly CLAY
WS11	19/09522/9	D	1.50	21	37	19	18	99	Brown slightly sandy slightly gravelly CLAY
WS12	19/09522/12	D	1.60	19	41	20	21	94	Brown slightly sandy slightly gravelly CLAY
WS13	19/09522/13	D	2.70	19	43	20	23	93	Brown grey slightly gravelly slightly sandy CLAY
WS13	19/09522/14	D	4.60	20	41	19	22	95	Brown slightly sandy slightly gravelly CLAY



**STRUCTURAL
SOILS LTD**

Contract:

19/09522

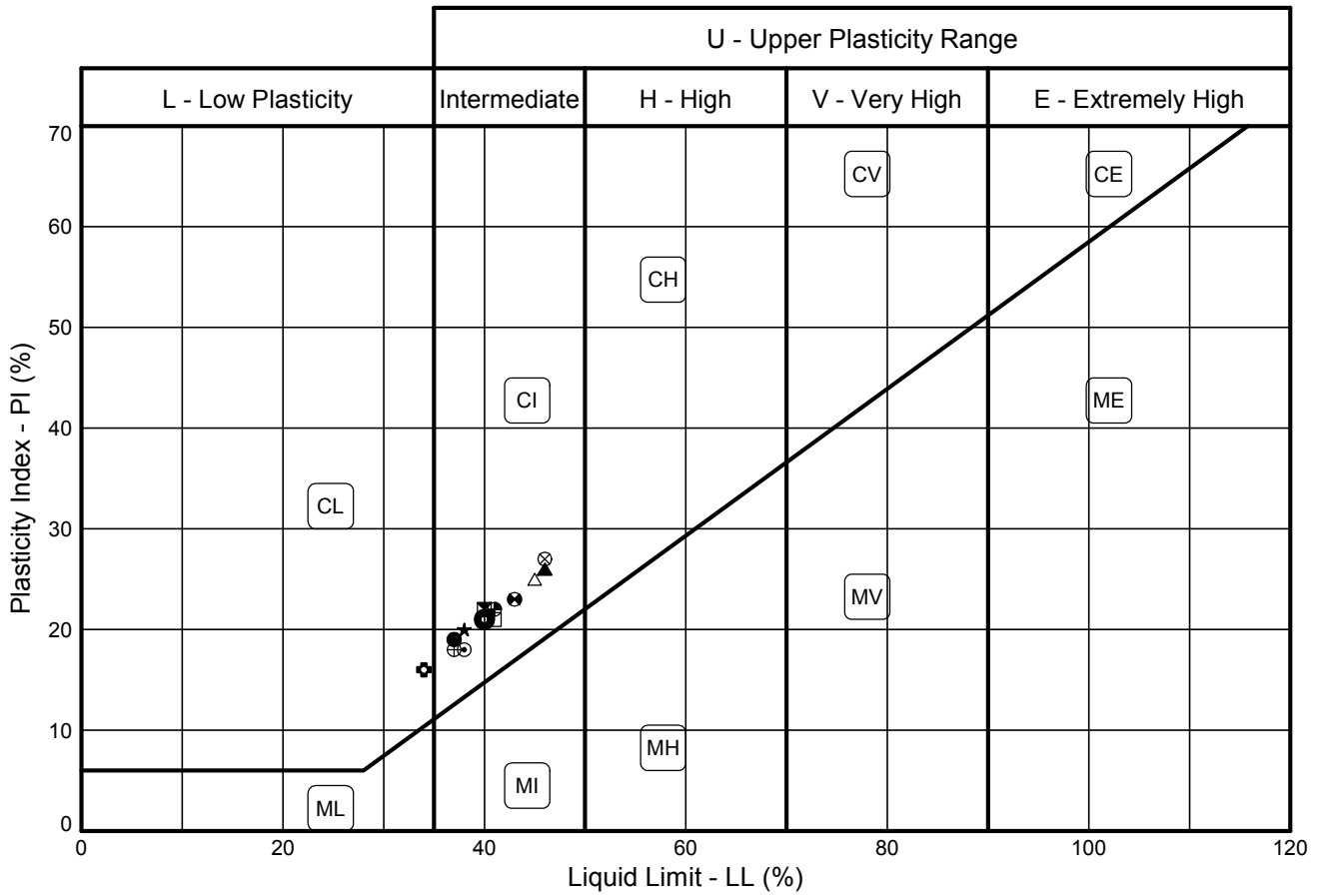
Contract Ref:

784160



PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC %	LL %	PL %	PI %	<425um %	Lab location
Exploratory Position ID	Sample	Depth (m)									
●	WS03	19/09522/5D	1.50	3.2/4.3/5.3/5.4	4.2.4	22	37	18	19	99	C
⊠	WS04c	19/09522/8D	2.90	3.2/4.3/5.3/5.4	4.2.4	20	40	18	22	96	C
▲	WS05	19/09522/3D	2.50	3.2/4.3/5.3/5.4	4.2.4	31	46	20	26	97	C
★	WS05	19/09522/4D	3.70	3.2/4.3/5.3/5.4	4.2.4	21	38	18	20	96	C
⊙	WS06	19/09522/2D	2.80	3.2/4.3/5.3/5.4	4.2.4	15	38	20	18	92	C
⊕	WS07	19/09522/1D	2.60	3.2/4.3/5.3/5.4	4.2.4	13	34	18	16	93	C
⊗	WS08	19/09522/6D	3.80	3.2/4.3/5.3/5.4	4.2.4	15	40	19	21	95	C
△	WS10	19/09522/10D	1.90	3.2/4.3/5.3/5.4	4.2.4	20	45	20	25	97	C
⊗	WS10	19/09522/11D	4.00	3.2/4.4/5.3/5.4	4.2.4	21	46	19	27	96	C
⊕	WS11	19/09522/9D	1.50	3.2/4.3/5.3/5.4	4.2.4	21	37	19	18	99	C
□	WS12	19/09522/12D	1.60	3.2/4.3/5.3/5.4	4.2.4	19	41	20	21	94	C
⊗	WS13	19/09522/13D	2.70	3.2/4.3/5.3/5.4	4.2.4	19	43	20	23	93	C
⊕	WS13	19/09522/14D	4.60	3.2/4.3/5.3/5.4	4.2.4	20	41	19	22	95	C

Tested in accordance with the following clauses of BS1377-2:1990.

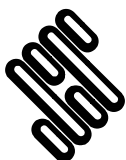
3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)



STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By

Sarah Mundy

Date

SARAH MUNDY

25/10/19

Contract

19/09522

Contract Ref:

784160



TESTING VERIFICATION CERTIFICATE



1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **25/10/2019 15:59:44**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Luke Fisher (Materials Laboratory Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU



**STRUCTURAL
SOILS LTD**

Contract:

19/09522

Job No:

784160



FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 20/09769
Issue Number: 1

Date: 18 December, 2020

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Philippa Neesham
Project Name: Newton Heath, Manchester
Project Ref: B074031.301
Order No: EBMA2574
Date Samples Received: 03/11/20
Date Instructions Received: 14/11/20
Date Analysis Completed: 15/12/20

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Sophie France
Client Service Manager

Envirolab Job Number: 20/09769

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09769/1	20/09769/2	20/09769/3	20/09769/5	20/09769/6	20/09769/8	20/09769/9	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP101	CP101	CP101	CP101	CP101	CP101	CP101			
Depth to Top	2.00	4.00	6.00	10.50	12.00	15.00	16.50			
Depth To Bottom	2.45	4.45	6.45	10.95	12.45	15.45	16.95			
Date Sampled	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20	27-Oct-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code		5A		5A	5		5A			
% Stones >10mm _A	-	<0.1	-	<0.1	<0.1	-	0.9	% w/w	0.1	A-T-044
pH BRE _D ^{M#}	-	8.42	-	8.65	8.77	-	8.39	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	-	125	-	60	36	-	54	mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	Appended	Appended	-	-	Appended	Appended	%	0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	Appended	Appended	-	-	Appended	Appended	%	1	Subcon SS
1.10c PSD (3.35mm-2um clay)(Sedimentation by Pipette/Hydrometer)BS1377 1990 pt2cl9.4/9.5 _A [#]	-	-	Appended	-	-	-	-	%	0.1	Subcon SS
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	-	-	-	-	Appended	-	-	%	0.1	Subcon SS

Envirolab Job Number: 20/09769

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09769/11	20/09769/17	20/09769/18	20/09769/19	20/09769/20	20/09769/22	20/09769/24	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP103	CP102	CP102	CP102	CP102	CP102	CP102			
Depth to Top	18.00	5.00	6.00	6.50	7.50	10.50	13.50			
Depth To Bottom	18.45	5.45	6.45		7.95	10.95	13.95			
Date Sampled	27-Oct-20	28-Oct-20	28-Oct-20	28-Oct-20	28-Oct-20	28-Oct-20	28-Oct-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5A	5A			4A	5A				
% Stones >10mm _A	<0.1	<0.1	-	-	1.2	<0.1	-	% w/w	0.1	A-T-044
pH BRE _D ^{M#}	8.57	8.67	-	-	9.07	8.58	-	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	50	26	-	-	<10	62	-	mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	Appended	-	Appended	-	Appended	Appended	%	0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	-	-	Appended	-	-	Appended	%	1	Subcon SS
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	-	-	-	-	Appended	-	-	%	0.1	Subcon SS
1.03 Atterburg 1Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	-	Appended	-	-	-	Appended	-	%	1	Subcon SS
5.02c QUT Multistage (100mm) BS1377 1990 pt7 cl9 (Undrained Shear Strength) _A [#]	-	-	Appended	-	-	-	-	N/A		Subcon SS

Envirolab Job Number: 20/09769

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09769/25	20/09769/26	20/09769/28	20/09769/29	20/09769/30	20/09769/31	20/09769/32	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP102	CP102	CP102	CP102	CP102	CP102	CP103			
Depth to Top	15.00	16.50	18.00	22.50	24.50	25.50	2.00			
Depth To Bottom	15.45	16.95	18.45	22.95	24.45	25.95	2.45			
Date Sampled	28-Oct-20	28-Oct-20	28-Oct-20	29-Nov-20	29-Nov-20	29-Nov-20	29-Oct-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4				5A					
% Stones >10mm _A	<0.1	-	-	-	<0.1	-	-	% w/w	0.1	A-T-044
pH BRE _D ^{M#}	8.91	-	-	-	8.71	-	-	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	27	-	-	-	34	-	-	mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	-	-	Appended	Appended	Appended	Appended	%	0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	-	-	Appended	Appended	Appended	Appended	%	1	Subcon SS
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	-	-	Appended	-	-	-	-	%	0.1	Subcon SS
5.02c QUT Multistage (100mm) BS1377 1990 pt7 cl9 (Undrained Shear Strength) _A [#]	-	Appended	-	-	-	-	-	N/A		Subcon SS

Envirolab Job Number: 20/09769

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09769/34	20/09769/35	20/09769/36	20/09769/38	20/09769/39	20/09769/42	20/09769/43	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP103	CP103	CP103	CP103	CP103	CP103	CP103			
Depth to Top	4.00	5.00	6.00	9.00	10.00	19.50	21.00			
Depth To Bottom	4.45	5.45	6.45	9.45	10.50	19.95	21.45			
Date Sampled	29-Oct-20	29-Oct-20	29-Oct-20	29-Oct-20	29-Oct-20		30-Oct-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code		5A					5A			
% Stones >10mm _A	-	6.4	-	-	-	-	<0.1	% w/w	0.1	A-T-044
pH BRE _D ^{M#}	-	8.64	-	-	-	-	8.51	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	-	57	-	-	-	-	27	mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	Appended	Appended	Appended	-	Appended	-	%	0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	Appended	Appended	Appended	-	Appended	-	%	1	Subcon SS
1.10c PSD (3.35mm-2um clay)(Sedimentation by Pipette/Hydrometer)BS1377 1990 pt2cl9.4/9.5 _A [#]	-	-	-	-	Appended	-	-	%	0.1	Subcon SS
5.02c QUT Multistage (100mm) BS1377 1990 pt7 cl9 (Undrained Shear Strength) _A [#]	-	-	-	-	-	-	Appended	N/A		Subcon SS

Envirolab Job Number: 20/09769

Client Project Name: Newton Heath, Manchester

Client Project Ref: B074031.301

Lab Sample ID	20/09769/44	20/09769/46	20/09769/47	20/09769/49	20/09769/50	20/09769/51	20/09769/58	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP103	WS205	WS205	WS201	WS201	WS202	CP101			
Depth to Top	23.50	1.60	2.40	1.70	2.60	1.20	18.00			
Depth To Bottom		1.80	2.60	1.90	2.80	1.40	18.50			
Date Sampled	30-Oct-20	02-Nov-20	02-Nov-20	02-Nov-20	02-Nov-20	02-Nov-20	27-Oct-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code			5A		5A		5A			
% Stones >10mm _A	-	-	<0.1	-	<0.1	-	<0.1	% w/w	0.1	A-T-044
pH BRE _D ^{M#}	-	-	8.58	-	8.39	-	8.54	pH	0.01	A-T-031s
Sulphate BRE (water sol 2:1) _D ^{M#}	-	-	34	-	80	-	60	mg/l	10	A-T-026s
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	-	-	Appended	Appended	Appended	-	%	0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	Appended	-	-	Appended	Appended	Appended	-	%	1	Subcon SS

REPORT NOTES

General

This report shall not be reproduced, except in full, without written approval from Envirolab.

The results reported herein relate only to the material supplied to the laboratory.

The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.

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.

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.

The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.

For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts.

All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

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.

Electrical Conductivity of water by Method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:

Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.

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 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,

E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.

US indicates Unsuitable 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.

Superscript "M" indicates method accredited to MCERTS.

Subscript "A" indicates analysis performed on the sample as received.

Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

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: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG
Project: Newton Heath, Manchester
Clients Project No: B074031.301

Project No: 20/09769
Date Received: 14/11/2020 (am)
Cool Box Temperatures (°C): 5.3 - 16.0

Lab Sample ID	20/09769/9	20/09769/11	20/09769/42	20/09769/43
Client Sample No				
Client Sample ID/Depth	CP101 16.50-16.95m	CP103 18.00-18.45m	CP103 19.50-19.95m	CP103 21.00-21.45m
Date Sampled	27/10/20	27/10/20		30/10/20
Deviation Code				
E (no date)			✓	
F	✓	✓		✓

Key

E (no date)

F

No sampling date provided (all results affected if not provided)

Maximum holding time exceeded between sampling date and analysis for analytes listed below

HOLDING TIME EXCEEDANCES

Lab Sample ID	20/09769/9	20/09769/11	20/09769/43
Client Sample No			
Client Sample ID/Depth	CP101 16.50-16.95m	CP103 18.00-18.45m	CP103 21.00-21.45m
Date Sampled	27/10/20	27/10/20	30/10/20
Sulphate BRE (water sol 2:1)	✓	✓	✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.



STRUCTURAL SOILS LTD

TEST REPORT



Report No. 584382-01 (00)

1774

Date 09-December-2020 Contract B074031.301

Client Envirolab
Address Units 7-8
Sandpits Business Park
Mottram Road
Hyde
SK14 3AR

For the Attention of Michael Knight

Samples submitted by client 18-November-2020
Testing Started 23-November-2020
Testing Completed 04-December-2020

Client Reference 20/09769
Client Order No. P0745165
Instruction Type Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

- 1.01 Moisture Content (oven drying method) BS1377:Part 2:1990:clause 3.2 (superseded)*
- 1.02 Liquid Limit (definitive method) & Plastic Limit BS1377:Part 2:1990,clause 4.3/5.3 (superseded)*
- 1.10 Particle Size Distribution wet sieve method BS1377:Part 2:1990,clause 9.2 (superseded)*
- 1.13a Particle Size Distribution sedimentation pipette method BS1377:Part 2:1990,clause 9.4 (superseded)*
- 5.04 Undrained shear strength triaxial compression without pore pressure measurement (definitive method) 100mm diameter specimens BS1377:Part 7:1990,clause 8.4 (superseded)*

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of .
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd 18 Frogmore Rd Hemel Hempstead HP3 9RT Tel.01442 416661 e-mail dimitris.xirouchakis@soils.co.uk

TESTING VERIFICATION CERTIFICATE



1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **09/12/2020 12:37:12**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Sharon Cairns (Laboratory Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU



**STRUCTURAL
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Contract:

B074031.301

Job No:

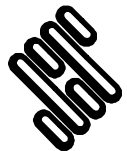
584382



SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Description of Sample
CP101	20/09769/1	D	2.00	26	44	22	22	96	Brown mottled grey and orange slightly sandy slightly gravelly CLAY
CP101	20/09769/2	D	4.00	22	48	23	25	99	Brown mottled orange slightly sandy slightly gravelly CLAY
CP101	20/09769/3	D	6.00	20	42	20	22	96	Brown mottled orange slightly sandy silty CLAY
CP101	20/09769/8	D	15.00	13	27	15	12	92	Brown mottled grey and orange slightly gravelly sandy CLAY
CP101	20/09769/58	D	18.00	15	30	16	14	97	Brown mottled orange slightly gravelly sandy CLAY
CP102	20/09769/17	D	5.00	21	41	20	21	96	Dark brown slightly gravelly sandy CLAY
CP102	20/09769/19	D	6.50	18	38	20	18	97	Brown mottled orange and grey gravelly slightly sandy CLAY
CP102	20/09769/22	D	10.50	21	38	20	18	99	Brown slightly gravelly sandy CLAY



**STRUCTURAL
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Contract:

B074031.301

Contract Ref:

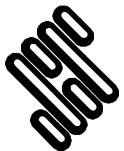
584382



SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Description of Sample
CP102	20/09769/24	D	13.50	25	NP	NP	NP	99	Brown silty SAND
CP102	20/09769/25	D	15.00	22	NP	NP	NP	98	Brown silty SAND
CP102	20/09769/29	D	22.50	22	32	21	11	99	Brown slightly gravelly sandy CLAY
CP102	20/09769/30	B	24.00	9.4	24	14	10	88	Brown slightly gravelly sandy CLAY
CP102	20/09769/31	D	25.50	12	35	18	17	96	Brown mottled orange slightly gravelly sandy CLAY
CP103	20/09769/32	D	2.00	28	41	19	22	96	Brown mottled orange and grey slightly sandy CLAY
CP103	20/09769/34	D	4.00	15	33	16	17	88	Brown mottled orange slightly gravelly sandy CLAY
CP103	20/09769/35	D	5.00	12	37	17	20	92	Brown mottled grey gravelly slightly sandy CLAY



**STRUCTURAL
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Contract:

B074031.301

Contract Ref:

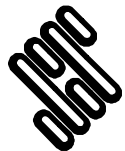
584382



SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Description of Sample
CP103	20/09769/36	D	6.00	20	38	18	20	97	Brown mottled orange slightly gravelly sandy CLAY
CP103	20/09769/38	D	9.00	12	29	15	14	91	Brown mottled orange and grey gravelly slightly sandy CLAY
CP103	20/09769/42	D	19.50	16	28	16	12	98	Brown slightly gravelly sandy CLAY
CP103	20/09769/44	D	23.50	14	36	17	19	93	Reddish brown mottled orange and grey gravelly slightly sandy CLAY
WS201	20/09769/49	D	1.70	29	45	22	23	89	Brown mottled orange and grey slightly gravelly sandy CLAY
WS201	20/09769/50	D	2.60	20	42	22	20	96	Brown mottled orange and grey slightly sandy slightly gravelly CLAY
WS202	20/09769/51	D	1.20	22	43	22	21	75	Brown mottled orange and grey gravelly sandy CLAY



**STRUCTURAL
SOILS LTD**

Contract:

B074031.301

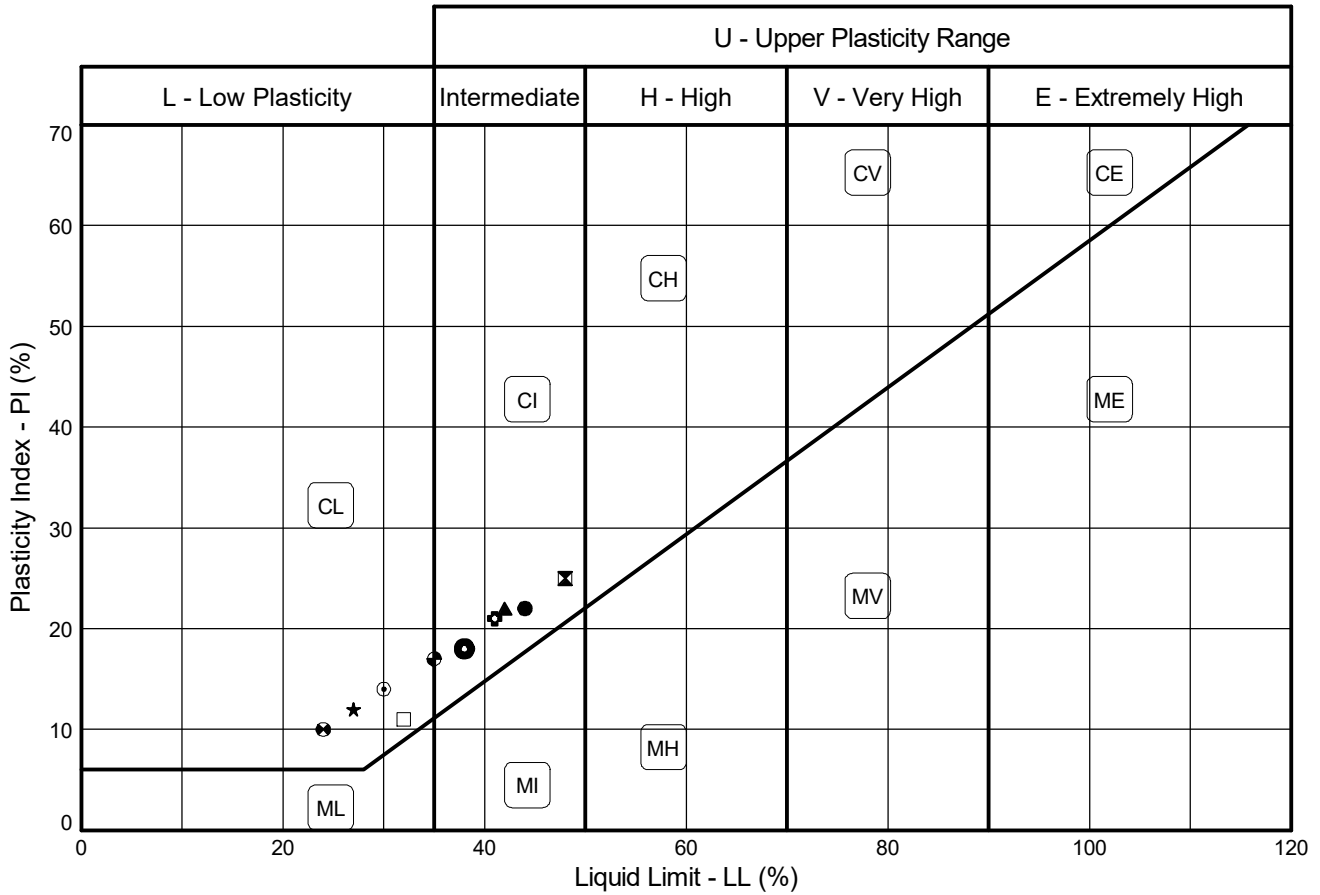
Contract Ref:

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PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990



Sample Identification			BS Test Method #	Preparation Method +	MC %	LL %	PL %	PI %	<425µm %	Lab location	Notes
Exploratory Position ID	Sample	Depth (m)									
●	CP101	20/09769/1D	2.00	3.2/4.3/5.3/5.4	4.2.4	26	44	22	22	96	T
⊠	CP101	20/09769/2D	4.00	3.2/4.3/5.3/5.4	4.2.4	22	48	23	25	99	T
▲	CP101	20/09769/3D	6.00	3.2/4.3/5.3/5.4	4.2.4	20	42	20	22	96	T
★	CP101	20/09769/8D	15.00	3.2/4.3/5.3/5.4	4.2.3	13	27	15	12	92	T
⊙	CP101	20/09769/58D	18.00	3.2/4.3/5.3/5.4	4.2.3	15	30	16	14	97	T
⊕	CP102	20/09769/17D	5.00	3.2/4.4/5.3/5.4	4.2.4	21	41	20	21	96	T
⊗	CP102	20/09769/19D	6.50	3.2/4.3/5.3/5.4	4.2.4	18	38	20	18	97	T
△	CP102	20/09769/22D	10.50	3.2/4.4/5.3/5.4	4.2.4	21	38	20	18	99	T
	CP102	20/09769/24D	13.50	3.2/4.3/5.3/5.4	4.2.4	25	NP	NP	NP	99	T
	CP102	20/09769/25D	15.00	3.2/4.3/5.3/5.4	4.2.4	22	NP	NP	NP	98	T
□	CP102	20/09769/29D	22.50	3.2/4.3/5.3/5.4	4.2.4	22	32	21	11	99	T
⊗	CP102	20/09769/30B	24.00	3.2/4.3/5.3/5.4	4.2.4	9.4	24	14	10	88	T
⊕	CP102	20/09769/31D	25.50	3.2/4.3/5.3/5.4	4.2.4	12	35	18	17	96	T

Tested in accordance with the following clauses of BS1377-2:1990.

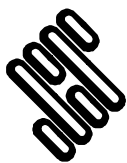
3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)



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Anerley Court
Half Moon Lane
Hildenborough
Tonbridge TN11 9HU

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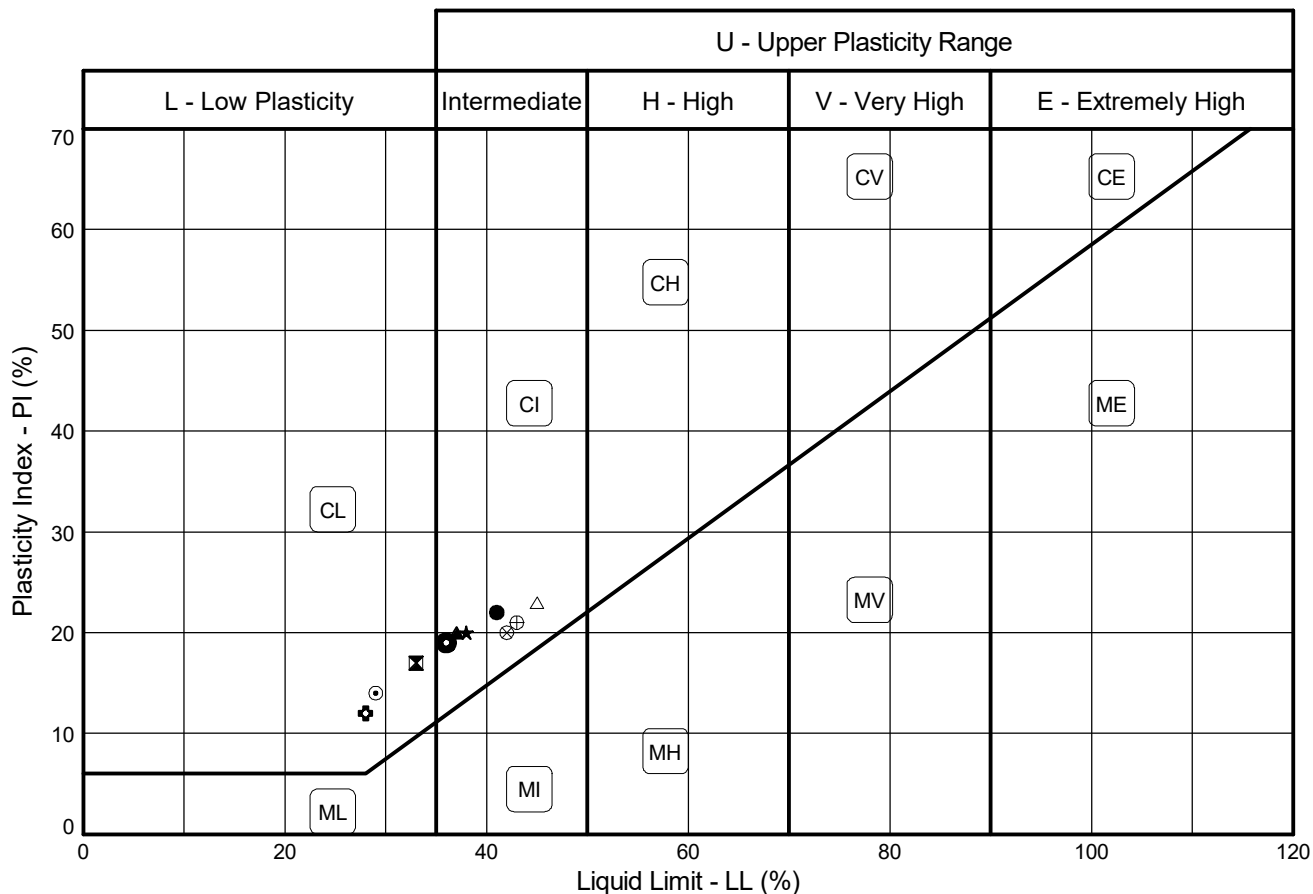
Contract Ref:

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PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC %	LL %	PL %	PI %	<425µm %	Lab location	Notes
Exploratory Position ID	Sample	Depth (m)										
●	CP103	20/09769/32D	2.00	3.2/4.3/5.3/5.4	4.2.4	28	41	19	22	96	T	
⊠	CP103	20/09769/34D	4.00	3.2/4.3/5.3/5.4	4.2.4	15	33	16	17	88	T	
▲	CP103	20/09769/35D	5.00	3.2/4.3/5.3/5.4	4.2.4	12	37	17	20	92	T	
★	CP103	20/09769/36D	6.00	3.2/4.3/5.3/5.4	4.2.4	20	38	18	20	97	T	
⊙	CP103	20/09769/38D	9.00	3.2/4.3/5.3/5.4	4.2.4	12	29	15	14	91	T	
⊕	CP103	20/09769/42D	19.50	3.2/4.3/5.3/5.4	4.2.4	16	28	16	12	98	T	
⊗	CP103	20/09769/44D	23.50	3.2/4.3/5.3/5.4	4.2.4	14	36	17	19	93	T	
△	WS201	20/09769/49D	1.70	3.2/4.3/5.3/5.4	4.2.4	29	45	22	23	89	T	
⊗	WS201	20/09769/50D	2.60	3.2/4.3/5.3/5.4	4.2.4	20	42	22	20	96	T	
⊕	WS202	20/09769/51D	1.20	3.2/4.3/5.3/5.4	4.2.4	22	43	22	21	75	T	

Tested in accordance with the following clauses of BS1377-2:1990.

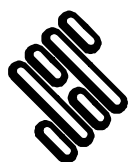
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4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)



STRUCTURAL SOILS
Anerley Court
Half Moon Lane
Hildenborough
Tonbridge TN11 9HU

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Date

SHARON CAIRNS

09/12/20

Contract

B074031.301

Contract Ref:

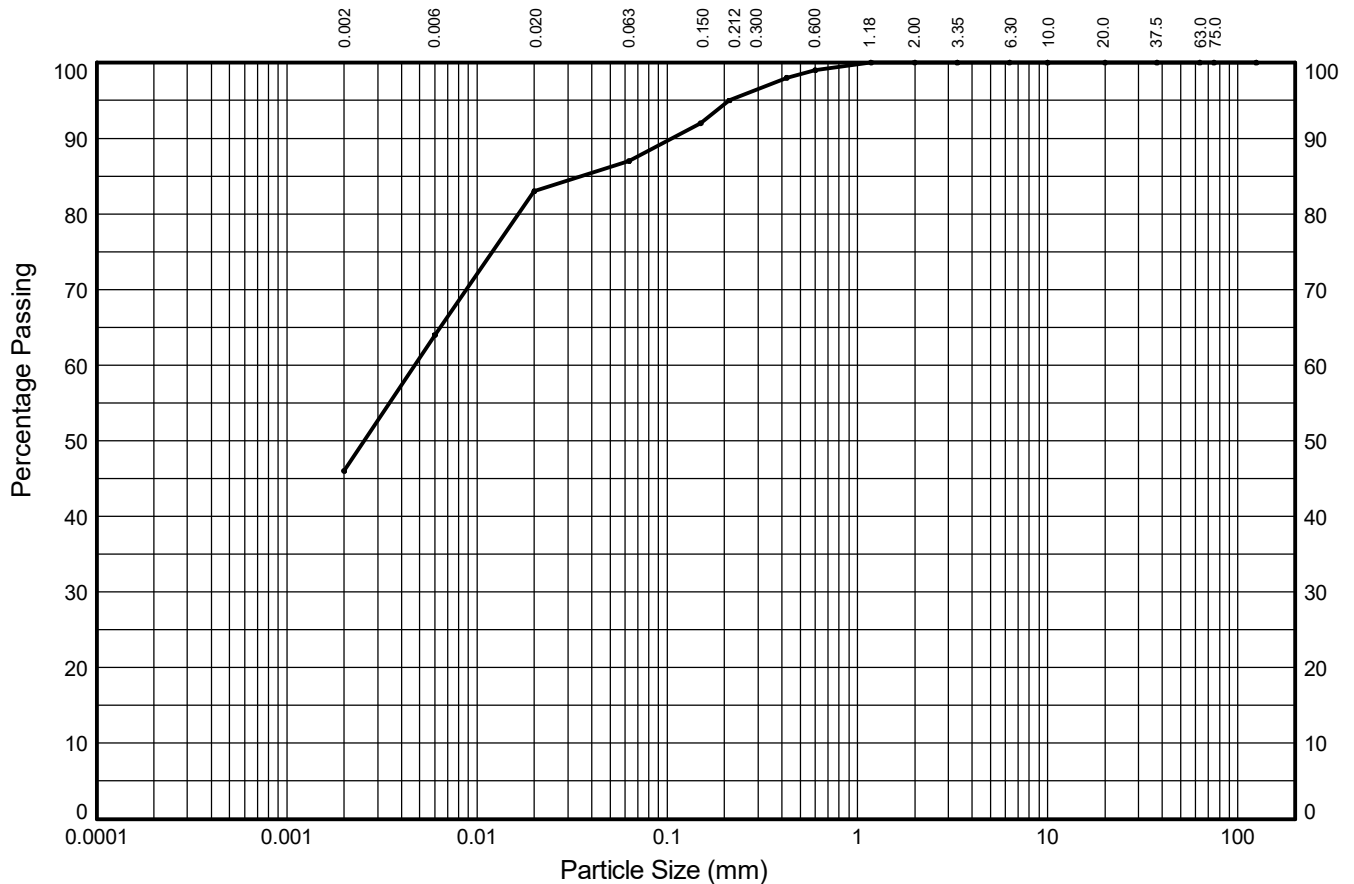
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PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.4 of BS1377:Part 2:1990

Position ID: **CP101** Sample Ref: **20/09769/3** Sample Type: **D** Depth (m): **6.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	18%	19%	4%	7%	5%	1%	0%	0%	0%	
	SILT			SAND			GRAVEL			
46%	41%			13%			0%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.3	100
3.35	100
2.0	100
1.18	100
0.600	99
0.425	98
0.212	95
0.150	92
0.063	87

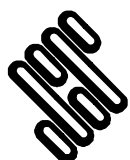
Particle Diameter (mm)	Percent Passing (%)
0.02	83
0.006	64
0.002	46
Sedimentation sample was not pre-treated	

Coefficients	
D ₁₀ (mm)	NA
D ₁₅ (mm)	NA
D ₃₀ (mm)	NA
D ₅₀ (mm)	0.003
D ₆₀ (mm)	0.005
D ₈₅ (mm)	0.035
D ₉₀ (mm)	0.106
C _U	NA
C _C	NA

Soil Description:

Brown mottled orange slightly sandy silty CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



STRUCTURAL SOILS
Anerley Court
Half Moon Lane
Hildenborough
Tonbridge TN11 9HU

Compiled By

Date

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09/12/20

Contract

B074031.301

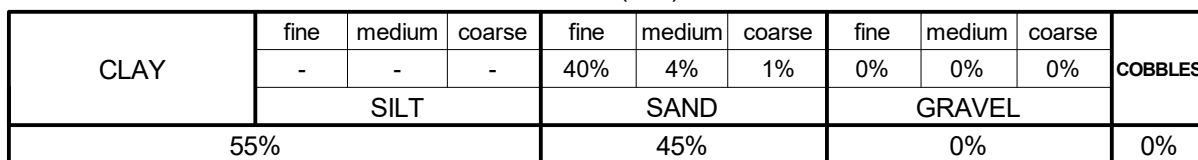
Contract Ref:

584382



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **12.00**



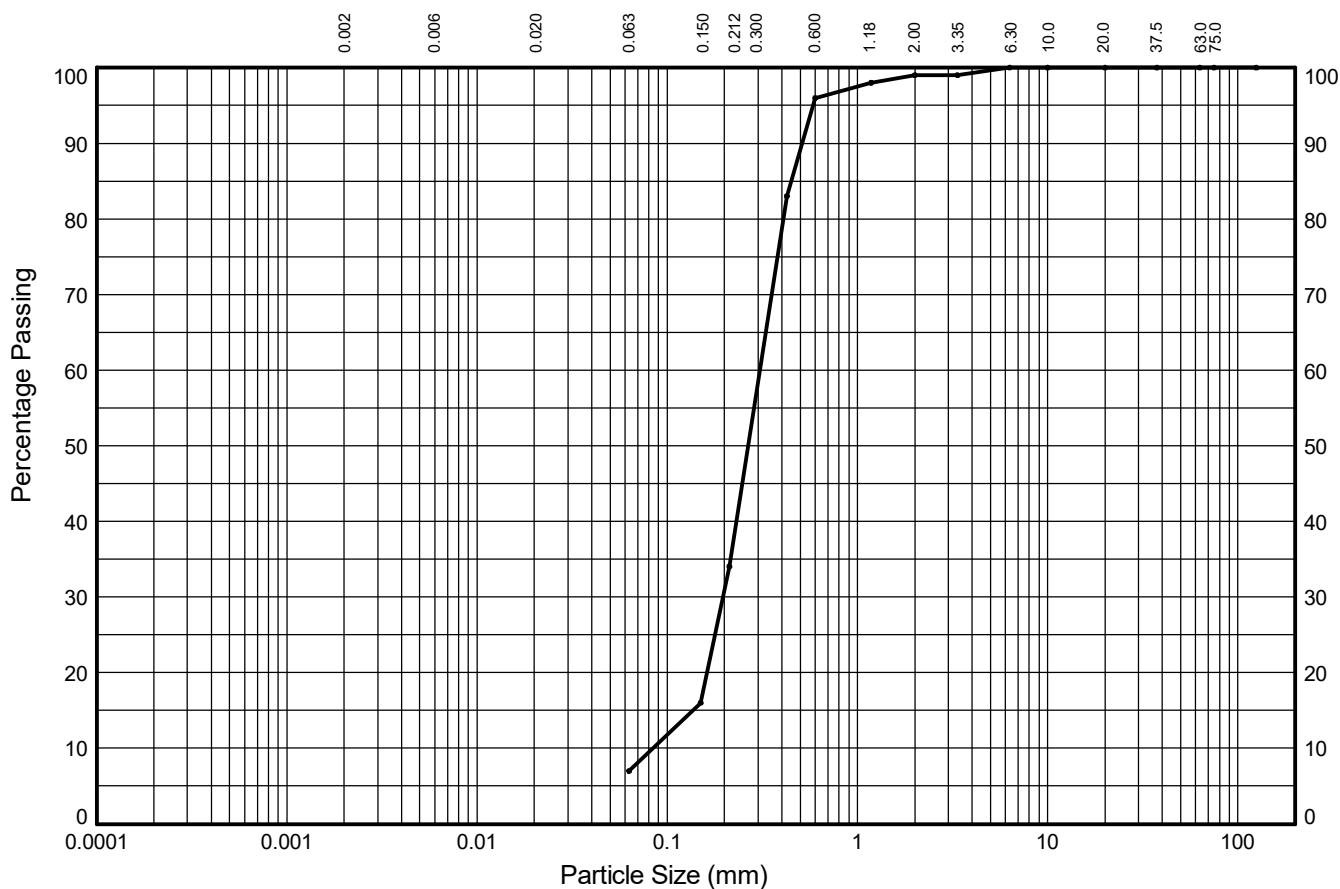
Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	NA
D_{50} (mm)	NA
D_{60} (mm)	0.071
D_{85} (mm)	0.125
D_{90} (mm)	0.140
C_u	NA
C_c	NA

Brown sandy clayey SILT



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **7.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	24%	66%	3%	1%	0%	0%	
	SILT			SAND			GRAVEL			
7%				92%			1%			0%

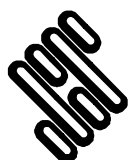
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.30	100
3.35	99
2.00	99
1.18	98
0.600	96
0.425	83
0.212	34
0.150	16
0.063	7

Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Coefficients	
D_{10} (mm)	0.084
D_{15} (mm)	0.136
D_{30} (mm)	0.196
D_{50} (mm)	0.266
D_{60} (mm)	0.307
D_{85} (mm)	0.448
D_{90} (mm)	0.512
C_U	3.6
C_C	1.5

Brown slightly gravelly clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



Compiled By

Date _____

SHARON CAIRNS

09/12/20

Contract

B074031.301

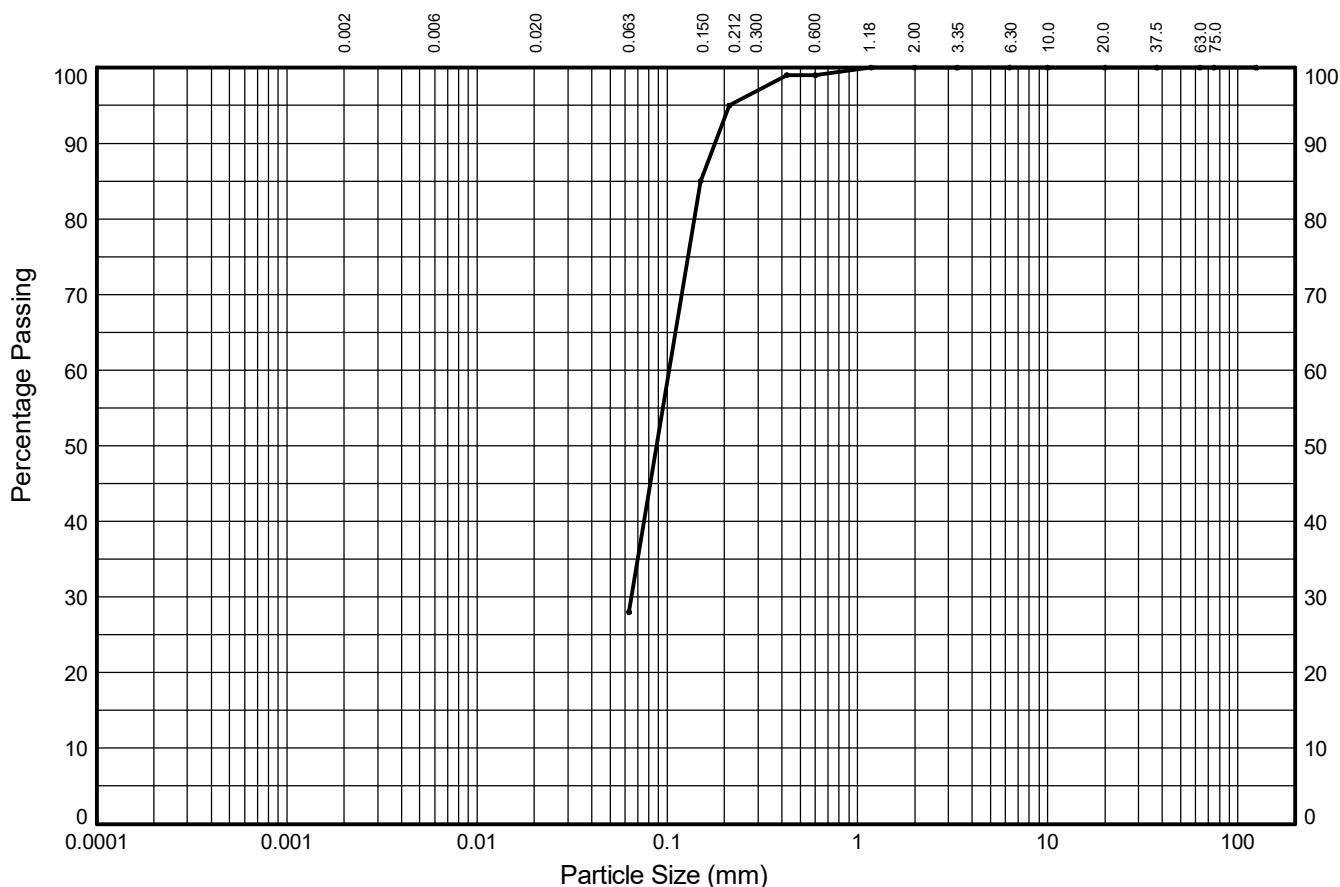
Contract Ref:

584382



In accordance with clauses 9.2 of BS1377:Part 2:1990

Depth (m): **18.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	65%	6%	1%	0%	0%	0%	
	SILT			SAND			GRAVEL			
28%				72%			0%			0%

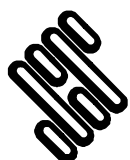
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.30	100
3.35	100
2.00	100
1.18	100
0.600	99
0.425	99
0.212	95
0.150	85
0.063	28

Particle Diameter (mm)	Percent Passing (%)
Sedimentation sample was not pre-treated	

Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	0.065
D_{50} (mm)	0.088
D_{60} (mm)	0.103
D_{85} (mm)	0.150
D_{90} (mm)	0.178
C_u	NA
C_c	NA

Brown very silty SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



Compiled By

Date _____

SHARON CAIRNS

09/12/20

Contract

B074031.301

Contract Ref:

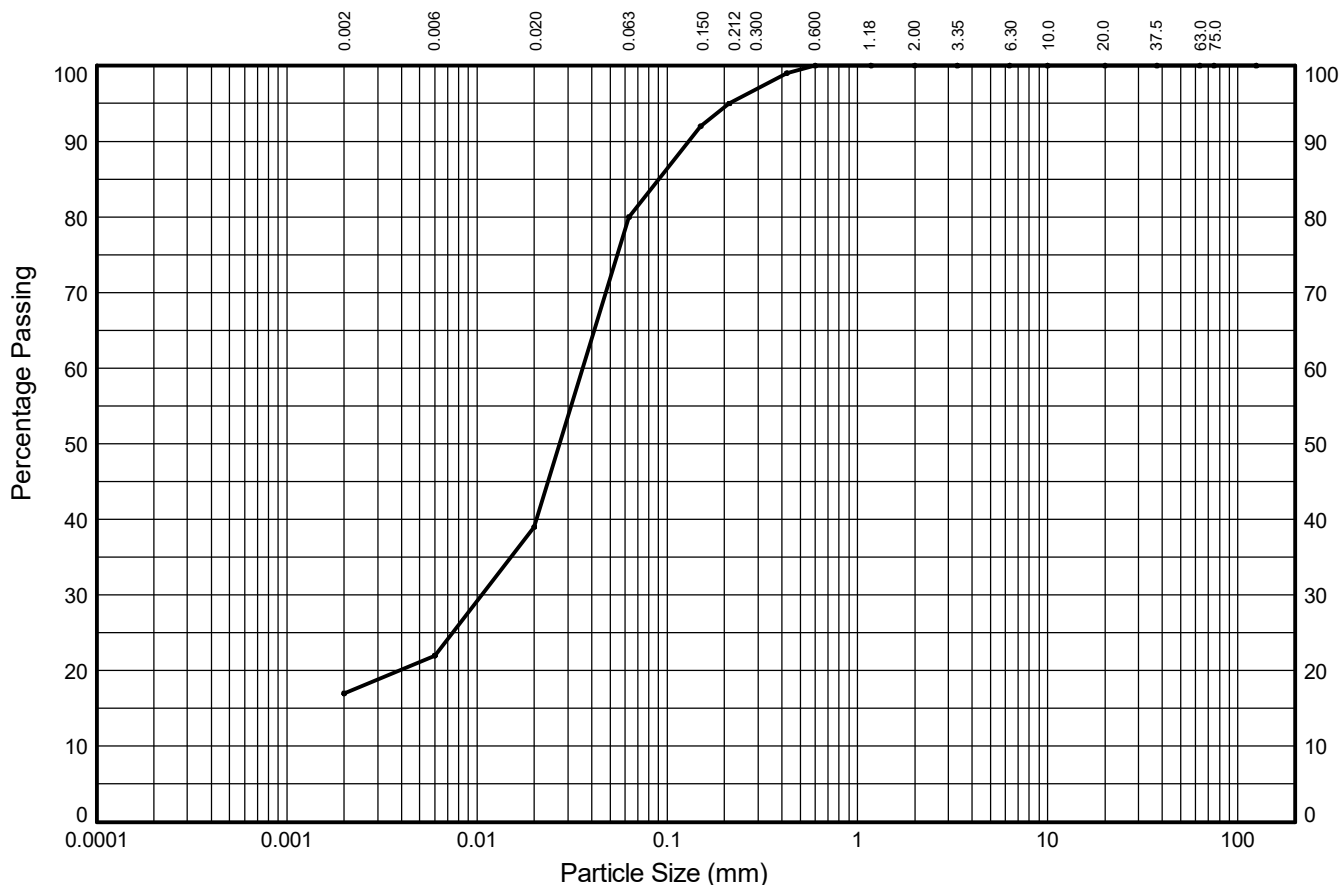
584382



PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2, 9.4 of BS1377:Part 2:1990

Position ID: **CP103** Sample Ref: **20/09769/39** Sample Type: **B** Depth (m): **10.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	5%	17%	41%	14%	6%	0%	0%	0%	0%	
	SILT			SAND			GRAVEL			
17%	63%			20%			0%			0%

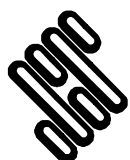
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.3	100
3.35	100
2.0	100
1.18	100
0.600	100
0.425	99
0.212	95
0.150	92
0.063	80

Particle Diameter (mm)	Percent Passing (%)
0.02	39
0.006	22
0.002	17
Sedimentation sample was not pre-treated	

Coefficients	
D ₁₀ (mm)	NA
D ₁₅ (mm)	NA
D ₃₀ (mm)	0.011
D ₅₀ (mm)	0.027
D ₆₀ (mm)	0.036
D ₈₅ (mm)	0.090
D ₉₀ (mm)	0.130
C _U	NA
C _C	NA

Soil Description:
Brown slightly sandy clayey SILT

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2



STRUCTURAL SOILS
Anerley Court
Half Moon Lane
Hildenborough
Tonbridge TN11 9HU

Compiled By		Date
SHARON CAIRNS		09/12/20
Contract	Contract Ref:	
B074031.301	584382	



UNCONSOLIDATED QUICK UNDRAINED (MULTI-STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377 Part 7 Clause 9

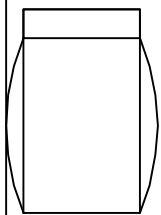
Position ID: **CP102**

Sample Ref: **20/09769/18**

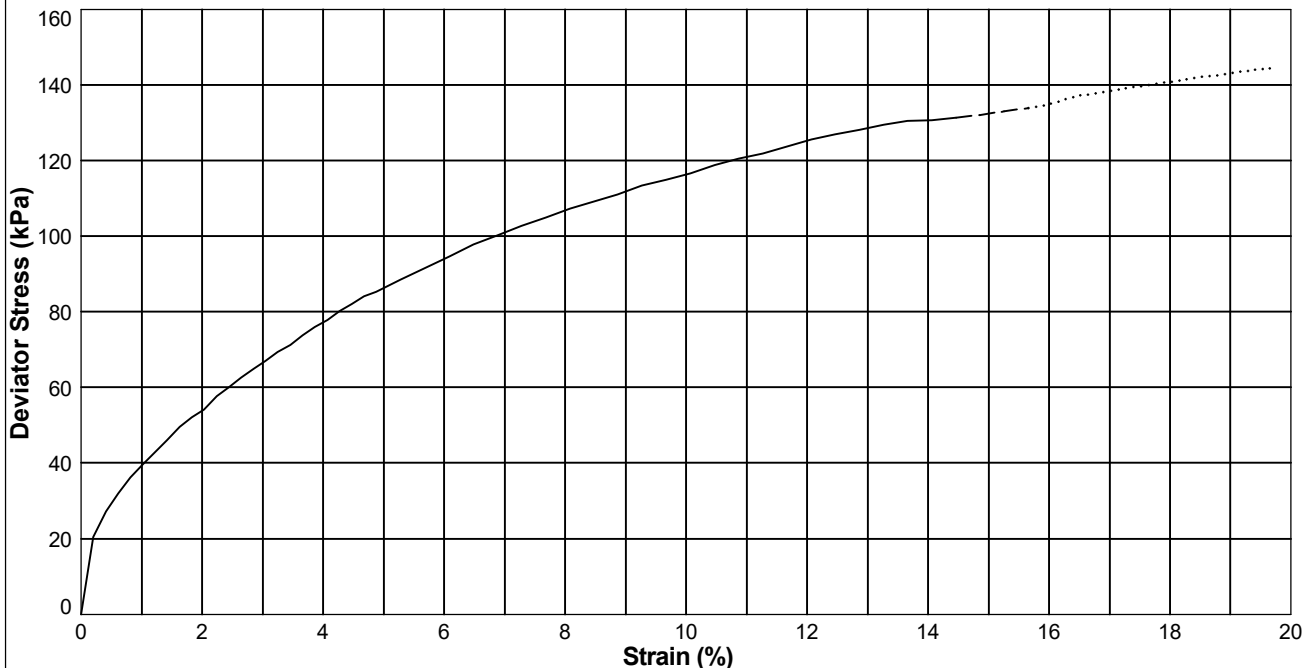
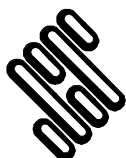
Sample Type: **U**

Depth (m): **6.02**

Description : **Dark brown slightly gravelly slightly sandy CLAY**

STAGE NUMBER		1	2	3
SAMPLE DETAILS	Sample Condition	Undisturbed		
	Orientation of sample	Vertical		
	Diameter (mm)	101.95		
	Height (mm)	201.70		
	Moisture Content (%)	22		
	Bulk Density (Mg/m ³)	2.08		
	Dry Density (Mg/m ³)	1.71		
TEST DETAILS	Membrane Type	Rubber	Rubber	Rubber
	Membrane Thickness (mm)	0.25	0.25	0.25
	Rate of Axial Displacement (%/min)	1.34	1.34	1.34
	Cell Pressure (kPa)	60	120	240
	Membrane Correction (kPa)	0.73	0.78	0.92
	Corrected Deviator Stress (kPa)	131	134	144
	Undrained Shear Strength (kPa)	66	67	72
FAILURE DETAILS	Strain at Failure (%)	14.5	15.7	19.6
	Mode of Failure			
	Plastic (Barrelling)			

Key: ————— Stage 1 - - - - - Stage 2 Stage 3



STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By

Francesca Bennett

FRANCESCA BENNETT

Date

09/12/20

Contract

B074031.301

Contract Ref:

584382



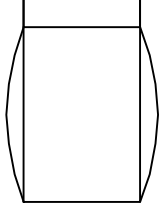
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

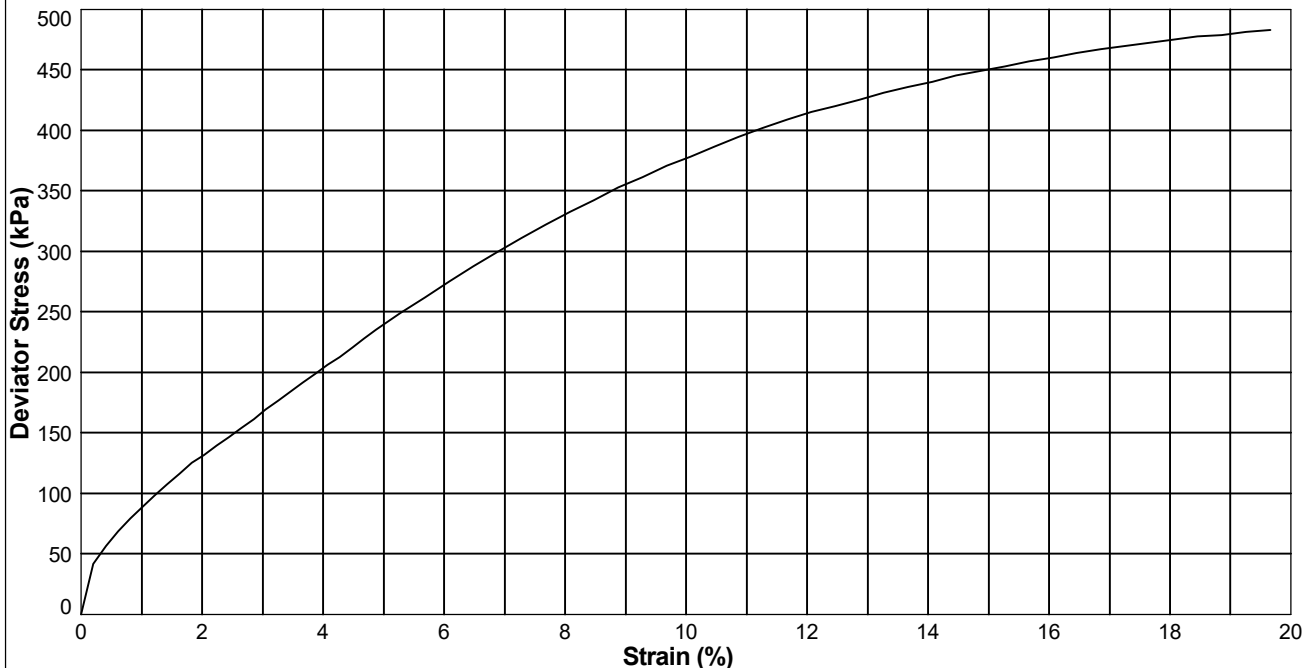
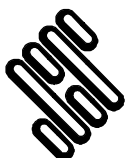
In accordance with BS1377 Part 7 Clause 8

Position ID: **CP102** Sample Ref: **20/09769/26** Sample Type: **U** Depth (m): **16.52**

Description : **Dark brown slightly gravelly slightly sandy silty CLAY**

Remarks : **Specimen reached 20% axial strain on first stage. Reported as single stage test**

STAGE NUMBER		1	2	3
SAMPLE DETAILS	Sample Condition	Undisturbed		
	Orientation of sample	Vertical		
	Diameter (mm)	102.72		
	Height (mm)	201.64		
	Moisture Content (%)	14		
	Bulk Density (Mg/m ³)	2.24		
	Dry Density (Mg/m ³)	1.98		
TEST DETAILS	Membrane Type	Rubber		
	Membrane Thickness (mm)	0.57		
	Rate of Axial Displacement (%/min)	1.34		
	Cell Pressure (kPa)	165		
	Membrane Correction (kPa)	2.09		
	Corrected Deviator Stress (kPa)	483		
	Undrained Shear Strength (kPa)	242		
FAILURE DETAILS	Strain at Failure (%)	19.7		
	Mode of Failure 1 : Plastic (Barrelling)			



STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By <i>Francesca Bennett</i>		Date 09/12/20
Contract B074031.301	Contract Ref: 584382	



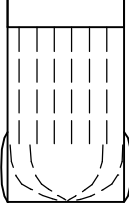
UNCONSOLIDATED QUICK UNDRAINED (SINGLE STAGE) TRIAXIAL COMPRESSION TEST

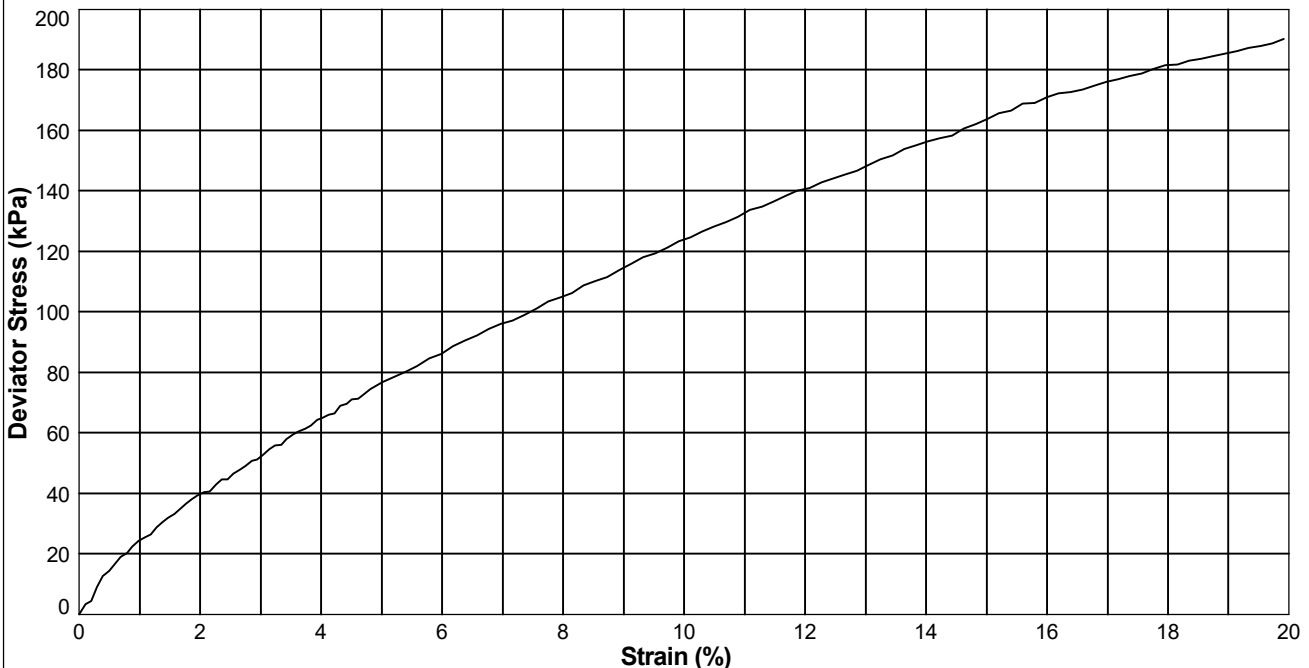
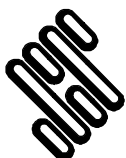
In accordance with BS1377 Part 7 Clause 8

Position ID: **CP103** Sample Ref: **20/06469/43** Sample Type: **U** Depth (m): **21.16**

Description : **Dark brown slightly gravelly slightly sandy silty CLAY**

Remarks : **Specimen reached 20% axial strain on first stage. Reported as single stage test**

STAGE NUMBER		1	2	3
SAMPLE DETAILS	Sample Condition	Undisturbed		
	Orientation of sample	Vertical		
	Diameter (mm)	102.77		
	Height (mm)	201.27		
	Moisture Content (%)	15		
	Bulk Density (Mg/m ³)	2.19		
	Dry Density (Mg/m ³)	1.90		
TEST DETAILS	Membrane Type	Rubber		
	Membrane Thickness (mm)	0.27		
	Rate of Axial Displacement (%/min)	0.99		
	Cell Pressure (kPa)	210		
	Membrane Correction (kPa)	1.00		
	Corrected Deviator Stress (kPa)	190		
	Undrained Shear Strength (kPa)	95		
FAILURE DETAILS	Strain at Failure (%)	19.9		
	Mode of Failure	 <p>1 : Semi-plastic (bulging, shear & axial splitting)</p>		



STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
<i>Francesca Bennett</i>		09/12/20
Contract	Contract Ref:	
B074031.301	584382	



Appendix E – Ground Gas Monitoring Results

- 2019 Due Diligence GI
 - Visits 1 – 4, Oct – Nov 2019
 - Gas Monitor Calibration certificate, serial no. 12002 dated April 2019
- 2020 Supplementary GI.
 - Visits 5 – 8, Nov – Dec 2020
 - Gas Monitor Calibration certificate, serial no 323787, dated Jan 2020

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: Newton Heath**Date:** 11/10/2019**Job Number:** B074031**Visit:** 1**Client:** One Manchester**Weather:** Heavy Rain**Barometric State:** Steady**Ground Conditions:** Wet

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	989												5
	WS4c	989												5
	WS6	989												5
Site 2	WS8	989	0.2	0.0	0.0	0.0	0.8	0.4	19.9	0	0	0.48	2.66	4
	WS9	989	0.0	0.0	0.0	0.0	0.9	0.9	19.2	0	0	Dry	1.44	
	WS10	989	3.4	0.4	0.0	0.0	0.8	0.5	19.7	0	3	0.26	3.85	3
	WS11	990	25.1	10.0	0.0	0.0	0.7	0.7	19.9	0	6	0.29	2.93	2
	WS12	990	0.0	0.0	0.0	0.0	1.0	0.5	19.9	0	0	0.47	3.91	
	WS13	990	0.3	0.0	0.0	0.0	1.6	1.6	18.5	0	0	2.79	3.96	1

Notes

- 1 Returned to 0.0 after 20 seconds.
- 2 Reached steady state after 5 minutes.
- 3 Steady state reached after 1 minute.
- 4 Returned to 0.0 after 10 seconds.
- 5 Boreholes inaccessible.

Logged by

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

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GAS MONITORING LOG SHEET

Project: Newton Heath**Date:** 22/10/2019**Job Number:** B074031**Visit:** 2**Client:** One Manchester**Weather:** Overcast**Barometric State:** Steady**Ground Conditions:** Wet

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS03	1012	-2.1	0.0	0.0	0.0	3.3	1.7	18.80	0	0	0.5	1.90	1
	WS04c	1012	-2.0	0.0	0.0	0.0	2.5	2.5	18.30	0	0	0.45	1.72	1
	WS06	1012	0.0	0.0	0.0	0.0	1.8	1.7	18.10	0	0	Dry	1.95	
Site 2	WS08	1011	0.0	0.0	0.0	0.0	1.7	0.2	20.20	0	0	0.7	2.63	
	WS09	1011	0.0	0.0	0.0	0.0	1.7	1.6	18.80	0	0	Dry	1.46	
	WS10	1011	0.0	0.0	0.0	0.0	1.3	0.3	20.1	0	0	0.27	3.88	
	WS11	1011	0.0	0.0	0.0	0.0	0.2	0.1	20.2	0	0	0.64	3.91	
	WS12	1011	0.0	0.0	0.0	0.0	1.7	1.7	18.0	0	0	1.27	3.95	
	WS13	1011	-0.9	0.0	0.0	0.0	2.2	1.8	20.0	0	0	0.25	2.93	1

Notes

1 Steadily increased to steady state of 0.

Logged by

ZH

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
 Tel: 0161 236 2394
 Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project:	Newton Heath	Date:	06/11/2019
Job Number:	B074031	Visit:	3
Client:	One Manchester	Weather:	Raining
Barometric State:	Falling	Ground Conditions:	Wet

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	992	0.0	0.0	0.0	0.0	4.6	3.2	18.6	0	0	0.41	1.92	
	WS4c	992	-7.7	-3.9	0.0	0.0	4.6	4.1	16.1	0	0	0.37	1.79	
	WS6	992	0.0	0.0	0.0	0.0	1.5	1.5	18.4	0	0	Dry	0.93	
Site 2	WS8	992	-14.6	0.0	0.0	0.0	2.5	0.7	18.5	0	0	0.52		
	WS9	991	0.0	0.0	0.0	0.0	1.2	1.2	18.5	0	0	Dry	1.46	
	WS10	991	0.0	0.0	0.0	0.0	1.6	0.3	18.5	0	1	0.27	3.87	
	WS11	989	6.0	6.0	0.0	0.0	2.1	2.0	16.6	0	41	0.28		1
	WS12	991	0.0	0.0	0.0	0.0	0.8	0.2	20.0	0	0	0.54	3.90	
	WS13	990	16.4	0.0	0.0	0.0	3.4	3.3	15.8	0	0	0.94	3.97	

Notes**Logged by**

1 WS11 flow slowly increased to 6.0 where it became steady.
 The Carbon Monoxide in the borehole fluctated throughout the whole three minutes of monitoring.

AHW

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
 All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: Newton Heath
Job Number: B074031
Client: One Manchester
Barometric State: Rising

Date: 14/11/2019
Visit: 4
Weather: Overcast with light rain
Ground Conditions: Damp

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	989	4.0	3.7	0.0	0.0	8.2	8.2	16.5	0	0	0.21	1.82	1
	WS4c	989	-3.1	-0.1	0.0	0.0	4.5	4.5	16.7	0	0	0.50	1.69	
	WS6	990	0.3	0.2	0.0	0.0	1.0	1.0	18.1	0	0	Dry	1.93	
Site 2	WS8	989	-10.2	0.0	0.0	0.0	3.6	2.5	16.4	0	0	0.53	2.59	3
	WS9	989	0.1	0.0	0.0	0.0	0.4	0.4	19.6	0	0	Dry	1.45	
	WS10	989	-5.8	0.0	0.0	0.0	2.1	0.9	17.4	0	0	0.20	3.83	
	WS11	988	-0.1	-0.1	0.0	0.0	2.9	2.9	16.8	0	0	0.30	2.90	2
	WS12	988	-0.1	0.0	0.0	0.0	0.9	0.3	19.5	0	0	0.50	3.88	
	WS13	988	1.3	0.9	0.0	0.0	3.7	3.5	16.1	0	0	0.90	3.95	

Notes

- 1 Stopped monitoring in WS4c after 2:30 minutes due to water ingress.
- 2 Stopped monitoring in WS11 at 2:30 mins due to water ingress.
- 3 WS8's flow steadily decreased to 0.0 after one minute of monitoring.

Logged by

AHW

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

TEST DATE AND CONDITIONS	
Date	09/04/19
Atmospheric Pressure	1003mB
Ambient Temp	23.8°C
Envionics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB

Tel 02476303311 Fax 02476307711


GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
12002	Gas Data Hire Fleet

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G436.0027/0002
Labels Fitted	✓	Recalibration Date	09/04/20

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	5.1	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	59.8	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	5.1	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	60.2	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.1	+0.1	20.8	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label	H2S	CO		Hexane	tol. (% vol.)
		Range	5000ppm	2000ppm		2.00%	
N2	100%		0	0		0	+/- 5.0
H2S	1500ppm		1500	0			+/- 5.0
CO	1000ppm		60	994			+/- 5.0
Hexane	2.00%					1.876	+/- 10.0

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All Ports	Current Atmospheric	1003	+/-2.0				
Ap Port (Internal)	+800mB(a)	802	+/-5.0				
	+1200mB(a)	1203	+/-5.0				

TEST DATE AND CONDITIONS	
Date	09/04/19
Atmospheric Pressure	1003mB
Ambient Temp	23.8°C
Envionics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB

Tel 02476303311 Fax 02476307711



GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0	-366	-30.1	+/-3.0	-364	+/-50
-3.0	-18	-2.7	+/-1.0	-17	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	14	2.8	+/-0.5	13	+/-3
+30.0	308	29.9	+/-3.0	310	+/-50
+60.0	898	59.5	+/-6.0	894	+/-130
+90.0	1802	89.8	+/-9.0	1795	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature [Temp] (°C)	tol. (°C)
-10.0	-10.5	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.0	+/- 1.0
60.0	60.0	+/- 1.0
100.0	100.0	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015. Certificate NQA 8374. Valid until 22/03/2019

TEST DATE AND CONDITIONS	
Date	10/04/19
Atmospheric Pressure	1007 mB
Ambient Temp	20.6 °C
EnviroNics Serial No.	3268

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd.
Coventry
CV3 4LB

Tel: 024 76 303311

Fax: 024 76 307711


GFM436-1 (MCERTS) OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS					
SO Number	Instrument Banner	Instrument Serial Number + SW Version	Job Number(s)		
322353	GFM436	12002 V27.02	16057	—	—

Calibration Technician JSP

DATE 9-4-19

Inspection Technician JSP

DATE 10/04/19

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable(NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All keys)	P	Leather Case		✓
	Backlight Test	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		✓
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mb)	N/A	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Gas Sample Pipe		✓
	Service Date set to?	09/04/20	Hard Carry Case		✓
Channel Tests	Data Logging Enabled?	P	Spares Pot		✓
	Verify CH4/LEL/Hexane/PID	P	Allen Key		✓
	Verify CO2	P	Flow Sample Pipe		✓
	Verify O2	P	Temperature Probe		X
	Verify H2S	P	Vane Anemometer		X
	Verify CO	P	USB Cable		✓
	Verify LEL	P	USB Memory Stick		✓
	Verify 1st Option gas	N/A	SM V5 Software	Ver 5.7	✓
	Verify atmospheric pressure	P	Internal Filter Pack	Qty	X
	Verify differential pressure	P	External Filter Pack	Qty	X
	Verify flow	P	Field Guide		X
	Verify temperature probe input	P	Extra Items:		
	Verify vane anemometer input	P			
	Jobcard(s) completed and signed	P			
	Jobcard(s) booked off database	P			
DataBase Checks	Calibration certificate completed	P	Comments		
	Complete & print QI record	N/A			
	No. of Calibration label fitted	9619			
	MCERTS label displayed	P			
Label Checks	Warranty label fitted	P			
	H2S Range from SO	5000 ppm			
	H2S Range from cal cert	5000 ppm			
H2S Range	Over-range value correct?	P			

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: Newton Heath
Job Number: B074031
Client: One Manchester
Barometric State: Rising

Date: 10/11/2020
Visit: 5
Weather: Cloudy
Ground Conditions: Damp

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	1009							18.6	0	0	0.55	1.65	1
	WS4c		0.0	0.0	0.0	0.0	1.6	1.6						
	WS6													
Site 2	WS8	1011	0.0	0.0	0.0	0.0	1.9	1.9	20.5	0	0	0.73	2.70	1
	WS9	1011							20.7	0	0	0.58	3.43	1
	WS10		0.0	0.0	0.0	0.0	0.3	0.3						
	WS11													
	WS12	1011	0.0	0.0	0.0	0.0	1.2	0.9	20.1	0	0	0.69	4.02	
WS13	1011	0.6	0.0	0.0	0.0	4.0	4.0	15.9	0	0	1.07	4.08		
Site 1 Zone 2	WS201	1011	0.0	0.0	0.0	0.0	0.4	0.4	20.3	0	0	DRY	4.04	
	WS202	1011	0.0	0.0	0.0	0.0	1.3	1.3	19.4	0	0	DRY	3.98	
	WS205	1011	-0.2	0.0	0.0	0.0	2.3	2.3	18.7	0	0	DRY	4.04	

Notes

1 Unable to locate

Logged by

PN

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

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GAS MONITORING LOG SHEET

Project: Newton Heath
Job Number: B074031
Client: One Manchester
Barometric State: Steady

Date: 24/11/2020
Visit: 6
Weather: Cloudy
Ground Conditions: Damp

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	1002												
	WS4c		0.1	0.1	0.0	0.0	4.4	4.3	16.5	0	0	0.49	1.65	
	WS6													
Site 2	WS8	1002	0.0	0.0	0.0	0.0	1.8	1.8	20.8	0	0	0.73	2.69	
	WS9	1002												
	WS10		0.0	0.0	0.0	0.0	0.0	0.0	21.1	0	0	0.47	3.46	
	WS11	1001												
	WS12		0.0	0.0	0.0	0.0	0.1	0.0	20.5	0	0	0.68	4.03	
	WS13	1002	3.6	0.0	0.0	0.0	4.2	4.2	19.8	0	0	1.05	4.07	1
Site 1 Zone 2	WS201	1002	0.1	0.0	0.0	0.0	0.3	0.2	20.4	0	0	DRY	4.02	
	WS202	1002	0.1	0.0	0.0	0.0	1.5	1.5	19.7	0	0	DRY	3.97	
	WS205	1002	0.1	0.0	0.0	0.0	2.1	1.9	18.9	0	0	DRY	4.04	

Notes

1 Reduced to 0 after 2 minutes

Logged by

PN

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: Newton Heath
Job Number: B074031
Client: One Manchester
Barometric State: Falling

Date: 10/12/2020
Visit: 7
Weather: Cloudy
Ground Conditions: Damp

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	972							1.3	0	0	0.62	1.64	1
	WS4c		0.0	0.0	0.0	0.0	6.1	6.1						2
	WS6													1
Site 2	WS8	978	0.0	0.0	0.0	0.0	2.9	2.9	18.3	0	0	0.66	2.50	1
	WS9	976							15.2	0	0	0.42	3.45	2
	WS10		13.9	0.1	0.0	0.0	3.0	3.0						1
	WS11													
	WS12	970	0.1	0.0	0.0	0.0	0.8	0.5	19.9	0	0	0.70	3.98	
	WS13	970	0.4	4.2	0.0	0.0	4.0	4.0	15.6	0	0	0.99	4.05	2
Site 1 Zone 2	WS201	973	0.0	0.0	0.0	0.0	1.7	1.7	18.9	0	0	3.70	3.92	
	WS202	972	0.0	0.0	0.0	0.0	1.3	1.3	18.8	0	0	DRY	3.97	
	WS205	973	0.0	0.0	0.0	0.0	0.8	0.5	19.7	0	0	3.92	4.00	

Notes

- 1 Unable to locate due to overgrown vegetation
 2 5 min for steady state to be reached

Logged by

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

Curtins

Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG

Tel: 0161 236 2394

Fax: 0161 228 7902



GAS MONITORING LOG SHEET

Project: Newton Heath
Job Number: B074031
Client: One Manchester
Barometric State: Steady

Date: 16/12/2020
Visit: 8
Weather: Drizzling
Ground Conditions: Damp

	Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
			Max	SS	Max	SS	Max	SS						
Site 1 Zone 1	WS3	972							15.9	0	0	0.71	1.64	1
	WS4c		-1.1	-1.0	0.0	0.0	1.9	1.9						2
	WS6													1
Site 2	WS8	972	-1.0	-1.0	0.0	0.0	1.2	0.9	19.2	0	0	0.73	2.50	1
	WS9	972							14.9	0	0	0.36	3.45	2
	WS10		-16.8	-1.3	0.0	0.0	2.4	2.2						1
	WS11													
	WS12	972	-1.2	-1.2	0.0	0.0	0.5	0.3	19.9	0	0	0.67	4.01	2
	WS13	972	0.4	0.0	0.0	0.0	4.1	4.1	15.5	0	0	1.04	4.01	
Site 1 Zone 2	WS201	973	-0.9	-0.8	0.0	0.0	0.3	0.3	19.8	0	0	3.79	3.92	
	WS202	972	0.0	0.0	0.0	0.0	1.3	1.3	18.8	0	0	DRY	3.97	
	WS205	973	0.0	0.0	0.0	0.0	0.8	0.5	19.7	0	0	DRY	4.00	

Notes

- 1 Unable to locate due to overgrown vegetation
 2 5 min for steady state to be reached

Logged by

RT

1% gas volume = 10,000 ppm

Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.

All other gases recorded at 'steady state' unless otherwise stated

TEST DATE AND CONDITIONS	
Date	31/1/20
Atmospheric Pressure	991 mB
Ambient Temp	21.9 °C
Envionics Serial No.	N/A

GAS DATA LTD	
Pegasus House	
Seven Stars Estate	
Wheler Rd.	
Coventry	
CV3 4LB	
Tel: 024 76 303311	Fax: 024 76 307711

GFM430-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS				
SO Number	Instrument Type	Instrument Serial Number + SW Version	Job Number(s)	
323487	GFM430	10357/24-13	18289	

Calibration Technician *FSO*

DATE *29-1-20*

Inspection Technician *A. Buggs*

DATE *31/1/20*

INSTRUMENT CHECKS		Pass (P), Fail (F) or not applicable (NA)	INSTRUMENT PACKING LIST		Tick if included
Function Tests	Dust Caps Fitted	P	Instrument		✓
	Keyboard Test (All Keys)	P	Leather Case		X
	Backlight Test	P	Instrument Strap		✓
	Clock Set / Running	P	AC Battery Charger (UK)		X
	Comms Test	P	AC Battery Charger (EURO)		X
	Pump Flow Test (In & Out)	P	AC Battery Charger (US)		X
	Overall Leak Test (30mB)	N/A	AC Battery Charger (AUS)		X
	Battery Charge Test	P	Gas Sample Pipe		✓
	Service Date set to?	29/1/21	Carry Case		X
Channel Test	Data Logging Enabled?	P	Spares Pot		X
	Verify CH4/LEL	P	Allen Key		X
	Verify CO2	P	Flow Sample Pipe		✓
	Verify O2	P	Temperature Probe		X
	Verify LEL	P	Vane Anemometer		X
	Verify 1st Option gas	H2S	USB Cable		X
	Verify 2nd Option gas	CO	USB Memory stick		X
	Verify 3rd Option gas	N/A	SiteMan Software	Ver	X
	Verify 4th Option gas	N/A	Internal Filter Pack	Qty 1	✓
	Verify atmospheric pressure	P	External Filter Pack	Qty	X
	Verify static pressure	N/A	Field Guide		X
	Verify differential pressure	P	Operation Manual (hard copy)		X
	Verify flow	P	Extra Items:		
	Verify temperature probe input	P			
	Verify vane anemometer input	P			
DataBase Checks	Jobcard(s) completed and signed	P	Comments:		
	Jobcard(s) booked off database	P			
	Calibration certificate completed	P			
	Complete & print QI record	N/A			
Label Checks	No. of Calibration label fitted	10025			
	Warranty label fitted	P			
H2S Range	H2S Range from Sales Order	20000 ppm			
	H2S Range from Cal Cert	20000 ppm			
	Over-range value correct?	P			

TEST DATE AND CONDITIONS	
Date	29/01/20
Atmospheric Pressure	995mB
Ambient Temp	24.9°C
Envionics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB

Tel 02476303311 Fax 02476307711



GFM430-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
10357	Curtins Consulting

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	300cc/min
Clock Set / Running	✓	S/W Version	G430.0024/0013
Labels Fitted	✓	Recalibration Date	29/01/21

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+0.1
CH4	5 %	5.1	+/-0.3	0.0	0.0	0.0	+0.1
	60%	59.7	+/-3.0	0.0	0.0	0.0	+0.1
CO2	5%	0.0	0.0	5.0	+/-0.3	0.0	+0.1
	40%	0.0	0	40.1	+/-3.0	0.0	+0.1
Air (20.9% O2, 400ppm CO2)	100%	0.0	0	0.1	+0.1	20.8	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label Range	H2S 2000ppm	CO 2000ppm			tol. (% vol.)
N2	100%		0	0			0.0
H2S	100ppm		100	0			+/- 5.0
CO	1000ppm		113	1001			+/- 5.0
							+/- 5.0
							+/- 5.0
							+/- 5.0

TEST DATE AND CONDITIONS	
Date	29/01/20
Atmospheric Pressure	995mB
Ambient Temp	24.9°C
Envionics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV3 4LB

Tel 02476303311 Fax 02476307711



GFM430-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All Ports	Current Atmospheric	995	+/-2.0				
Ap Port (Internal)	+800mB(a)	801	+/-5.0				
	+1200mB(a)	1201	+/-5.0				

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0	-321	-29.9	+/-3.0	-316	+/-50
-3.0	-14	-2.6	+/-1.0	-13	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	14	2.9	+/-0.5	14	+/-3
+30.0	329	29.9	+/-3.0	332	+/-50
+60.0	1006	60.6	+/-6.0	1021	+/-130
+90.0	2031	91.6	+/-9.0	2085	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature [Temp] (°C)	tol. (°C)
-10.0	-10.5	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.0	+/- 1.0
60.0	60.0	+/- 1.0
100.0	100.0	+/- 1.0

Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015. Certificate NQA 8374. Valid until 22/03/2019

Appendix F – GAC Screening Thresholds

- Curtins GAC Tier 1 Thresholds.

Adopted Soil Generic Assessment Criteria
Sandy loam with 6% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 21	6 21	1.8 170	33 49	7.7 21	220 250
Lead	200	310	80	2,300	630	1,300
Mercury (<i>elemental</i>)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (<i>inorganic</i>)	170	240	80	3600	120	240
Nickel	130⁽¹⁰⁾	180⁽¹⁰⁾	53⁽¹¹⁾	980⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 79	170 170
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₆	160	160	3900	12000	600000	180000
EC ₅₋₆ - EC ₈	530	530	13000	40000	620000	320000
EC ₅₋₈ - EC ₁₀	150	150	1700	11000	13000	21000
EC ₁₀₋₁₀ - EC ₁₂	760	770	7300	47000	13000	24000
EC ₁₂₋₁₂ - EC ₁₆	4300	4400	13000	90000	13000	26000
EC ₅₋₁₆ - EC ₃₅	110000	110000	270000	1800000	250000	490000
EC ₃₅₋₃₅ - EC ₄₄	110000	110000	270000	1800000	250000	490000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅₋₅ - EC ₇	300	1400	57	86000	56000	92000
EC ₅₋₇ - EC ₈	660	3900	120	180000	56000	100000
EC ₅₋₈ - EC ₁₀	190	270	51	17000	5000	9300
EC ₁₀₋₁₀ - EC ₁₂	380	1200	74	34000	5000	10000
EC ₁₂₋₁₂ - EC ₁₆	660	2500	130	38000	5000	10000
EC ₅₋₁₆ - EC ₂₁	930	1900	260	28000	3800	7800
EC ₂₁₋₂₁ - EC ₃₅	1700	1900	1600	28000	3800	7900
EC ₃₅₋₃₅ - EC ₄₄	1700	1900	1600	28000	3800	7900
Aliph + Arom EC >44-70	1900	1900	3000	28000	3800	7900
Aromatic						
Benzene	0.33 0.87	1.0 3.3	0.07 0.18	95 98	73 140	110 230
Ethyl benzene	350	840	90	2800⁽⁸⁾ [66000]	2800⁽⁸⁾ [25000]	2800⁽⁸⁾ [27000]
Toluene	610	2700	120	4400⁽⁸⁾ [190000]	4400⁽⁸⁾ [56000]	4400⁽⁸⁾ [100000]
Xylene ⁽⁹⁾	230	290	160	2600⁽⁸⁾ [32000]	2600⁽⁸⁾ [43000]	2600⁽⁸⁾ [31000]
Phenol	420	520	280	3200⁽¹⁴⁾ (38000)	3200⁽¹⁴⁾ (10000)	3200⁽¹⁴⁾ (9300)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	13	13	24	1100	4900	3000
Acenaphthylene	920	6000	160	100000	15000	30000
Acenaphthene	1100	6000	200	100000	15000	30000
Fluorene	860	4500	160	71000	9900	20000
Phenanthrene	440	1500	90	23000	3100	6300
Anthracene	11000	37000	2200	540000	74000	150000
Fluoranthene	890	1600	290	23000	3100	6400
Pyrene	2000	3800	620	54000	7400	15000
Benz(a)anthracene	13	15	13	180	29	62
Chrysene	27	32	19	350	57	120
Benzo(b)fluoranthene	3.7	4.0	3.9	45	7.2	16.0
Benzo(k)fluoranthene	100	110	130	1200	190	440
Benzo(a)pyrene	3.0 5.0	3.2 5.3	3.5 5.7	36 77	5.7 10	13 21
Indeno(123cd)pyrene	41	46	39	510	82	180
Dibenzo(ah)anthracene	0.3	0.32	0.43	3.6	0.58	1.4
Benzo(ghi)perylene	350	360	640	4000	640	1600
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.0014	0.0015	0.0018	0.12	3.5	5.4
Trichloroethene (TCE)	0.075	0.08	0.21	5.7	120	120
1,1,1,2 Tetrachlorethane	6.4	8.2	4.4	560	1400	2100
Tetrachlorethane (PCE)	0.90	0.92	3.6	95	1400	1500
1,1,1 Trichlorethane	39	40	240	3000	140000	100000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs**
- Soil organic matter (SOM) is assumed to be 6% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 2.5% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 <u>21</u>	6 <u>21</u>	1.8 <u>170</u>	33 <u>49</u>	7.7 <u>21</u>	220 <u>250</u>
Lead	<u>200</u>	<u>310</u>	<u>80</u>	<u>2,300</u>	<u>630</u>	<u>1,300</u>
Mercury (elemental)	1	1	26	26	16	26 ⁽⁸⁾ [30]
Mercury (inorganic)	170	240	80	3600	120	240
Nickel	130 ⁽¹⁰⁾	180 ⁽¹⁰⁾	53 ⁽¹¹⁾	980 ⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 <u>79</u>	170 <u>170</u>
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
<i>Aliphatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₆	78	78	1700	5900	590000	130000
EC ₆ - EC ₈	230	230	5600	17000	610000	220000
EC ₈ - EC ₁₀	65	65	770	4800	13000	18000
EC ₁₀ - EC ₁₂	330	330	4400	23000	13000	23000
EC ₁₂ - EC ₁₆	2400	2400	13000	82000	13000	25000
EC ₁₆ - EC ₃₅	92000	92000	270000	1700000	250000	480000
EC ₃₅ - EC ₄₄	92000	92000	270000	1700000	250000	480000
<i>Aromatic risk banded hydrocarbons - TPHCWG method</i>						
EC ₅ - EC ₇	140	690	27	46000	56000	84000
EC ₇ - EC ₈	290	1800	51	110000	56000	95000
EC ₈ - EC ₁₀	83	110	21	8100	5000	8500
EC ₁₀ - EC ₁₂	180	590	31	28000	5000	9700
EC ₁₂ - EC ₁₆	330	2300	57	37000	5100	10000
EC ₁₆ - EC ₂₁	540	1900	110	28000	3800	7700
EC ₂₁ - EC ₃₅	1500	1900	820	28000	3800	7800
EC ₃₅ - EC ₄₄	1500	1900	820	28000	3800	7800
Aliph + Arom EC >44-70	1800	1900	2100	28000	3800	7800
<i>Aromatic</i>						
Benzene	0.16	0.49	0.035	50	72	100
Ethyl benzene	150	380	39	1200⁽⁸⁾ [35000]	1200⁽⁸⁾ [24000]	1200⁽⁸⁾ [22000]
Toluene	270	1300	51	1900⁽⁸⁾ [110000]	1900⁽⁸⁾ [56000]	1900⁽⁸⁾ [95000]
Xylene ⁽⁹⁾	98	120	70	1200⁽⁸⁾ [14000]	1200⁽⁸⁾ [42000]	1200⁽⁸⁾ [23000]
Phenol	290	420	140	1500⁽¹⁴⁾ (35000)	1500⁽¹⁴⁾ (10000)	1500⁽¹⁴⁾ (8300)
<i>Polycyclic Aromatic Hydrocarbons (PAH)</i>						
Naphthalene	5.6	5.6	10	460	4900	1900
Acenaphthylene	420	4600	69	97000	15000	30000
Acenaphthene	510	4700	85	97000	15000	30000
Fluorene	400	3800	67	68000	9900	20000
Phenanthrene	220	1500	38	22000	3100	6200
Anthracene	5400	35000	950	540000	74000	150000
Fluoranthene	560	1600	130	23000	3100	6300
Pyrene	1200	3800	270	54000	7400	15000
Benz(a)anthracene	11	14	6.5	170	29	56
Chrysene	22	31	9.4	350	57	110
Benzo(b)fluoranthene	3.3	4.0	2.1	44	7.2	15
Benzo(k)fluoranthene	93	110	75	1200	190	410
Benzo(a)pyrene	2.7	3.2	2	35	5.7	12
Indeno(123cd)pyrene	36	46	21	510	82	170
Dibenzo(ah)anthracene	0.28	0.32	0.27	3.6	0.57	1.3
Benzo(ghi)perylene	340	360	470	4000	640	1500
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00087	0.001	0.001	0.077	3.5	5
Trichloroethene (TCE)	0.034	0.036	0.091	2.6	120	91
1,1,1,2 Tetrachlorethane	2.8	3.5	1.9	250	1400	1800
Tetrachlorethane (PCE)	0.39	0.4	1.5	42	1400	1100
1,1,1 Trichlorethane	18	18	110	1300	140000	76000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs
- Soil organic matter (SOM) is assumed to be 2.5% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
- Lowest of o-, m- and p-xylene
- Based on comparison of inhalation exposure with inhalation TDI
- Based on comparison of oral, dermal, and inhalation exposure with the oral TDI
- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Adopted Soil Generic Assessment Criteria
Sandy loam with 1% SOM



Contaminants	Residential <u>with</u> home grown produce	Residential <u>without</u> home grown produce	Allotments	Commercial	Public open space near residential housing POS _{resi}	Public park POS _{park}
Metals						
Beryllium	1.7	1.7	35	12	2.2	63
Boron	290	11,000	45	240,000	21,000	46,000
Cadmium	10⁽¹³⁾ 22	85⁽¹³⁾ 150	1.8 3.9	230 410	120 220	560 880
Chromium III	910	910	18,000	8,600	1,500	33,000
Chromium VI	6 21	6 21	1.8 170	33 49	7.7 21	220 250
Lead	200	310	80	2,300	630	1,300
Mercury (<i>elemental</i>)	1	1	26	26	16	26⁽⁸⁾ [30]
Mercury (<i>inorganic</i>)	170	240	80	3600	120	240
Nickel	130 ⁽¹⁰⁾	180 ⁽¹⁰⁾	53 ⁽¹¹⁾	980 ⁽¹⁰⁾	230	800
Vanadium	410	1200	91	9000	2000	5000
Copper	2400	7100	520	68000	12000	44000
Zinc	3700	40000	620	730000	81000	170000
Semi-Metals and non-metals						
Arsenic	32⁽¹²⁾ 37	35⁽¹²⁾ 40	43⁽¹²⁾ 49	640⁽¹²⁾ 640	79 79	170 170
Antimony		550		7500	1500	3300
Selenium	350	600	120	13000	1100	1800
Inorganic chemicals						
Cyanide	34	34	34	34	34	34
Organic contaminants						
Aliphatic risk banded hydrocarbons - TPHCWG method						
EC ₅₋₅ - EC ₆	42	42	730	3200	570000	95000
EC ₆₋₆ - EC ₈	100	100	2300	7800	600000	150000
EC ₈₋₈ - EC ₁₀	27	27	320	2000	13000	14000
EC ₁₀₋₁₀ - EC ₁₂	130	130	2200	9700	13000	21000
EC ₁₂₋₁₂ - EC ₁₆	1100	1100	11000	59000	13000	25000
EC ₁₆₋₁₆ - EC ₃₅	65000	65000	260000	1600000	250000	450000
EC ₃₅₋₃₅ - EC ₄₄	65000	65000	260000	1600000	250000	450000
Aromatic risk banded hydrocarbons - TPHCWG method						
EC ₅₋₅ - EC ₇	70	370	13	26000	56000	76000
EC ₇₋₇ - EC ₈	130	860	22	56000	56000	87000
EC ₈₋₈ - EC ₁₀	34	47	8.6	3500	5000	7200
EC ₁₀₋₁₀ - EC ₁₂	74	250	13	16000	5000	9200
EC ₁₂₋₁₂ - EC ₁₆	140	1800	23	36000	5100	10000
EC ₁₆₋₁₆ - EC ₂₁	260	1900	46	28000	3800	7600
EC ₂₁₋₂₁ - EC ₃₅	1100	1900	370	28000	3800	7800
EC ₃₅₋₃₅ - EC ₄₄	1100	1900	370	28000	3800	7800
Aliph + Arom EC >44-70	1600	1900	1200	28000	3800	7800
Aromatic						
Benzene	0.08	0.3	0.017	28	72	90
Ethyl benzene	65	170	16	520⁽⁸⁾ [17000]	520⁽⁸⁾ [24000]	520⁽⁸⁾ [17000]
Toluene	120	610	22	860⁽⁸⁾ [59000]	860⁽⁸⁾ [56000]	860⁽⁸⁾ [87000]
Xylene ⁽⁹⁾	41	53	28	480⁽⁸⁾ [69000]	480⁽⁸⁾ [41000]	480⁽⁸⁾ [17000]
Phenol	180	310	66	760⁽¹⁴⁾ (31000)	760⁽¹⁴⁾ (10000)	760⁽¹⁴⁾ (7600)
Polycyclic Aromatic Hydrocarbons (PAH)						
Naphthalene	2.3	2.3	4.1	190	4900	1200
Acenaphthylene	170	2900	28	83000	15000	29000
Acenaphthene	210	3000	34	84000	15000	29000
Fluorene	170	2800	27	63000	9900	20000
Phenanthrene	95	1300	15	22000	3100	6200
Anthracene	2400	31000	380	520000	74000	150000
Fluoranthene	280	1500	52	23000	3100	6300
Pyrene	620	3700	110	54000	7400	15000
Benz(a)anthracene	7.2	11	2.9	170	29	49
Chrysene	15	30	4.1	350	57	93
Benzo(b)fluoranthene	2.6	3.9	0.99	44	7.1	13
Benzo(k)fluoranthene	77	110	37	1200	190	370
Benzo(a)pyrene	2.2	3.2	0.97	35	5.7	11
Indeno(123cd)pyrene	27	45	9.5	500	82	150
Dibenzo(ah)anthracene	0.24	0.31	0.14	3.5	0.57	1.1
Benzo(ghi)perylene	320	360	290	3900	640	1400
Chlorinated Aliphatic Hydrocarbons						
Vinyl chloride	0.00064	0.00077	0.00055	0.059	3.5	4.8
Trichloroethene (TCE)	0.016	0.017	0.041	1.2	120	70
1,1,1,2 Tetrachlorethane	1.2	1.5	0.79	110	1400	1500
Tetrachlorethane (PCE)	0.18	0.18	0.65	19	1400	810
1,1,1 Trichlorethane	8.8	9	48	660	140000	57000

Notes

- All values above are in mg/kg
- Numbers in bold are SGVs or GAC that are derived based on SGV report input parameters, numbers in italics are S4ULs, numbers in bold-italics are based on EIC/AGS/CL:AIRE numbers & input parameters and underlined numbers are C4SLs
- Soil organic matter (SOM) is assumed to be 1% - DEFAULT VALUE
- Soil type is assumed to be sandy loam - DEFAULT SOIL TYPE
- For residential, the building type is conservatively assumed to be a small terrace house where the development includes bungalows change to more conservative bungalow setting in computer model
- For commercial, the building type is conservatively assumed to be a pre 1970s office building, where the proposed development comprises houses, flat with living spaces changes setting in model accordingly
- For classrooms consider increasing the dust loading factor in the 'Soil and Building Data' of the CLEA 1.04 model from 50 to 100µg m⁻³
- Based on vapour saturation limit as suggested by EA / [] model value
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- Based on comparison of inhalation exposure with inhalation TDI
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- Based on a comparison of oral and dermal soil exposure with oral Index Dose only
- Averaged over and based on lifetime exposure
- Based on critical concentration for skin irritation in humans arising from contact with phenol in aqueous solution (number in brackets based on health effects following long term exposure for illustration)
- NA: Not applicable

Appendix G – Risk Assessment Methodology

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of an event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment, the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	Medium	Mild	Minor
Probability (Likelihood)	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

In accordance with DoE guidance, the following categorisation of **probability** has been developed.

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

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	<i>Harm is likely to arise</i> to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	<i>It is possible</i> that without appropriate further action <i>harm could arise</i> to a designated receptor. It is relatively <i>unlikely</i> that any such harm would be <i>severe</i> , and if any harm were to occur it is <i>more likely</i> that such harm would be <i>relatively mild</i> .
Low Risk	<i>It is possible</i> that <i>harm could arise</i> to a designated receptor from an identified hazard. It is <i>likely</i> that, at worst, if any harm was realised any effects would be <i>mild</i> .
Very Low Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term 'risk' in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

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