

Decant Village, NMGH

Phase 2 Ground Investigation

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Executive Summary

Appointment	In July 2020 Curtins were instructed by Greater Manchester NHS Foundation Trust to undertake a Phase 2 Ground Investigation for Decant Village at North Manchester General Hospital, Ellis Drive, Crumpsall M8 5RL (approximately centred on NGR SD 84800 02100) that covers an area of approximately 0.18 Ha. Development plans comprise the construction of an offsite manufactured four storey modular building for use of temporary office accommodation.
Current Site Status	The site entrance is located off Ellis Drive, Crumpsall, M8 5RL. The site is part of the wider North Manchester General Hospital (NMGH), currently occupied by a service yard and car park associated with the Estates and Transport Department. The site is generally flat, surveyed to be 74.49m to 75.70m AOD.
Summary of Preliminary Site Assessment	Historical mapping shows the site remains an area of undeveloped agricultural land from 1848 to 1950. Two ponds are located 50m and 60m southeast of the site, no longer present from 1894. By 1950 the north of the site is occupied by tennis courts and a bowling green, with the remainder of the site a sports ground until 1978. The Manchester Workhouse is present directly north of the site from 1894, later extended to the east becoming North Manchester General Hospital by 1978. From 1978 the site is occupied by a car park with an electrical sub-station 20m east. Made Ground deposits are not indicated to be present onsite according to BGS, however given the previous uses deposits are anticipated to be present. Superficial soils are indicated as Glacial Till deposits overlying the Chester Formation (bedrock). Environment Agency data indicates that the site, corresponding with the underlying bedrock geology, overlies a Principal Aquifer. The Glacial Till deposit is associated with a Secondary Undifferentiated Aquifer. The site is not located within a Source Protection Zone (SPZ). Nearest surface water feature is the River Irk approximately 464m east of site.
Fieldworks Undertaken	Fieldworks were carried out between 10th and 13th August and on the 26th August, comprising one cable percussion with rotary open-hole follow-on and four window sample boreholes. Three hand dug pits were advanced primarily for the identification of possible tanks below the raised concrete slab on site. BH101-BH101A was advanced up to 42.0m bgl (33.37m AOD), terminated in granular superficial deposits. Ground gas and groundwater monitoring standpipes were installed within the cable percussive with rotary open-hole follow-on exploratory hole (BH101-BH101A) and three of the window sample boreholes (WS101 to WS103). Selected soil samples were subjected to laboratory analysis. No groundwater samples were taken. Six ground gas monitoring visits have been undertaken.
Encountered Ground Conditions	Made Ground was encountered in all exploratory hole locations from ground level to depths between 0.80 and 1.30m bgl. This generally comprised a tarmacadam layer overlying a sandy gravel layer which in turn overlies a sandy clayey gravel or a slightly sandy gravelly clay. Gravel comprises dolomite hardcore and brick. In BH101-BH101A a very gravelly sand was encountered above the sandy gravel layer. In all hand pits (HP101 to HP103) a slightly sandy SILT was noted. Underlying the Made Ground the superficial deposits were highly variable, comprising cohesive and granular Till. The cohesive Till deposits were recorded as soft to firm slightly to sandy Clay and soft to firm slightly sandy to sandy Silt. In BH101-BH101A the silt was thinly laminated and in WS101 it was recorded as organic. Cohesive Till deposits were absent in the northern-most window samples, indicating the top of these deposits deepen northwards to greater than 5.45m bgl. The base of the cohesive deposits, as recorded in BH101-BH101A, was 38.0m bgl (37.37m AOD). The granular Till deposits comprised a loose to medium dense, becoming dense, slightly clayey Sand. In BH101-BH101A and WS104 the granular Till deposits were recorded as a slightly gravelly Sand. BH101-BH101A recorded granular deposits from 3.45-8.90m bgl and 38.0-42.0m bgl, with the base of the superficial deposits not confirmed. Bedrock was not encountered in any of the exploratory holes. During returned monitoring visits, shallow groundwater levels were recorded 73-74m AOD, with BH101-101A recorded deeper groundwater 66.72 - 66.88m AOD.
Environmental Laboratory Testing	With respect to the proposed 'Commercial' end-use of the site, no exceedances were noted in within the samples collected. Soil samples were also screened for asbestos, no suspected asbestos containing materials were identified in any of the laboratory testing. Concentrations of SVOCs and VOCs were recorded below thresholds where available and concentrations of PCBs were recorded below the Environmental Agency Soil Guidance Values for dioxins, furans and dioxin-like PCBs in Soil.

Ground Gas Assessment	During the ground gas monitoring programme methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells. Maximum carbon dioxide (CO₂) concentrations were recorded at 0.8% in BH101-BH101A on the sixth monitoring visit. Gas flow was recorded at a maximum steady state flow rate of 2.2 l/hr in WS101 on the sixth visit. The 'representative' scenario records a maximum Q_{hg} of 0.0022 l/hr for carbon dioxide. The site is therefore classified as CS1.
Geotechnical Assessment	The Made Ground, shallow cohesive and granular Glacial Till deposits do not provide suitable founding strata for the proposed development. As such, it is likely a piled foundation is used to transfer the loads to the firm becoming very stiff cohesive deposits below to provide suitable resistance for the proposed loads. It is recommended that a specialist piling contractor is consulted for advice on most suitable piling solution and design. A suitably qualified temporary works designer and an experienced piling contractor must be consulted prior to commencement of any works. No ground floor slabs are proposed for the temporary office accommodation development. Based on the laboratory test results it is considered that a Design Sulphate Class may be taken as DS-1 with an ACEC class of AC-1 within Made Ground and a Design Sulphate Class of DS-1 with an ACEC class of AC-1 within superficial deposits being appropriate.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1) It is recommended that specialist piling contractors are to be consulted to establish suitable pile design. 2) 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 <i>Appendix C</i>. 3) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer.

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- Appendix G Risk Assessment Methodology**

1.0 Introduction

1.1 Project Background

Curtins were instructed by Greater Manchester NHS Foundation Trust in July 2020 to undertake an initial Phase 2 Ground Investigation for Decant Village at North Manchester General Hospital, Ellis Drive, Crumpsall M8 5RL. The site is centred on National Grid Reference (NGR) SD 84800 02100 and covers an area of approximately 0.18 Ha. The site location plan is presented on *Figure 2.1*.

The proposed development comprises an offsite manufactured four storey modular building for use of temporary office accommodation. A Finished Floor Level of approximately 75.3m AOD is proposed. A current proposed development plan is included in *Appendix A*.

1.2 Scope of Services

The Phase 2 Ground Investigation Report will characterise the environmental and geotechnical conditions of the site. The ground investigation has been undertaken to assess the ground and groundwater conditions at the proposed location of the temporary office accommodation.

The Phase 2 Ground Investigation Report is intended to determine:

- a) Likely risk of the proposed end-user being adversely impacted 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 to the end-user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide;
- c) Recommendations for the design of foundations and building ground floor slabs; and
- d) Recommendations for the specification of sub-structure concrete.

Detailed flood risk assessment, ecology, archaeological studies and waste classification for off-site disposal are outside of the scope of this report.

2.0 Preliminary Site Assessment Summary

A Phase 1 Desktop Study was undertaken for the site by Curtins Consulting in July 2020 (Ref.1). A summary of the detailed findings of this Desktop Study, comprising current site setting, history, geology and hydrogeology/hydrology is presented within this Section with reference to additional information sources.

2.1 Current Setting

The site entrance is located off Ellis Drive, Crumpsall, M8 5RL, as shown on *Figure 2.1*. The site is part of the wider North Manchester General Hospital and is currently an area of hardstanding used as a service yard and car parking area associated with the hospital's Estates and Transport Department.

The site is bounded to the north by Ellis Road followed by the majority of the North Manchester General Hospital, to the east by Eyam Road and areas of car parking associated with the hospital and to the west by the hospital's Estates and Transport department. The south of the site is bound by Magna Drive, followed by residential properties.

Main access to the site is from Ellis Drive through the service yard gates.

A topographical survey of the show record current site levels to range from, 74.49m AOD at the entrance from Ellis Drive, to 75.70m AOD in the southeastern corner. The site is relatively flat and level.

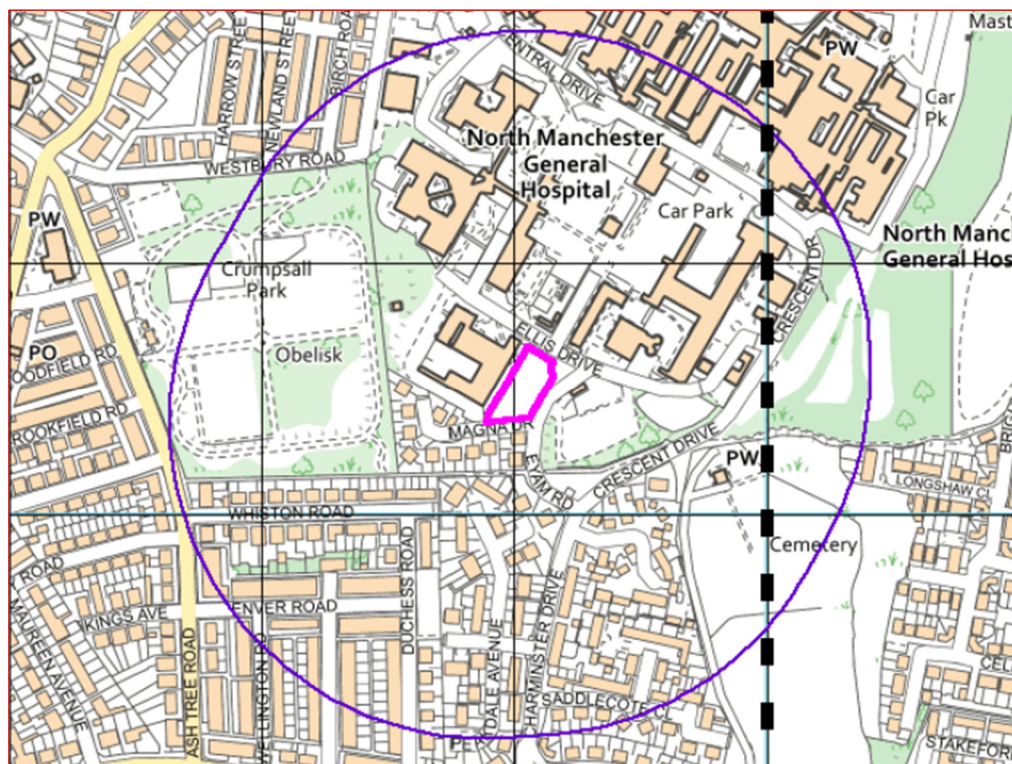


Figure 2.1 – Site Location Plan (site boundary shown in pink, 100m buffer shown in purple). Crown Copyright. License number 100020245

2.2 Previous Site Use

A review of the available historical maps (Ref. 1) for the site has been undertaken with specific reference to the potential sources of contamination.

Earliest historical map (1848) shows the site remains an undeveloped area of agricultural land with a footpath along the western boundary until 1950.

The surrounding land is generally agricultural fields with Crumpsall Hall located 100m southwest, no longer present from 1923, and Clarkville Farm 250m southeast. Two ponds are located 50 and 60m southeast of the site, no longer present on maps from 1894.

From 1894 The Manchester Workhouse (later Crescent Road Institution) is recorded immediately north of the site and a *Brick Works* 250m southwest which is no longer present from 1908 and presumably infilled. The surrounding areas become populated by residential and commercial properties.

By 1950 the north of the site is occupied by a tennis court and bowling green, with a sports ground occupying the remainder of the site. Crescent Road Institution is renamed Springfield Hospital in 1950 and is extended to the west.

By 1978 the Springfield Hospital becomes North Manchester General Hospital immediately north of the site and the sporting grounds (including the tennis court and bowling green) is no longer recorded on site. From 1978 the site is occupied by a car park with an electrical sub-station recorded 20m east and a car park immediately west of the site.

By 1992 an unnamed building, is present immediately south of the site, later demolished in 2020 and replaced by residential properties.

2.3 Published Geology

A study of the British Geological Survey (BGS) maps, 1:50,000 (Solid and Drift Edition, Sheet No. 085, 2011) (Ref. 2) indicates the following geological sequence underlying the site:

- **Superficial Deposits:** Glacial Till
- **Solid Geology:** Chester Formation

There are no BGS borehole logs within 250m of the development site available to review.

2.3.1 Made Ground Deposits

Made Ground deposits are not indicated on the geological maps; however, it is anticipated that Made Ground of unknown composition will be present in parts of the site, associated with the construction of the car park on site and redevelopment in the surrounding area.

2.3.2 Superficial Deposits

Superficial deposits are recorded as Glacial Till deposits. The Till deposits are expected to consist of a heterogenous mixture of clay, sand, gravel and boulders that vary widely in size and shape.

Glaciofluvial Sheet Deposits (sand and gravel) are also recorded in close proximity to the site and may be encountered interbedded with the Glacial Till (clay) deposits.

2.3.3 Bedrock Deposits

The site is underlain by a Chester Formation, typically comprising conglomerate and sandstone beds with subordinate beds of mudstone.

2.4 Hydrogeology and Hydrology

Environment Agency and the Phase 1 Report (Ref. 1) data indicates that the geological sequence underlying the site has the following hydrogeological characteristics:

Geology	Associated Hydrogeological Classification
Made Ground deposits are not indicated to be present	N/A
Glacial Till	Secondary Undifferentiated Aquifer ¹
Chester Formation	Principal Aquifer ²

Notes:

1. Assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
2. Layers of rock or drift deposits that have high intergranular and/or river base flow on a strategic scale. They provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

There are no recorded faults directly on site. The nearest fault is located approximately 80m north of the site orientated northwest-southwest.

The site is not located within a Source Protection Zone (SPZ).

There are no groundwater abstraction points within 500m of the site.

The nearest surface water feature is the River Irk, 464m east of the site which flows towards the south and has a river quality of GAQ Grade E with a flow rate of less than 2.5 cumecs.

2.5 Unexploded Ordnance (UXO) Risk Assessment

The likelihood of UXO being encountered on a development site is influenced by several 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. 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 (Ref. 3).

Risk mapping (Ref. 4) for UXO's has placed the site in a Moderate Risk area. Moderate-risk areas are those with a bombing density of up to 11-50 bombs per 1000 acres and may contain WWII targets.

The Phase 1 report (Ref. 1) indicated no evidence of ruins or significant bomb damage within 1km of the site and no significant targets noted within 1km of the site boundary.

Considering the above and that the site was occupied throughout the war period and developed after the war, Curtins identified a low risk of encountering UXO during Ground Investigation works.

Contractors undertaking excavations works should carry out their own UXO Risk Assessment in respect to their works.

2.6 Landfill

There are no operational or historic landfills within 250m of the site, the closest is 290m south with no records of the type of waste disposed. There are no records of licenced waste management facilities within 500m of the site.

There are four potentially infilled land (water and non-water) recorded within 250m of the site. The closest recorded is 35m south associated with an unknown filled ground, most likely a small pond.

2.7 Summary of Phase 1 Conceptual Site Model

Table 2.7 records initial Potential Pollutant Linkages (PPL) identified which are to be assessed further through the Phase 2 Investigation.

Table 2.7 – Potential Pollutant Linkages

Source	Pathway	Receptor	Risk Rating
On-site sources of potential contamination: Potential contamination associated with Made Ground of unknown composition from uncontrolled deposition of construction materials on-site during construction of the tennis courts, bowling green and later, the car park. Potential contamination associated with Made Ground of unknown composition from uncontrolled deposition during demolition of buildings on site. Off-site sources of potential contamination: Potential contamination associated with the construction of the residential and commercial properties off site. Potential contamination associated with the various <i>Works</i> within 250m of the site. Uncontrolled deposition of Made Ground within 250m of the site associated with the back fill of ponds within 250m of the site.	Direct contact, ingestion, inhalation (dust and vapours)	Site End Users (Hospital - Commercial)	Moderate / Low
On and off-site soils with the potential to generate ground gases: Potential ground gas generation from Made Ground containing organic/putrescible content on site. Historically infilled land within 250m of the site of unknown material.	Vertical and horizontal migration through underlying superficial deposits into buildings and air spaces	Site End Users (Hospital - Commercial)	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; organic compounds including PCBs present with the *Works* and *Workhouse* within 250m of the site; 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 is detailed in *Section 3.0*.

The risks presented to controlled waters (groundwater and surface water) were identified as Low and Very Low respectively. 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 Ground Investigation Scope of Works

Site investigation works were undertaken by Curtins between the 10th and 13st August and the 26th August 2020.

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

- LCRM (Ref. 5);
- British Standard (BS) 10175:2011+A2:2017 (Ref. 6);
- BS5930:2015+2020 (Ref. 7);
- and BS EN1997: Part 2:2007 Eurocode 7 (Ref. 8).

The scope and rationale are summarised in *Table 3.0*.

Table 3.0 – Scope and Rationale of Fieldwork Undertaken

Exploratory Hole Type	Exploratory Hole Ref.	Exploratory Hole Depth (m bgl)	Rationale
Cable Percussion Borehole with Rotary open-hole Follow-on	BH101-BH101A	42.00	Confirm the ground and groundwater conditions. Collect Soil Samples for chemical analysis. Collect samples for geotechnical soil testing. Gas and groundwater level monitoring.
Window Sample Boreholes	WS101 WS102 WS103 WS104	5.45 5.45 5.45 5.45	Confirm shallow ground and groundwater conditions. Collect Soil Samples for chemical analysis. Collect samples for geotechnical soil testing. Gas and groundwater level monitoring.
Hand Dug Foundation Pits	HP101 HP102 HP103	1.20 1.25 1.20	Confirm the ground conditions. Confirm presence or absence of buried tanks or foundations below raised concrete slab.

BH101 was drilled using cable percussive techniques with SPTs to 20.00m with rotary open-hole follow-on (BH101) to 42.00m bgl in order to confirm depth to bedrock; however the borehole was terminated at 42m bgl (33.37m AOD) with bedrock was not encountered. For ease of writing and understanding, exploratory hole logs BH101 and BH101A were combined.

For the location of the exploratory holes refer to Curtins drawing ref: 075805-CUR-00-XX-DR-GE-80004-P01 located in *Appendix A*. Exploratory hole locations were surveyed upon completion of the works, with the surveyed ground levels of the exploratory holes added to the logs, contained within *Appendix B*.

3.1 Soil Logging and Sampling

Exploratory hole arisings were logged onsite by a qualified Engineer from Curtins and in accordance with the requirements of BS5930 (Ref. 7). No observed visual and olfactory indications of contamination were recorded. Exploratory hole logs are provided in *Appendix B*.

3.2 Monitoring Well Installations

Groundwater monitoring 50mm diameter slotted pipes were installed within the cable percussive exploratory hole with rotary open-hole follow-on (BH101-BH101A) and three of the window sample boreholes (WS101 to WS103). Bentonite seal was placed at the top and bottom of each of the exploratory holes, surrounding the screened sections of the pipe. A gravel surround was installed in the annulus between the sides of the borehole and the slotted sections of the pipe.

The monitoring wells were designed to assess the potential for ground gas and monitor groundwater levels in all exploratory holes. No groundwater samples were collected. The screened sections therefore focused on the more permeable deposits where encountered, where ground gas and groundwater may be encountered.

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

Table 3.2 – Monitoring Well Response Zones

Borehole Ref.	Response Zone m bgl (m AOD)	Strata Description(s) (Principal Strata in Capitals)
BH101- BH101A	11.00 – 13.80 (64.37 – 61.57)	COHESIVE TILL
WS101	1.30 – 4.00 (74.03 – 71.33)	GRANULAR TILL and COHESIVE TILL
WS102	0.80 – 4.10 (74.61 – 71.31)	GRANULAR TILL and COHESIVE TILL
WS103	0.80 – 3.50 (73.97 – 71.27)	GRANULAR TILL

A copy of the borehole logs can be referred to in *Appendix B* of this report.

3.3 Post-Investigation Monitoring

3.3.1 Groundwater and Ground Gas Monitoring

Six groundwater level and ground gas monitoring visits over six weeks have been undertaken, to assess the groundwater levels and the ground gas conditions identified in *Section 2.0*.

The results of the groundwater level monitoring are detailed in *Section 5.8*.

4.0 Laboratory Testing

4.1 Geo-environmental Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide information about the encountered ground conditions.

Selected soil samples for chemical testing 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 analysis was 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 sites proposed end use and the immediate environmental setting, concentrated in the near surface deposits.

4.1.1 Soil Analysis

The source material of contaminants of concern potentially present on the site was considered to include, amongst others; organic matter, ash and fill, hydrocarbons (e.g. fuel/oils), heavy metals, and asbestos. The presence of localised Semi/Volatile Organic Compounds (SVOCs & VOCs), Poly Chlorinated Biphenyls (PCBs) could also not be ruled out due to the present of the historic Workhouse (now NMGH) adjacent to site and tanks on-site without record of decommission.

The extent of the above is captured by the broad environmental testing suites listed in *Table 4.1.1* below.

Table 4.1.1 – Environmental Chemistry Analysis Suite: Soils

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, asbestos quantification (%), pH, 2;1 Water Soluble Sulphate & Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Nickel	1 mg/kg
	Zinc	5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Phenols (screen)	0.2 mg/kg

Suite Ref.	Analyte	LOD
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg
	TPH (Aro/Alk Split)	0.01 to 1.0 mg/kg
Additional Soil Analysis	Semi-volatile Organic Compounds (SVOC)	0.1 to 0.5 mg/kg
	Volatile Organic Compounds (VOC)	0.001 to 0.01 mg/kg
	Speciated PCB-EC7 & WHO12	0.001 to 0.002 µg/l

Soil samples were taken from the top 2.00m of exploratory hole locations (BH101-BH101A, and WS101 to WS103); all were tested for Suite A. The sample at 0.80m bgl in WS101 was also tested for VOCs and SVOCs, and speciated PCB-EC7 and WHO12 due to the proximity to one of the possible fuel tanks on site.

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

4.1.2 Groundwater Analysis

No groundwater samples were taken on site.

4.2 Geotechnical Testing

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref. 9). The undertaken geotechnical testing is summarised in *Table 4.2*.

Table 4.2 – Geotechnical Testing

Test Type	Quantity	Standard
In Situ Testing		
Standard Penetration Testing	36	BS 5930: 2015, Clause 41
Laboratory Testing		
Atterberg Limit	4	BS1377 1990, Part 2 (clause 4.5, 5.3 & 5.4)
Multistage Triaxial compression test	2	BS1377 1990, Part 7 (clause 9.0)
Water Soluble Sulphate	7	ISO 17025 MCERTS
pH Value	7	ISO 17025 MCERTS
Moisture Content	4	BS1377 1990, Part 2
PSD	6	BS1377 1990, Part 2 (clause 9.2)

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*.

5.0 Ground Conditions

The ground conditions across the site, determined during the Curtins ground investigation works, generally comprised Made Ground of a layer of tarmacadam overlying a very sandy gravel with occasional cobbles, above a slightly sandy clayey gravel or slightly sandy slightly gravelly clay. This typically overlay superficial deposits comprising interbedded cohesive clay and silt deposits and granular sand deposits.

The solid geology was not encountered during the investigation.

5.1 Encountered Ground Conditions

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

A summary of the geotechnical test results recorded within the superficial deposits are presented in *Section 6.0*. Full details of the geotechnical results can be found in *Appendix D*.

Table 5.1 – Summary of Ground Conditions Encountered

Stratum	Depth to top of strata, m bgl (m AOD)	Thickness (m)		Description
		Min	Max	
MADE GROUND	0.00 (75.41 – 74.77)	0.80	1.30	MADE GROUND: Tarmacadam Overlying MADE GROUND: Grey sandy angular to subangular fine to gravel of dolomite hardcore and concrete with occasional cobbles. Sand is fine to coarse. Overlying MADE GROUND: Dark brownish grey sandy clayey angular to subangular fine to coarse gravel of dolomite hardcore. Sand is fine to coarse. OR MADE GROUND: Dark greyish brown slightly sandy gravelly clay. Sand is fine to coarse. Grave is angular to subangular fine to coarse of brick and dolomite hardcore.
SUPERFICIAL DEPOSITS – Cohesive Glacial Till	1.00 – 2.30 (74.51 – 73.11)	0.30 ¹	29.10	Soft to firm brown slightly to very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone. And Soft to firm greyish brown slightly sandy to sandy SILT. Sand is fine.
SUPERFICIAL DEPOSITS – Granular Glacial Till	0.80 – 3.45 (74.61 – 71.92)	0.50	7.55 ²	Loose to medium dense, becoming dense brownish grey slightly clayey fine to coarse SAND.

¹ Thickness not proven in hand pits

2 Base not always proven

5.2 Made Ground

Made Ground was encountered in all of the exploratory hole locations from ground level to depths of between 0.80m and 1.30m bgl across the site. The Made Ground generally comprised a tarmacadam layer (0.10m thickness) overlying a sandy gravel layer (0.20m to 0.40m thickness), which in turn overlies sandy clayey gravel or a slightly sandy gravelly clay (0.40m to 0.90m thickness). The sand is typically fine to coarse and the gravel fine to coarse, angular to subangular of dolomite hardcore and brick

In exploratory hole BH101-BH101A a layer of very gravelly fine to coarse sand with angular to subangular fine to coarse gravel of dolomite hardcore and concrete was encountered above the sandy gravel encountered in all exploratory holes.

In exploratory hole WS101 angular cobbles of dolomite hardcore and concrete were encountered in the sandy gravel layer.

In exploratory holes HP101 to HP103 instead of the clay layer noted in all other exploratory holes, a darkish grey-black slightly sandy slightly clayey to very clayey angular to subangular fine to medium gravel of brick, ash and rare coal fragments is noted. Sand is fine to coarse.

5.3 Glacial Till

The superficial deposits encountered beneath the site were generally as anticipated from published geological data. The Glacial Till which is described by the BGS as an heterogenous mixture of clay, sand, gravel, and boulders (diamicton) varying widely in composition, was encountered to depths of up to c. 42.00m bgl (33.37m AOD) where proven. The base of this layer has not been encountered.

Due to the variability in the composition of the Till (i.e. interbedded granular and cohesive materials) and the little appreciable distinction with the Glaciofluvial Sheet Deposits present close to the site, (owing to similar deposition and geomorphological processes), this report has classified the soils based on engineering behaviour as opposed to the nomenclature used by the BGS. Therefore, the natural superficial deposits have been interpreted and assessed as either 'Cohesive Till' or 'Granular Till' in respect to their geotechnical assessment. However, a brief description of the geological units is presented below.

Cohesive Till

The cohesive layers of the Glacial Till are recorded as a soft to firm slightly to very sandy slightly gravelly Clay and a soft to firm greyish brown slightly sandy to sandy Silt. Typically, the sand is fine to coarse and the gravel is angular to subangular fine to coarse of sandstone. The silt layer is recorded as thinly laminated in BH101-BH101A and as a firm blackish brown organic Silt in WS101.

These cohesive deposits were encountered in BH101-BH101A and WS102 whilst the silt deposits were encountered in BH101-BH101A, WS101 and HP101 to HP103.

The cohesive deposits of WS101 and WS102 were recorded interbedded between granular deposits, at 1.80-2.10m bgl and 2.30-3.00m bgl respectively. No cohesive deposits were recorded in the northern boreholes of WS03 and WS04 which were terminated at 5.45m bgl (69.32-69.62m AOD), indicating the top of the cohesive deposits deepen towards the northern area of the site.

The base of the cohesive deposits was recorded in BH101-BH101A at 38.00m bgl (37.37m AOD), with the borehole terminated in granular deposits at 42.00m bgl.

Granular Till

The Glacial Till granular deposits are encountered in all exploratory holes, excluding HP101 to HP103, from depths between 0.8m bgl to 3.45m bgl. It appears to be common near the surface based upon the window sampler borehole encounters. Generally, the deposits comprised a loose to medium dense, becoming dense, brownish grey slightly clayey fine to coarse Sand. In BH101-BH101A and WS104, the granular deposits encountered are a slightly gravelly fine to coarse Sand, with angular to subangular fine to medium gravel of sandstone.

BH101-BH101A recorded granular deposits from 3.45-11.00m bgl and 38.0-42.0m bgl, with the base of the superficial deposits not confirmed.

WS101 and WS102 in the southern area of the site recorded granular deposits underlying Made Ground at 1.30-1.80m and 0.80-2.30m bgl respectively. A cohesive band was found to be interbedded between the initial granular layer and a second granular layer which extended from 2.10m (WS101) and 2.30m bgl (WS102) to the base of the boreholes at 5.45m bgl.

WS103 and WS104 in the northern area of the site, recorded granular deposits directly underlying the Made Ground at 0.80m and 0.90m bgl respectively. These deposits extended to the end of the boreholes at 5.45m bgl, with no underlying cohesive deposits encountered before termination of these boreholes.

5.4 Bedrock Deposits

The Chester Formation bedrock was not encountered in any of the exploratory hole locations, with BH101A terminated at 42m bgl (33.37m AOD).

5.5 Observed Potential Contamination

No potential visual or olfactory contamination was observed during the intrusive investigation works.

5.6 Obstructions Encountered

No obstructions were encountered.

5.7 Groundwater

A summary of the groundwater levels recorded during the siteworks is presented in *Table 5.7a*.

Table 5.7a – Groundwater Noted During Site Investigation

Borehole Ref.	Water Strikes			
	Strike Depth m bgl (m AOD)	Water Depth after 20 mins m bgl (m AOD)	Strata	Notes
BH101-BH101A	11.00 (64.37)	10.70 (64.67)	Cohesive Till	0.30m rise after 20 mins. Strike at boundary of Clay and Silt.
BH101-BH101A	18.50 (56.87)	18.20 (57.17)	Cohesive Till	0.30m rise after 20 mins

Six rounds of groundwater monitoring have been undertaken between 1st September and 5th October 2020, the results of which are presented in *Table 5.7b*.

Table 5.7b – Groundwater Monitoring Results

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	01/09/20	08/09/20	17/09/20	24/09/20	01/10/20	05/10/20
			Depth m bgl (m AOD)	Depth m bgl (m AOD)	Depth m bgl (m AOD)	Depth m bgl (m AOD)	Depth m bgl (m AOD)	Depth m bgl (m AOD)
BH101-BH101A	Cohesive Till	11.00 – 13.80 (64.37 – 61.57)	8.55 (66.82)	8.54 (66.83)	8.60 (66.77)	8.65 (66.72)	8.51 (66.86)	8.49 (66.88)
WS101	Interbedded Cohesive and Granular Till	1.30 – 4.00 (74.03 – 71.33)	1.73 (73.60)	0.81 (74.52)	1.42 (73.91)	1.52 (73.81)	1.10 (74.23)	1.14 (74.19)
WS102	Interbedded Cohesive and Granular Till	0.80 – 4.10 (74.61 – 71.31)	1.06 (74.35)	0.89 (74.52)	1.08 (74.33)	1.07 (74.34)	1.07 (74.34)	-*
WS103	Granular Till	0.80 – 3.50 (73.97 – 71.27)	1.00 (73.77)	0.74 (74.03)	1.00 (73.77)	-*	1.00 (73.77)	-*

* Borehole inaccessible due to parked vehicle

Based upon groundwater elevations and the underlying geology, the following considerations are given to the underlying groundwater regime:

- A groundwater table appears to be present within the granular till at shallow depths below the site in the order of 73 to 74 mAOD.

- Groundwater levels were also encountered at greater depths at BH101/BH101A (namely 66.72m to 66.88m AOD) also within the granular till and may represent a deeper groundwater level below the site which may be in hydrological connectivity with the shallower level.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (August 2020) and are likely indicative of summer conditions and it is possible that variable groundwater levels are recorded in winter months.

6.0 Ground Model

6.1 Made Ground

Made Ground was encountered in all exploratory holes.

The geotechnical test results recorded within the Made Ground are summarised in *Table 6.1*. No in-situ SPT or laboratory geotechnical testing has been undertaken on this stratum due to its unsuitable properties for use as a founding stratum.

Table 6.1 – Summary of geotechnical test results – Glacial Till

Parameter	No. of tests	Results
pH	5	Min: 6.56 Max: 7.59 Average: 7.22
Water Soluble Sulphate (mg/l)	5	Min: 10 Max: 50

6.2 Glacial Till

The Made Ground is underlain by Glacial Till deposits and typically recorded as cohesive and granular strata which are described separately below.

6.2.1 Cohesive Glacial Till

The geotechnical test results recorded within the cohesive Glacial Till deposits are summarised in *Table 6.2.1*.

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

Parameter		No. of Tests	Results
In-Situ Tests			
SPT 'N' Value ⁽²⁾ – Cohesive		13	Min: 8 Max: 50 Average: 32.8
Laboratory Tests			
Atterberg Test	Liquid Limit (%) ¹	2	24 & 30
	Plastic Limit (%) ¹	2	17 & 17
	Plasticity Index (%) ¹	2	7 & 13
	Modified Plasticity Index (%) ³	2	6.93 & 11.96
Moisture Content (%)		4	Min: 17 Max: 27 Average: 21
pH		6	Min: 7.09 Max: 8.38 Average: 7.74

Parameter	No. of Tests	Results
Water Soluble Sulphate (mg/l)	6	Min: 20 Max: 120 Average: 70
Quick Undrained Multistage Triaxial – Cu (kPa)	2	Min: 19 Max: 70

(1) Excludes non-plastic test result

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

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

A total of two Atterberg Tests were undertaken in the cohesive material, these indicate low plasticity clays.

The SPT N results are presented on *Figure 6.2.1a* and *Figure 6.2.1b*, predominantly increasing with increasing depth and decreasing elevation.

A moderately conservative unit weight of 18 kN/m³ is deemed suitable for medium to high strength cohesive soils from a review of the published values (Ref. 10).

A moderately conservative Undrained Shear Strength, Cu, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 11) using Equation 1:

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

Where:

C_u is the Undrained Shear Strength

f₁ is the Stroud Factor determined from Figure 1.5 (Ref. 12)

SPT N is Characteristic Standard Penetration Test Result

Due to the small cohort of plasticity index data, an f₁ value of 5.2 has been selected based upon literature, rather than through a correlation with plasticity index (CIRIA C504). Cu values ranging between 41.6 kPa and 260 kPa were determined. The estimated results indicate a variable strength from low strength clay to very high strength clay. The Undrained Multistage Triaxial testing reported a Cu value of 19 kPa and 70 kPa, indicating a low and medium strength clay, still suggesting an increase in strength with depth. Typically, the results indicate an increase in strength with an increase in depth, see *Figure 6.2.1c* and *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. 13). A peak angle of drained shearing resistance of 31° is recommended based on this correlation taking into consideration the guidance from Gibson (1953) and Trenter (1999) regarding the variation in angle of friction with Plasticity Index for UK Glacial Tills.

The Drained and Undrained Young's Modulus, E' and Eu, can be derived for cohesive material from the relationship with SPT N values (Ref. 15), as presented in Equation 3 and Equation 4.

An increasing with depth Young's modulus is proposed for design, according to the following relationships obtained from the ICE Manual of Geotechnical Engineering, 2012:

$$E_u = 330 \times c_u \quad \text{Equation 2}$$

$$E' = 200 \times c_u \quad \text{Equation 3}$$

It should be noted that care should be taken in using linear stiffness values derived from relationships as they do not necessarily reflect the non-linear nature of soil stiffness. The actual stiffness will be strain dependent and non-linear and should be considered in detailed design of sensitive structures.

Moderately conservative Drained and Undrained Young's Modulus, E' and E_u , have been estimated using this correlation and are shown on *Figure 6.2.1g* and *Figure 6.2.1h*.

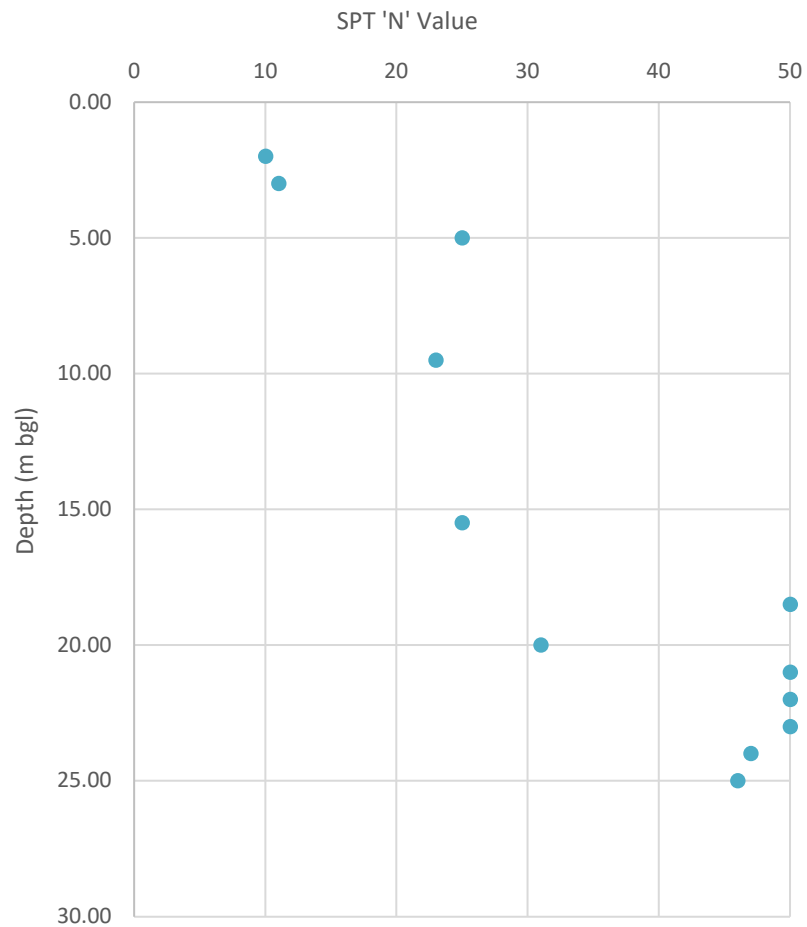


Figure 6.2.1a – Standard Penetration Test vs. Depth - Cohesive

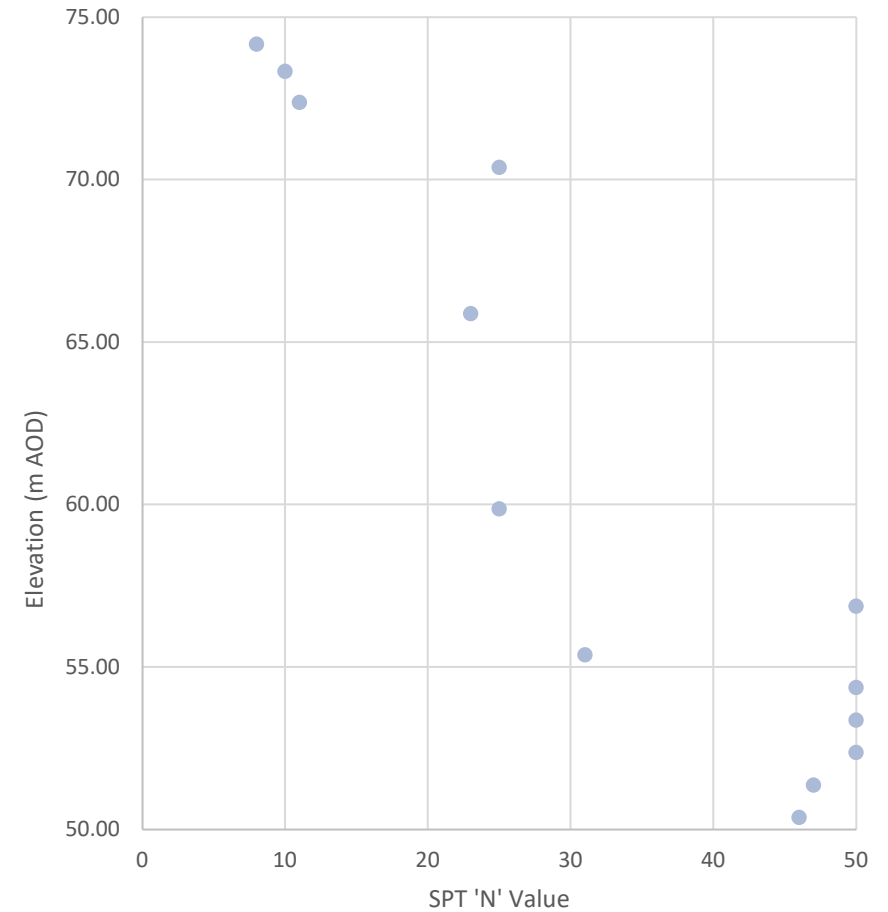
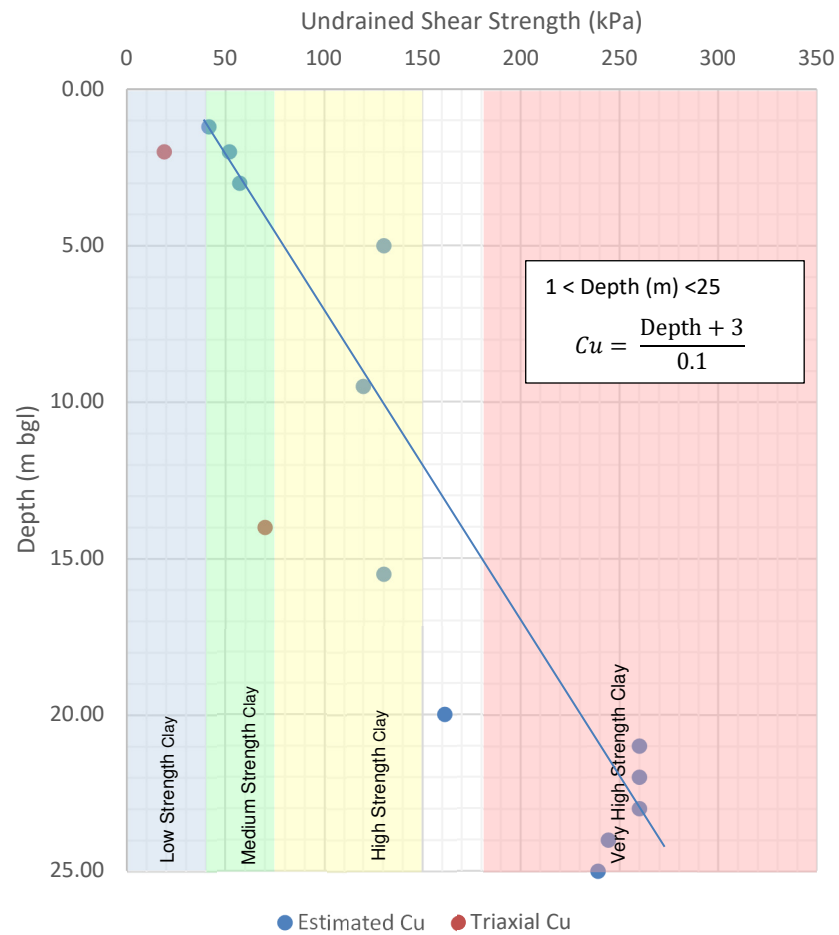
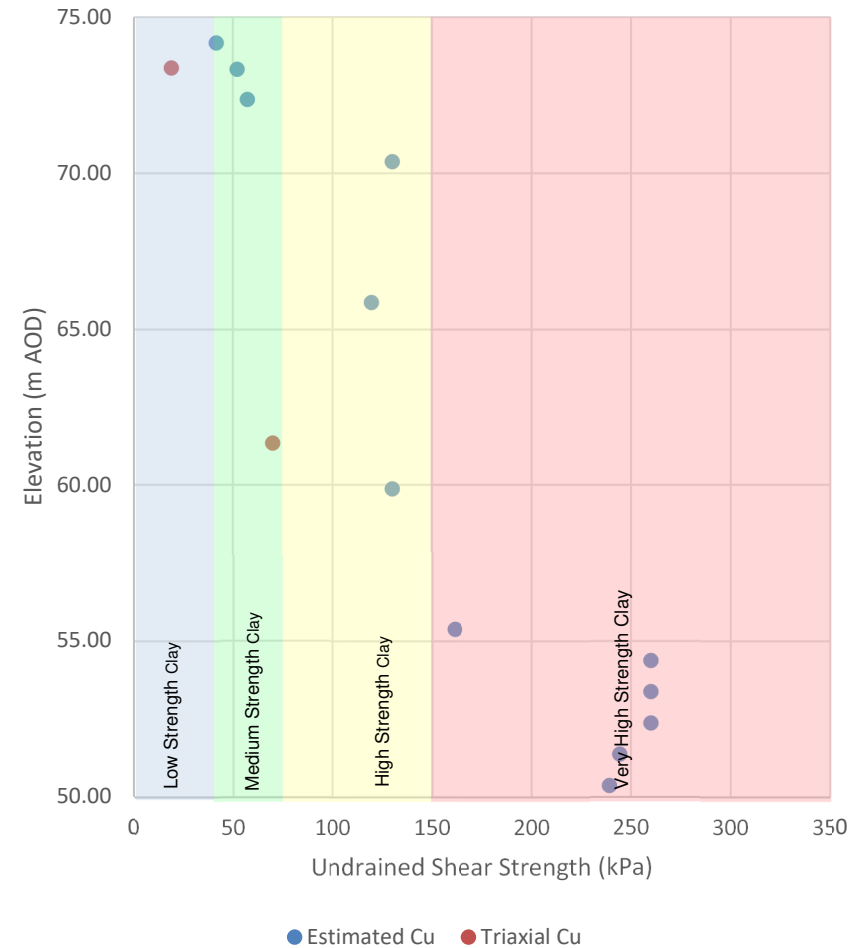
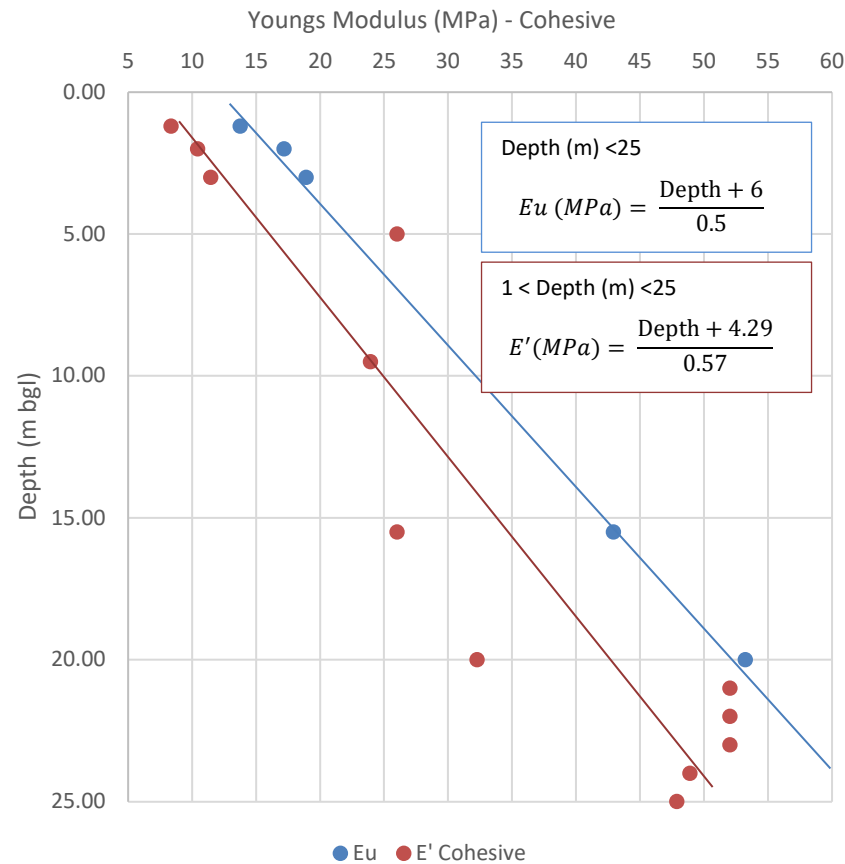
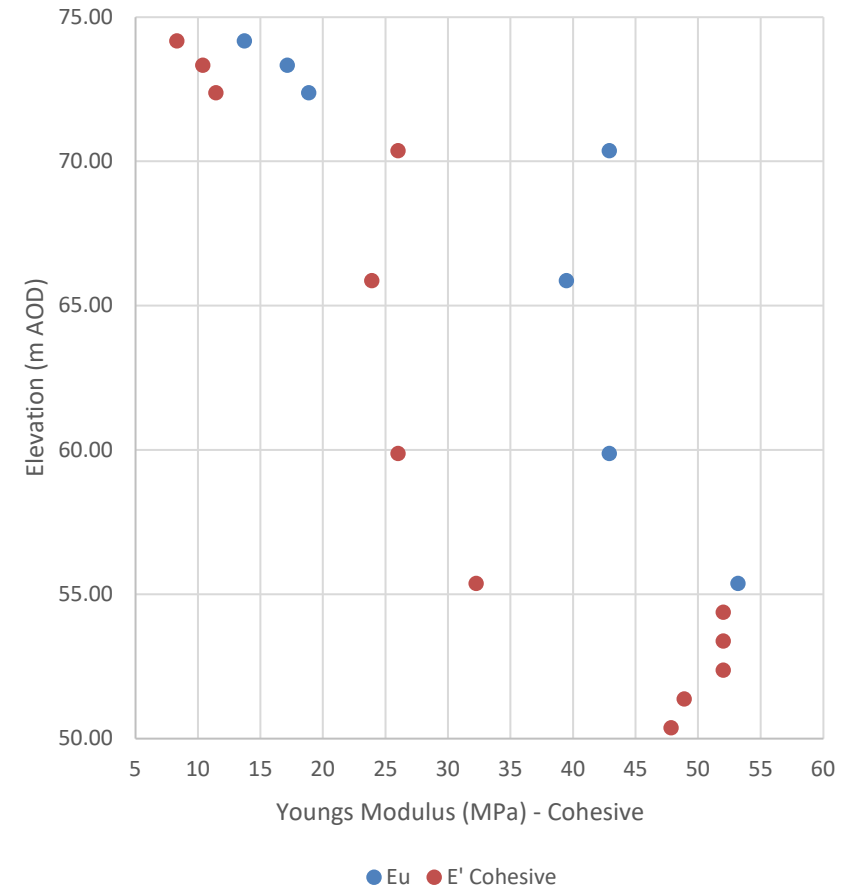


Figure 6.2.1b – Standard Penetration Test vs. Elevation - Cohesive

**Figure 6.2.1c** – Estimated Undrained Shear Strength vs Depth**Figure 6.2.1d** – Estimated Undrained Shear Strength vs Elevation

**Figure 6.2.1g** – Estimated Young's Modulus (Cohesive) vs Depth**Figure 6.2.1h** – Estimated Young's Modulus (Cohesive) vs Depth

6.2.2 Granular Glacial Till Deposits

The geotechnical test results recorded within the Granular Glacial Till deposits are summarised in *Table 6.2.2*.

Table 6.2.2 – Summary of geotechnical test results – Granular Glacial Till

Parameter	No. of Tests	Results
In-Situ Tests		
SPT 'N' Value	23	Min: 2 Max: 50 Average: 20.4
Laboratory Tests		
pH	3	Min: 6.75 Max: 8.23 Average: 7.5
Water Soluble Sulphate (mg/l)	3	Min: 10 Max: 50 Average: 23.3
Particle Size Distribution	6	See <i>Appendix D</i> for Results

Twenty-three SPT 'N' values were recorded in the granular strata, ranging between 20 and refusal at 50. The SPT 'N' results indicate a loose to very dense state of compaction across the site. The results are shown on *Figure 6.2.2a* and *Figure 6.2.2b*, indicating a general increase in 'N' value with increase in depth.

The PSD results carried out in the laboratory show variability in the material with 50/50 weight percentages of sand and clay detailed.

A moderately conservative unit weight of 18 kN/m³ is deemed suitable for loose to dense granular soils above water and a unit weight of 20 kN/m³ is deemed suitable for deposits below groundwater, from a review of published values (Ref. 10).

The Angle of Internal Friction, ϕ' , for the granular Glacial Till has been derived from a review of relationships with SPT N values (Ref. 12 & 10) and published values. A value of 33° has been selected based on these graphs. The values are shown on *Figure 6.2.2c* and *Figure 6.2.2d*.

The Drained Young's Modulus, E' , can be derived for granular material from the relationship with SPT N values (Ref. 16), as presented in Equation 5.

$$E' = (\text{SPT } N / 2) + 7.5 \quad \text{Equation 5}$$

Where:

E' is the Drained Young's Modulus

SPT N is Characteristic Standard Penetration Test Result

The estimated drained Young's Modulus, E' , for granular Glacial Till deposits from correlation with SPT N values (Ref. 16) are presented on *Figure 6.2.2e* and *Figure 6.2.2f*.

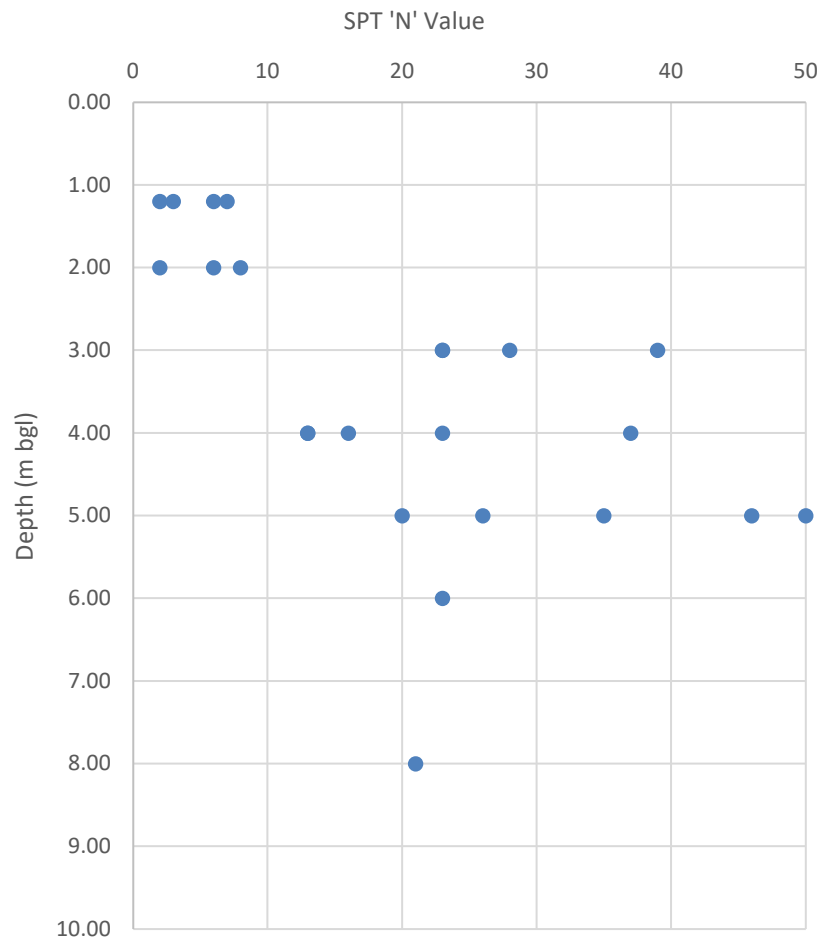


Figure 6.2.2a – Standard Penetration Test vs. Depth - Granular

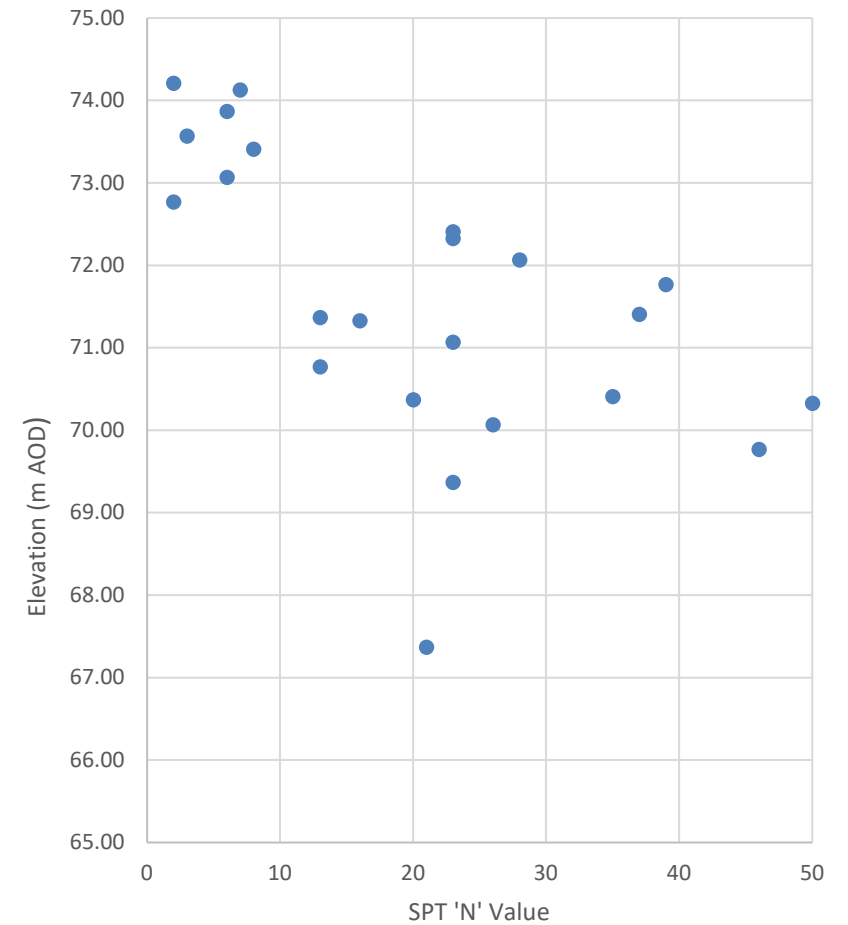
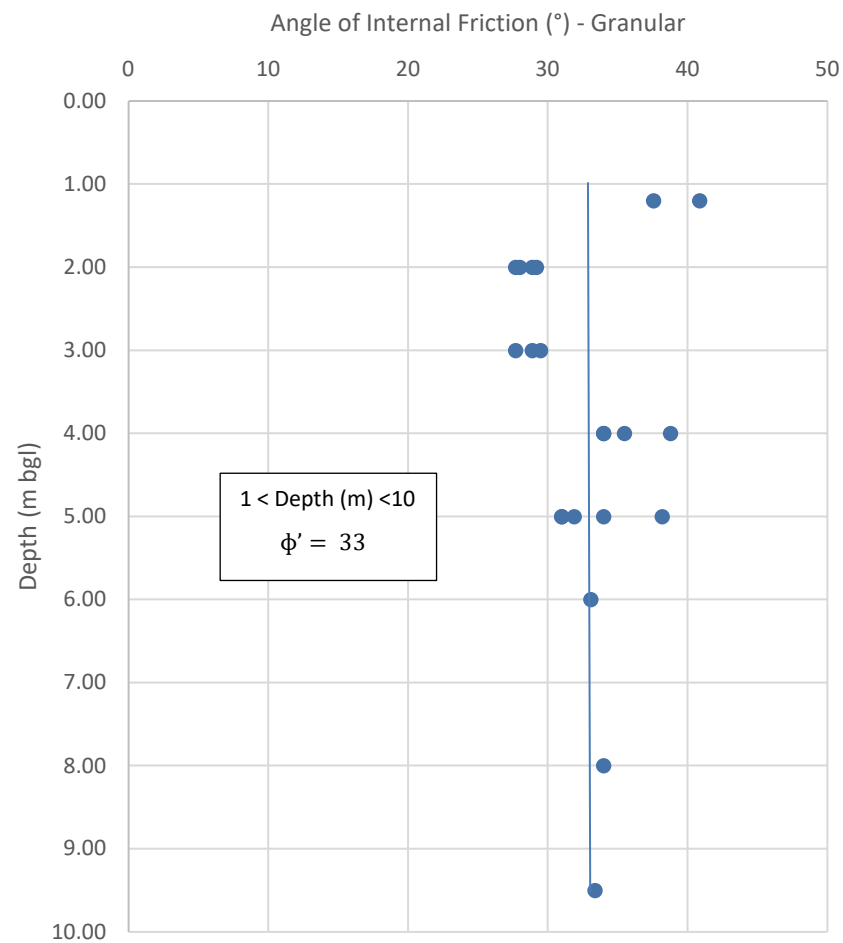
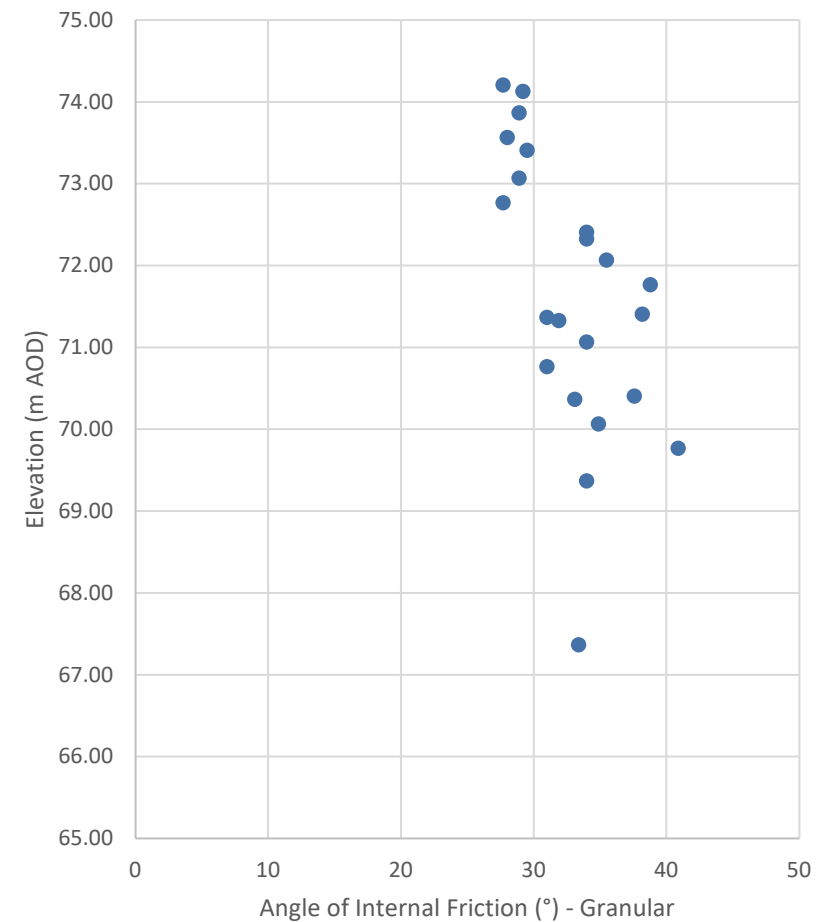
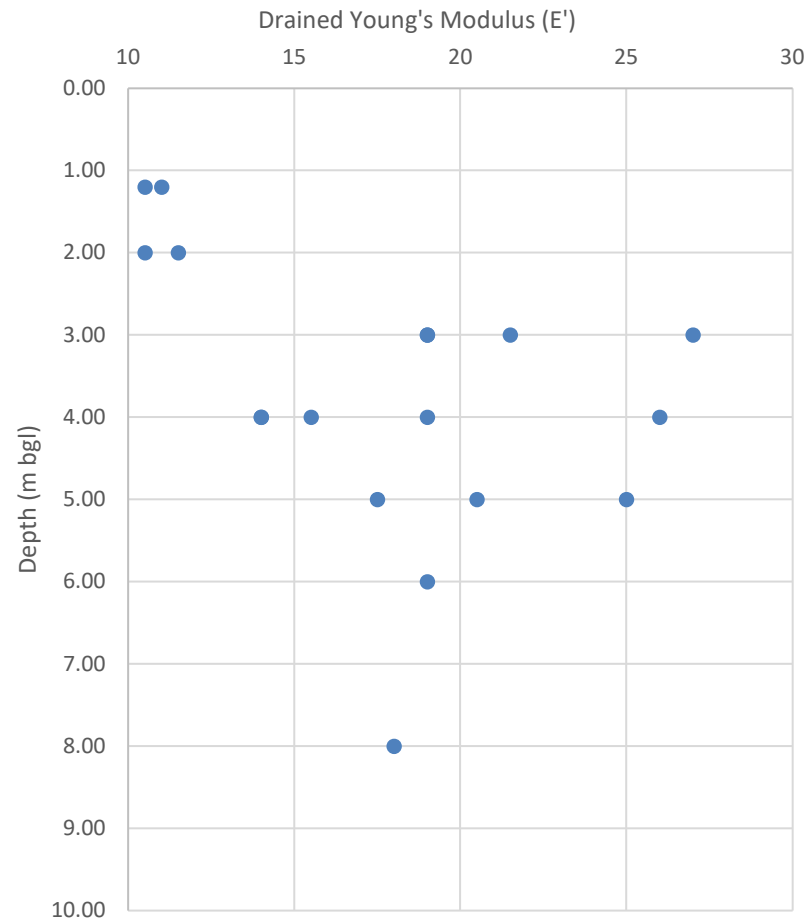
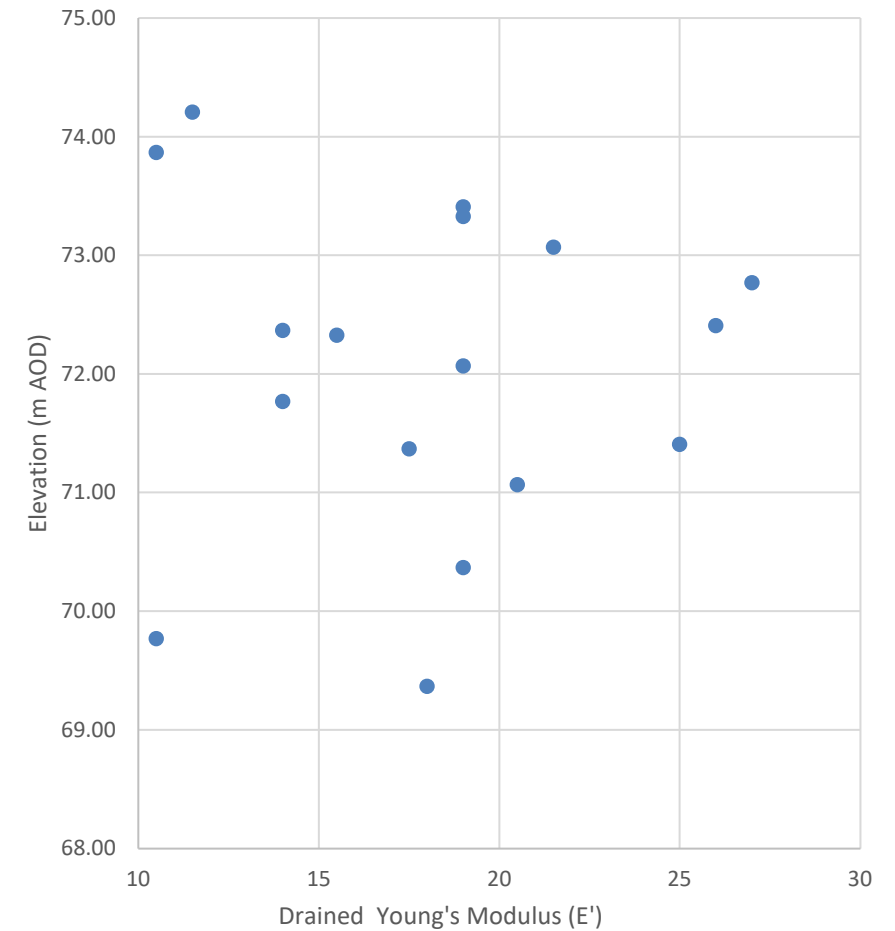


Figure 6.2.2b – Standard Penetration Test vs. Elevation - Granular

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**Figure 6.2.2c** – Angle of Internal Friction (Granular) vs Depth**Figure 6.2.2d** – Angle of Internal Friction (Granular) vs Elevation

**Figure 6.2.2e** – Estimated Drained Young's Modulus (Granular) vs Depth**Figure 6.2.2f** – Estimated Drained Young's Modulus (Granular) vs Elevation

6.3 Ground Model – Geotechnical Parametric Analysis Summary

The estimated parameters derived for the ground conditions are summarised in *Table 6.3a*.

Table 6.3a – Material Properties

Strata	Parameter	Characteristic Value	Rationale	Reference
Cohesive Glacial Till	Unit Weight, γ (kN/m ³)	18	Published Values	Ref. 10 (BS 8004, 2020)
	Undrained Shear Strength, C_u (kN/m ²)	$1 < \text{Depth (m)} < 25$ $C_u = \frac{\text{Depth} + 3}{0.1}$	Geotechnical test results and correlation with SPT N values and Plasticity Index	Ref.11 (Stroud, 1975)
	Drained angle of shearing resistance, ϕ' (°)	31	Correlation with Plasticity Index	Ref.13 (Gibson, 1953) and Ref. 14 (Trenter 1999)
	Youngs Modulus, E'	$1 < \text{Depth (m)} < 25$ $E' (MPa) = \frac{\text{Depth} + 4.29}{0.57}$	Correlation with SPT N values	Ref. 15 (ICE, 2012)
	Youngs Modulus, E_u	$1 < \text{Depth (m)} < 25$ $E_u (MPa) = \frac{\text{Depth} + 6}{0.5}$	Correlation with SPT N values	Ref. 15 (ICE, 2012)
Granular Glacial Till	Unit Weight, γ (kN/m ³)	20	Published Values	Ref.10 (BS 8004, 2020)
	Drained angle of shearing resistance, ϕ' (°)	33	Correlation with SPT N Values	Ref.16 (Peck et al., 1975)
	Youngs Modulus, E'	Highly Variable	Correlation with SPT N Values	Ref. 15 (Yandizo, 1967)

6.4 Aggressive Ground Conditions

The classification of the site 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. 17). A summary of the results obtained as a part of the ground investigation are summarised in *Table 6.4a* below.

Table 6.4a –Aggressive Chemical Environment for Concrete (ACEC) Site Classification

Stratum	Test Type	Range
Made Ground	pH	6.56 – 7.59
	Water Soluble Sulphate (mg/l)	10 - 50

Stratum	Test Type	Range
Glacial Till	pH	6.75 – 8.38
	Water Soluble Sulphate (mg/l)	10 - 120

In these conditions, and as a preliminary assessment and subject to further testing, it is considered that deterioration of buried concrete due to sulphate or acid attack is unlikely to occur. The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 (AC-1) conditions assuming mobile groundwater.

7.0 Ground and Groundwater Contamination Assessment

7.1 Human Health

The soil results will be screened against the 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. 18) 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

The current use of the site is noted as a service yard associated with the Estates and Transport Department, with the proposed development a four storey modular building for use of temporary office accommodation. This land use is most analogous with a *Commercial* end-use scenario and so assessment has been undertaken against the following GACs, in order of preference:

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.

Atkins At Risk derived Commercial SSV thresholds have been supplemented for VOC and SVOC compounds where thresholds are not available in the GACs for listed above.

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 soils ranged from 2.0% to 14.4%. The high organic content encountered in the soils is typically representative of the shallower Made Ground, however high SOM was noted in WS101 at 1.80m with a SOM of 6.6%.

With consideration for a calculated geometric average, soils from the Made Ground determine a SOM of 5.68% while deeper soils maintain a lower valuation of 5.05%. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM of 2.5% and 1.0% for *Commercial* end-use has been adopted for made ground and natural soil features respectively.

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 respect to the proposed *Commercial* end-use of the site, there are no exceedances noted within samples collected.

Concentrations of SVOCs and VOCs were recorded below thresholds where available with many determinands recorded below limits of detection. Concentrations of PCB's were recorded below the Environmental Agency Soil Guidance Values for dioxins, furans and dioxin-like PCBs in Soil.

All soil samples were screened for asbestos. No suspected asbestos containing materials (ACMs) were identified within any of the exploratory hole logs or laboratory screening.

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. 19), BSI Publication code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2015 (Ref. 20) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 21).

The 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 Risk Assessment (desk study) (Ref. 1) 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 three of the window sample boreholes (WS101 to WS103) and the cable percussive/rotary borehole as detailed in *Section 3.2*.

An initial programme of six gas monitoring visits over six weeks was proposed. Six gas monitoring visits have been undertaken between 1st September and 5th October 2020, with barometric pressure recorded between 983 and 1025mb. Falling barometric pressure was recorded on the first (01/09), third (17/09) and fourth (24/09) and sixth (24/09) visits, steady on the second (08/09) and fifth (01/10) visits and rising on the sixth (05/10) visit.

The results log sheets are contained within *Appendix E* and summarised in *Table 8.1a*.

Table 8.1a – Summary of Ground Gas Monitoring Results

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Peak Gas Flow (l/hr)	Steady State Gas Flow (l/hr)
BH101-BH101A	<0.0	0.8	18.5	-7.2	-0.1
WS101	<0.0	0.1	20.3	13.8	2.2
WS102	<0.0	0.3	19.4	0.0	0.0
WS103	<0.0	<0.1	20.6	0.0	0.0

Methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells.

Hydrogen Sulphide (H₂S) was recorded in all monitoring wells, a maximum concentration was recorded as 5ppm in BH101-BH101A on the first visit. Carbon Monoxide (CO) was recorded in all monitoring wells, a maximum concentration was recorded at 7ppm in BH101-BH101A on the first visit.

Maximum carbon dioxide (CO₂) concentrations were recorded at 0.8% in BH101-BH101A on the sixth monitoring visit. Gas flow was recorded at a maximum peak flow rate of 13.8 l/hr and a maximum steady state flow rate of 2.2l/hr in WS101 on the sixth visit.

8.2 Ground Gas Assessment

The Conceptual Site Model presented in *Section 2.7* highlighted the Made Ground as a potential source of ground gas generation. The report suggests no records of organic rich drift deposits (e.g. peat) being present however, or historic or active landfills within close proximity to the site, however there is filled land within 250m of the site, the closest 35m south of the site in relation to the infill of a small pond. 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 were encountered to a maximum depth of 1.30m bgl. The ground investigation revealed ground model generally consistent with the preliminary conceptual site model. The natural deposits encountered were exclusively Glacial Till.

In accordance with BS8485:2015 (Ref. 20) consideration of the recorded soil gas flow rates, presented below, 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. For a 'representative' scenario (highest hazardous gas flow rate that is realistically possible, i.e. in a single borehole) steady state flow rates and maximum gas concentrations are adopted, whilst for a 'worst case' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) peak flows and gas concentrations are adopted.

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 0.0022 l/hr for carbon dioxide where maximum steady state readings were used. Methane was recorded below the limit of detection.

Evaluation of the 'worst case' scenario (highest Q_{hg} across the entire dataset irrespective of location and discrete monitoring events) records a maximum Q_{hg} of 0.011 l/hr for carbon dioxide maximum steady state readings were used. Methane was recorded below the limit of detection.

Given the completed data set from across the site, with ground gas monitoring completed on six occasions over a period of six weeks and varying atmospheric conditions, the 'representative' Q_{hg} scenario is deemed representative and has been adopted as the sites GSVs. The hazardous gas flow rates for both carbon dioxide and methane indicates a CS1 classification on site.

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.

9.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented *Section 2.7* and discussed in *Section 2.0* 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.

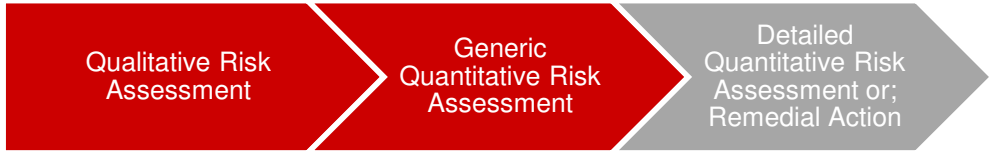
The CSM follows the framework outlined within CIRIA C552 (Ref. 22) which is summarised within *Appendix G*.

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 Unexploded Ordnance is discussed and assessed in *Section 2.5*.

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*.

Phase 2 Ground Investigation



- 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.
- In the absence of specific site data, a Generic Quantitative Risk Assessment is invariably recommended.

Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	Pathway(s)	Receptor(s)	Consequence	Likelihood of Occurrence	Risk Rating		
No potential sources of contamination identified.	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation (indoor & outdoor air)	Commercial end users	Medium Human Health Risk	Unlikely	Low	No exceedances in the Made Ground and natural when compared to Commercial end-use thresholds.	No further action required.
		Construction and maintenance workers				No exceedances identified within SVOC, VOC or speciated PCB test results.	
	Soil dust ingestion/inhalation produced during construction	Adjacent residents				No suspected asbestos containing materials (ACMs) were identified within any of the exploratory hole logs or laboratory screening.	
	Vertical and horizontal migration of soluble phase contamination through groundwater.	Controlled Waters (Surface Water) Nearest surface water feature is River Irk 464m east	Mild	Unlikely	Very Low	No evidence of free product or gross contamination was evident during the ground investigation. Significant distance for contamination to migrate to reach the River Irk.	No further action required.
	Vertical and horizontal migration of soluble phase contamination through superficial deposits and bedrock.	Controlled Waters (Groundwater) Secondary Undifferentiated Aquifer (Superficial) Principal Aquifer (Bedrock)	Medium	Unlikely	Low	No evidence of free product or gross contamination was evident during the ground investigation. Not within a Source Protection Zone (SPZ). Considering the low permeability of the underlying ground conditions (Glacial Till) this SPR linkage likelihood is considered unlikely.	
Potential ground gas generation from Made Ground containing organic/putrescible content on site and off site.	Ground gas & vapour migration and inhalation. Vertical and horizontal migration through existing service corridors and the underlying superficial deposits.	Site End Users	Medium Human Health Risk	Unlikely	Low	Using the 'borehole Q _{hg} / 'representative' scenario, due to a full data set within varying pressures, the calculated Q _{hg} for the site was -0.036 l/hr for carbon dioxide. Methane was recorded below the limit of detection. Characteristic Gas Situation is assessed as CS1 no gas protection measures are required in accordance with BS8485.	No further action required.

9.1 Summary of Significant Pollutant Linkages

A **Low** risk rating is identified to site end-users and construction workers, from soils and dust from inhalation and ingestion. No further action is required.

A **Low** and **Very Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) following the ground investigation, where no major sources of contamination were identified and limited pathways due to low permeability superficial deposits and the significant distance to nearest surface water feature.

A **Low** risk rating is identified to site end users from ground gases arising from Made Ground and natural soils migrating into buildings and subsequent inhalation by on-site employees. This corresponds to a Characteristic Gas Situation assessed as CS1, therefore no gas protection measures are required.

10.0 Geotechnical Assessment and Recommendations

10.1 Introduction

This section will discuss the ground and groundwater conditions encountered across the site and assess their associated risks for the proposed scope of the works. The proposed development is included in *Appendix A* and comprises an offsite manufactured four storey modular building for use of temporary office accommodation. A Finished Floor Level of approximately 75.3m AOD is proposed.

It must be noted that at the time of writing this report, the structural details and loadings have not been provided. As such, any changes in the development of designs beyond the issue of this Ground Investigation Report to the client, should be further investigated by the Construction Designer.

10.2 Geotechnical Considerations

Presence of existing services

The presence of existing services may require capping and/or diversion associated with the development, which should be managed through the appropriate utility suppliers during the construction phase. The Principal Contractor should ensure that appropriate mitigation measures are put in place during the construction phase (i.e. during excavation of foundations).

Variable Made Ground

Made Ground was encountered in all of the exploratory hole locations from ground level to depths of between 0.80m and 1.30m bgl across the site. The Made Ground should not be considered as a suitable founding stratum.

Presence of low strength natural deposits

Low strength deposits of cohesive till and very loose deposits of granular till were encountered during intrusive investigation works to depths of approximately 3m below current ground level (approx. 71m AOD).

Based on the proposed development engineering levels and likely loadings it is unlikely the near surface deposits of till would be considered a suitable foundation stratum without ground improvement. This is described in Foundations Options section below.

Foundation Options

Based on the ground and groundwater conditions encountered in the exploratory holes, it is considered that it will not currently be possible to support the proposed development on conventional spread foundations as such foundations would need to be taken down below any Made Ground and weak superficial soils and be placed in the medium dense till deposits which were encountered at depths of

at least 3.00m below existing ground level in the exploratory holes (71m AOD). Excavations would also have to be carried out through the shallow groundwater below the site present at depths of between 73 to 74 mAOD which would further reduce any allowable bearing capacity for these soils (Meyerhof (1956) and Craig (2004).

Therefore it is recommended at this stage that consideration be given to the following options:

- Improvement of bearing capacity of the ground by ground improvement using vibro compaction / replacement techniques prior to foundation construction. Following ground improvement adopt ground bearing floor slabs and shallow foundations.
- Excavate near surface soils and replace with a structural fill (6N/6P) and found structure on a raft foundation. This will require design by a competent structural engineer will require a full geotechnical analysis and further testing to analyse the potential for total and differential settlements across the structure. Groundwater management may be required for excavations for a raft foundation and if internal column loads are locally high this option is likely to be unfavourable;
- Excavate and remove buried foundations, structures and obstructions. Support building structures on piled foundations.

In view of the above, and subject to confirmation of building loads, piled foundations may be considered the best option to take the load of the structure to suitable bearing soils at depth. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

It is considered likely that bored/Continuous Flight Auger (CFA) piles would be the most suitable piling technique for this site. This suggestion does not however preclude the consideration of other pile types being used.

It is important to note that the specific pile design will depend on a number of factors including the particular details of the piling system to be adopted. The advice of a specialist piling contractor should be sought such that the final design of the piles can be undertaken and the suitability of the particular piling system can be considered. All information relating to the site should be provided to the piling contractor including historical drawings.

10.3 Ground Floor Slabs

No ground floor slabs are proposed for the proposed temporary office accommodation development.

10.4 Chemical Attack on Buried Concrete

The site has been classified in accordance with BRE Special Digest 1 (Ref. 17) and laboratory testing undertaken accordingly in *Section 7.0*. Based on the laboratory test results it is considered that a Design

Sulphate Class may be taken as DS-1 with an ACEC class of AC-1 for both the Made Ground and the Glacial Till.

10.5 Excavation and Support

Observations during the intrusive works and subsequent monitoring indicate that a shallow groundwater table is present below the site at levels of between 73 to 74 mAOD, close to the proposed FLL of 75.30m AOD. Groundwater is therefore considered likely to be encountered during shallow excavations below the site and any excavations for foundations and services are likely to require close side support in the short term.

The chosen contractor should provide details on how they intend to ensure the safety and stability of proposed excavations.

In accordance with Health and Safety Regulations, side support for safety purposes should be provided to all excavations which appear unstable and those more than 1.20m deep. Excavations shallower than 1.20m deep, requiring personnel access, will require closed side support.

11.0 Geo-environmental Conclusions & Recommendations

11.1 Conclusions

11.1.1 Ground and Groundwater Contamination

The environmental chemistry soil results have been compared with the Generic Assessment Criteria (GAC) for soils with respect to human health against '*Commercial*' thresholds.

With respect to the proposed end-use of the site no exceedances have been noted with respect to the GAC thresholds. No suspected asbestos containing materials (ACMs) were identified within any of the exploratory hole logs or during laboratory screening.

A **Low** risk rating is identified to site end-users and construction workers, from soils during inhalation and ingestion of soil or dust.

A **Low** risk rating is identified to controlled waters (Groundwater and Surface Waters) following the ground investigation, where no major sources of contamination were identified and limited pathways due to low permeability superficial deposits and the significant distance to nearest surface water feature.

During the ground gas monitoring programme methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells.

Maximum carbon dioxide (CO₂) concentrations were recorded at 0.6% in BH101-BH101A on the first monitoring visit. Gas flow was recorded at a maximum peak flow rate of -7.2 l/hr in BH101-BH101A on the second visit.

A Gas Screening Value of -0.036 l/hr for carbon dioxide was calculated. The site was classified as CS1.

A **Low** risk rating is identified to site end users from ground gases arising from Made Ground and natural soils migrating into buildings and subsequent inhalation by on-site employees. This corresponds to a Characteristic Gas Situation assessed as CS1, therefore no gas protection measures are required.

11.2 Recommendations

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

- 1) It is recommended that specialist piling contractors are to be consulted to establish suitable pile design.

- 2) 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.
- 3) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer.

12.0 References

1. Curtins (2020) *Phase 1 Preliminary Risk Assessment, Decant Village, NMGH*, Ref. 075805-CUR-00-XX-RP-GE-001-V02 dated August 2020.
2. British Geological Survey (BGS) 1:50,000 (Solid and Drift Edition, Sheet No. 085, 2011) for Manchester
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4. Zetica Regional Unexploded Bomb Risk, Risk Map, <https://zeticauxo.com/downloads-and-resources/risk-maps/> (accessed August 2020).
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7. British Standards Institution BSI (2015+2000) *Code of Practice for Site Investigations* (report no. BS5930).
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9. British Standard (2016) *Methods of test for soils for civil engineering purposes. General requirements and sample preparation* (report no. BS1377-1).
10. British Standard Institution BSI (2020) *Code of Practice for Foundations* (report no. BS8004).
11. Stroud, M. a. B. F. (1975) *The Standard Penetration Test and the Engineering Properties of Glacial Materials*.
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13. Gibson, R. E. (1953) *Experimental Determination of the True Cohesion and True Angle of Internal Friction in Clays*.
14. N A Trenter (1999) *Engineering in Glacial Tills*.
15. ICE (2012) *Manual of Geotechnical Engineering*.
16. Peck et al (1967) *Soil Mechanics in Engineering Practice*.
17. Building Research Establishment (2005) *Concrete in Aggressive Ground (Special Digest 1)*.
18. Department of Environment Food and Rural Affairs (DEFRA). (2012) *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance* (report no. PB13735).
19. CIRIA (2007) *Assessing Risks Posed by Hazardous Ground Gases to Buildings* (report no. C665).
20. British Standards Institution (2015) *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings* (report no. BS8485:2015 +A1:2019).
21. S Wilson, G Card, S Haines (2009) *Ground Gas Handbook Cathness, Scotland*, Whittles Publishing.
22. CIRIA (2001) *Contaminated Land Risk Assessment. A guide to good practice* (report no. C552).
23. CITB (2015) *Construction (Design and Management) Regulations*.

Appendix A – Drawings

- Curtins (August 2020), *Exploratory Hole Location Plan for NMGH Site Plt 2 (Decant Village)*, ref. 075805-CUR-00-XX-DR-GE-80004-V01
- Development Plans:
 - 6512-SRA-E1-00-DR-A-20200-P02
 - 6512-SRA-E1-XX-DR-A-00004-P02

△ AX6
74.120



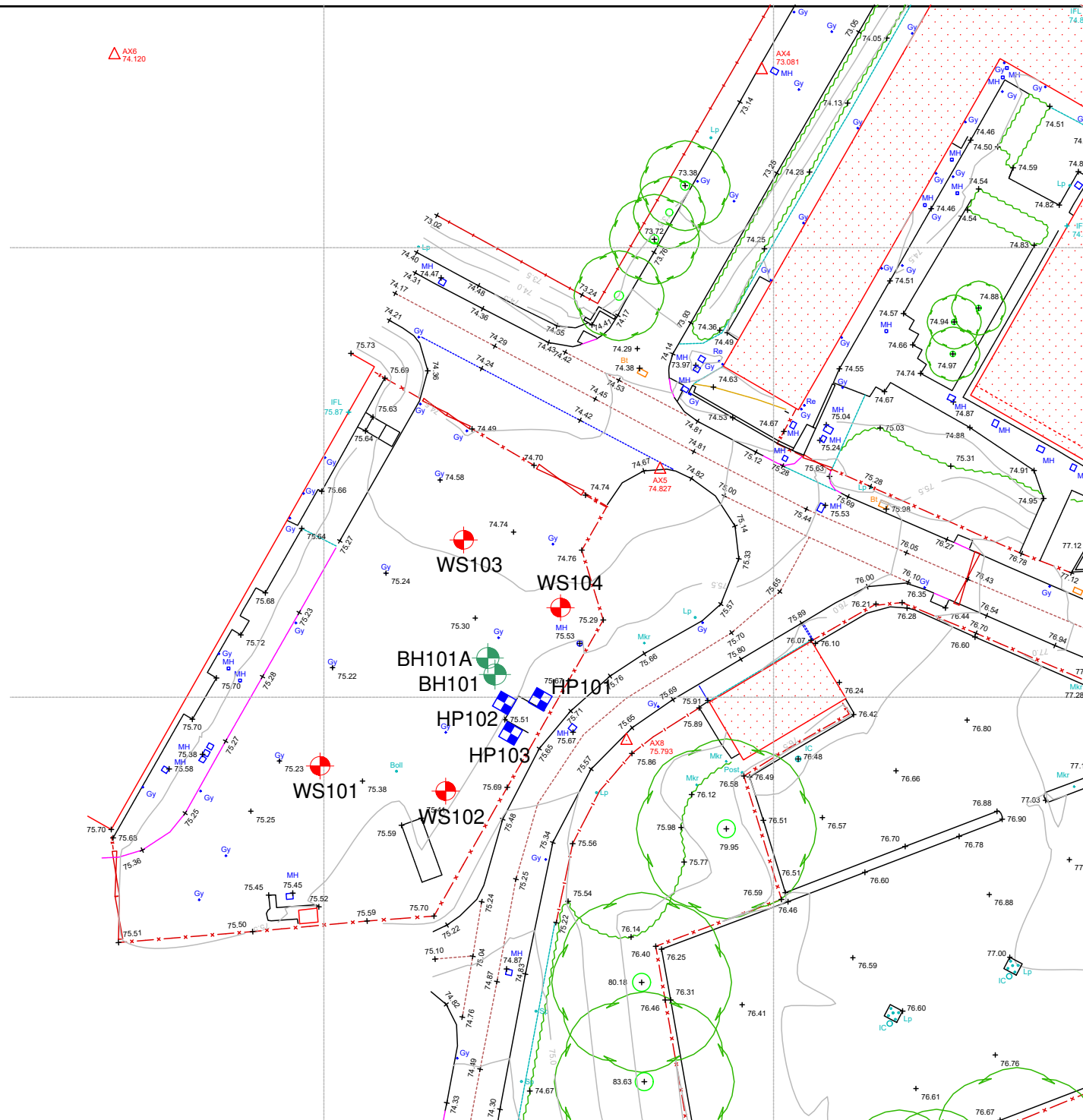
CABLE PERCUSSIVE BOREHOLE LOCATION



WINDOW SAMPLE BOREHOLE LOCATION



HAND EXCAVATED FOUNDATION PIT LOCATION



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:

NMGH SITE PLT 2 (DECANT VILLAGE)

Drg Title:

EXPLORATORY HOLE LOCATION PLAN

Scale:	Size:	First Issue:	Drawn:	Checked:
NTS	A3	28/08/2020	ZH	ZH

Drg No:	Rev:
075805-CUR-00-XX-DR-GE-80004	P01

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DO NOT SCALE FROM THIS DRAWING
The contractor shall check and verify all dimensions on site and report any discrepancies in writing to Sheppard Robson before proceeding work.

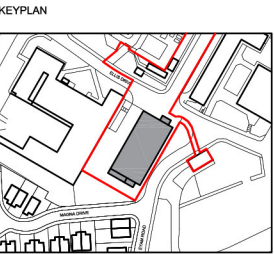
FOR ELECTRONIC DATA ISSUE
Electronic Data / drawings are issued as "read only" and should not be interrogated for measurement. All dimensions and levels should read, only from those values stated in text, on the drawing.

All levels subject to further coordination with Curtins and Modular Contractor

Key:

- Core
- Office
- Teapoint/Social
- Reception
- Plant

REV.	DATE	AMENDMENT
P01	03/08/20	FIRST ISSUE
P02	11/09/20	General Update, building moved 2m towards east boundary



CLIENT



bruntwood

SHEPPARD ROBSON

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PROJECT
6512 North Manchester General Hospital Masterplan

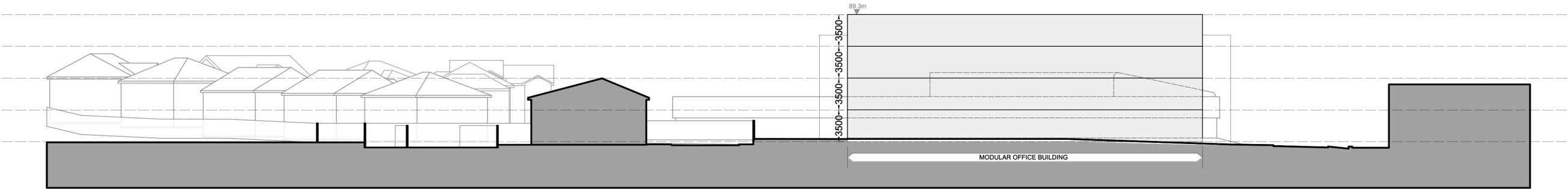
SCALE@A3	DATE	ORIGINATOR	CHECKED	AUTHORISED
1:200	01/08/20	SS	DB	AS

General Arrangement
Ground Floor Plan

Stage 2

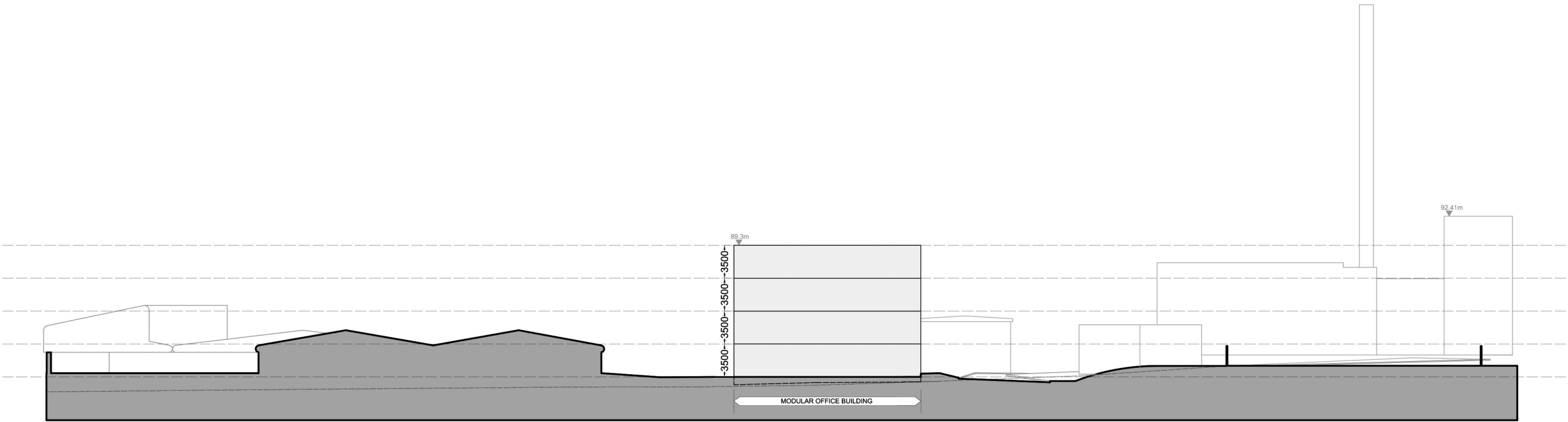
STATUS	PURPOSE FOR ISSUE	SR NO.
S2	For Information	6512
DRAWING NO.	REV.	
6512 - SRA - E1 - 00 - DR - A - 20200	P02	

Ground Floor Plan
1:200

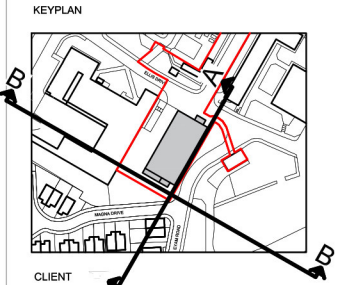


Site Section A-A
1:500

REV.	DATE	AMENDMENT
P01	05/08/20	FIRST ISSUE
P02	11/09/20	Modular building moved 2m closer to the east boundary



Site Section B-B
1:500



NHS
Manchester University
NHS Foundation Trust

bruntwood

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PROJECT
6512 North Manchester General Hospital Masterplan
SCALE@A3 DATE ORIGINATOR CHECKED AUTHORISED
1:500 01/08/20 SS DB AS

Site Sections

Stage 2				
STATUS	PURPOSE FOR ISSUE	SR NO.		
S2	For Information	6512		
DRAWING NO.		REV.		
6512 - SRA - E1 - XX - DR - A - 00004		P02		

Appendix B – Exploratory Hole Logs

- Cable Percussive Borehole with Rotary Open-hole Follow-on Log
- Window Sample Borehole Logs
- Foundation Pit Logs



Borehole Log

Borehole No.
BH101-BH101A
Sheet 1 of 6
Hole Type
CP
Scale
1:40
Logged By
ZH

Project Name: Decant Village

Project No.
075805

Co-ords: 384819.65 - 402104.15

Location: North Manchester General Hospital

Level: 75.37

Client: North Manchester General Hospital

Dates: 10/08/2020 - 13/08/2020

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	75.27		MADE GROUND: Black tarmacadam.	
		0.30			0.30	75.07		MADE GROUND: Dark greyish brown very gravelly fine to coarse sand. Gravel is angular to subangular fine to coarse of concrete and dolomite hardcore.	
		0.55 - 0.60	ES		0.55	74.82		MADE GROUND: Light brown sandy angular to subangular fine to coarse gravel of dolomite hardcore and concrete.	
		1.00			1.00	74.37		MADE GROUND: Black slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular fine to coarse of brick.	1
		1.20		N=8 (1,2/2,2,2,2)				Soft brown mottled black slightly gravelly very sandy CLAY. Sand is fine to coarse. Gravel is angular to subangular fine of sandstone.	
		1.20 - 1.65	D						
		2.00	B						
		2.00	U						
		2.00 - 2.10	ES	Ublow=21					2
		2.50	D						
		3.00	B						
		3.00	D	N=11 (2,3/3,2,3,3)				From 3.00 to 3.45m firm.	3
		3.00 - 3.50			3.45	71.92		Loose brown slightly gravelly very clayey fine to coarse SAND. Gravel is angular to subangular fine to medium of sandstone.	
		4.00	B						4
		4.00	D	N=13 (4,4/3,4,3,3)					
		4.00 - 4.45							
		5.00		N=20 (4,4/5,4,5,6)					5
		5.00 - 5.45	D						
		6.00		N=23 (5,5/6,5,6,6)					6
		6.50 - 6.95	D						7
		8.00		N=21 (6,5/6,6,5,4)					8

Continued on next sheet

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl. Groundwater encountered at 11.50m and at 18.50m. From 11.00 to 12.50m unable to record SPTs due to recovery of material. Open hole from 20.00m.





Borehole Log

Borehole No.
BH101-BH101A

Sheet 2 of 6

Hole Type
CP

Scale
1:40

Logged By
ZH

Project Name: Decant Village

Project No.
075805

Co-ords: 384819.65 - 402104.15

Location: North Manchester General Hospital

Level: 75.37

Client: North Manchester General Hospital

Dates: 10/08/2020 - 13/08/2020

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		8.00 - 8.45	D	N=23 (6,6/6,6,5,6)	8.90	66.47			9
		9.50 9.50 - 9.95	D						
		10.50	B				11.00	64.37	
			Soft greyish brown thinly laminated slightly sandy SILT. Sand is fine.	11					
				12					
				13					
				13.80 14.00 - 14.45	D U	Ublow=56		13.80	61.57
		14.50	D	15					
		15.50 15.50 - 15.95	D	N=25 (,6/25 for 225mm)					
		Continued on next sheet							

Continued on next sheet

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl. Groundwater encountered at 11.50m and at 18.50m. From 11.00 to 12.50m unable to record SPTs due to recovery of material. Open hole from 20.00m.





Borehole Log

Borehole No.
BH101-BH101A

Sheet 3 of 6

Hole Type
CP

Scale
1:40

Logged By
ZH

Project Name: Decant Village

Project No.
075805

Co-ords: 384819.65 - 402104.15

Location: North Manchester General Hospital

Level: 75.37

Client: North Manchester General Hospital

Dates: 10/08/2020 - 13/08/2020

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		17.00 - 17.45	U						17
		17.50	D						18
		18.50		50 (0,0/50 for 160mm)					19
		18.50 - 18.95	D						20
		20.00	D	N=31 (3,4/4,9,9,9)					21
		20.00							22
		21.00	D	N=50 (4,7/9,12,14,15)					23
		21.00							24
		22.00		N=50 (0,7/50 for 233mm)					
		23.00	D	N=50 (3,6/50 for 290mm)					
		23.00							
		24.00	D						

From 16.80m very stiff.

Continued on next sheet

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl. Groundwater encountered at 11.50m and at 18.50m. From 11.00 to 12.50m unable to record SPTs due to recovery of material. Open hole from 20.00m.





Borehole Log

Borehole No.
BH101-BH101A

Sheet 4 of 6

Hole Type
CP

Scale
1:40

Logged By
ZH

Project Name: Decant Village

Project No.
075805

Co-ords: 384819.65 - 402104.15

Location: North Manchester General Hospital

Level: 75.37

Client: North Manchester General Hospital

Dates: 10/08/2020 - 13/08/2020

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		24.00		N=47 (5,5/47 for 273mm)					
		25.00		N=46 (5,9/9,11,11,15)					25
									26
									27
									28
									29
									30
									31
									32

Continued on next sheet

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl. Groundwater encountered at 11.50m and at 18.50m. From 11.00 to 12.50m unable to record SPTs due to recovery of material. Open hole from 20.00m.



Borehole Log

Borehole No.
BH101-BH101A

Sheet 5 of 6

Project Name: Decant Village

Project No.	075805
-------------	--------

Co-ords: 384819.65 - 402104.15

Hole Type
CP

Location: North Manchester General Hospital

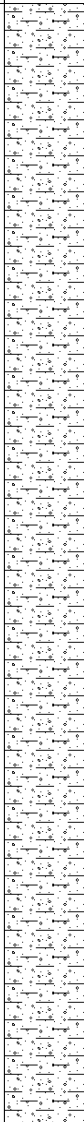
Level:	75.37
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Scale
1:40

Client: North Manchester General Hospital

Dates: 10/08/2020 - 13/08/2020

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
					38.00	37.37			33		
									34		
									35		
									36		
									37		
										Greyish brown fine to coarse SAND.	38
											39
											40

Continued on next sheet

Remarks	
---------	--

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl.
Groundwater encountered at 11.50m and at 18.50m. From 11.00 to 12.50m unable to record SPTs due to recovery of material. Open hole from 20.00m.





Borehole Log

Borehole No.
BH101-BH101A
Sheet 6 of 6
Hole Type
CP
Scale
1:40
Logged By
ZH

Project Name: Decant Village

Project No.
075805

Co-ords: 384819.65 - 402104.15

Location: North Manchester General Hospital

Level: 75.37

Client: North Manchester General Hospital

Dates: 10/08/2020 - 13/08/2020

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					42.00	33.37		End of borehole at 42.00 m	41 42 43 44 45 46 47 48

Remarks
GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl. Groundwater encountered at 11.50m and at 18.50m. From 11.00 to 12.50m unable to record SPTs due to recovery of material. Open hole from 20.00m.





Trial Pit Log

Trialpit No

HP101

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805Co-ords: -
Level: 75.67Date
26/08/2020

Location: North Manchester General Hospital

Dimensions
(m):

0.3

0.35

Depth
1.20Scale
1:20Logged
ZH

Client: North Manchester General Hospital

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.10	75.57		MADE GROUND: Black tarmacadam.	
							MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolomite hardcore. Sand is fine to coarse.	
				0.50	75.17		MADE GROUND: Dark greyish black slightly sandy slightly clayey angular to subangular fine to medium gravel of brick, ash and rare coal fragments. Sand is fine to coarse. <i>From 0.70m low cobble content. Cobbles are angular to subangular of brick.</i>	
				1.05	74.62		Firm grey slightly sandy SILT. Sand is fine to coarse.	1
				1.20	74.47		End of pit at 1.20 m	2
								3
								4

Remarks: Service clearance with CAT Scanner prior to progression of exploratory hole. Groundwater encountered at 1.20m bgl.

Stability: Stable.





Trial Pit Log

Trialpit No

HP102

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805Co-ords: -
Level: 75.51Date
26/08/2020

Location: North Manchester General Hospital

Dimensions
(m):

0.35

Depth
1.25

0.4

Scale
1:20Logged
ZH

Client: North Manchester General Hospital

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.10	75.41		MADE GROUND: Black tarmacadam.	
							MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolomite hardcore. Sand is fine to coarse.	
				0.45	75.06		MADE GROUND: Dark greyish black slightly sandy slightly clayey angular to subangular fine to medium gravel of brick and ash. Sand is fine to coarse.	
				1.00	74.51		Firm grey slightly sandy SILT. Sand is fine to medium.	1
				1.25	74.26		End of pit at 1.25 m	4

Remarks: Service clearance with CAT Scanner prior to progression of exploratory hole.

Stability: Stable.





Trial Pit Log

Trialpit No

HP103

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805Co-ords: -
Level: 75.55Date
26/08/2020

Location: North Manchester General Hospital

Dimensions
(m):

0.3

Client: North Manchester General Hospital

Depth
1.20

0.4

Scale
1:20Logged
ZH

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10	75.45		MADE GROUND: Black tarmacadam.
							MADE GROUND: Grey sandy angular to subangular fine to coarse gravel of dolomite hardcore with low cobble content. Sand is fine to coarse. Cobbles are subangular of concrete.
				0.45	75.10		MADE GROUND: Dark grey very clayey slightly sandy angular to subangular fine to coarse gravel of dolomite hardcore, concrete, slate and brick. Sand is fine to coarse. <i>At 0.60m subangular boulder of concrete.</i>
				1.10	74.45		Firm grey slightly sandy SILT. Sand is fine to medium.
				1.20	74.35		End of pit at 1.20 m

Remarks: Service clearance with CAT Scanner prior to progression of exploratory hole.

Stability: Stable.





Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805

Co-ords: 384804.58 - 402096.86

Hole Type
WS

Location: North Manchester General Hospital

Level: 75.33

Scale
1:50

Client: North Manchester General Hospital

Dates: 13/08/2020 - 13/08/2020

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	75.22		MADE GROUND: Black tarmacadam.	
		0.40			0.40	74.92		MADE GROUND: Grey very sandy angular to subangular fine to coarse gravel of dolomite hardcore and concrete with low cobble content. Sand is fine to coarse. Cobbles are angular of dolomite hardcore and concrete.	
		0.80 - 0.90	ES					MADE GROUND: Dark brownish grey slightly sandy clayey angular to subangular fine to coarse gravel of dolomite hardcore. Sand is fine to coarse.	1
		1.20		N=7 (0 for 75mm/1,1,2,3)	1.30	74.03		Medium dense brown fine to coarse SAND. From 1.60 to 1.80m slightly clayey.	
		1.80 - 1.90	ES		1.80	73.53		Firm blackish brown organic SILT.	2
		2.00		N=10 (2,/1,2,3,4)	2.10	73.22		Medium dense greyish brown clayey fine to coarse SAND.	
		2.50	D					From 2.50 to 2.70m very clayey.	
		3.00		N=23 (4,6/8,5,6,4)					3
		3.00 - 3.50	B						
		4.00		N=16 (3,4/4,3,5,4)					4
		5.00		50 (5,9/50 for 225mm)				From 5.00 to 5.45m very dense.	5
					5.45	69.88		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl.





Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805

Co-ords: 384812.05 - 402089.46

Hole Type
WS

Location: North Manchester General Hospital

Level: 75.41

Scale
1:50

Client: North Manchester General Hospital

Dates: 13/08/2020 - 13/08/2020

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	75.31		MADE GROUND: Black tarmacadam.	
		0.40			0.40	75.01		MADE GROUND: Grey very sandy angular to subangular fine to coarse gravel of dolomite hardcore and concrete with low cobble content. Sand is fine to coarse. Cobbles are angular of dolomite hardcore and concrete.	
		0.80			0.80	74.61		MADE GROUND: Dark brownish grey slightly sandy clayey angular to subangular fine to coarse gravel of dolomite hardcore. Sand is fine to coarse.	1
		1.20		N=2 (1,0/0,0,1,1)				Loose brownish grey clayey fine to coarse SAND.	
		2.00		N=8 (1,1,2,2,3)					2
		2.30			2.30	73.11		Firm brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of sandstone.	
		3.00		N=23 (1,2/3,4,8,8)	3.00	72.41		Medium dense brown clayey fine to coarse SAND.	3
		3.50 - 4.00	B						
		4.00		N=37 (4,10/7,9,10,11)				From 4.00 to 5.45m dense.	4
		5.00		N=35 (6,7/7,10,8,10)					5
		5.45			5.45	69.96		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl.





Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805

Co-ords: 384817.09 - 402119.31

Hole Type
WS

Location: North Manchester General Hospital

Level: 74.77

Scale
1:50

Client: North Manchester General Hospital

Dates: 13/08/2020 - 13/08/2020

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	74.67		MADE GROUND: Black tarmacadam.	
		0.30			0.30	74.47		MADE GROUND: Black and grey very sandy angular to subangular fine to coarse gravel of brick and dolomite hardcore. Sand is fine to coarse.	
		0.80			0.80	73.97		MADE GROUND: Dark greyish brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick and dolomite hardcore.	1
		1.20		N=3 (1,0/0,1,1,1)				Loose brown slightly clayey fine to coarse SAND.	
		1.50 - 2.00	B						
		2.00		N=2 (1,0/1,0,0,1)				From 1.80 to 2.00m very clayey.	2
								From 2.00 to 5.45m medium dense.	
		3.00		N=39 (4,8/10,9,10,10)				From 3.00 to 4.00m dense.	3
		4.00							
		4.00	D	N=13 (3,2/2,4,4,3)				From 4.00 to 5.00m medium dense.	4
		5.00		N=46 (3,7/46 for 251mm)				From 5.00 to 5.45m very dense.	5
					5.45	69.32		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl.





Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Decant Village

Project No.
075805

Co-ords: 384828.54 - 402111.14

Hole Type
WS

Location: North Manchester General Hospital

Level: 75.07

Scale
1:50

Client: North Manchester General Hospital

Dates: 13/08/2020 - 13/08/2020

Logged By
ZH

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES	N=6 (1,1/1,2,1,2)	0.10	74.97		MADE GROUND: Black tarmacadam.	
		0.35			0.35	74.72		MADE GROUND: Brownish grey very sandy angular to subangular fine to coarse gravel of brick and dolomite hardcore with low cobble content. Sand is fine to coarse. Cobbles are subangular of dolomite hardcore.	
		0.70 - 0.80			0.90	74.17		MADE GROUND: Dark reddish brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subangular fine to coarse of brick, porcelain and dolomite hardcore.	
		1.20	B	N=23 (7,6/5,6,6,6)				Medium dense to dense brown slightly gravelly fine to coarse SAND. Gravel is angular to subangular fine of sandstone.	
		2.00						From 0.90 to 2.50m loose.	
		3.00							
		3.50 - 4.00							
		4.00							
		5.00							
		5.45			5.45	69.62		End of borehole at 5.45 m	

Remarks

GPR service clearance prior to progression of exploratory hole. Service clearance pit hand excavated to 1.20m bgl.



Appendix C – Chemical Laboratory Testing Results

- Envirolab, Environmental Chemistry Analysis Results, Soils
 - Final Analytical Test Report Ref. 20/06681-2
 - Final Analytical Test Report Ref. 20/06773-3

FINAL ANALYTICAL TEST REPORT SUPPLEMENT TO TEST REPORT 20/06681/1

Amendments: Request for split report

Envirolab Job Number: 20/06681
Issue Number: 2

Date: 03 September, 2020

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

Project Manager: Rob Allen/Zoe Henderson
Project Name: Decant Village
Project Ref: B075805
Order No: EBMA2484
Date Samples Received: 12/08/20
Date Instructions Received: 13/08/20
Date Analysis Completed: 21/08/20

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
% Stones >10mm _A	5.4	0.4						% w/w	0.1	A-T-044
pH _D ^{M#}	7.37	7.17						pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.05	0.08						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#}	14.4	3.5						% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	26	8						mg/kg	1	A-T-024s
Boron (water soluble) _D	1.4	<1.0						mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.7	0.9						mg/kg	0.5	A-T-024s
Copper _D ^{M#}	131	32						mg/kg	1	A-T-024s
Chromium _D ^{M#}	19	17						mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1						mg/kg	1	A-T-040s
Lead _D ^{M#}	155	55						mg/kg	1	A-T-024s
Mercury _D	0.39	<0.17						mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	53	21						mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1						mg/kg	1	A-T-024s
Zinc _D ^{M#}	134	58						mg/kg	5	A-T-024s

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
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: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
PAH-16MS										
Acenaphthene _A ^{M#}	0.08	<0.01						mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.02	<0.01						mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.19	<0.02						mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.93	<0.04						mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.96	<0.04						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	1.25	<0.05						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.62	<0.05						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.39	<0.07						mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	1.04	<0.06						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.14	<0.04						mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.78	<0.08						mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.07	<0.01						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.70	<0.03						mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.05	<0.03						mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.82	<0.03						mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.72	<0.07						mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	10.8	<0.08						mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
Speciated PCB-EC7 & WHO12										
PCB BZ 28 _A	<0.002	-						mg/kg	0.002	A-T-004s
PCB BZ 52 _A ^{M#}	<0.002	-						mg/kg	0.002	A-T-004s
PCB BZ 81 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 101 _A ^{M#}	<0.004	-						mg/kg	0.004	A-T-004s
PCB BZ 105 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 114 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 118 _A ^{M#}	<0.007	-						mg/kg	0.007	A-T-004s
PCB BZ 123 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 126 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 138 _A ^{M#}	<0.006	-						mg/kg	0.006	A-T-004s
PCB BZ 153 _A ^{M#}	<0.004	-						mg/kg	0.004	A-T-004s
PCB BZ 156 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 157 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 167 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 169 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 180 _A ^{M#}	<0.004	-						mg/kg	0.004	A-T-004s
PCB BZ 189 _A	<0.005	-						mg/kg	0.005	A-T-004s
PCB BZ 77 _A	<0.005	-						mg/kg	0.005	A-T-004s
Total Speciated PCB-EC7 & WHO12 _A	<0.007	-						mg/kg	0.002	A-T-004s

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
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	2	<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#}	2	<1						mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	4	<1						mg/kg	1	A-T-055s
Ali >C21-C35 _A	13	5						mg/kg	1	A-T-055s
Total Aliphatics _A	23	5						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	4	<1						mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	2	<1						mg/kg	1	A-T-055s
Aro >C12-C16 _A	8	<1						mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	19	4						mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	67	7						mg/kg	1	A-T-055s
Total Aromatics _A	100	11						mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	123	16						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

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2								
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
SVOC										
Hexachlorobenzene _A	<100	-						µg/kg	100	A-T-052s
Diethyl phthalate _A	<100	-						µg/kg	100	A-T-052s
Dimethyl phthalate _A	<100	-						µg/kg	100	A-T-052s
Dibenzofuran _A	<100	-						µg/kg	100	A-T-052s
Carbazole _A	<100	-						µg/kg	100	A-T-052s
Butylbenzyl phthalate _A	<100	-						µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate _A	<500	-						µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane _A	<100	-						µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether _A	<100	-						µg/kg	100	A-T-052s
4-Nitrophenol _A	<100	-						µg/kg	100	A-T-052s
3+4-Methylphenol _A	<100	-						µg/kg	100	A-T-052s
4-Chloro-3-methylphenol _A	<100	-						µg/kg	100	A-T-052s
2-Nitrophenol _A	<100	-						µg/kg	100	A-T-052s
2-Methylphenol _A	<100	-						µg/kg	100	A-T-052s
2-Chlorophenol _A	<100	-						µg/kg	100	A-T-052s
2,6-Dinitrotoluene _A	<100	-						µg/kg	100	A-T-052s
2,4-Dinitrotoluene _A	<100	-						µg/kg	100	A-T-052s
2,4-Dimethylphenol _A	<100	-						µg/kg	100	A-T-052s
2,4-Dichlorophenol _A	<100	-						µg/kg	100	A-T-052s
2,4,6-Trichlorophenol _A	<100	-						µg/kg	100	A-T-052s
2,4,5-Trichlorophenol _A	<100	-						µg/kg	100	A-T-052s
2-Chloronaphthalene _A	<100	-						µg/kg	100	A-T-052s
2-Methylnaphthalene _A	<100	-						µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether _A	<100	-						µg/kg	100	A-T-052s
Phenol _A	<100	-						µg/kg	100	A-T-052s
Pentachlorophenol (SVOC) _A	<100	-						µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine _A	<100	-						µg/kg	100	A-T-052s
n-Diethylphthalate _A	<500	-						µg/kg	500	A-T-052s
n-Dibutylphthalate _A	<100	-						µg/kg	100	A-T-052s
Nitrobenzene _A	<100	-						µg/kg	100	A-T-052s
Isophorone _A	<100	-						µg/kg	100	A-T-052s
Hexachloroethane _A	<100	-						µg/kg	100	A-T-052s

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
Hexachlorocyclopentadiene _A	<100	-						µg/kg	100	A-T-052s
Perylene _A	303	-						µg/kg	100	A-T-052s

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
VOC										
Dichlorodifluoromethane _A	<1	-						µg/kg	1	A-T-006s
Chloromethane _A	<10	-						µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene) _A [#]	<1	-						µg/kg	1	A-T-006s
Bromomethane _A [#]	<1	-						µg/kg	1	A-T-006s
Chloroethane _A [#]	<1	-						µg/kg	1	A-T-006s
Trichlorofluoromethane _A [#]	<1	-						µg/kg	1	A-T-006s
1,1-Dichloroethene _A [#]	<1	-						µg/kg	1	A-T-006s
Carbon Disulphide _A [#]	<1	-						µg/kg	1	A-T-006s
Dichloromethane _A	<10	-						µg/kg	5	A-T-006s
trans 1,2-Dichloroethene _A [#]	<1	-						µg/kg	1	A-T-006s
1,1-Dichloroethane _A [#]	<1	-						µg/kg	1	A-T-006s
cis 1,2-Dichloroethene _A [#]	<1	-						µg/kg	1	A-T-006s
2,2-Dichloropropane _A [#]	<1	-						µg/kg	1	A-T-006s
Bromochloromethane _A [#]	<5	-						µg/kg	5	A-T-006s
Chloroform _A [#]	<1	-						µg/kg	1	A-T-006s
1,1,1-Trichloroethane _A [#]	<1	-						µg/kg	1	A-T-006s
1,1-Dichloropropene _A [#]	<1	-						µg/kg	1	A-T-006s
Carbon Tetrachloride _A [#]	<1	-						µg/kg	1	A-T-006s
1,2-Dichloroethane _A [#]	<2	-						µg/kg	2	A-T-006s
Benzene _A [#]	<1	-						µg/kg	1	A-T-006s
Trichloroethene _A [#]	<1	-						µg/kg	1	A-T-006s
1,2-Dichloropropane _A [#]	<1	-						µg/kg	1	A-T-006s
Dibromomethane _A [#]	<1	-						µg/kg	1	A-T-006s
Bromodichloromethane _A [#]	<10	-						µg/kg	10	A-T-006s
cis 1,3-Dichloropropene _A [#]	<1	-						µg/kg	1	A-T-006s
Toluene _A [#]	<1	-						µg/kg	1	A-T-006s
trans 1,3-Dichloropropene _A [#]	<1	-						µg/kg	1	A-T-006s
1,1,2-Trichloroethane _A [#]	<1	-						µg/kg	1	A-T-006s
1,3-Dichloropropane _A [#]	<1	-						µg/kg	1	A-T-006s
Tetrachloroethene _A [#]	<1	-						µg/kg	1	A-T-006s
Dibromochloromethane _A [#]	<3	-						µg/kg	3	A-T-006s
1,2-Dibromoethane _A [#]	<1	-						µg/kg	1	A-T-006s

Envirolab Job Number: 20/06681

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06681/1	20/06681/2						Units	Limit of Detection	Method ref
Client Sample No	ES1	ES4								
Client Sample ID	BH101	BH101								
Depth to Top	0.55	2.00								
Depth To Bottom	0.60	2.10								
Date Sampled	10-Aug-20	10-Aug-20								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6ABE	5A								
Chlorobenzene _A [#]	<1	-						µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane _A	<1	-						µg/kg	1	A-T-006s
Ethylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
m & p Xylene _A [#]	<1	-						µg/kg	1	A-T-006s
o-Xylene _A [#]	<1	-						µg/kg	1	A-T-006s
Styrene _A [#]	<1	-						µg/kg	1	A-T-006s
Bromoform _A [#]	<1	-						µg/kg	1	A-T-006s
Isopropylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane _A	<1	-						µg/kg	1	A-T-006s
1,2,3-Trichloropropane _A [#]	<1	-						µg/kg	1	A-T-006s
Bromobenzene _A [#]	<1	-						µg/kg	1	A-T-006s
n-Propylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
2-Chlorotoluene _A [#]	<1	-						µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
4-Chlorotoluene _A [#]	<1	-						µg/kg	1	A-T-006s
tert-Butylbenzene _A [#]	<2	-						µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
sec-Butylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
4-Isopropyltoluene _A [#]	<1	-						µg/kg	1	A-T-006s
1,3-Dichlorobenzene _A	<1	-						µg/kg	1	A-T-006s
1,4-Dichlorobenzene _A [#]	<1	-						µg/kg	1	A-T-006s
n-Butylbenzene _A [#]	<1	-						µg/kg	1	A-T-006s
1,2-Dichlorobenzene _A [#]	<1	-						µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP) _A	<2	-						µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene _A	<3	-						µg/kg	3	A-T-006s
Hexachlorobutadiene _A [#]	<1	-						µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene _A	<3	-						µg/kg	3	A-T-006s

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:	20/06681
Project:	Decant Village	Date Received:	13/08/2020 (am)
Clients Project No:	B075805	Cool Box Temperatures (°C):	29.4

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 SUPPLEMENT TO TEST REPORT 20/06773/2

Amendments: Request for split report

Envirolab Job Number: 20/06773
Issue Number: 3

Date: 03 September, 2020

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

Project Manager: Rob Allen/Zoe Henderson
Project Name: Decant Village
Project Ref: B075805
Order No: EBMA2484
Date Samples Received: 14/07/20
Date Instructions Received: 17/08/20
Date Analysis Completed: 26/08/20

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:


Holly Neary-King
Client Services Supervisor

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
% Stones >10mm _A	0.9	17.5	16.5	<0.1	<0.1			% w/w	0.1	A-T-044
pH _D ^{M#}	7.59	7.45	7.13	6.56	7.77			pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01	0.03	<0.01	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#}	2.0	2.8	4.7	4.5	6.6			% w/w	0.1	A-T-032 OM
Arsenic _D ^{M#}	6	9	17	5	9			mg/kg	1	A-T-024s
Boron (water soluble) _D	<1.0	<1.0	<1.0	1.4	2.6			mg/kg	1	A-T-027s
Cadmium _D ^{M#}	0.9	0.7	0.9	0.7	1.0			mg/kg	0.5	A-T-024s
Copper _D ^{M#}	24	25	50	23	117			mg/kg	1	A-T-024s
Chromium _D ^{M#}	17	10	15	20	18			mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1			mg/kg	1	A-T-040s
Lead _D ^{M#}	36	48	104	44	81			mg/kg	1	A-T-024s
Mercury _D	0.31	0.21	0.20	<0.17	0.94			mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	20	15	26	19	39			mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	1			mg/kg	1	A-T-024s
Zinc _D ^{M#}	51	52	89	46	86			mg/kg	5	A-T-024s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
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: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	<0.01	0.03	<0.01	<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	<0.02	<0.02			mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	<0.04	0.14	<0.04	<0.04			mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	<0.04	0.13	<0.04	<0.04			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	<0.05	0.08	<0.05	<0.05			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	<0.05	0.07	<0.05	<0.05			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	<0.07	<0.07	<0.07			mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	<0.06	0.19	<0.06	<0.06			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#}	<0.08	<0.08	0.29	<0.08	<0.08			mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	0.03	<0.01	<0.01			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	<0.03	0.09	<0.03	<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#}	0.08	<0.03	0.28	<0.03	<0.03			mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.08	<0.07	0.31	<0.07	<0.07			mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	0.16	<0.08	1.69	<0.08	<0.08			mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
Speciated PCB-EC7 & WHO12										
PCB BZ 28 _A	-	-	-	<0.002	-			mg/kg	0.002	A-T-004s
PCB BZ 52 _A ^{M#}	-	-	-	<0.002	-			mg/kg	0.002	A-T-004s
PCB BZ 81 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 101 _A ^{M#}	-	-	-	<0.004	-			mg/kg	0.004	A-T-004s
PCB BZ 105 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 114 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 118 _A ^{M#}	-	-	-	<0.007	-			mg/kg	0.007	A-T-004s
PCB BZ 123 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 126 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 138 _A ^{M#}	-	-	-	<0.006	-			mg/kg	0.006	A-T-004s
PCB BZ 153 _A ^{M#}	-	-	-	<0.004	-			mg/kg	0.004	A-T-004s
PCB BZ 156 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 157 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 167 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 169 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 180 _A ^{M#}	-	-	-	<0.004	-			mg/kg	0.004	A-T-004s
PCB BZ 189 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
PCB BZ 77 _A	-	-	-	<0.005	-			mg/kg	0.005	A-T-004s
Total Speciated PCB-EC7 & WHO12 _A	-	-	-	<0.007	-			mg/kg	0.002	A-T-004s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
TPH CWG										
Ali >C5-C6 _A [#]	<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			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	4	<1			mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	<1	<1	<1			mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	<1	3	<1			mg/kg	1	A-T-055s
Ali >C21-C35 _A	5	<1	2	21	5			mg/kg	1	A-T-055s
Total Aliphatics _A	5	<1	2	29	5			mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<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			mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	<1	<1	3	<1			mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	2	<1	<1	4	<1			mg/kg	1	A-T-055s
Aro >C12-C16 _A	2	<1	2	3	1			mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	6	<1	4	3	1			mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	20	3	13	60	6			mg/kg	1	A-T-055s
Total Aromatics _A	33	3	19	72	9			mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	37	3	21	101	13			mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<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			mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<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			mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<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			mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
SVOC										
Hexachlorobenzene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Diethyl phthalate _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Dimethyl phthalate _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Dibenzofuran _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Carbazole _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Butylbenzyl phthalate _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate _A	-	-	-	<500	-			µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether _A	-	-	-	<100	-			µg/kg	100	A-T-052s
4-Nitrophenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
3+4-Methylphenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
4-Chloro-3-methylphenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2-Nitrophenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2-Methylphenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2-Chlorophenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2,6-Dinitrotoluene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2,4-Dinitrotoluene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2,4-Dimethylphenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2,4-Dichlorophenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2,4,6-Trichlorophenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2,4,5-Trichlorophenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2-Chloronaphthalene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
2-Methylnaphthalene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Phenol _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Pentachlorophenol (SVOC) _A	-	-	-	<100	-			µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine _A	-	-	-	<100	-			µg/kg	100	A-T-052s
n-Diethylphthalate _A	-	-	-	<500	-			µg/kg	500	A-T-052s
n-Dibutylphthalate _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Nitrobenzene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Isophorone _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Hexachloroethane _A	-	-	-	<100	-			µg/kg	100	A-T-052s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
Hexachlorocyclopentadiene _A	-	-	-	<100	-			µg/kg	100	A-T-052s
Perylene _A	-	-	-	<100	-			µg/kg	100	A-T-052s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
VOC										
Dichlorodifluoromethane _A	-	-	-	<1	-			µg/kg	1	A-T-006s
Chloromethane _A	-	-	-	<10	-			µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene) _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Bromomethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Chloroethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Trichlorofluoromethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1-Dichloroethene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Carbon Disulphide _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Dichloromethane _A	-	-	-	<5	-			µg/kg	5	A-T-006s
trans 1,2-Dichloroethene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1-Dichloroethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
cis 1,2-Dichloroethene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
2,2-Dichloropropane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Bromochloromethane _A [#]	-	-	-	<5	-			µg/kg	5	A-T-006s
Chloroform _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1,1-Trichloroethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1-Dichloropropene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Carbon Tetrachloride _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,2-Dichloroethane _A [#]	-	-	-	<2	-			µg/kg	2	A-T-006s
Benzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Trichloroethene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,2-Dichloropropane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Dibromomethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Bromodichloromethane _A [#]	-	-	-	<10	-			µg/kg	10	A-T-006s
cis 1,3-Dichloropropene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Toluene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
trans 1,3-Dichloropropene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1,2-Trichloroethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,3-Dichloropropane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Tetrachloroethene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Dibromochloromethane _A [#]	-	-	-	<3	-			µg/kg	3	A-T-006s
1,2-Dibromoethane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s

Envirolab Job Number: 20/06773

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/06773/1	20/06773/2	20/06773/3	20/06773/4	20/06773/5			Units	Limit of Detection	Method ref
Client Sample No	ES1	ES1	ES1	ES1	ES2					
Client Sample ID	WS103	WS102	WS104	WS101	WS101					
Depth to Top	0.50	0.60	0.70	0.80	1.80					
Depth To Bottom	0.60	0.70	0.80	0.90	1.90					
Date Sampled	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20	13-Aug-20					
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES					
Sample Matrix Code	6AE	4A	6AE	5AE	5AE					
Chlorobenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane _A	-	-	-	<1	-			µg/kg	1	A-T-006s
Ethylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
m & p Xylene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
o-Xylene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Styrene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Bromoform _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Isopropylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane _A	-	-	-	<1	-			µg/kg	1	A-T-006s
1,2,3-Trichloropropane _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
Bromobenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
n-Propylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
2-Chlorotoluene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
4-Chlorotoluene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
tert-Butylbenzene _A [#]	-	-	-	<2	-			µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
sec-Butylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
4-Isopropyltoluene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,3-Dichlorobenzene _A	-	-	-	<1	-			µg/kg	1	A-T-006s
1,4-Dichlorobenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
n-Butylbenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,2-Dichlorobenzene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP) _A	-	-	-	<2	-			µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene _A	-	-	-	<3	-			µg/kg	3	A-T-006s
Hexachlorobutadiene _A [#]	-	-	-	<1	-			µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene _A	-	-	-	<3	-			µg/kg	3	A-T-006s

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:	20/06773
Project:	Decant Village	Date Received:	17/08/2020 (am)
Clients Project No:	B075805	Cool Box Temperatures (°C):	20.0

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.

Appendix D – Geotechnical Laboratory Testing Results

- Envirolab, Environmental Geotechnical Analysis Results
 - Final Analytical Test Report Ref. 20/07369-1
 - Final Analytical Test Report Ref. 20/07369-2
- Structural Soils, Geotechnical Analysis Results
 - Test Report No. 784635 R1
 - Test Report No. 784671 R1

FINAL ANALYTICAL TEST REPORT

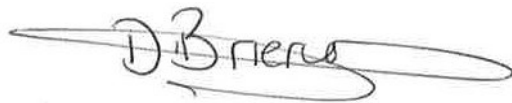
Envirolab Job Number: 20/07369
Issue Number: 1

Date: 24 September, 2020

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

Project Manager: Rob Allen/Zoe Henderson
Project Name: Decant Village
Project Ref: B075805
Order No: EBMA2485
Date Samples Received: 12/08/20
Date Instructions Received: 03/09/20
Date Analysis Completed: 24/09/20

Prepared by:



Danielle Brierley
Client Manager

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 20/07369

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/07369/2	20/07369/3	20/07369/6	20/07369/7	20/07369/10	20/07369/13	20/07369/14	Units	Limit of Detection	Method ref
Client Sample No	B3	U5	D8	B9	D12	B15	D16			
Client Sample ID	BH101	BH101	BH101	BH101	BH101	BH101	BH101			
Depth to Top	2.00	2.00	3.00	4.00	6.50	10.50	13.80			
Depth To Bottom			3.50		6.95					
Date Sampled	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20	11-Aug-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5A		5AE		4A		5A			
% Stones >10mm _A	<0.1	-	<0.1	-	<0.1	-	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	7.66	-	7.09	-	7.52	-	8.36	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.12	-	0.03	-	<0.01	-	0.09	g/l	0.01	A-T-026s
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	Appended	-	-	Appended	-	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: 20/07369

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/07369/15	20/07369/19	20/07369/25	20/07369/26	20/07369/27	20/07369/28	20/07369/29	Units	Limit of Detection	Method ref
Client Sample No	U17	D21	D3	B2	B2	D3	B2			
Client Sample ID	BH101	BH101	WS101	WS102	WS103	WS103	WS104			
Depth to Top	14.00	17.50	2.50	3.50	1.50	4.00	3.50			
Depth To Bottom	14.45			4.00	2.00		4.00			
Date Sampled	11-Aug-20	11-Aug-20								
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code		5A	5A			4A				
% Stones >10mm _A	-	2.1	<0.1	-	-	<0.1	-	% w/w	0.1	A-T-044
pH _D ^{M#}	-	8.38	6.75	-	-	8.23	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	0.08	0.05	-	-	<0.01	-	g/l	0.01	A-T-026s
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	-	-	-	Appended	Appended	-	Appended	%	0.1	Subcon SS
5.02c QUT Multistage (100mm) BS1377 1990 pt7 cl9 (Undrained Shear Strength) _A [#]	Appended	-	-	-	-	-	-	N/A		Subcon SS

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General

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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:** 20/07369
Project: Decant Village **Date Received:** 03/09/2020 (am)
Clients Project No: B075805 **Cool Box Temperatures (°C):** 15.3

Lab Sample ID	20/07369/25	20/07369/26	20/07369/27	20/07369/28	20/07369/29
Client Sample No	D3	B2	B2	D3	B2
Client Sample ID/Depth	WS101 2.50m	WS102 3.50- 4.00m	WS103 1.50- 2.00m	WS103 4.00m	WS104 3.50- 4.00m
Date Sampled					
Deviation Code					
E (no date)	✓	✓	✓	✓	✓

Key
E (no date) No sampling date provided (all results affected if not provided)

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 SUPPLEMENT TO TEST REPORT 20/07369/1

Amendments: Request for Additional Analysis

Envirolab Job Number: 20/07369
Issue Number: 2

Date: 12 October, 2020

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

Project Manager: Rob Allen/Zoe Henderson
Project Name: Decant Village
Project Ref: B075805
Order No: EBMA2485 & 2518
Date Samples Received: 12/08/20
Date Instructions Received: 03/09/20
Date Analysis Completed: 12/10/20

Prepared by:


Melanie Marshall
Laboratory Coordinator

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 20/07369

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/07369/1	20/07369/2	20/07369/3	20/07369/6	20/07369/7	20/07369/10	20/07369/12	Units	Limit of Detection	Method ref
Client Sample No	D2	B3	U5	D8	B9	D12	D14			
Client Sample ID	BH101	BH101	BH101	BH101	BH101	BH101	BH101			
Depth to Top	1.20	2.00	2.00	3.00	4.00	6.50	9.50			
Depth To Bottom	1.65			3.50		6.95	9.95			
Date Sampled	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20	10-Aug-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code		5A		5AE		4A				
% Stones >10mm _A	-	<0.1	-	<0.1	-	<0.1	-	% w/w	0.1	A-T-044
pH _D ^{M#}	-	7.66	-	7.09	-	7.52	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	0.12	-	0.03	-	<0.01	-	g/l	0.01	A-T-026s
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	-	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
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	Appended	-	-	Appended	-	-	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: 20/07369

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/07369/13	20/07369/14	20/07369/15	20/07369/17	20/07369/19	20/07369/22	20/07369/25	Units	Limit of Detection	Method ref
Client Sample No	B15	D16	U17	D19	D21	D2	D3			
Client Sample ID	BH101	BH101	BH101	BH101	BH101	BH101A	WS101			
Depth to Top	10.50	13.80	14.00	15.50	17.50	21.00	2.50			
Depth To Bottom			14.45	15.95						
Date Sampled	10-Aug-20	11-Aug-20	11-Aug-20	11-Aug-20	11-Aug-20					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code		5A			5A		5A			
% Stones >10mm _A	-	<0.1	-	-	2.1	-	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	-	8.36	-	-	8.38	-	6.75	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	0.09	-	-	0.08	-	0.05	g/l	0.01	A-T-026s
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	Appended	-	-	-	-	-	-	%	0.1	Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4 _A [#]	-	-	-	Appended	-	Appended	-	%	1	Subcon SS
1.01 % Moisture BS1377 1990 pt2 cl3.2 _A [#]	-	-	-	Appended	-	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: 20/07369

Client Project Name: Decant Village

Client Project Ref: B075805

Lab Sample ID	20/07369/26	20/07369/27	20/07369/28	20/07369/29				Units	Limit of Detection	Method ref
Client Sample No	B2	B2	D3	B2						
Client Sample ID	WS102	WS103	WS103	WS104						
Depth to Top	3.50	1.50	4.00	3.50						
Depth To Bottom	4.00	2.00		4.00						
Date Sampled										
Sample Type	Soil	Soil	Soil	Soil						
Sample Matrix Code			4A							
% Stones >10mm _A	-	-	<0.1	-				% w/w	0.1	A-T-044
pH _D ^{M#}	-	-	8.23	-				pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	-	-	<0.01	-				g/l	0.01	A-T-026s
1.10a PSD (Grading/63um/sand fraction/wet sieve) BS1377 pt 2 1990 cl 9.2 _A [#]	Appended	Appended	-	Appended				%	0.1	Subcon SS

REPORT NOTES

General

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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.

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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:

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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: Decant Village
Clients Project No: B075805

Project No: 20/07369
Date Received: 03/09/2020 (am)
Cool Box Temperatures (°C): 15.3

Lab Sample ID	20/07369/22	20/07369/25	20/07369/26	20/07369/27	20/07369/28	20/07369/29
Client Sample No	D2	D3	B2	B2	D3	B2
Client Sample ID/Depth	BH101A 21.00m	WS101 2.50m	WS102 3.50- 4.00m	WS103 1.50- 2.00m	WS103 4.00m	WS104 3.50- 4.00m
Date Sampled						
Deviation Code						
E (no date)	✓	✓	✓	✓	✓	✓

Key
E (no date) No sampling date provided (all results affected if not provided)

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. 784635 R1

Date 22-September-2020 Contract 20/07369

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

For the Attention of Holly Neary-King

Samples submitted by client 04/09/2020
Testing Started 07/09/2020
Testing Completed 22/09/2020

Client Reference 20/07369
Client Order No.
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

Particle Size Distribution wet sieve method BS1377:Part 2:1990,clause 9.2
Undrained shear strength triaxial compression without pore pressure measurement
(multistage loading) BS1377:Part 7:1990,clause 8.5

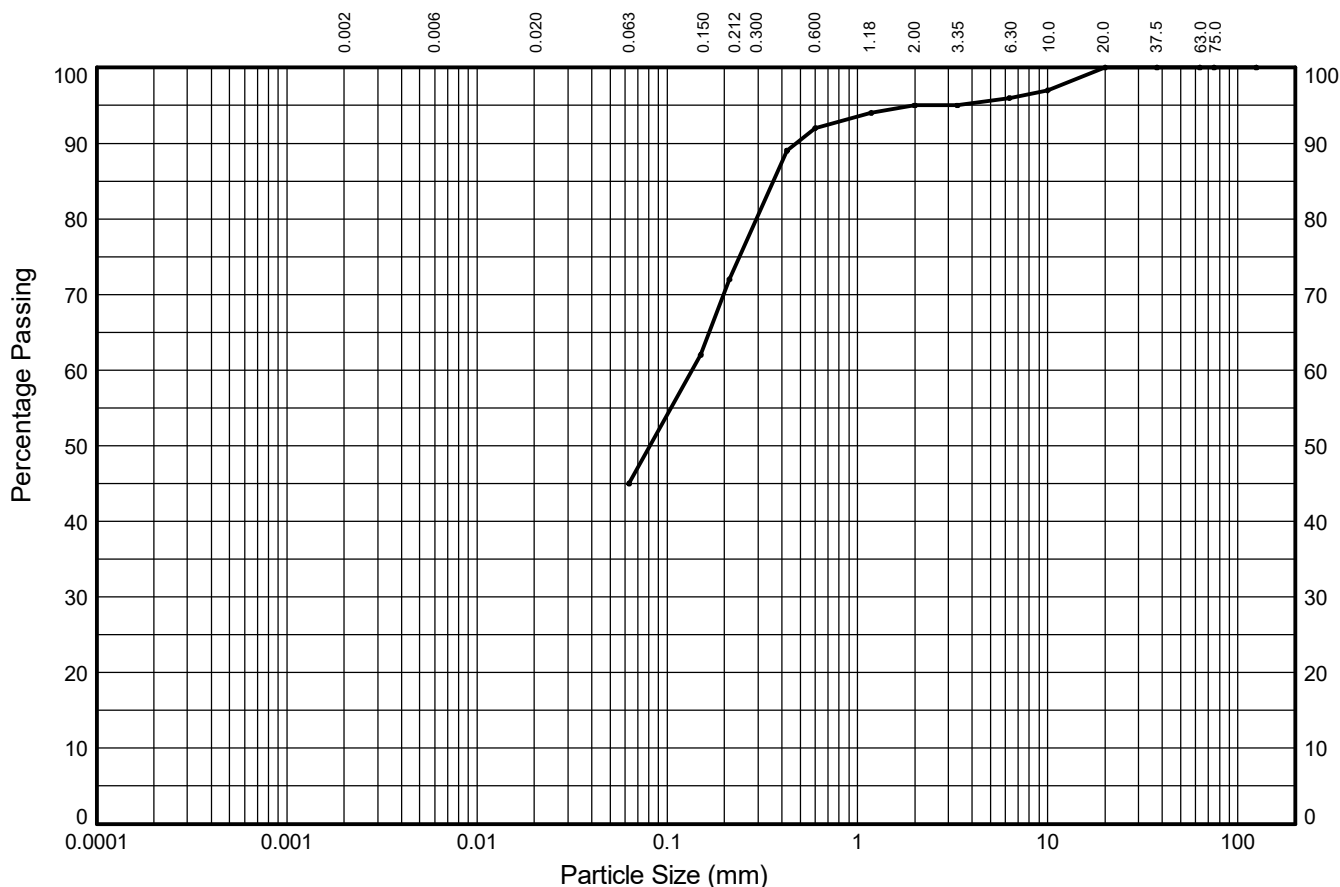
* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

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

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

Depth (m): **2.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	25%	22%	3%	1%	4%	0%	
	SILT			SAND			GRAVEL			
45%				50%			5%			0%

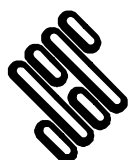
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	97
6.30	96
3.35	95
2.00	95
1.18	94
0.600	92
0.425	89
0.212	72
0.150	62
0.063	45

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

Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	NA
D_{50} (mm)	0.081
D_{60} (mm)	0.135
D_{85} (mm)	0.361
D_{90} (mm)	0.477
C_u	NA
C_c	NA

Grey slightly gravelly very clayey SAND

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



Compiled By

Date _____

Contract

20/07369

LORNA WHITWORTH

Contract Ref:

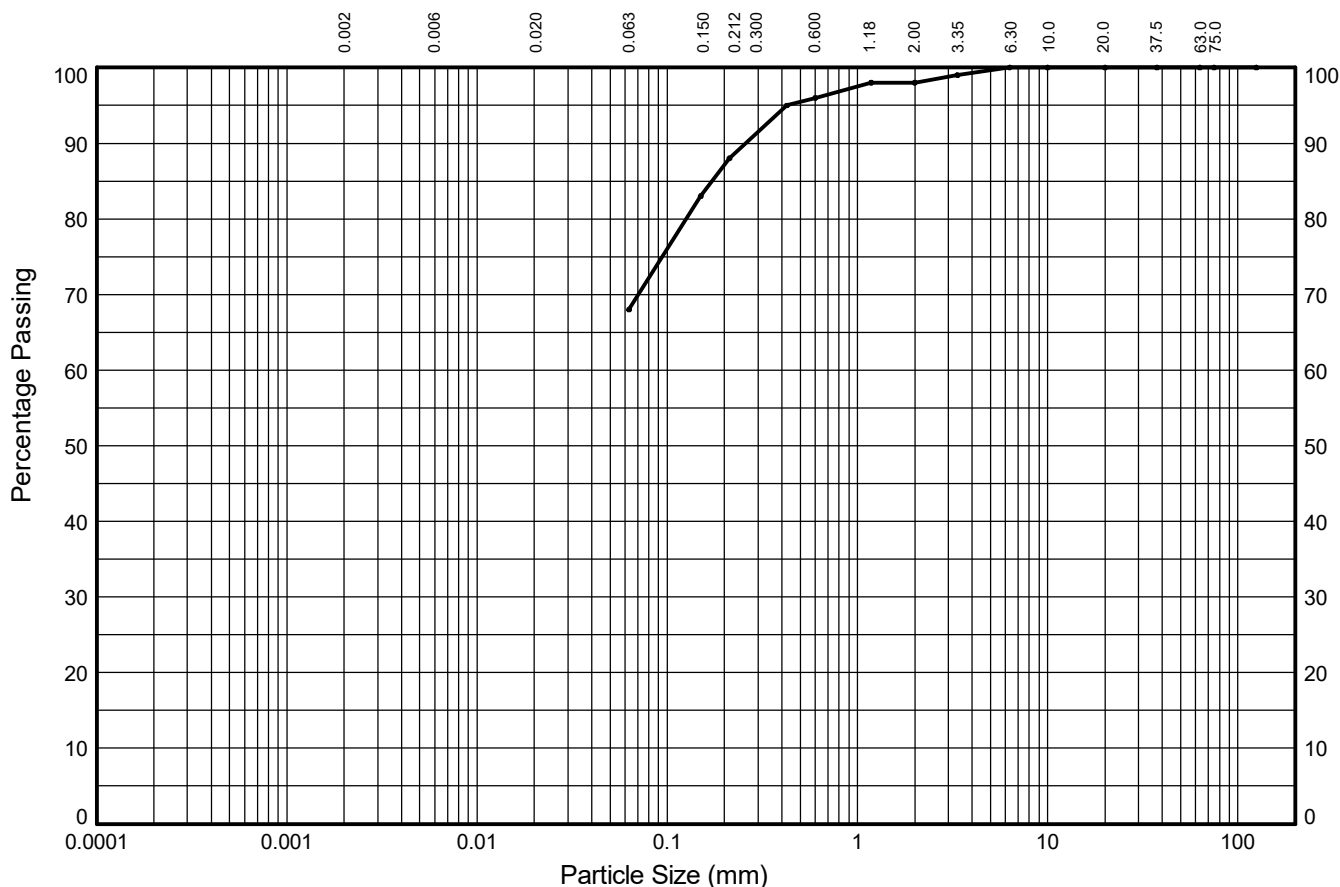
22/09/20

784635



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

Depth (m): **4.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	19%	9%	2%	2%	0%	0%	
	SILT			SAND			GRAVEL			
68%				30%			2%			0%

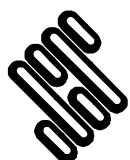
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.30	100
3.35	99
2.00	98
1.18	98
0.600	96
0.425	95
0.212	88
0.150	83
0.063	68

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

Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	NA
D_{50} (mm)	NA
D_{60} (mm)	NA
D_{85} (mm)	0.172
D_{90} (mm)	0.259
C_u	NA
C_c	NA

Grey slightly gravelly slightly sandy CLAY

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



Compiled By

Date _____

22/09/20

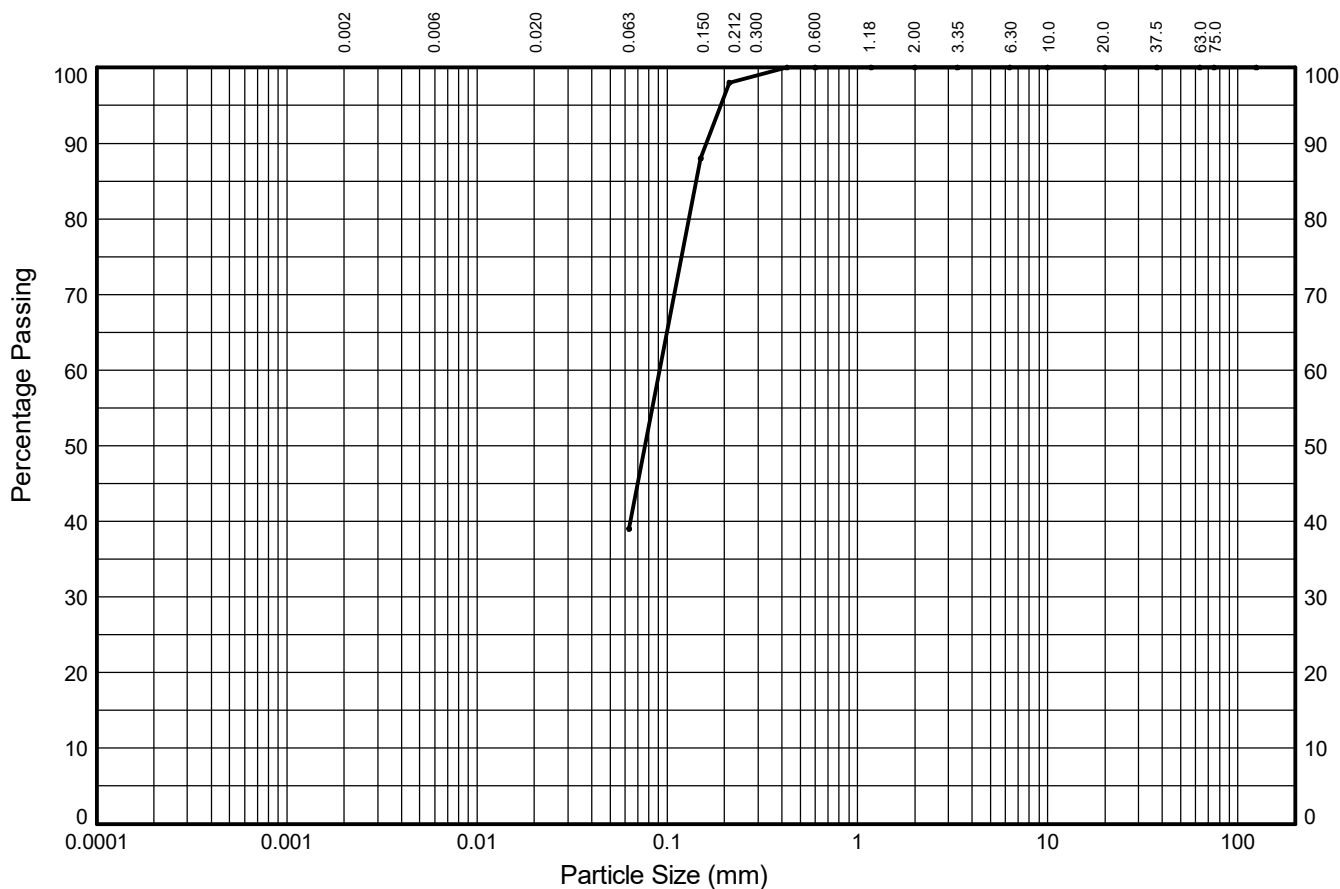
20/07369

784635



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

Depth (m): **10.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	57%	4%	0%	0%	0%	0%	
	SILT			SAND			GRAVEL			
39%				61%			0%			0%

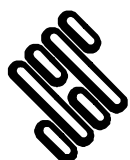
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	100
6.30	100
3.35	100
2.00	100
1.18	100
0.600	100
0.425	100
0.212	98
0.150	88
0.063	39

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

Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	NA
D_{50} (mm)	0.077
D_{60} (mm)	0.091
D_{85} (mm)	0.142
D_{90} (mm)	0.161
C_u	NA
C_c	NA

Soil Description:
Brown very clayey SAND

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



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

Compiled By

Date _____

Contract

20/07369

LORNA WHITWORTH

22/09/20

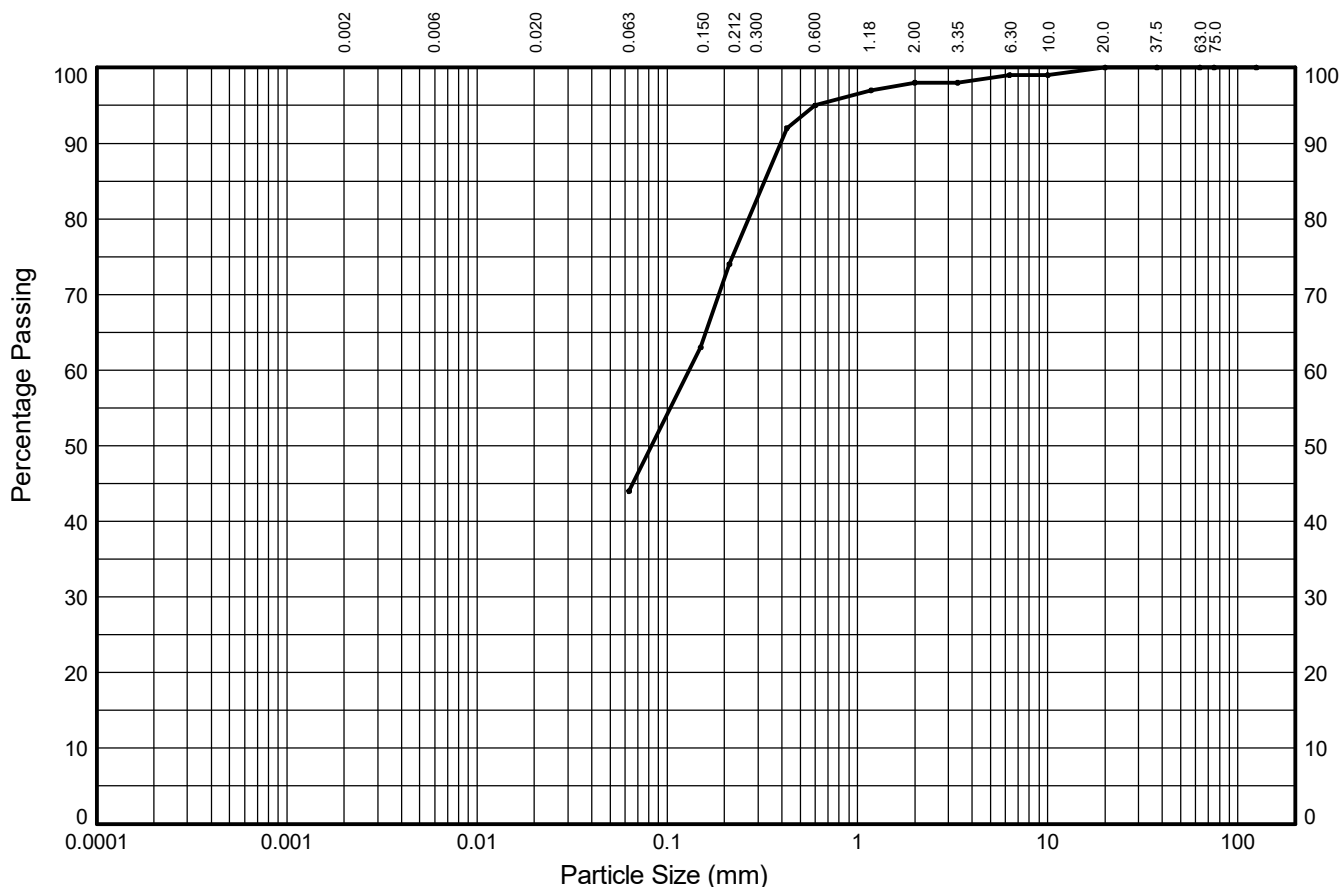
Contract Ref:

784635



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

Depth (m): **1.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	28%	23%	3%	1%	1%	0%	
	SILT			SAND			GRAVEL			
44%				54%			2%			0%

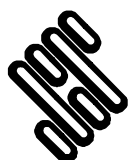
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	99
6.30	99
3.35	98
2.00	98
1.18	97
0.600	95
0.425	92
0.212	74
0.150	63
0.063	44

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

Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	NA
D_{50} (mm)	0.083
D_{60} (mm)	0.131
D_{85} (mm)	0.324
D_{90} (mm)	0.393
C_u	NA
C_c	NA

Brown slightly gravelly very clayey SAND

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



Compiled By

Date _____

Contract

20/07369

LORNA WHITWORTH

22/09/20

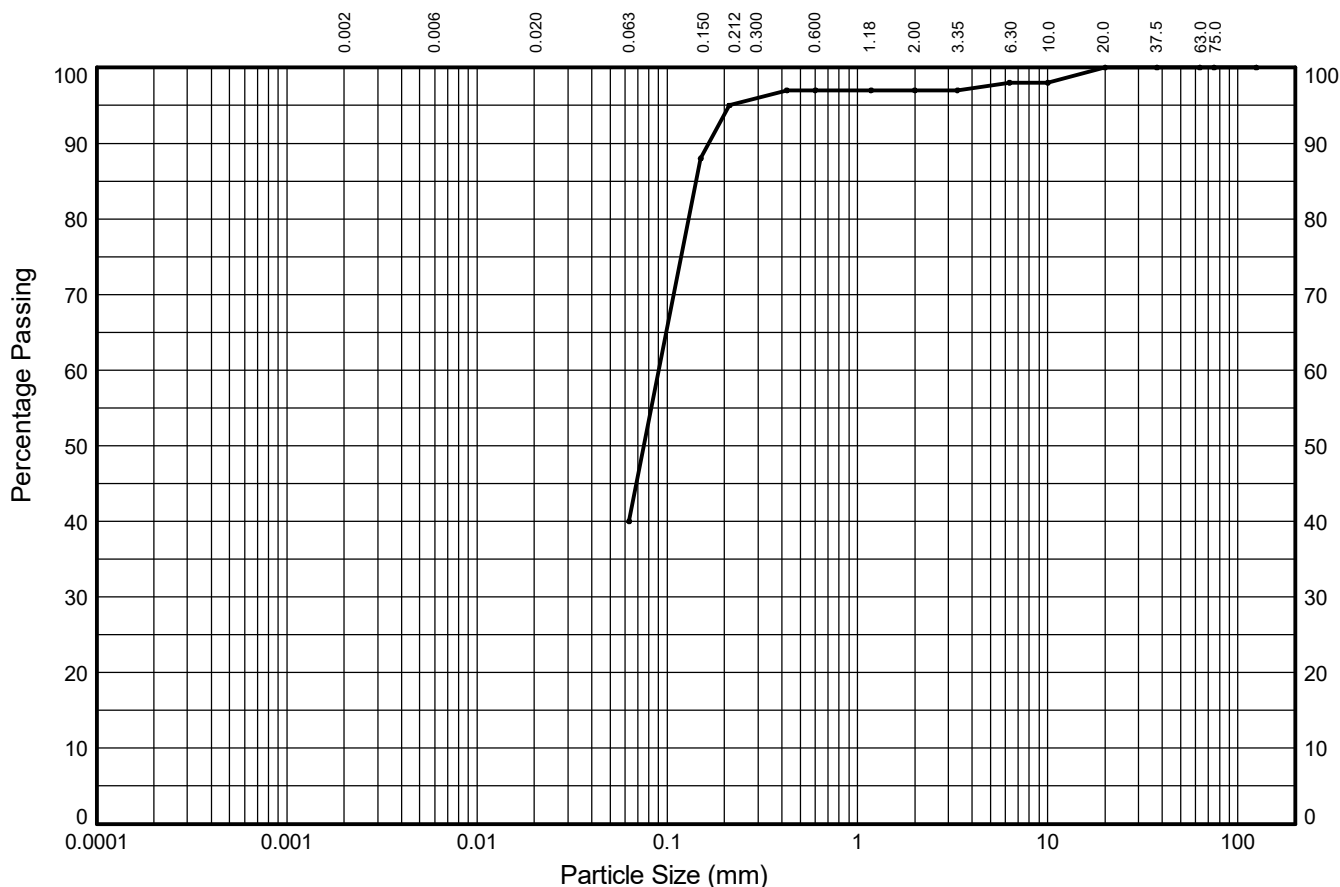
Contract Ref:

784635



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

Depth (m): **3.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	54%	3%	0%	1%	2%	0%	
	SILT			SAND			GRAVEL			
40%				57%			3%			0%

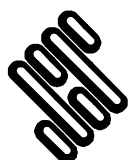
Test Sieve (mm)	Percent Passing (%)
125.0	100
75.0	100
63.0	100
37.5	100
20.0	100
10.0	98
6.30	98
3.35	97
2.00	97
1.18	97
0.600	97
0.425	97
0.212	95
0.150	88
0.063	40

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

Coefficients	
D_{10} (mm)	NA
D_{15} (mm)	NA
D_{30} (mm)	NA
D_{50} (mm)	0.075
D_{60} (mm)	0.090
D_{85} (mm)	0.142
D_{90} (mm)	0.166
C_u	NA
C_c	NA

Brown slightly gravelly very clayey SAND

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



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Date _____

20/07369

22/09/20

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784635



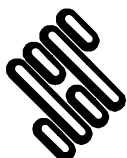
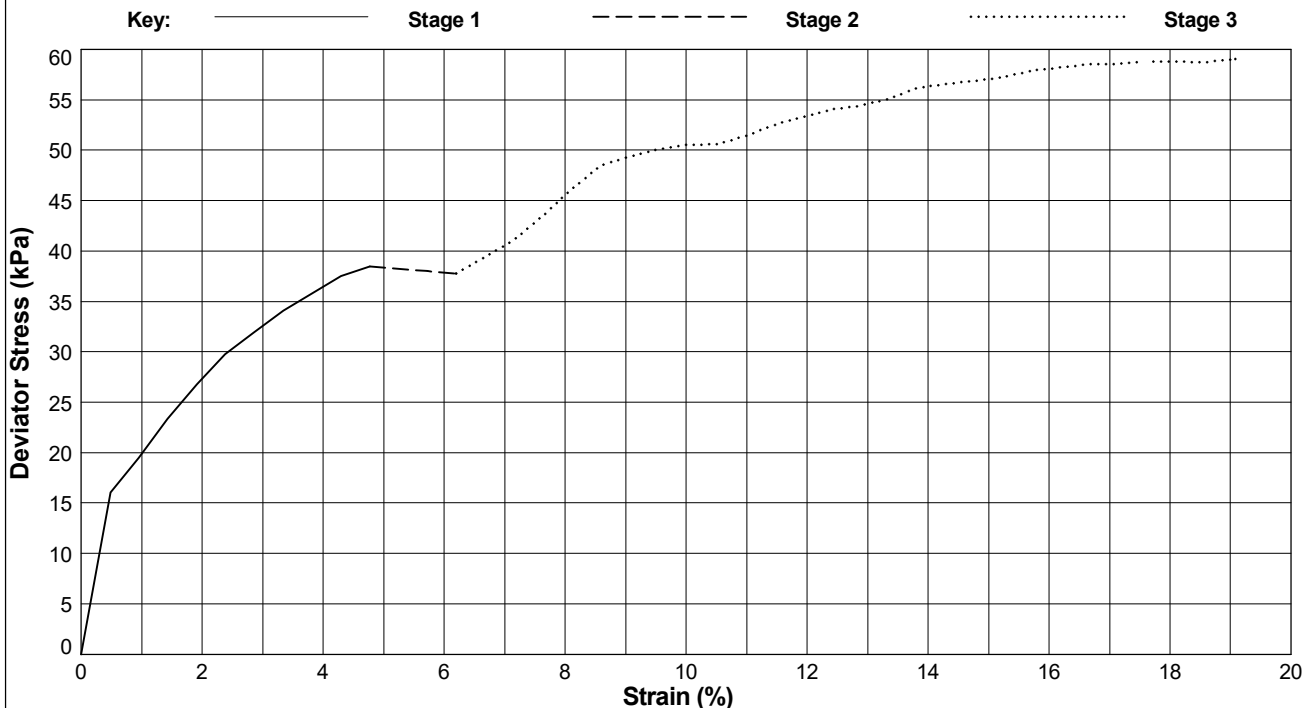
UNCONSOLIDATED QUICK UNDRAINED (MULTI-STAGE) TRIAXIAL COMPRESSION TEST

In accordance with BS1377 Part 7 Clause 9

Borehole: **BH101** Sample Ref: **20/07369/3** Sample Type: **B** Depth (m): **2.00**

Description : **Brown slightly gravelly sandy CLAY**

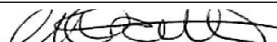
STAGE NUMBER		1	2	3
SAMPLE DETAILS	Sample Condition	Undisturbed		
	Orientation of sample	Vertical		
	Diameter (mm)	102.83		
	Height (mm)	209.67		
	Moisture Content (%)	24		
	Bulk Density (Mg/m ³)	2.00		
	Dry Density (Mg/m ³)	1.62		
TEST DETAILS	Membrane Type	Rubber	Rubber	Rubber
	Membrane Thickness (mm)	0.30	0.30	0.30
	Rate of Axial Displacement (%/min)	2.00	2.00	2.00
	Cell Pressure (kPa)	20	40	80
	Membrane Correction (kPa)	0.38	0.38	1.07
	Corrected Deviator Stress (kPa)	38	38	59
	Undrained Shear Strength (kPa)	19	19	30
FAILURE DETAILS	Strain at Failure (%)	4.8	4.8	19.1
	Mode of Failure			
	Semi-plastic (intermediate)			



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

Compiled By

Date



LORNA WHITWORTH

22/09/20

Contract

20/07369

Contract Ref:

784635

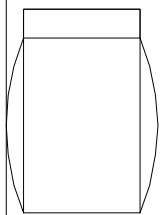


UNCONSOLIDATED QUICK UNDRAINED (MULTI-STAGE) TRIAXIAL COMPRESSION TEST

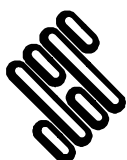
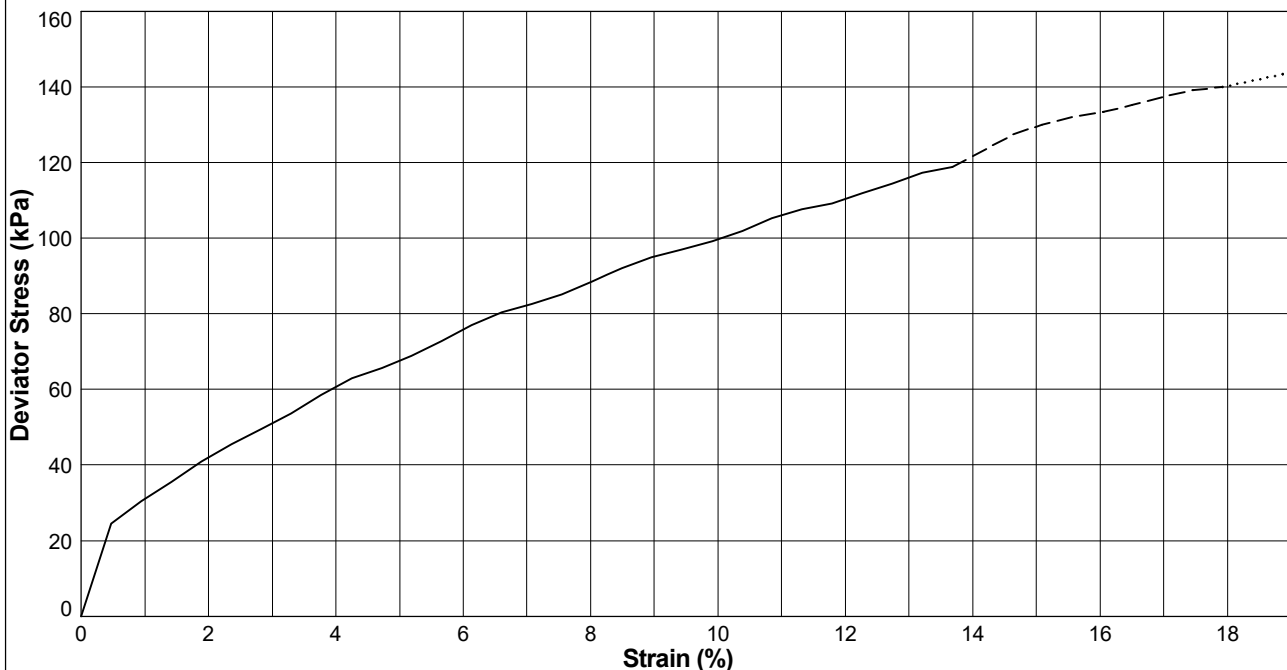
In accordance with BS1377 Part 7 Clause 9

Borehole: **BH101** Sample Ref: **20/07369/15** Sample Type: **B** Depth (m): **14.00**

Description : **Brown slightly gravelly slightly sandy CLAY**

STAGE NUMBER		1	2	3
SAMPLE DETAILS	Sample Condition	Undisturbed		
	Orientation of sample	Vertical		
	Diameter (mm)	102.00		
	Height (mm)	212.00		
	Moisture Content (%)	16		
	Bulk Density (Mg/m ³)	2.16		
	Dry Density (Mg/m ³)	1.86		
TEST DETAILS	Membrane Type	Rubber	Rubber	Rubber
	Membrane Thickness (mm)	0.30	0.30	0.30
	Rate of Axial Displacement (%/min)	2.00	2.00	2.00
	Cell Pressure (kPa)	140	280	560
	Membrane Correction (kPa)	0.84	1.03	1.07
	Corrected Deviator Stress (kPa)	119	140	143
	Undrained Shear Strength (kPa)	59	70	72
FAILURE DETAILS	Strain at Failure (%)	13.7	17.9	18.9
	Mode of Failure			
	Plastic (Barrelling)			

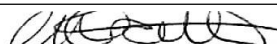
Key: Stage 1 Stage 2 Stage 3



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

Compiled By

Date



LORNA WHITWORTH

22/09/20

Contract

20/07369

Contract Ref:

784635



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: **24/09/2020 07:35:30**.

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

Approved Signatory
Luke Fisher (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:

20/07369

Job No:

784635





STRUCTURAL SOILS LTD
TEST REPORT



Report No. 784671 R1

Date 12-October-2020 Contract 20/07369

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

For the Attention of Holly Neary-King

Samples submitted by client 29/09/2020
Testing Started 01/10/2020
Testing Completed 12/10/2020

Client Reference 20/07369
Client Order No.
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 (superseded) **
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.

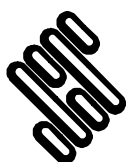
Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail luke.fisher@soils.co.uk

SUMMARY OF MOISTURE CONTENT TESTS

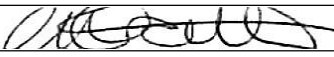
In accordance with clause 3.2 of BS1377:Part 2

Exploratory Position ID	Sample Ref	Depth (m)	Sample Type	Moisture Content %	Lab
BH101	20/07369/1	1.20	D	27	C

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



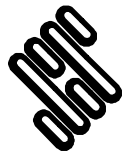
STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By		Date
		12/10/20
Contract: 20/07369		Contract Ref: 784671

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
BH101	20/07369/6	D	3.00	21	24	17	7	99	Brown sandy CLAY
BH101	20/07369/12	D	9.50	20	NP	NP	NP	100	Brown silty SAND
BH101	20/07369/17	D	15.50	17	30	17	13	92	Dark brown slightly sandy CLAY



**STRUCTURAL
SOILS LTD**

Contract:

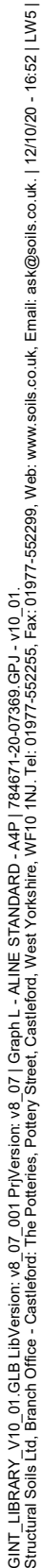
20/07369

Contract Ref:

784671



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



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: **12/10/2020 16:58:08**.

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

Approved Signatory
Daniel Smith (Contract 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:

20/07369

Job No:

784671



Appendix E – Ground Gas Monitoring Results

- Gas Monitoring Visits 1 – 6

GAS MONITORING LOG SHEET

Project:	Decant Village	Date:	01/09/2020
Job Number:	B075805	Visit:	1
Client:	Hive Land and Planning	Weather:	Sunny
Barometric State:	Falling	Ground Conditions:	Dry

[illegible]

Notes

Logged by

MH

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

GAS MONITORING LOG SHEET

Project: Decant Village **Date:** 08/09/2020
Job Number: B075805 **Visit:** 2
Client: Hive Land and Planning **Weather:** Raining
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						
WS101	1015	0.0	0.0	0.0	0.0	0.1	0.0	21.40	0	1	0.81	2.09	1
WS102	1014	0.0	0.0	0.0	0.0	0.1	0.1	21.40	1	1	0.89	4.02	
WS103	1016	0.0	0.0	0.0	0.0	0.0	0.0	20.60	1	1	0.74	3.34	
BH101	1015	-7.2	-0.1	0.0	0.0	0.3	0.0	20.90	0	0	8.54	11.59	

Notes

1 Steady state flow was reached after 3 minutes.

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

GAS MONITORING LOG SHEET

Project:	Decant Village	Date:	17/09/2020
Job Number:	B075805	Visit:	3
Client:	Hive Land and Planning	Weather:	Sunny
Barometric State:	Falling	Ground Conditions:	Dry

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						
WS101	1025	0.0	0.0	0.0	0.0	0.0	0.0	20.9	2	1	1.42	2.25	
WS102	1025	0.0	0.0	0.0	0.0	0.0	0.0	20.7	1	0	1.08	4.08	
WS103	1025	0.0	0.0	0.0	0.0	0.0	0.0	20.9	2	1	1.00	3.48	
BH101	1025	-1.9	0.0	0.0	0.0	0.0	0.0	20.9	2	1	8.60	11.60	

Notes

Logged by

SH

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

GAS MONITORING LOG SHEET

Project: Decant Village **Date:** 24/09/2020
Job Number: B075805 **Visit:** 4
Client: Hive Land and Planning **Weather:** Overcast
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						
WS101	983	1.4	0.0	0.0	0.0	0.0	0.0	20.9	2	3	1.52	2.27	1
WS102	985	0.0	0.0	0.0	0.0	0.0	0.0	20.8	2	1	1.07	4.07	
WS103	983	0.0	0.0	0.0	0.0	0.0	0.0	20.9	2	3	-	-	
BH101	985	0.6	0.0	0.0	0.0	0.3	0.1	20.5	2	3	8.65	11.70	

Notes

1 Car parked over borehole, could not dip water level

Logged by

SH

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

GAS MONITORING LOG SHEET

Project: Decant Village **Date:** 01/10/2020
Job Number: B075805 **Visit:** 5
Client: Hive Land and Planning **Weather:** Sunny
Barometric State: Steady **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						
WS101	987	0.0	0.0	0.0	0.0	0.0	0.0	20.9	0	0	1.10	2.27	1
WS102	987	0.0	0.0	0.0	0.0	0.3	0.3	19.4	0	0	1.07	4.07	
WS103	987	0.0	0.0	0.0	0.0	0.0	0.0	20.8	1	2	1.00	3.46	
BH101	987	-	-	0.0	0.0	0.0	0.0	20.9	0	5	8.51	11.71	

Notes

1 Flow not measured due to flooded borehole cover

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

GAS MONITORING LOG SHEET

Project: Decant Village **Date:** 05/10/2020
Job Number: B075805 **Visit:** 6
Client: Hive Land and Planning **Weather:** Rain
Barometric State: Rising **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						
WS101	984	13.8	2.2	0.0	0.0	0.0	0.0	20.3	0	0	1.14	2.25	
WS102	-	-	-	-	-	-	-	-	-	-	-	-	1
WS103	-	-	-	-	-	-	-	-	-	-	-	-	1
BH101	985	-6.7	0.0	0.0	0.0	0.8	0.8	18.5	2	1	8.49	11.63	2

Notes

- 1 - Vehicle parked over borehole location, unable to monitor.
 2 - Steady state flow rate achieved after 70 seconds.

Logged by

MH

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

Appendix F – GAC Screening Thresholds

- Curtins GAC Commercial Thresholds for 1.0% SOM.
- Curtins GAC Commercial Thresholds for 2.5% SOM.

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
- 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

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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