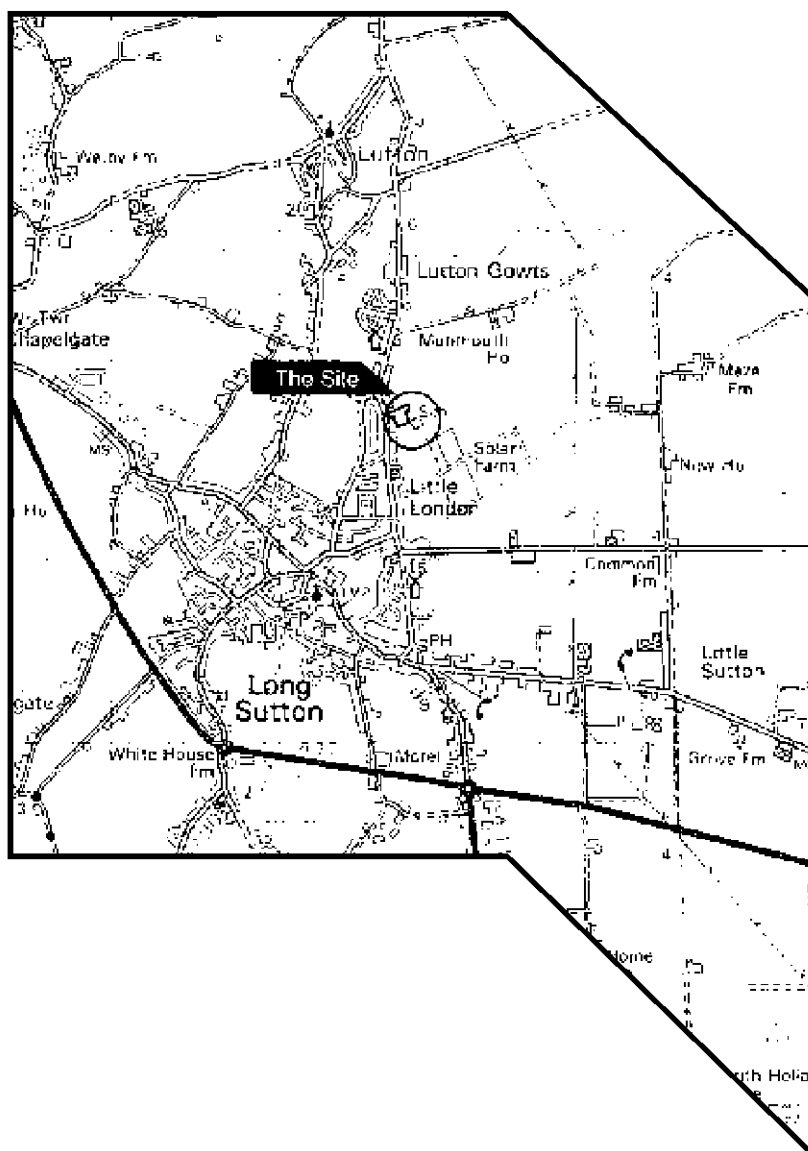


Ground
Investigation



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University Academy, Long Sutton

Preliminary Ground Investigation Report
with Interpretative Chapter

for
The Department for Education

Engineer : Mott McDonald Limited

Project Number PC228532

July 2023

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Preliminary Ground Investigation Report with
Interpretative Chapter at

University Academy, Long Sutton

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PC228532
July 2023

DOCUMENT CONTROL

Issuing Office	The Geotechnical Centre, 203 Torrington Avenue, Tile Hill, Coventry, CV4 9UT
Project Number	PC228532
Project Title	University Academy Long Sutton
Document Title	PC228532 Preliminary Ground Investigation Report with Interpretative Chapter for University Academy Long Sutton
Client	Department for Education
Engineer	Mott MacDonald Limited
Document Status	FINAL

Revision History

Rev No.	Issue No.	Issue Date	Author	Authoriser
DRAFT	1	19/07/2023	Nick Frost / Trevor Hardie	Len Threadgold
1	2	28/07/2023	Nick Frost / Trevor Hardie	Len Threadgold

Distribution

Rev No.	Issue No.	Reason for Issue	Organisation	Format
DRAFT	1	Issue for review	Mott MacDonald Limited	PDF
1	2	Issue as final	Mott MacDonald Limited	PDF

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We have prepared this report in our professional capacity using reasonable skill, care and diligence. The assessments, conclusions and recommendations within this report pertain to the study site defined herein, and the immediate area in continuity with the Site. They are based on the established historical uses, and information available at the time of writing and the proposed use of the Site. Where any information supplied by the client or other sources have been utilised, it has been assumed that the information is correct. No responsibility can be accepted by Geotechnics for inaccuracies in data supplied by any other party.

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Preliminary Ground Investigation Report with Interpretative Chapter for

**UNIVERSITY ACADEMY,
LONG SUTTON**

Project No: PC228532
July 2023

1.0 INTRODUCTION

This Geo-environmental and Geotechnical Ground Investigation was carried out to the instructions of the Engineer, Mott McDonald Limited, on behalf of the Client, The Department for Education, with the purpose of providing design input with respect to Civil, Structural and Geo-Environmental engineering for the proposed redevelopment of University Academy Long Sutton. The site currently comprises a combined primary and secondary school with associated infrastructure, leisure centre, sports field and open space.

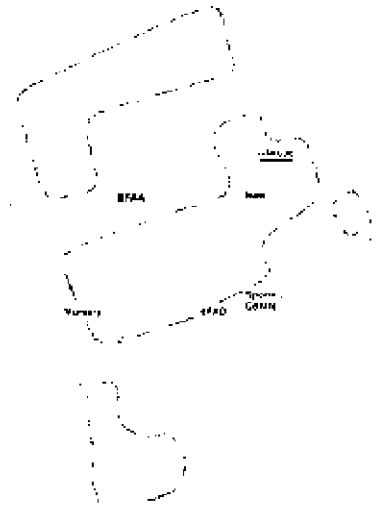
A Desk Study Report, previously prepared by Geotechnics Limited, should be referred to for full details of the site history and its environmental setting and this report should be read in conjunction with it (Ref: PC228532 Geo-environmental and Geotechnical Desk Study Report at University Academy Long Sutton; dated December 2022).

There are multiple options being considered by the Client and Engineer for the proposed redevelopment. The locations for the proposed rebuilds are summarised in the Site Layout Plan in Appendix 1 and in the figure which follows. These can be summarised as the following:

- Block EFAB will most likely be demolished and rebuilt.
- Block EFAB/EFAC (temporary structure) will most likely be demolished and rebuilt.
- Block EFAD will most likely involve some minor refurbishment. However, there is potential for demolition and rebuild.
- Peele Leisure Centre will remain in place with the possibility of an extension and some minor internal remodelling works.
- Rainbow Nursery will either remain at the current location or be rebuild in another area of site.

This report will primarily provide an assessment of the significance of ground conditions in relation to the options which involve construction of new structures, as instructed by the Engineer.

Site Proposals



The above image is taken from the 'Possible build locations' plan contained within Appendix 1. The full plan in Appendix 1 shows the building labels of EFAA, EFAB, EFAC and EFAD. The three development areas proposed are labelled as A to C and will be referred to as Area A, Area B and Area C throughout this report. The area marked as Area D is no longer being considered.

As mentioned above, a Desk Study Report for the site was previously prepared by Geotechnics Limited. This current report summarises the findings of the Desk Study and presents the findings of an intrusive geo-environmental and geotechnical survey undertaken in accordance with Stage 1 of RIBA Plan of Work 2020 Overview. The report aims to reduce uncertainty about the geo-environmental and geotechnical risks identified in the previous Desk Study. It is intended that it be used by the Client to aid in later stages of the design and construction of a rebuild. In addition, this report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Part IIA of the Environment Protection Act, 1990.
- Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, April 2012).
- National Planning Policy Framework (HCA, July 2021).
- BS EN 1997-1:2004+A1:2013: "Eurocode 7. Geotechnical Design".
- BS5930:2015+A1:2020: "Code of Practice for Ground Investigations".
- BS10175: 2011 +A2:2017 "Investigation of Potentially Contaminated Sites - Code of Practice".
- The Building Regulations 2010. Part C (HM Government 2013).
- Environment Agency (2020) "Land Contamination Risk Management".
- Environment Agency (2011) Report GPLC1 "Guiding Principles for Land Contamination".
- Environment Agency (2017) "The Environment Agency's Approach to Groundwater Protection" November 2017 Version 1.1.
- Sustainable Remediation Forum UK (SuRF) Framework.

The purpose of this report is to gain a preliminary understanding of the ground conditions at the site within the limitations of the scope of the Ground Investigation authorised by the Department for Education. The ground investigation was commissioned to help potential Contractors assess the ground-related risks and make suitable cost allowances for the most likely design solution and undertake a preliminary assessment of the risks relating to identified source-pathway-receptor linkages.

Contractors for the scheme should only use the factual data from this preliminary Ground Investigation Report together with any additional investigation work that they may consider necessary to prepare their own detailed Ground Investigation Report and Geotechnical Design Report to Eurocode 7. They should prepare their own contaminated land risk assessment in line with Land Contamination Risk Management (LCRM, 2021) guidance, including further ground investigation and risk assessment, remediation options appraisal and remediation strategy and verification they require as the basis for their detailed design.

2.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 3 to 6. The factual data obtained are presented in Appendices 1 to 9 of this report.

A Desk Study to seek existing information about the site, its history, geology and ground conditions was carried out by Geotechnics Limited in January 2023.

An interpretation of the data obtained is presented in Section 7 and a geotechnical evaluation of its significance in relation to proposals available at the time of preparation of this report is presented in Section 8. A Geoenvironmental assessment is presented in Sections 9 and 10 with conclusions and recommendations in Section 11.

Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 13 to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, data in electronic format in accordance with “The Electronic Transfer of Geotechnical Data from Ground Investigations” published by the AGS (the AGS Format) are presented separately.

3.0 THE SITE

For full details of the site’s history, environmental setting and sensitive land use, reference should be made to the Desk Study referenced in Section 1.0 above. A Site Location Plan is presented in Appendix 1. The site location is summarised in the table below:

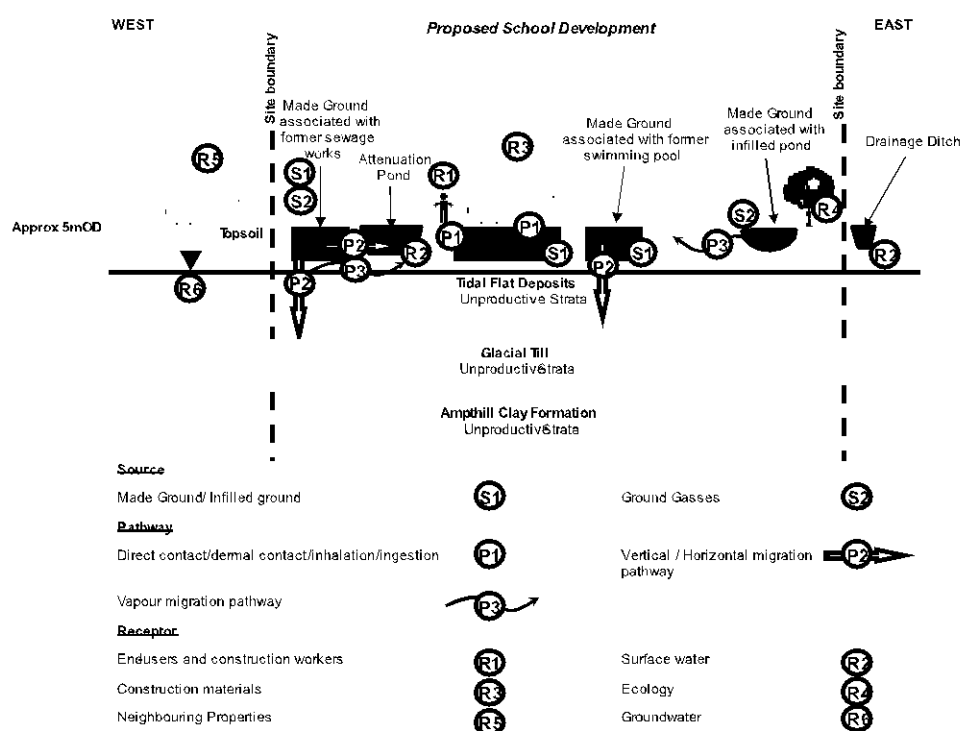
Location	University Academy Long Sutton, 84 Little London, Long Sutton, Spalding, Lincolnshire
Grid Reference	TF 43828 23947
Post Code	PE12 9LF
Site Area	Approximately 9.0 hectares
Site Shape	The site is approximately rectangular in shape with maximum extents of approximately 280m northwest to southeast and 380m northeast to southwest.
Topography	The site is generally flat with local undulations. The field in the eastern part of the site is at a level of between about 4.0-5.5mOD. Around the school buildings in the western area, the ground level is approximately 4.0-6.0mOD. The surrounding land is all at a similar elevation.

4.0 PRELIMINARY CONCEPTUAL SITE MODEL & CONTAMINANT LINKAGES

The Desk Study for the site (Ref: PC228532, December 2022) presented a preliminary conceptual site model based on publicly available information and on-site observations. The preliminary conceptual site model identified several potential contaminant linkages (source → pathway → receptor). Potential risks were assessed for these contaminant linkages, which identified where additional information was required. These are summarised below.

4.1 Preliminary Conceptual Site Model

In accordance with BS 10175 and LCRM, a schematic Initial Conceptual Site Model was developed, and this is shown below.



The ground model and proposed end use described above have been broadly considered in relation to Nathaniel et al. 2015, The LQM/ClEH S4ULs for Human Health Risk Assessment. Whilst the proposed redevelopment generally does not conform to the conceptual models defined in Nathaniel et al. 2015, for the purpose of this geoenvironmental assessment, the site is closest to the classification of “public open space (parkland) and residential without home grown produce.”

4.2 Potential Contaminant Linkages Assessment

For each potential contaminant linkage, an assessment was made of the potential impact upon identified sensitive receptors. Potential contaminant linkages requiring further investigation are summarised below:

- Contaminants in soil and groundwater → Dermal contact, ingestion, inhalation → Construction workers
- Contaminants in soil and groundwater → Dermal contact, ingestion, inhalation → Future site workers, visitors and pupils
- Contaminants in gaseous form (permanent ground gases) → Vertical / lateral migration → Proposed / retained buildings.

Further details of the potential contaminant linkage assessment are presented in the Desk Study (Ref: PC228532, December 2022).

5.0 PROCEDURE

5.1 Commissioning

The intrusive ground investigation was awarded to Geotechnics Limited following submission of a proposal for ground investigation of the site, in consultation with Mott MacDonald Limited.

5.2 General

The procedures followed in this site investigation are based on BS 5930:2015+A1:2020 – Code of Practice for Site Investigations and BS 10175:2011+A2:2017 - Investigation of Potentially Contaminated Sites. The soils and rocks encountered have been described in accordance with BS5930:2015+A1:2020, BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018. The positions of the exploratory holes are shown on the Exploratory Hole Location Plan in Appendix 2 and the records of the Cable Percussion Boreholes, Dynamic Sample Boreholes and Trial Pits are included in Appendices 3 to 5 respectively.

The exploratory hole locations were selected by Geotechnics Limited, and approved by Mott MacDonald Limited, to give a general coverage of the site as well as focus on any targets identified in the Desk Study within the constraints posed by buried and overhead services and existing structures. The selected number and type of exploratory holes was such as to be within the Client's financial limits, with the investigation being considered as a preliminary phase of the investigation works. The co-ordinates and levels shown on the Exploratory Hole Records were measured using a GPS survey device. The depths quoted on the exploratory hole records are in metres below ground level. It should be noted that Cable Percussive Borehole BH05 was added during the fieldwork to supplement BH03 which stopped short of its target depth. Also, the numbering of the Dynamic Cone Penetrometer (DCP) tests and the Dynamic sample Boreholes differ slightly from those outlined in the Desk Study report.

At each exploratory hole location, with the exception of the trial pits, an inspection pit was excavated using hand tools to a depth of 1.20m below ground level to check for the presence of underground services. Prior to and on completion of the excavation, the location was scanned using a cable avoidance tool (CAT).

5.3 Cable Percussion Boreholes

Five (5 No.) boreholes (numbered BH01 to BH05), up to 200mm in diameter, were sunk utilising Cable Percussion techniques to depths ranging between 10.00m and 20.00m below ground level (bgl). The work was carried out between 11th and 18th April 2023. Borehole BH03 stopped short of the target depth of 20.00m bgl at a depth of 12.50m bgl due to the presence of sand beyond which it was not possible to advance the casing in the sands to avoid the collapse of the borehole.

Representative disturbed (D and B) and driven open-tube thin-walled (UT) samples of the soils encountered were obtained at regular intervals. In addition, environmental soil samples (ES) were recovered at the depths indicated on the borehole records. Standard Penetration Tests (SPTs) were undertaken in the boreholes at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the borehole records together with, where appropriate, any rise in the water level recorded over 20 minutes whilst drilling operations were suspended.

On completion, standpipes were installed in all the boreholes (see Section 5.7).

5.4 Dynamic Sample Boreholes

Four (4 No.) Dynamic Sample Boreholes (numbered DS01 to DS04) were carried out to depths of 4.45m bgl on the 12th April 2023. The dynamic samples were taken using a super-heavy dynamic probe apparatus which drives lined steel tubes into the ground in 1m lengths. Samples are retrieved in the plastic liners. The retrieved liners were split, and the recovered soils described before being sub-sampled into ES, D and B samples as shown on the borehole Records in Appendix 5. The holes were not cased and progress depended on the nature of the strata penetrated. Photographs of the dynamic sample inspection pits and liners are presented in Appendix 4.

Standard Penetration Tests (SPTs) were undertaken at the depths indicated on the borehole records in accordance with BS EN ISO 22476-3:2005+A1:2011 to obtain a measure of the engineering properties of the proved strata.

Groundwater observations are included on the borehole records where appropriate.

On completion, boreholes were backfilled with bentonite followed by arisings.

5.5 Trial Pits

Two (2 No.) trial pits (numbered HD01 and HD02) were excavated utilising hand tools to depths of 1.00m and 1.20m below ground level (bgl). The work was carried out on the 13th April 2023. This work was supervised on site by a geotechnical / geo-environmental engineer.

The profiles of strata or other features were recorded as excavation proceeded and measurements taken from ground level. Representative samples were taken, where appropriate, for laboratory examination and analysis and in addition, Environmental samples (ES) were recovered at the depths indicated on the Trial Pit Records. Groundwater observations and trench stability notes are included on the Trial Pit Records. Photographs of the pits are presented in Appendix 5.

5.6 Dynamic Cone Penetration Tests

Seven (7 No.) Dynamic Cone Penetration (DCP) Tests were carried out immediately adjacent to a borehole as indicated in the table below and as marked on the Exploratory Hole Location Plan (see Appendix 2). The tests were commenced from ground level or at depths of between 0.17m and 0.20m bgl to avoid the asphalt surfacing and the underlying sub-base material. The tests were performed to give an indication of CBR values at shallow depths to aid pavement design. The DCP test locations were located adjacent to exploratory holes so the corresponding inspection or trial pit could be used to check for buried services. The relevant adjacent locations are as follows:

DCP Location	Start Depth (m bgl)	Final Depth (m bgl)	Test No.	Adjacent Borehole Location
BH01-DCP	0.20	1.201	1	BH01
BH02-DCP	0.15	1.245	1	BH02
BH03-DCP	0.23	1.293	1	BH03
BH04-DCP	0.00	1.211	1	BH04
DS01-DCP	0.17	1.236	1	DS01
DS02-DCP	0.00	1.436	1	DS02
DS03-DCP	0.00	1.485	1	DS03

The Dynamic Cone Penetration Tests were carried out on 13th April 2023.

The test comprises the measurement of increments of penetration of a 20mm diameter 60° cone driven into the ground using an 8kg hammer falling a distance of 575mm. The CBR is obtained from the relationship between the CBR and the DCP readings;

$$\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 \times \text{Log}_{10}(\text{mm/blow})$$

as defined in the Design Manual for Roads and Bridges Document CS229 Revision 0, March 2020, published by Highways England. The test results are presented in Appendix 6.

5.7 Instrumentation and Monitoring

Long-term monitoring of the gas and groundwater levels was made possible by the installation of standpipes as follows:

Exploratory Hole	Diameter (mm)	Standpipe Slotted Pipe & Filter Zone (m)	Strata Monitored
BH01	50	1.50 to 3.50	Tidal Flat Deposits (Upper Silt)
BH02	50	4.00 to 11.50	Tidal Flat Deposits (Lower Sand)
BH03	50	3.50 to 9.00	Tidal Flat Deposits (Upper Silt & Lower Sand)
BH04	50	0.60 to 1.70	Made Ground
BH05	50	14.00 to 20.00	Glacial Till (Clay Soils)

The site was classified as having a moderate gas risk, with some potential sources of gas being identified during the Desk Study.

Monitoring of the groundwater levels at the site commenced on 28th April 2023, with further visits on 3rd, 11th and 18th May 2023.

The following parameters were measured and recorded in each standpipe using a Gas Data Limited GFM435 Gas Analyser:-

- Concentrations (% Vol) of CH₄, O₂, CO₂, along with (ppm) H₂S, CO.
- Flow Rate.
- Differential Pressure.
- Barometric Pressure.

The results of the monitoring are presented in Appendix 7.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was formulated by Geotechnics Limited, and approved by Mott MacDonald Limited, in order to relate to the proposed redevelopment plans available at the time of scheduling. The number and type of tests undertaken were constrained by the Client's financial limits, with the investigation being considered as a preliminary phase of the investigation works. Unless otherwise stated, the tests were carried out in Geotechnics Limited's UKAS accredited Laboratory (Testing No. 1365) and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Test Certificate in Appendix 8. Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

Standard	Test Description	Quantity
BS EN ISO 17892-1:2014	Water Content Determination	30
BS EN ISO 17892-4:2016	Particle Size Distribution Determination – Sieving Method	10
	Particle Size Distribution Determination – Pipette Method	6
BS EN ISO 17892-12:2018	Determination of Liquid and Plastic Limits	13
BS EN ISO 17892-8:2018	Unconsolidated Undrained Triaxial Test – Single Stage	8
BS EN ISO 17892-5:2017	One Dimensional Consolidation Test - Oedometer	2

The following testing was carried out at the laboratories of Derwentside Environmental Testing Services (DETS) (UKAS Accredited Laboratory, Number 2139).

Test Description	Quantity
BRE Special Digest 1 Suite Suites comprising: - Soluble Sulphate Total Sulphur Total Sulphate pH	11
Total Organic Content	4
Organic Matter	4

The results of these geotechnical tests are presented in Appendix 8.

6.2 Contamination

Twelve (12 No.) selected samples of soil, five (5 No.) soil leaching samples and four (4 No.) groundwater samples were tested at the laboratories of Derwentside Environmental Testing Services Limited for a number of determinands in order to allow assessment of potential site contamination. The determinands were specified by the Engineer and are detailed below and on the results sheets in Appendix 9, together with the test result as well as the test method, accreditation and detection limit. The laboratory testing schedule was formulated by Geotechnics Limited, in order to relate to the proposed redevelopment plans available at the time of scheduling. The numbers and types of testing undertaken were constrained by the Client's financial limits, with the investigation being considered as a preliminary phase of the investigation works. The soil samples were tested for the following determinands:-

Metals

- Beryllium
- Chromium (Hexavalent)
- Lead
- Selenium
- Antimony
- Arsenic
- Boron (Water Soluble)
- Copper
- Molybdenum
- Vanadium
- Barium
- Chromium
- Iron
- Nickel
- Zinc

Inorganics

- pH
- Sulphate (Water Soluble)
- Cyanide (Free)
- Total Sulphur
- Total Organic Carbon

Other

- Petroleum Hydrocarbons (Aliphatic / Aromatic speciated)
- Asbestos
- Polyaromatic Hydrocarbons (Speciated)
- Volatile Organic compounds (VOCs)
- Phenol (Monohydric)

The soil leaching samples were prepared from selected soil samples in accordance with the BS EN 12457 and analysed for the determinands detailed below and on the results sheets in Appendix 9.

Metals

- | | | |
|-------------|----------------|-------------------------|
| • Calcium | • Arsenic | • Barium |
| • Beryllium | • Boron | • Chromium (Hexavalent) |
| • Chromium | • Chromium III | • Lead |
| • Copper | • Iron | • Molybdenum |
| • Magnesium | • Manganese | • Vanadium |
| • Nickel | • Selenium | • Antimony |
| • Zinc | • Mercury | |

Inorganics

- | | | |
|------------|--------------------------|-----------------------|
| • pH | • Cyanide (Total & Free) | • Ammoniacal Nitrogen |
| • Sulphate | • Sulphide | • Chloride |
| • Fluoride | • Total Hardness | |

Other

- Phenol (Monohydric)
- Speciated Phenols

Groundwater samples were taken from monitoring wells, where available, and analysed for the determinands detailed below and on the results sheets in Appendix 9.

Metals

- | | | |
|-------------|----------------|-------------------------|
| • Calcium | • Arsenic | • Barium |
| • Beryllium | • Boron | • Chromium (Hexavalent) |
| • Chromium | • Chromium III | • Lead |
| • Copper | • Iron | • Molybdenum |
| • Magnesium | • Manganese | • Vanadium |
| • Nickel | • Selenium | • Antimony |
| • Zinc | • Mercury | |

Inorganics

- | | | |
|------------|--------------------------|-----------------------|
| • pH | • Cyanide (Total & Free) | • Ammoniacal Nitrogen |
| • Sulphate | • Sulphide | • Chloride |
| • Fluoride | • Total Hardness | |

Other

- | | |
|---|---|
| • Petroleum Hydrocarbons (Aliphatic / Aromatic speciated) | • Polyaromatic Hydrocarbons (Speciated) |
|---|---|

7.0 INTERPRETATION

7.1 Ground Conditions

Based on the expected geology discussed in the Desk Study and the findings of the exploratory holes, the various strata proved in the investigation have been classified into the following divisions:-

- Topsoil
- Made Ground
- Tidal Flat Deposits
- Glacial Till

The ground profile exposed in the exploratory holes represents the conditions at discrete locations. The degree to which they represent conditions between or beyond the exploratory holes is a matter for conjecture and these can

only be interpolated and hence, the uncertainties arising from this should be recognised.

The table below provides a brief summary of the ground profile found in the exploratory holes. Reference should be made to the Exploratory Hole Records for detailed descriptions of the soils encountered:-

Stratum	Typical Description	Depth to Top (m bgl)	Level of Top (m OD)	Thickness (m)
Topsoil	Soft dark brown slightly sandy to sandy clay with many rootlets, slightly gravelly in DS04. Gravel is subrounded fine to medium of quartzite. <i>Only in DS02-DS04</i>	GL	3.57 to 3.70	0.15 to 0.30
Made Ground	Comprises a mix of soils:- Surface Layer – Asphalt <i>(All holes where Made Ground found, 0.07 to 0.17m thick)</i> <u>Granular Layers</u> Orangish or light brown or grey / black gravelly sand or sandy gravel, slightly clayey in places. With a low to high cobble content in parts. Gravel variously comprises concrete, brick and flint. <i>(In BH01 to BH05, DS01 and HD02, 0.10 to 0.60m thick, generally below asphalt)</i> <u>Cohesive Layers</u> Soft, and soft to firm in places, brown slightly gravelly sandy clay. With a low cobble content in parts. Gravel variously comprises brick, flint and concrete. <i>(Only in BH01, BH03 to BH05 and HD02, 0.20 to 0.60m thick, generally below granular soil layers except in BH04 and HD02 where from the surface)</i> Layer of Concrete, 0.2m thick found in BH04 at 1.20m bgl	GL	3.38 to 3.76	0.16 to 1.70
Tidal Flat Deposits	Generally comprised upper layers of silt over lower layers of silty sand. <u>Upper Silt Layers</u> Soft brown or grey slightly sandy varying to sandy and very sandy SILT, in parts grading to silty to very silty sand and slightly sandy to sandy silty clay. Slightly gravelly in BH04, the gravel comprising flint and quartzite. In places organic pockets / lenses up to 50mm in size were noted. <i>(Found in all exploratory holes)</i>	0.16 to 1.70 0.16 to 1.70	2.06 to 3.48 2.06 to 3.48	11.20 to 13.30 (in BH02, BH03 & BH05. Elsewhere 0.75 to 9.50m proved *) 2.50 to 4.30 (except DS05, HD01 & HD02 where 0.75 to 4.20 proved *)

Stratum	Typical Description	Depth to Top (m bgl)	Level of Top (m OD)	Thickness (m)
Tidal Flat Deposits (cont.)	<u>Lower Sand Layers</u> Medium dense, occasionally loose, dark grey and brown silty to very silty fine SAND	3.00 to 6.00	-2.24 to 0.57	6.90 to 9.90 (in BH02, BH03 & BH05. Elsewhere 0.45 to 6.50m proved *)
Glacial Till	Generally comprises layers of cohesive soils with layers of granular soil at the top. <u>Granular Soils</u> Medium dense greyish brown and grey gravelly silty SAND with occasional shell fragments and sandy GRAVEL in BH02, the gravel comprising flint and quartzite. (Only in BH02, BH03 & BH05, 0.20 to 1.30m thick, 0.50m proved in BH03) <u>Cohesive (Fine) Soils</u> Stiff and very stiff dark grey and grey slightly sandy slightly gravelly CLAY, the gravel comprising flint and chalk. (Only in BH02 & BH05, up to 5.30m & 7.00m proved respectively)	11.70 to 13.50	-8.30 to -9.88	0.50 to 8.30m proved *

* Base of stratum not found

7.1.1 Topsoil

Topsoil was only encountered in Dynamic Sample Boreholes DS02, DS03 and DS04 which were located in areas of soft landscaping and was directly underlain by the Tidal Flat Deposits. It was found to vary in thickness from 0.15m (DS02) to 0.3m thick (DS03) and generally comprised soft brown slightly sandy slightly gravelly clay with a low cobble content of brick and concrete in just one location (DS04). Rootlets were present in all boreholes.

7.1.2 Made Ground

Made Ground was encountered in all exploratory holes, with the exception of DS02, DS03 and DS04, and was found to be variable in thickness ranging from 0.16m (HD02) to 1.70m thick (BH04), although, apart from BH04, it was found to be less than 0.50m thick. Except in BH04, a surface layer of asphalt of 0.70 to 0.17m in thickness was found and was underlain by granular soils that typically comprised brown or grey sandy gravel or gravelly sand with a low cobble content of brick and concrete that was found to be between 0.09m and 0.31m thick. This in turn was underlain by a thin layer of cohesive soils generally comprising soft to firm brown slightly sandy slightly gravelly clay. The gravel typically comprised brick, concrete and quartzite. In BH04, where the Made Ground was found to be the thickest, it comprised an interbedded sequence of cohesive soils and granular soils with a 0.20m thick layer of concrete at 1.2m bgl. Borehole BH04 was located in the approximate location of former swimming pool identified in the Desk Study which may explain the increased thickness of the Made Ground at this location, the concrete possibly marking the bottom of the former pool.

A table summarising the test results for the Made Ground is presented as Table 1 in Appendix 10.

In view of the limited thickness of the Made Ground found in most exploratory holes, only a small amount of laboratory and in situ testing was carried out. A single SPT was carried out at the base of the stratum in BH04 at 1.50m bgl with the test extending into the underlying Tidal Flat Deposits. Therefore, as nearly all the test drive was within the Tidal Flat Deposits (Upper Silt), the N value of 9 has been included with the results from that stratum.

From the Dynamic Cone Penetration tests, CBR values were typically estimated as generally being greater than 20% in the granular soils, where tested, although CBR values as low as 4% and 9% were recorded in tests BH04-DCP and DS01-DCP respectively. Within the cohesive soils above 0.80m bgl, the CBR was estimated as being between 5 and 20% in BH01-DCP and BH03-DCP and 1 to 2% in BH04-DCP. In these western tests, CBRs of between 1 and 15% were estimated from the tests in the upper 0.60m bgl. From TRRL Report LR1132, equilibrium CBRs of 20% for poorly graded sand, 40% for well graded sand and 60% for gravels are indicated. For cohesive soils the equilibrium CBR depends on Plasticity Index and these are discussed in Section 8.7 below.

7.1.3 Tidal Flat Deposits

Soil classified as Tidal Flat Deposits was encountered in all exploratory holes below the Made Ground or Topsoil at depths of between 0.16m and 1.70m bgl (2.06m to 3.48m OD). The base of the stratum was only identified in BH02, BH03 and BH05 where a thickness 11.20 to 13.30m was found. Elsewhere the stratum was penetrated to depths below the top of stratum of 0.75 to 9.50m.

Based on the visual descriptions and the results of the particle size distribution (PSD) analyses, the stratum has been divided into two units, an Upper Silt and Lower Sand layer. It should be noted that whilst a definite boundary between these units has been determined, based on the descriptions and PSD tests, it is likely that this is a gradational boundary between the upper silt-dominated layers and the lower sand-dominated layers.

Upper Silt Layers

These layers have typically been described as soft brown and grey slightly sandy varying to sandy and very sandy SILT, grading in places to very silty sand and slightly sandy to sandy silty clay. A 0.60m thick layer of slightly gravelly sandy silt was found at the top of the stratum in BH04, the gravel being composed of quartzite and flint. In places organic pockets / lenses up to 50mm in size were noted. Where the Lower Sand was found (all exploratory holes except DS04, HD01 and HD02) the Upper Silt was found to be between 2.50 and 4.30m thick.

A table summarising the test results for the Tidal Flat Deposits (Upper Silt) is presented as Table 2 in Appendix 10.

The water content ranged between 25% and 44%, (see Figure 2 Appendix 10) although all but one water content was between 25 and 35%. The data shows a slight trend of increasing water content with depth. The reason for the high water content of 44% or the low water content of 25% at 5.50m is not known. The Atterberg Limit test results were variable with six tests showing the soil (silt) to be non-plastic with the other three results showing the presence of clay layers with a low / intermediate plasticity, the data lying very close to the low and intermediate plasticity boundary (see Figure 2, Appendix 10). A Plasticity Index (PI) of 16% and 17% was recorded in the clay soils, thus indicating a low volume change potential (NHBC Standards Chapter 4.2). The PSD curves (see Figure 4, Appendix 10) were all of a similar shape and showed silt contents of 35 to 37% with sand contents of 57 to 62%. Bulk densities of between 1.94 and 1.99Mg/m³ were obtained from the triaxial and oedometer test specimens (see Figure 5, Appendix 10)

The SPT N values ranged between 0 and 26 (see Figure 1, Appendix 10), all but the test with an N value of 0, where the test penetrated 450mm under the first blow of the seating part of the test, and the N value of 26 from BH04 at 5.50m, the N values were between 2 and 13 with an average of 6. These results show no clear trend with a greater scatter of results in the upper 4 to 5m. The N value of 26 is more in keeping with the N values from the Lower Sand layers and whilst the PSD from this level in BH04 is consistent with the Silt Layers, it is evidence of the gradational nature of the change from the silt-dominated to sand-dominated layers referred to above.

Undrained shear strengths ranging between 17 and 44kN/m² were obtained from undrained triaxial tests on four specimens taken from UT samples and indicate very low to medium strength conditions. The undrained shear strength data are shown on Figure 6 (Appendix 10) and do not show any trend with depth, an average of 30kN/m²

(low strength) being obtained. The results correlate well with the visually assessed consistency of soft, occasionally very soft and firm.

Two (2 No.) oedometer consolidation tests were carried out on specimens cut from UT samples from Borehole BH02 at 1.20m bgl and BH05 at 2.20m bgl. For an applied pressure range of approximately 100 to 200kN/m², a value for the coefficient of volume compressibility, m_v of 0.07 and 0.14MN/m² was found from the tests. These values are consistent with a medium compressibility soil ($m_v = 0.10$ -0.30 m²/MN) and a low compressibility soil ($m_v = 0.05$ -0.10m²/MN) as presented by Tomlinson (Ref: Tomlinson, M.J., "Foundation Design and Construction", 7th Ed., Pub. Pearson Education Ltd., 2001).

Above a depth of 0.8m bgl, CBR values estimated from the Dynamic Cone Penetration tests, were typically between 2 and 10%. From TRRL Report LR1132, equilibrium CBRs of 1 to 2% are indicated for silt soils.

Lower Sand Layers

These layers have typically been described as medium dense (occasionally very loose and loose) increasing to dense below 8m, brown and dark grey silty to very silty fine SAND, varying in places to very sandy silt. Where the underlying Glacial Till was encountered (BH02, BH03 and BH05) the Lower Sand was found to be between 6.90 and 9.90m thick.

A table summarising the test results for the Tidal Flat Deposits (Lower Sand) is presented as Table 3 in Appendix 10.

The water content ranged between 24% and 31%, (see Figure 2 Appendix 10) and suggests a slight trend of decreasing water content with depth. The range of water contents is similar to that for the Upper Silt with the data above 6m being close to the upper end of the main range of results for the Lower Silt and below 6m close to the lower bound of that range. The PSD curves (see Figure 4, Appendix 10) were all of a similar shape and showed much lower silt contents of 4 to 17% than for the Upper Silt with higher sand contents of 80 to 96%.

The SPT N values ranged between 3 and 47 (see Figure 1, Appendix 10) and show a trend of increasing density with depth, although below a depth of 7.5m bgl there is more scatter in the N values and there may be less of an increase with depth in this zone. It is noted that the higher N values with a range of 28 to 47 were found in this zone below 7.5m in Boreholes BH01 and BH02 which were located in the north eastern part of the main school buildings area of the site. In the other boreholes (BH03-BH05) slightly lower N values of 22 to 34 were found. It can be seen that between 3 and 5m bgl, there is an overlap in the data with that for the Upper Silt in the possible gradational zone between the two layers. Based on the relationship given in BS 8004:2015+A1:2020 from the PSD curves and using the average SPT N value above 7.5m and below 7.5m, angles of friction (ϕ') of 33° above 7.5m and 36° below 7.5m has been estimated.

7.1.4 Glacial Till

Soils considered to form part of the Glacial Till were found in BH02, BH03 and BH05 at depths between 11.70 and 13.50m bgl (-8.30 and -9.88m OD). The base of the deposits was not found in the three boreholes, a thickness of 5.80m (BH02), 0.50m (BH03) and 8.30m (BH05) being proved. The soils encountered were variable but can be divided into Granular dominated and Clay dominated soils.

Granular Soils

The granular soils were typically described as medium dense greyish brown and grey gravelly silty SAND with a layer of sandy GRAVEL in BH02, the gravel comprising flint and quartzite. It was interbedded with the Clay dominated layers in BH02 with thicknesses of 0.20 and 0.30m at the top of the stratum. It also formed the upper layer in BH03 and BH05 (located close together in the north western part of the site) where 0.50m was proved in BH03 and 1.30m found in BH05. These granular soils may comprise the base of the Tidal Flat deposits but due to the presence of the quartzite and flint gravel have been included in the Glacial Till for the purposes of this report.

A table summarising the test results for the Glacial Till (Granular Soil) is presented as Table 4 in Appendix 10 although only a small amount of laboratory testing was carried out in view of the limited thickness found in the boreholes.

A single water content of 16% was measured from a sample from BH05 (11.70m) with the PSD indicating a gravelly sand (see Figure 4, Appendix 10).

Clay Soils

Clay soils were found in BH02 and BH05, and formed the lowest layer found in the boreholes, both boreholes terminating within this layer at depths of 19.30m bgl (BH02) and 20.00m (BH05). It typically comprised stiff becoming very stiff grey and dark grey slightly sandy slightly gravelly CLAY, the gravel being composed of flint and chalk.

A table summarising the test results for the Glacial Till (Clay Soil) is presented as Table 5 in Appendix 10.

The water contents were found to be variable, ranging from 16% to 19%, see Figure 2 (Appendix 10) and were reasonably consistent with depth. The Atterberg Limit test results classified the soils as clay of low plasticity (see Figure 3, Appendix 10) with a Plasticity Index (PI) of 13 to 18%. Modifying the PI to take account of the soil particles greater than 425µm of the sample tested, following the procedures in NHBC Standards Chapter 4.2, gives Modified PIs of 11 to 15% and indicates a low volume change potential. Bulk densities of between 2.13 and 2.23Mg/m³ were obtained from the triaxial test specimens (see Figure 5, Appendix 10) and were also reasonably consistent with depth.

The SPT N values were generally found to be between 25 and 50. The N values are shown on Figure 1 (Appendix 10) and generally show an increase in strength with depth. Based on the relationship $c_u = f_1 \times N$ (kN/m²) proposed by Stroud & Butler, where $f_1 = 6.5$ for clay using the mean PI of 15%, the N values are approximately equivalent to undrained shear strengths of 160 to 325kN/m² and are indicative of very high and extremely high strength conditions. Undrained shear strengths ranging between 54 and 236kN/m² were obtained from undrained triaxial tests on four specimens taken from UT samples and indicate medium to very high strength conditions. The undrained shear strength data are shown on Figure 6 (Appendix 10) and, apart from the low undrained strength of 54kN/m² from BH02 (18.00m), show an increase in strength with depth. The reason for the low strength from BH02 is uncertain but may be due to disturbance to the test specimen during the driving of the sample.

7.1.5 Ground Model

Cross sections are presented in Appendix 11.

7.2 Groundwater

Groundwater was encountered in Made Ground and the Tidal Flat Deposits during the sinking of the exploratory holes. A groundwater strike was encountered in the relatively deep Made Ground in BH04 at 1.4m bgl and at the base of shallower Made Ground in DS01 at 0.48m bgl.

Groundwater strikes and associated rises were encountered at various depths in the Tidal Flat Deposits and these probably represent localised changes in permeability of materials encountered within the exploratory hole compared to the surrounding materials.

- Within the Upper Silt layers, groundwater was struck in Boreholes BH01 to BH05 at depths of between 1.20m and 4.00m bgl with the level rising to between 0.90 and 2.40m bgl (1.36m and 2.48m OD) after a 20 minute pause in the drilling operations, with seepages being noted in DS02 to DS04 at depths of 2.00 to 3.00m bgl (0.70 to 1.64m OD).
- Within Lower Sand Layers, groundwater was struck in Boreholes BH01, BH02, BH05 and DS01 at depths of 3.00 to 14.00m bgl with the level rising to a level of 2.50 to 5.00m bgl (-1.38 to 1.02m OD) after a 20minute pause in the drilling operations.

A groundwater seepage was also noted in BH05 within the Glacial Till at a depth of 17.00m bgl (-13.6m OD).

Water was added to aid drilling progress for BH01, BH03, BH04 and BH05.

Standpipes (50mm in diameter) were installed in each of the boreholes. The results of monitoring of the installations carried out over the period between the can be summarised as follows:

Borehole	Response zone (m bgl)	Stratum covered by Filter Zone	Groundwater Level		Remarks
			Depth (m bgl)	Level (m OD)	
BH01	1.50-3.50	Tidal Flat Deposits (Upper Silt)	0.75 - 1.59	2.63 – 1.79	Groundwater depths varied by becoming shallower and deeper between monitoring round over the monitoring period
BH02	4.00-11.50	Tidal Flat Deposits (Lower Sand)	1.18 - 1.94	2.44 – 1.68	Groundwater depths varied by becoming shallower and deeper between monitoring round over the monitoring period
BH03	3.50-9.00	Tidal Flat Deposits (Upper Silt & Lower Sand)	1.54 - 1.87	1.88 – 1.55	Groundwater depths varied by becoming shallower and deeper between monitoring round over the monitoring period
BH04	0.60-1.70	Made Ground	1.41 - 1.81	2.35 – 1.95	Groundwater depths varied by becoming shallower and deeper between monitoring round over the monitoring period
BH05	14.00-20.00	Glacial Till (Clay Soil)	1.60 - 1.92	1.80 – 1.48	Groundwater depths varied by becoming shallower and deeper between monitoring round over the monitoring period

The monitoring was undertaken on 28th April and the 3rd, 11th and 18th May 2023. The results suggest a water table within the Tidal Flat Deposits that is relatively close to ground level, being generally less than 1.5m below current ground level.

It should be noted that groundwater levels can vary both seasonally and after prolonged periods of wet or dry weather. The results of the groundwater monitoring are presented in Appendix 6.

8.0 GEOTECHNICAL EVALUATION

8.1 Proposals

It is understood that proposals for the site include the construction of new school buildings, possibly one to two storeys in height, within the three areas marked on the plan in Section 1 and the plan included in Appendix 1 following the demolition of Blocks EFAB and EFAC/EFAC. The following structural loadings have been provided by the Engineer, for a single and two storey steel framed building.

Loadings for a Single Storey Steel Framed Building

	SLS (kN)	ULS (kN)
Internal	850.0	1200.0
Edge	475.0	650.0
Corner	250.0	350.0

Loadings for a Two Storey Steel Framed Building

	SLS (kN)	ULS (kN)
Internal	1500.0	2075.0
Edge	825.0	1150.0
Corner	450.0	625.0

Details of proposed finished levels had not been made available at the time of preparation of this report. It has been assumed that finished levels will be close to the existing ground levels.

8.2 Foundation Solutions

The approach to design and selection of suitable foundation options for this site is based on a hierarchy of complexity and expense. If the simplest and cheapest solution can be shown to be appropriate, then further discussion is considered superfluous. Where such simple and proven techniques are not expected to be suitable, then other options are examined in more detail. It should be noted that the following comments on foundation solutions are based on the proposals discussed in Section 8.1 above; if proposals for the site are changed, it may be necessary to reconsider the foundation solutions. The following options have been considered:

- Traditional strip/pad foundations at shallow depth.
- Traditional strip/pad foundations but using trench fill or piers to transfer loads to soils at greater depths.
- Ground treatment by vibro-replacement and allow the adoption of conventional shallow foundations and ground bearing floor slabs.
- Piled foundations to transfer the structural loads to the soils at depths greater than that for concrete trench fill foundations.

Bearing in mind that the proposals are likely to result in building a new structure over the site of a previous ones, at least in part, the performance of the existing building will provide invaluable data on the potential performance of the new structure. Hence, before demolition, note should be taken of any deformation or movement of the structure, and of the foundations used, in providing site-specific indication of problems and their solution in any new building. That building will also have loaded the ground in the past and foundations outside its area may behave differentially to those which have been previously loaded. The scale of this will need to be assessed when preparing designs for the new works.

8.2.1 Strip/Pad Foundations

It is anticipated that foundations, floor slabs and other substructures will be removed as part of the demolition of the existing school buildings. The proposed new school building will overlie the footprint of the existing school building and therefore remnant demolition fill is likely to be encountered within new foundation excavations. Other Made Ground soils have been noted elsewhere across the site. In BH04, Made Ground was found down to depth of 1.70m in the area of the former swimming pool. Elsewhere a thickness of up to 0.5m was found in the exploratory holes, although greater thicknesses may be present in the other areas not investigated.

Made Ground is typically of variable composition, thickness, consistency, and compressibility, with a potential for further degradation and could potentially be chemically aggressive in nature. Hence, in its present condition, the Made Ground is deemed unsuitable to support the proposed school buildings on traditional strip/pad foundations without the risk of excessive and unacceptable settlements occurring.

Foundations should be installed at a minimum depth of 1.0m below ground level but based on the exploratory holes, founding depths of up to 1.70m bgl are indicated to get below the Made Ground. The founding depths should also take account of any existing trees and shrubs, or to any that are proposed or removed, see Section 8.2.5 below. Any existing foundations should be removed out to prevent hard spots below the new buildings. The resulting voids should be filled with suitably compacted clean crushed stone or similar suitable hardcore and the new foundations taken below this.

The Upper Silt layers of the Tidal Flat Deposits underlying the Made Ground might provide a suitable bearing stratum for structural foundations but that would be dependent on the applied loads. However, for the structural column loads given above in Section 8.1 above and the low strength conditions and soft consistencies found in the exploratory holes, the use of shallow strip / pad foundations are unlikely to be economic in terms of the likely size of foundation that would be needed to carry the loads. Hence, the use of trench fill or piled foundations, discussed below, should be considered.

8.2.2 Trench Fill or Pier Foundations

In some areas, foundation depths will be required to be increased for the following reasons:

- 1) To take account of the effect of nearby trees (both current, pre-existing and proposed) in line with NHBC Standards Chapter 4.2, 'Building near Trees' (2020),
- 2) to extend through any greater thicknesses of Made Ground, and
- 3) to extend the founding depth to stiffer and more uniform soils.

As discussed above for the shallow foundations, for the structural column loads given above in Section 8.1 and the low shear strengths found in the Upper Silt layers, trench foundations are also unlikely to be economic in terms of the likely size of foundation that would be needed to carry the loads indicated. Placing foundations in the Lower Sand layers of the Tidal Flat Deposits may prove viable for trench fill foundations due to the higher available bearing capacity but founding depths of 3m to 6m based on the boreholes is indicated, and together with high groundwater levels, placing the foundation in the Lower Sand is likely to be problematic and unviable. As such the use of vibro-stone columns or pile foundations as discussed below (Section 8.2.3) should be considered. Should changes to the structural design of the buildings lead to reduced column loads then the use of trench fill or pier foundations may provide a viable option.

Once the final location of the proposed building and its foundations is established, further targeted investigations, possibly involving static cone penetration tests (CPT) as well as boreholes would allow the strength and compressibility of the Tidal Flat Deposits to be better defined local to the building and more efficient foundations could be adopted for the applied structural loads. Larger foundations can tend to accommodate strengths closer to the average and minimise the effects of any lower bound shear strengths. Where practicable the foundations should bear onto a uniform stratum to minimise the risk of differential settlements.

Piers having width and length dimensions similar to those of typical spread foundations but extending down to greater depths in the Tidal Flat Deposits could be considered, but the economics will depend upon the proved strength and compressibility of this strata beneath the column locations. Assessment of the ground conditions for pier solution could be part of any further investigation.

It is recommended that the foundation excavations are carefully inspected by a geotechnical engineer or other suitably qualified person prior to concreting.

8.2.3 Ground Improvement

In view of the variable ground conditions, consideration could be given to the use of the vibratory 'vibro' ground improvement process by which stone columns would be formed through the Made Ground and Upper Silt Layers of the Tidal Flat Deposits and into the underlying soils to increase the load bearing capacity of the ground and provide a relatively uniform response of the ground to loading.

Prior to progressing any vibro ground treatment designs the advice of specialist contractors should be sought to confirm the suitability of their methods for the particular ground conditions, particularly the low strength of the Upper Silt layers, and to allow development of designs and costings. Any vibro-replacement works should ensure full depth treatment of the Made Ground and should penetrate into the competent underlying strata and could also be suitably designed to accommodate the proposed column loads, subject to suitable settlement behaviour being found, and should be undertaken by suitably experienced ground treatment contractors. Assurances should also be sought on the likely bearing capacity that would be available for pad foundations and the likely settlements that would occur.

8.2.4 Piled Foundations

Consideration could be given to the adoption of piled foundations to carry all structural loads down to greater depths in the Tidal Flat Deposits and into the Glacial Till. This will extend the foundations past upper lower-strength soils in the Tidal flat Deposits. Driven or bored cast in situ piles would be suited to the ground conditions but the latter possibly have the advantage of lower noise and vibration levels during installation, which might be preferable given the proximity of the nearby buildings and infrastructure. It is recommended that the specialist piling contractors should be approached for advice on the suitability of their proprietary piling systems to this site and for guidance on the pile size/length/load capacity relationship. On completion of pile installation, reinforced concrete pile caps should be constructed to support the structural columns. Walls should be supported on reinforced concrete ground beams, these being designed to span between the pile caps.

It should be noted that some obstructions from remnant foundations and buried structures from previous development may be present. Should the development take place in areas of former structures, an allowance should therefore be made for grubbing out remnant foundations or breaking out other obstructions where they occur and this may necessitate pre-excavation of pile positions where obstructions are encountered.

The design of the piles will depend on such factors as the required working load and foundation layout (in particular, the number of piles below each pile cap carrying the individual column loads). The carrying capacity of piles is fundamentally related to their method of emplacement and individual piling contractors have their own formulae specific to their individual techniques. As stated above, it is recommended that early discussions are held with experienced specialist contractors for advice on the applicability of their own particular proprietary techniques to these specific site conditions. It should also be noted that the boreholes stopped at a depth of up to 20m bgl and it the piles may need to be taken to depth below 20m bgl depending on the structural loads and hence, it will be necessary to carry out further investigation at the site with boreholes being taken to greater depths in the Glacial Till or possibly into the bedrock (Amphill Clay Formation) which was not found during this preliminary investigation.

As a tentative guide, for a pile diameter of 0.45m and an indicative pile resistance of the order of 390kN is estimated for a length of 15m and 695kN estimated for a length of 20m for a bored cast in situ pile. This generally follows the procedures in BS 8004:2015 +A1:2020, with the partial factors assuming no verification of the serviceability limit state and uses a simplified ground profile with no contribution to the shaft friction from the upper 4m in the Made Ground and Tidal Flat Deposits (Upper Silt). The preliminary parameters used in the estimated pile resistances are given in the table below. A pile adhesion factor of 0.5 has been used in the Glacial Till in estimating the shaft resistance and in the Upper Sand layers, values of K_s of 0.7 together with a δ of 32° have been used.

Stratum	Depth (m bgl)	Bulk Unit Weight (kN/m ³)	Angle of Friction (φ°)	Undrained Shear Strength (kN/m ²)
Tidal Flat Deposits (Upper Sand)	4.00 – 7.50	20	33	-
Tidal Flat Deposits (Upper Sand)	7.50 – 13.50	20	36	-
Glacial Till	13.50 – 20.00	20	-	135kN/m ² at 13.50m bgl increasing to 300kN/m ² at 20.00m bgl

It should be noted that the above pile resistances are purely for indicative purposes and are based on a simplified ground profile down to the base of the deepest borehole. Further investigation is required to define the nature of the soils below this depth and the undrained shear strength profile down to a depth of 25m to 30m bgl and also to look in more detail at the strength of the Upper Silt layers in the Tidal Flat Deposits as well as the ground and groundwater profiles at the location of the proposed buildings to facilitate the design of any piles.

Piling specialists have their own procedures for the installation of their proprietary products and an associated methodology for design based on this and the results of the investigation. Furthermore, their experience in this area and in the soils encountered would be drawn upon in arriving at their proposals. It would be necessary for them to draw on data to beyond the toes of the piles which they propose and any group effect drawn upon in assessing likely performance.

8.2.5 Building near Trees

Several mature / semi mature trees are present around the edges of the site and also in a group in the south western corner of the site. The location of the main trees can be seen on the Exploratory Hole Location Plan in Appendix 2.

Tree root systems in clay soils can cause shrinkage and swelling movements due to moisture extraction by the trees. NHBC Standards Chapter 4.2, 'Building near Trees' (2022) gives guidance on foundation depths and precautions against heave where foundations are to be constructed within influencing distance of trees and the volume change potential of the foundation soils. It should be noted that special precautions may be required relating to heave where trees have been or are to be removed.

The volume change potential of the soils found during the investigation are based on the PI values discussed in Section 7.1 above and for the Upper Silt layers of the Tidal Flat deposits, the volume change potential is indicated to be low. On this basis, a low volume change potential can be adopted when determining foundation depths in relation to trees and the requirements for compressible materials/ voids adjacent to foundations or below floor slabs.

As a guide, based on the procedures outlined in NHBC Standards Chapter 4.2 for a low volume change potential soil with a high, moderate and low water demand mature tree of 20m in height, the following minimum foundation depths are indicated;

Distance of foundation from Tree (m)	Broad Leaf Tree			Coniferous Tree	
	High Water Demand	Moderate Water Demand	Low Water Demand	High Water Demand	Moderate Water Demand
0	2.5	1.6	1.2	2.5	1.6
10	1.8	1.05	0.75	1.05	0.75
20	1.1	0.75	0.75	0.75	0.75

These foundation depths are for guidance only. As part of the design process, the foundation depths should be assessed in relation to the tree species, its water demand and its mature height for existing or planned trees and for its actual height where one is to be removed.

8.3 Ground Floor Slabs

The preferred solution for the floor slab typically depends on the type of foundation adopted with a suspended floor slab being used where the structural loads are carried on piled foundations and a ground bearing floor slab where strip / pad foundations are adopted. Where ground treatment through the use vibro-replacement is adopted a ground bearing floor slab could be adopted where the treatment is extended across the whole building footprint.

Where bearing soils are affected by the presence of trees and shrubs, the use of suspended floor slabs is likely following NHBC Chapter 4.2, 'Building near Trees'. As previously stated in Section 8.2.5 above, a low volume change potential Upper Silt layers of the Tidal flat Deposits can be used based on NHBC Chapter 4.2.

For low volume change potential soils, the NHBC recommend the following minimum void dimensions below ground beams or ground floor slabs constructed within the zone of influence of trees.

Type	Under Ground Beam and Suspended In Situ Concrete Ground Floor	Under Precast Concrete Ground Floor
Minimum Void	50mm	125mm

Should cast in situ suspended floor slabs be adopted then a void former will be required in order to create the minimum required void dimension beneath the slabs to protect against potential heave of the underlying clay soils.

8.4 Buried Concrete

The results of the chemical testing on samples from the site, including the contamination testing suites, during this preliminary investigation show the following:

Made Ground

Water Soluble Sulphate	11 to 52 mg/l
Total Sulphate	0.03 to 0.07%
Total Sulphur	0.01 to 0.11%
pH	7.8 to 11.8

Tidal Flat Deposits (Upper Silt)

Water Soluble Sulphate	11 to 360 mg/l
Total Sulphate	0.03 to 0.93%
Total Sulphur	0.01 to 0.31%
pH	7.6 to 8.4

Tidal Flat Deposits (Lower Sand)

Water Soluble Sulphate	100 & 130 mg/l
Total Sulphate	0.05 & 0.07%
Total Sulphur	0.12%
pH	8.1 & 8.2

Glacial Till (Clay Soils)

Water Soluble Sulphate	320 & 480 mg/l
Total Sulphate	0.18 & 0.22%
Total Sulphur	0.47 & 0.55%
pH	8.1 & 8.3

Groundwater

(From the Standpipes in BH01 to BH04))

BH01 with a filter zone in the Tidal Flat Deposits (Upper Silt)

Water Soluble Sulphate 23 mg/l
pH 7.1

BH02 and BH03 with a filter zone in the Tidal Flat Deposits (Lower Sand)

Water Soluble Sulphate 46 & 59 mg/l
pH 7.3 & 8.0

BH04 with a filter zone in the Glacial Till

Water Soluble Sulphate 200 mg/l
pH 7.4

Based on the test results, the characteristic water-soluble sulphate concentrations for all the units tested and the groundwater lie within Design Sulphate Class DS-1 of BRE Special Digest 1.

In view of the potential presence of pyrite that can oxidise to form sulphates, a check for their presence has been undertaken. The Oxidisable Sulphide Content (OS) is determined from the Total Potential Sulphur Content (TPS) and Acid Soluble Sulphate (AS) for the soils at the site. The TPS is equal to 3 times the Total Sulphur (TS) content such that,

$$OS (\%) = (3 \times TS) - AS$$

Based on the geotechnical suites of tests, where the OS < 0.3%, pyrite is unlikely to be present in significant amounts and hence the concrete class can be determined on the basis of the water-soluble sulphate and pH. Where OS > 0.3%, pyrite is probably present and the sulphide content of the ground should be taken into account and hence the TPS value used in determining the concrete class. The OS content was found to be greater than 0.3% in samples from the Tidal Flat Deposits (Upper Silt) and (Lower Sand) and the Glacial Till (Clay Soils) and from the TPS values gives the Design Sulphate Classes indicated below. In the Made Ground, an OS < 0.3% was found in the samples tested.

Stratum	Design Sulphate (DS) Class	Aggressive Chemical Environment for Concrete (ACEC) Class
Made Ground	DS-1	AC-1
Tidal Flat Deposits (Upper Silt)	DS-3	AC-3 *
Tidal Flat Deposits (Lower Sand)	DS-2	AC-2 *
Glacial Till (Clay Soil)	DS-4	AC-4 *

* Based on oxidisable sulphides being present

Given the general high groundwater levels, the groundwater is considered to be "mobile" for the above assessments of the ACEC Classes.

It should be noted that the digest states that "concrete in pyritic ground which is initially low in soluble sulphate does not have to be designed to withstand a high potential sulphate class unless it is exposed to ground which has been disturbed to the extent that contained pyrite may oxidise and the resultant sulphate ions reach the concrete. This may prompt the redesign of the structure or change the construction process to avoid ground disturbance, for example using piles instead of using a spread footing that is constructed in an excavation that is subsequently backfilled".

On this basis where strip or pad foundations are constructed in the Tidal Flat Deposits (Upper Silt) or where concrete is in contact with fill sourced from this stratum and the Tidal Flat Deposits (Lower Sand) or the Glacial Till, the subsurface concrete should be designed to comply with the classifications given above. However, should piles be installed through these strata that would not allow the oxidation of sulphates in the soils, an ACEC Class of AC-1 could be adopted for the concrete in the piles based on the pH and Sulphate results and the Design Sulphate Class of DS-1.

The above ACEC classes are based on a small number of tests and it is recommended that further chemical testing is undertaken as part of further ground investigations.

8.5 Excavations

The soils below this site could all be classed as 'easy digging' for normal backhoe excavation plant. However, following demolition, any areas of hardstanding and concrete floor slabs from any existing buildings, together with any remnant foundations or other substructure remains will require the use of hydraulic breakers to assist with their removal. The possibility of large obstructions in the Made Ground should also be considered, although within the exploratory holes, layers of concrete were only found in BH04.

Where foundation excavations extend to depths greater than 1.00m they will need to be fully shored if entry by personnel is required. Even for shallow excavations the need for support will still need to be evaluated under CDM regulations. Support to the sides of excavations should be in accordance with the recommendations of CIRIA Report 97, 1983. Close-boarded support will be required for excavations in excess of 1.00m depth where any granular materials or soft cohesive deposits are encountered. Shallower excavations will need support or battering back to a safe slope angle (gradient no steeper than 1 vertical to 3 horizontal) if they are to remain open for extended periods or if personnel are expected to enter.

Maximum groundwater levels of 0.75m to 1.65m bgl (1.80m to 2.63m OD) was recorded over the monitoring period. For excavations above the maximum level in BH01 of 0.75m bgl, groundwater is unlikely to present any significant problems. For excavations below the water table some form of dewatering will be necessary.

All plant and machinery will need to maintain an appropriate standoff distance from the crest of all open excavations.

The soils likely to be exposed at formation are likely to be sensitive to moisture changes and potential softening or drying out and it is recommended they are promptly protected following exposure and inspection.

8.6 Pavement Design

The conditions prevailing at the time of construction will affect the CBR of the subgrade soil and its strength. Research has shown the importance of the equilibrium moisture content of the subgrade. The relationship between soil suction and the moisture content shows that a soil that becomes wet during construction will retain water and will therefore be weaker under the pavement in the equilibrium condition than a foundation that has remained dry, particularly for soils of low to medium plasticity.

The formation for new pavements is very likely to be within the soils of the Made Ground or the Tidal Flat Deposits (Upper Silt). The Plasticity Indices (PI) obtained from tests on the fine soils within the Tidal Flat Deposits (Upper Silt) was found to be between 16 and 17%.

Equilibrium CBR values for various materials for poor and good construction conditions are given in a report by the TRRL (Report 1132). The following equilibrium CBR values are indicated in the TRRL Report for poor and good construction conditions assuming a high water table and a thin or thick pavement construction.

PI	Equilibrium CBR (%)	
	Poor Conditions	Good Conditions
10	1.5 – 3.5	3.5 – 7
20	2.5 – 4	4.5 – 7

For silt soils, the TRRL Report indicates an equilibrium CBR of 1% for poor conditions and 2% for good conditions and for granular soils an equilibrium CBR of greater than 20%.

Minimum and maximum CBR values for the soils between 400 and 600mm depth estimated from dynamic cone penetration tests are presented in the following table:

DCP Test	CBR (%) At 400mm to 600mm depth	Material
BH01 - DCP	5 - 12	Made Ground (Clay Soils)
	5 - 10	Tidal Flat Deposits (Upper Silt)
BH02 - DCP	2 - 4	Tidal Flat Deposits (Upper Silt)
BH03 - DCP	7 - 8	Made Ground (Clay Soils)
	5 - 6	Tidal Flat Deposits (Upper Silt)
BH04 - DCP	1 - 22	Made Ground (Clay Soils)
DS01 - DCP	8 - 12	Made Ground (Granular Soils)
	9 - 12	Tidal Flat Deposits (Upper Silt)
DS02 - DCP	6 - 8	Tidal Flat Deposits (Upper Silt)
DS03 - DCP	3 - 5	Tidal Flat Deposits (Upper Silt)

With the variations in CBR encountered and potential variation in the soils likely to be present at formation it would be prudent to adopt a conservative approach to pavement design, with the adoption of a single preliminary design CBR value of 2% for the site. The exposed surface should be proof-rolled, and any soft spots should be removed and replaced with clean crushed stone or similar suitable granular fill. Further testing of the formation surface following a site strip and any further re-grading would help to confirm the design CBR value and may allow a higher CBR value to be adopted. As noted in Section 8.6, the soils likely to be exposed at formation will probably be sensitive to moisture changes and it is recommended that the formation is promptly protected by a capping layer following exposure and inspection. Where this is not practicable it should be sealed and cut with a cross-fall and drainage provided.

In accordance with Road Note 29, "A Guide to the Structural Design of Pavements for New Roads", 1970, where poorly drained untreated cohesive soils have a PI of less than 20%, they are considered to be frost susceptible. The Atterberg Limit tests in the for the Tidal Flat Deposits (Upper Silt) showed test results meeting this criterion and hence, it would be prudent to consider the soils as being frost susceptible.

It is generally accepted that no material within 450mm of the road surface should be susceptible to frost action and if necessary, the sub-base thickness should be increased such that the total thickness of road construction is not less than 450mm.

8.7 Retaining Walls

Due to the generally even topography of the site in the area of the development option, it is anticipated that retaining walls are unlikely to be required as part of the development.

8.8 Earthworks

Due to the generally even topography of the site in areas of the proposed development option, significant earthworks are not anticipated. However, surplus spoil will arise from excavations for foundations. These arisings could be used, if required, for any landscape mounds, subject to their geo-environmental suitability.

8.9 Updated Geotechnical Risk Register

A preliminary geotechnical risk register for the site was presented in the Desk Study (reference: PC228546, January 2022). The geotechnical risk register has been updated to reflect the findings of this investigation and above recommendations, as follows:

	Condition	Hazard	Potential Impact	Before Control			Comments / Proposed Mitigation	After Control		
				Probability	Impact	Risk		Probability	Impact	Risk
R1	Compressible ground	Insufficient bearing capacity leading to potential increased total and differential settlement problems.	Failure / excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings. Potential for differential settlement.	3 (P)	4 (H)	12 (Md)	Use vibro-replacement treatment or piled foundations as appropriate to transfer the structural loads into the natural soils at depth or the bedrock. If further investigation shows sufficient strength in the Tidal Flat Deposits (Upper Silt), trench fill or pier foundations could potentially be used. Foundation excavations to be inspected prior to foundation construction.	1 (VU)	4 (H)	4 (N)
R2	Made Ground	Variable behaviour and thickness leading to variable bearing capacities and unpredictable total and differential settlements.	Failure / excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings. Potential for differential settlement.	2 (U)	4 (H)	8 (Mn)	Foundations to be taken through the Made Ground to bear into the natural soils. Apart from BH04, Made Ground was found to less than 0.50m thick.	1 (VU)	4 (H)	4 (N)
R3	Swelling / Shrinking Soils	Shallow foundation movement due to seasonal shrinkage / swelling of clay soils associated with trees and shrubs.	Excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings.	3 (P)	4 (H)	12 (Md)	If any foundations are within influencing distance of existing or removed trees, determine foundation depths and requirements for compressible materials/voids adjacent to foundations/below floor slabs using guidance in NHBC Chapter 4.2 'Building Near Trees'. A low volume change potential is indicated from this preliminary investigation.	1 (VU)	4 (H)	4 (N)
R4	Obstruction / Hard Strata	Affecting excavations during construction works and potential hard spots below foundations / floor slabs.	Differential movement of the foundations / ground bearing floor slabs leading to cracking of buildings. Delays to excavations during construction.	3 (P)	4 (H)	12 (Md)	Use backhoe excavation plant but have hydraulic breakers available to assist with the removal of any remnant hardstanding, concrete floor slabs, foundations or other substructure remains following the demolition of the existing school buildings. A layer of concrete was found in BH04 at 1.20m bgl but was penetrated by the cable percussive drilling rig.	2 (U)	4 (H)	8 (Mn)
R5	High groundwater	Instability of foundation excavations and problems with foundation, floor slab and road / hardstanding formations.	Excessive movement of the foundations / ground bearing floor slabs leading to cracking of buildings and subsidence of roads / hardstanding areas.	2 (U)	4 (H)	8 (Mn)	Maximum variable groundwater levels of 0.75m to 1.65m bgl (1.80m to 2.63m OD) recorded during monitoring. Groundwater not anticipated to present significant problems in excavations above about 0.75m bgl. Below this, groundwater control provisions will be required.	1 (VU)	4 (H)	4 (N)

R6	Chemically Aggressive Soil	Corrosive attack of buried concrete.	Degradation of concrete foundation and buried concrete structures leading to failure.	3 (P)	3 (M)	9 (Md)	Use concrete of AC-1 to AC-4 classification from BRE SD1 as indicated in Section 8.5 for all subsurface concrete in the Made Ground and the natural soils or where in contact with fill sourced from these strata. Should piled foundations be adopted then consideration could be given to reducing the ACEC class to AC-1 (see Section 8.5 above). Further testing is recommended to confirm the above classes as part of future investigations.	1 (VU)	3 (M)	3 (N)
R7	Buried services	Damage during construction works posing risk to Health and Safety of site personnel and public.	Increased cost and delay for unplanned diversions, protection or repair.	2 (U)	5 (VH)	10 (Md)	All Statutory Service Plans to be provided to the Specialist Contractors prior to works taking place. Vigilance throughout any excavation work for any indications of unrecorded buried services.	1 (VU)	5 (VH)	5 (Mn)
R8	Slopes	Failure of existing slopes and any slope created during redevelopment separating different areas.	Not expected; gently sloping site.	1 (VU)	3 (M)	3 (N)		-	-	-
R9	Retaining Walls	Failure or movement of retaining walls.	Not expected; none present, none known to be planned.	1 (VU)	3 (M)	3 (N)		-	-	-
R 10	Solution Features	Potential collapse settlement of ground affecting buildings, hardstanding and infrastructure.	Not expected	1 (VU)	4 (H)	4 (N)		-	-	-
R 11	Mining Activities	Potential collapse or settlement of ground affecting buildings, hardstanding and infrastructure.	Not expected	1 (VU)	4 (H)	4 (N)		-	-	-
R 12	Frost Susceptibility /Frost Heave	Affecting the subgrade of roads, areas of hardstanding and ground floor slabs.	Subsidence and cracking of roads and areas for hardstanding and increased maintenance and management costs.	3 (P)	3 (M)	9 (Mn)	Atterberg limit testing indicates that the Tidal Flat Deposits (Upper Silt) should be considered to be frost susceptible. For new pavement construction all materials within 450mm of the pavement surface shall not be frost susceptible.	1 (VU)	3 (P)	3 (N)
R 13	UXO	Affecting investigation and construction works and posing risk to Health and Safety of site personnel and the public.	Increased costs and delay to the project and potential serious injury or death.	2 (U)	5 (VH)	10 (Md)	Preliminary UXO Threat Assessment carried out and risk assessed as very low and no further action required. Vigilance throughout investigation and construction works required.	1 (VU)	5 (VH)	5 (Mn)

9.0 GENERIC QUANTITATIVE RISK ASSESSMENT

9.1 Introduction

The UK approach to the assessment of contaminated land is based upon the principles of risk assessment, which is founded on the use of 'source-pathway-receptor' principles in order to establish the potential presence of 'pollutant linkage' as detailed in the LCRM.

Geotechnics Limited adopts a tiered approach to risk assessment in accordance with current UK guidance and good practice. The initial step of this process, known as Tier 1 or Generic Quantitative Risk Assessment (GQRA), is the comparison of site-derived data with relevant guideline levels.

Should the adopted criteria be exceeded, then two courses of action are available. The first is to break the pollutant linkage by undertaking remedial works such as removing or treating the contaminated soil. Alternatively, a more detailed risk assessment (DQRA) can be carried out to determine whether a contamination risk exists.

The UK approach to the assessment of human health risk from contaminated land is set out in the CLEA (Contaminated Land Exposure Assessment) framework, which was first published in 2002 by the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA). The original guidance was withdrawn, and revised guidance issued in 2009, which is set out in the following documents published by the EA:

'Human Health Toxicological Assessment of Contaminants in Soil', Science Report SC050021/SR2; and

'Updated Technical Background to the CLEA Model', Science Report SC050021/SR3.

The CLEA model uses generic assumptions about the fate and transport of chemicals in the environment and a generic conceptual model for site conditions together with human behaviour to estimate long term human exposure to soil contaminants. Soil Guideline Values (SGV) were previously derived using the CLEA Model by comparing estimated exposure with 'Health Criteria Values' (HCV) that represent a tolerable risk to health from chronic exposure.

The CLEA model has also been used to determine other generic assessment criteria (GACs), including those used within this assessment.

9.2 Risk Assessment Methodology

Based on site size, homogeneous ground conditions and site history, the site has been considered as one averaging zone. Relevant guidance issued by the Chartered Institute of Environmental Health (CIEH), in association with LQM, published November 2015 has been adopted.

Laboratory testing results were directly compared to the adopted GAC for residential without home grown produce / public open space (parkland), and results are shown in full in Appendix 9.

9.3 Risk Assessment for Human Health

The assessment of soil contaminant concentrations has used the relevant SGV/GACs adjusted for 2.5% Soil Organic Matter.

Of the twelve samples analysed, only naphthalene exceeded the SGV/GAC for just one sample (DS01, 0.2m) for residential without homegrown produce, although it did not exceed the public open space (park) GAC. For the exploratory hole log records, this sample is located just below a layer of asphalt, and it is possible that some asphalt has become entrained within the sample of Made Ground below the asphalt which appears to be a sub-base laid prior to the installation of the asphalt cover layer. Two samples were analysed of speciated PCBs from DS04 (0.5m and 1.0m bgl) with all PCBs being below the laboratory limit of detection.

The twelve samples were laboratory screened for asbestos. Asbestos was encountered in one sample (BH03, 0.10-0.20m) and this was further identified and quantified as chrysotile and amosite bundles with the sample having an overall asbestos concentration of 0.002%. This sample appears to come from a layer of sub-base presumably installed prior to the installation of asphalt above. The description of the materials does show the presence of construction materials, notably brick and concrete, which probably provide a source for the asbestos fibres depending on the age of the construction materials used to form the sub-base.

Analysis for PCBs were undertaken in two samples from DS04 located in close proximity of a substation to screen for any leakages / spillages of PCB containing oils. All PCBs were below the laboratory limit of detection.

9.4 Risk Assessment for Phytotoxic Effects

Concentrations of the phytotoxic metals copper, nickel and zinc do not exceed the guideline values for the protection of plants as presented in the Defra Sewage Sludge Code of Practice. Any risks to plants are assessed as being very low. Mercury and cadmium were not included in the analytical suite. The results of the phytotoxic screening are presented in the table below.

Determinand	Number of samples	GAC (mg/kg)	Results Exceeding GAC (mg/kg)	Exceeds GAC (Y/N)
Arsenic	12	All pH - 50	-	N
Copper	12	pH>7 - 200	-	N
Cadmium	-	All pH - 3	Not analysed for	-
Chromium	12	All pH - 400	-	N
Nickel	12	pH>7 - 110	-	N
Mercury	-	All pH - 1	Not analysed for	-
Lead	12	All pH - 300	-	N
Zinc	12	pH>7 - 300	-	N
Selenium	12	All pH - 3	-	N

9.5 Assessment for the Protection of Controlled Waters

The risks to controlled waters (groundwater and surface waters) from contaminants on-site have been assessed in accordance with the Environment Agency (EA) documents (The Environment Agency's Approach to Groundwater Protection, 2017 and Remedial Targets Methodology, 2006). Pollutant inputs from contaminated land sites are considered as passive inputs under the European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives, and as such are regulated under the Agency's 'limit' pollution objective. Acceptable water quality targets (WQT) are defined for protection of human health (based on Drinking Water Standards (DWS)) and for protection of aquatic ecosystems (Environmental Quality Standards (EQS)).

Groundwater was encountered during the progression of exploratory holes BH01 to BH05 and DS01 to DS04. Groundwater was not encountered during progression of the shallow trial pits. Monitoring wells were installed within exploratory holes BH01 to BH05 inclusive. During the four rounds of groundwater monitoring groundwater depths varied between depths of: BH01 – 0.75m to 1.59m; BH02 – 1.18m to 1.94m; BH03 – 1.54m to 1.87m; BH04 – 1.41m to 1.81m and BH05 – 1.60 to 1.92m.

Five soil samples were selected for soil leaching analysis with the leaching aliquot, performed in line with BS EN 12457 10:1 and four groundwater samples, were analysed and screened against Environmental Quality Standards (EQS) and Drinking Water Standards (DWS). EQS are considered the most appropriate screening criteria as the site is located on a Secondary Undifferentiated aquifer and groundwater is likely to discharge to surface water features in the wider site setting.

Exceedances of the relevant guidance criteria are summarised in the table below.

Determinand	Unadjusted EQS GAC (µg/l)	DWS GAC (µg/l)	Results Exceeding EQS (µg/l)	Results Exceeding DWS (µg/l)
Chromium (III)	4.7	50	BH01 – Groundwater – 25 BH04 – Soil Leachate – 5.4	N/A
Copper	1	2000	BH01 – Groundwater – 1.0 BH01 – Soil Leachate – 1.9 BH02 – Soil Leachate – 1.7 BH03 – Soil Leachate – 3.0 BH04 – Soil Leachate – 7.1 BH05 – Soil Leachate – 1.9	N/A
Lead	1.2	10	BH03 – Soil Leaching – 2.4 BH04 – Soil Leaching – 14	BH04 – Soil Leaching – 14
Manganese	123	50	BH02 – Groundwater – 260 BH05 – Groundwater – 140	BH02 – Groundwater – 260 BH03 – Groundwater – 69 BH04 – Groundwater – 140
Zinc	10.9	3000	BH01 – Groundwater – 37 BH02 – Groundwater – 39 BH03 – Groundwater – 20 BH05 – Groundwater – 36	N/A
Chloride	-	250	-	BH05 – Groundwater - 480
Ammoniacal Nitrogen	1	50	BH01 – Groundwater – 1500	BH01 – Groundwater – 1500
Fluoranthene	0.0063	-	BH01 – Groundwater – 0.18 BH02 – Groundwater – 0.02 BH03 – Groundwater – 0.07	N/A
Benzo(b)fluoranthene	0.00017	0.1	BH01 – Groundwater – 0.21 BH03 – Groundwater – 0.05	BH01 – Groundwater - 0.21
Benzo(k)fluoranthene	0.00017	0.1	BH01 – Groundwater – 0.09 BH03 – Groundwater – 0.02	N/A
Benzo(a)pyrene	0.00017	0.01	BH01 – Groundwater – 0.20 BH03 – Groundwater – 0.04	BH01 – Groundwater 0.20
Indeno(123cd)pyrene	0.00017	0.1	BH01 – Groundwater – 0.16 BH03 – Groundwater – 0.03	BH01 - Groundwater – 0.16
Benzo(ghi)perylene	0.00017	-	BH01 – Groundwater – 0.16 BH03 – Groundwater – 0.03	N/A

Chromium

Chemical analysis has shown that an exceedance of the EQS is only found in one groundwater sample (BH01). Soil leaching in BH04 is below the EQS and only one sample shows an exceedance of the EQS in BH04 and this concentration is below the maximum recorded groundwater sample. It is likely that Chromium (III) concentrations in groundwater are not contributed to by soil leaching and represent dissolution of Chromium (III) locally from the aquifer matrix.

Copper

The results above show that there are slight exceedances of the EQS value for copper from all five soil leaching samples (between 1.7µg/l and 7.1µg/l) and only one groundwater sample at a concentration equal to the EQS (1.0µg/l). With no obvious sources ubiquitous anthropogenic copper, these concentrations which are only slightly above the EQS and are assessed as naturally occurring concentrations, with soil leaching not influencing groundwater concentrations.

Lead

The results above show that there are slight exceedances of the EQS value for lead in two soil leaching samples (BH03, BH05) (2.4µg/l and 14µg/l respectively) and one exceedance of the higher DWS for BH04 (14 µg/l). All four groundwater samples are below the EQS with two being below the laboratory limit of detection. This suggest that lead is present in some soils in a leachable form, but there is insufficient present to impact groundwater quality.

Manganese

Manganese is only elevated in three out of four groundwater samples with concentrations between 69µg/l and 260µg/l. This is probably due to biogeochemical reduction of manganese oxides in the aquifer matrix, also suggested by elevated concentrations of iron in groundwater compared to soil leaching samples.

Zinc

The results above show that there are slight exceedances of the EQS value for zinc in all four groundwater samples (between 20µg/l and 39µg/l) and no exceedances from soil leaching samples. With no obvious sources anthropogenic zinc, these concentrations are assessed as naturally occurring concentrations, released due to dissolution or other biogeochemical reactions of groundwater with the aquifer matrix.

Ammoniacal Nitrogen

The results above show that there are slight exceedances of the EQS value for ammoniacal nitrogen in one groundwater samples (BH01) with a concentration of 1500mg/l and no exceedances from soil leaching samples. BH01 shows a concentration is several orders of magnitude higher than any soil leaching or groundwater concentration. There are no obvious sources of ammoniacal nitrogen in the area of BH01 although this may be due to the use of fertilisers which may then have leached into groundwater, acting as a sink for ammoniacal nitrogen or associated with impact from the presence of former sewage works.

Chloride

The results above show that there are slight exceedances of the DWS value for chloride in one groundwater sample (480mg/l) and no exceedances from soil leaching samples. This may be due to the use of sodium chloride for ice clearance for health and safety reasons which may then have leached into groundwater, acting as a sink for chloride.

PAHs

PAH compounds were below the laboratory limit of detection in one sample (BH03), with a second sample (BH04) having a single PAH compound at the laboratory limit of detection and the remainder below the laboratory limit of detection. The remaining two groundwater samples (BH01 and BH02) had slightly elevated concentrations of PAH compounds where EQS values are available. Although above the EQS values, the actual concentrations are only slightly above the laboratory limit of detection and are not assessed to present potential risks to controlled waters receptors are they will be effectively immobile due to relatively high Koc values resulting in retardation.

9.6 Ground Gas Risk Assessment

Ground gas monitoring results were obtained on 28th April 2023, with further readings taken on 3rd, 11th and 18th May 2023, presented in Appendix 6. None of the rounds of monitoring were undertaken when atmospheric pressure was less than 1000mbar.

The conceptual model has shown there are potential significant sources of ground gas to be present, including a former sewage works, a potentially infilled swimming pool and potentially infilled ponds. There are no closed landfills, thick Made Ground containing labile carbon or bedrock subject to mining and possibly mineshafts on or nearby the site. The intrusive works have confirmed this, with a maximum thickness for Made Ground of 1.70m in BH04. The measured flow rates show that there is no significant source of ground gases at depth. No significant sources of carbon dioxide or methane were recorded.

It should be noted that due to the relatively shallow groundwater and the design of the monitoring wells, ground gases were only potentially recordable from BH01 and BH04 as the slotted section for other monitoring wells would be flooded. Indeed, for BH01, BH03 and BH05, the slotted sections would be flooded for at least some of the monitoring rounds. However, the presence of relatively shallow groundwater will result in minimal opportunity of any ground gases that may be present to move within the vadose zone. In addition, from the nature of the Made Ground encountered, the potential for significant sources to be present is considered to be minimal.

The ground gas regime is classified as being Characteristic Situation 1.

10.0 REVISED CONTAMINANT LINKAGE ASSESSMENT

An updated assessment of pollutant linkages has been made following the completion of a ground investigation and generic quantitative risk assessment to assess potential sources (LCRM, 202, EA, 2008 (R&D Publication 66) and Defra, 2011).

Hazard Identification				Hazard Assessment			
Link	Contaminant	Pathway	Receptor	Probability	Consequence	Risk	Contaminant Linkage Assessment
1	Contaminated soil / groundwater	Ingestion (via soil dust) and inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	Humans using the site during construction.	Low	Medium	Low /Medium	AR: Asbestos encountered in sub-base below asphalt. All appropriate asbestos related legislation and regulations to be adhered to during any site works that disturb these materials.
2		Ingestion (via soil dust) and inhalation (via soil dust and vapours), ingestion through dirty hands, dermal contact with soil/water.	Humans using the site after development completion / off-site	Low	Medium	Low/ Medium	AR: Although slightly elevated PAHs and asbestos have been encountered in shallow soils, the present of hardstanding, buildings or growing media as part of any site redevelopment should break the pathway for any exposure to future site users.
3		Downward / Lateral migration	Unproductive strata / drainage ditches	Negligible / Not credible	Medium	Low	NAR: Low concentrations of contaminants encountered. In soil leaching and groundwater or concentrations associated with natural biogeochemical processes. No visual or olfactory evidence for the presence of contaminants.
4		Inhalation	Humans using the site after development completion / off-site.	Low	Medium	Low/ Medium	AR: See above. No Made Ground should be left exposed at Ground Level and suitable cover materials should be used where this may be a possibility.
5	Gas – methane & carbon dioxide	Ingestion, inhalation, dermal / direct contact	Ecology (Flora/Fauna)	Low	Negligible	Low	NAR
6		Ingestion, inhalation, dermal / direct contact	Humans using the site after development completion / off-site	No significant sources identified		Low	NAR: No evidence of any waste / sewage related waste materials being present on site. No significant off-site sources identified eg waste disposal facilities / landfills. No significant ground gas concentrations / flow rates or calculated Gas Screen Values encountered, although it should be noted, several monitoring wells had groundwater above the slotted sections.

7	Contaminated soil / waste / groundwater	Unproductive strata	Ecology (Flora/Fauna)	Negligible	Negligible	Low	NAR
8	Contaminated groundwater	Direct contact	Building structures.	Negligible	Mild	Low	NAR

NAR – No Action Required

11.0 CONCLUSIONS

11.1 Geotechnical

This preliminary ground investigation has shown the site to be underlain by variable depths of Made Ground between 0.50m and 1.70m thick, overlying the Tidal Flat Deposits. The Tidal Flat Deposits can be divided into two units: Upper Silt and Lower Sand layers, overlying Glacial Till at depths of 11.70m to 13.50m bgl (-8.30m to -9.88m OD) in Boreholes BH02, BH03 and BH05. The Glacial Till was found to be made up of granular and clay dominated soils. The bedrock beneath the Till was not found in the boreholes, the Glacial Till being proved to depths of 12.50m to 20.00m bgl.

The Made Ground is not considered to be a suitable founding stratum for the proposed buildings. In view of the low undrained shear strength and low consistencies in the Upper Silt of the Tidal Flat Deposits and the depth below ground level to the Lower Sand layers of the Tidal Flat Deposits, the use of shallow pad foundations or trench fill / pier foundations are unlikely to be viable and hence, vibro-replacement ground treatment or piled foundations bearing into the Glacial Till or bedrock could be considered for the foundations. As discussed, pile design should be undertaken by a specialist pile designer adopting appropriate factors of safety using the proposed structural loads. Should changes to the structural design of the buildings occur, leading to reduced column loads and reduced pad foundation sizes, then the use of trench fill or pier foundations may be a viable option.

Testing carried out during this preliminary investigation indicates that subsurface concrete, or where concrete is in contact with fill sourced from the strata below the site, it should be designed to comply with a BRE Special Digest 1 AEC classification of AC-1 in the Made Ground, AC-3 in the Tidal Flat Deposits (Upper Silt), AC-2 in the Tidal Flat Deposits (Lower Sand) and AC-4 in the Glacial Till (Clay Soils). However, should piles be installed through these strata that would not allow the oxidation of sulphates in the soils, an AEC Class of AC-1 could be adopted.

It would be prudent to adopt a conservative approach to pavement design, with the adoption of a preliminary design CBR value of 2% for the site (based on the DCP results and the Atterberg Limit test results). Where weaker zones are present at formation level, the exposed surface should be proof-rolled and any soft spots that depress unduly should be removed and replaced with clean crushed stone or similar suitable granular fill. Further CBR testing of the likely formation surface is advised prior to final design/construction.

Significant regrading of site levels is not anticipated as part of the site development, but the removal of existing buildings with their foundations, as well as the former swimming pool, will be a particular early element of the site's redevelopment. Recycling of such materials after selection, crushing and grading should be considered as part of the sustainability plans for the site. This could include the provision of a platform for safe operation of piling or vibro-plant and/or for further use of such material in permanent construction works. Surplus spoil will also arise from excavations for new foundations. These arisings, if considered unsuitable for temporary or permanent works, could be used for landscape mounds, if required, subject to their geo-environmental suitability. It is also unlikely that retaining walls will be required as part of the school development.

It is recommended that further investigation is carried out once development proposals are known in more detail to further refine the ground and groundwater design parameters.

Potential abnormal geotechnical costs may arise from the following:

- The use of vibro-replacement ground treatment or piled foundations
- The potential requirement for a suspended floor slab.
- Increased pavement thickness due to the low recommended preliminary CBR of 2%

11.2 Updated Environmental Risk Assessment

A preliminary risk assessment has been carried out based on the contaminant-pathway-receptor model as defined in Statutory Guidance to Part IIA of the Environment Protection Act, 1990, in accordance with BS 10175: 2011 +A2 2017 "Investigation of Potentially Contaminated Sites – Code of Practice" and LCRM. In order to make a more detailed assessment of the potential hazards, a preliminary Phase 2 intrusive investigation was carried out to reduce uncertainty and produce a more comprehensive conceptual site model of the site. This detailed the characteristic ground conditions and elements of the surrounding environment and has assisted with identifying contaminant linkages.

There was a minor exceedance of the human health GAC for naphthalene for future site users in one soil sample. One shallow soil sample composed of suspected sub-base installed prior to laying asphalt showed the presence of asbestos. Concentrations of soil leaching and groundwater sample, although elevated show that there are no significant risks to controlled water receptors. Ground gas monitoring has shown that there are no significant sources of ground gases present affecting the site and the ground gas regime is classified as Characteristic Situation 1 for methane and carbon dioxide and no ground gas protection measures are required for any proposed structures.

Based on the scope of the works undertaken during this preliminary investigation, there are anticipated abnormal costs relating to geoenvironmental conditions:

- Asbestos encountered at 0.002% in one Made Ground sample, and appropriate asbestos legislation and regulations will require implementation, including a risk assessment by the ground works / construction contractors.

Localised areas of contaminant impact encountered during earthworks. In addition, there may be special conditions appertaining to the site which were not revealed by this investigation and which have not been taken into account in this report.

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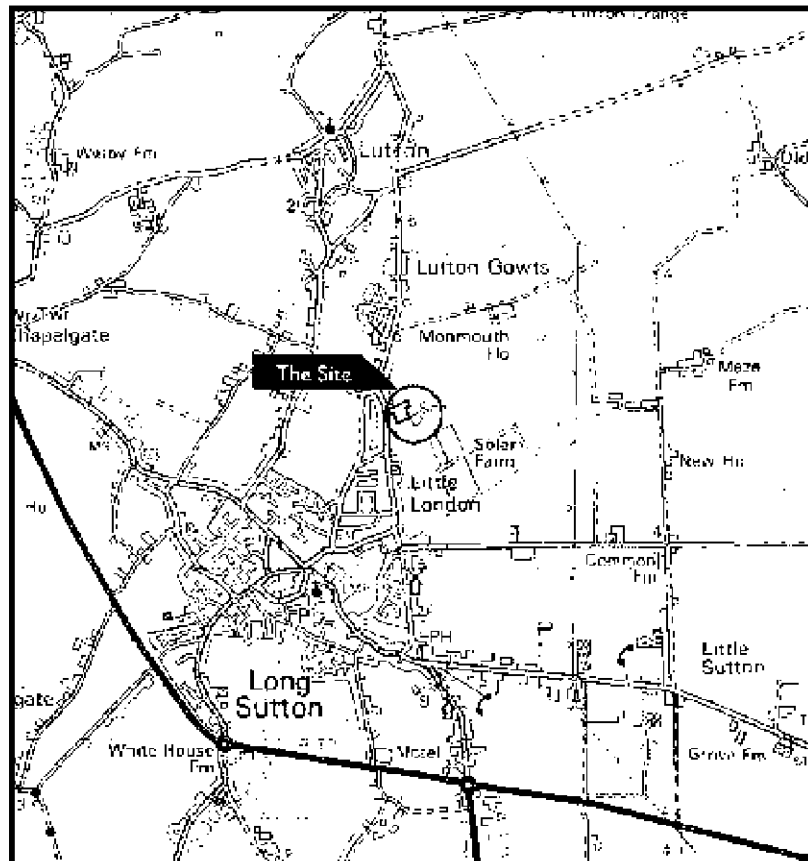
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APPENDIX I

Site Plans

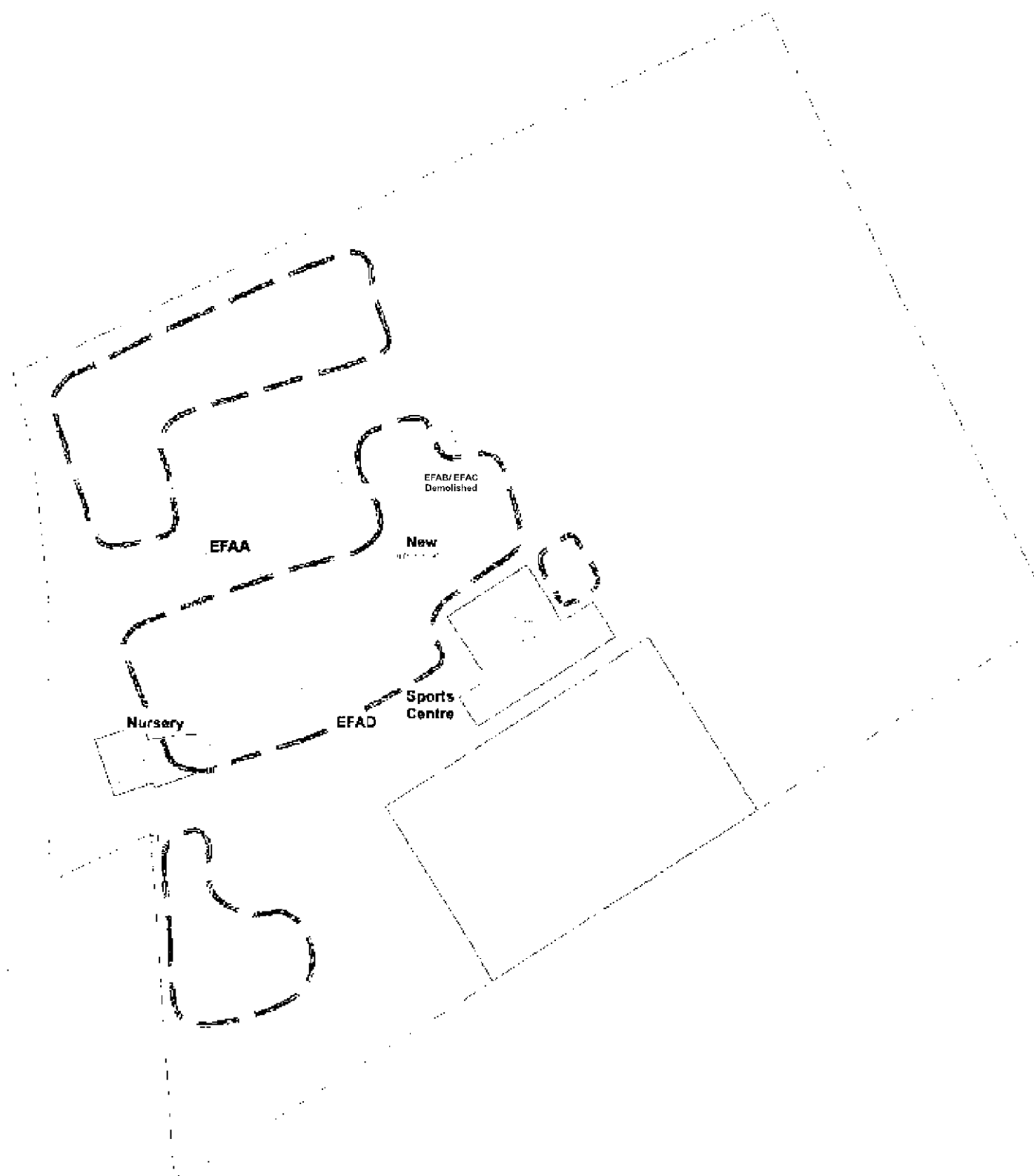
SITE LOCATION PLAN



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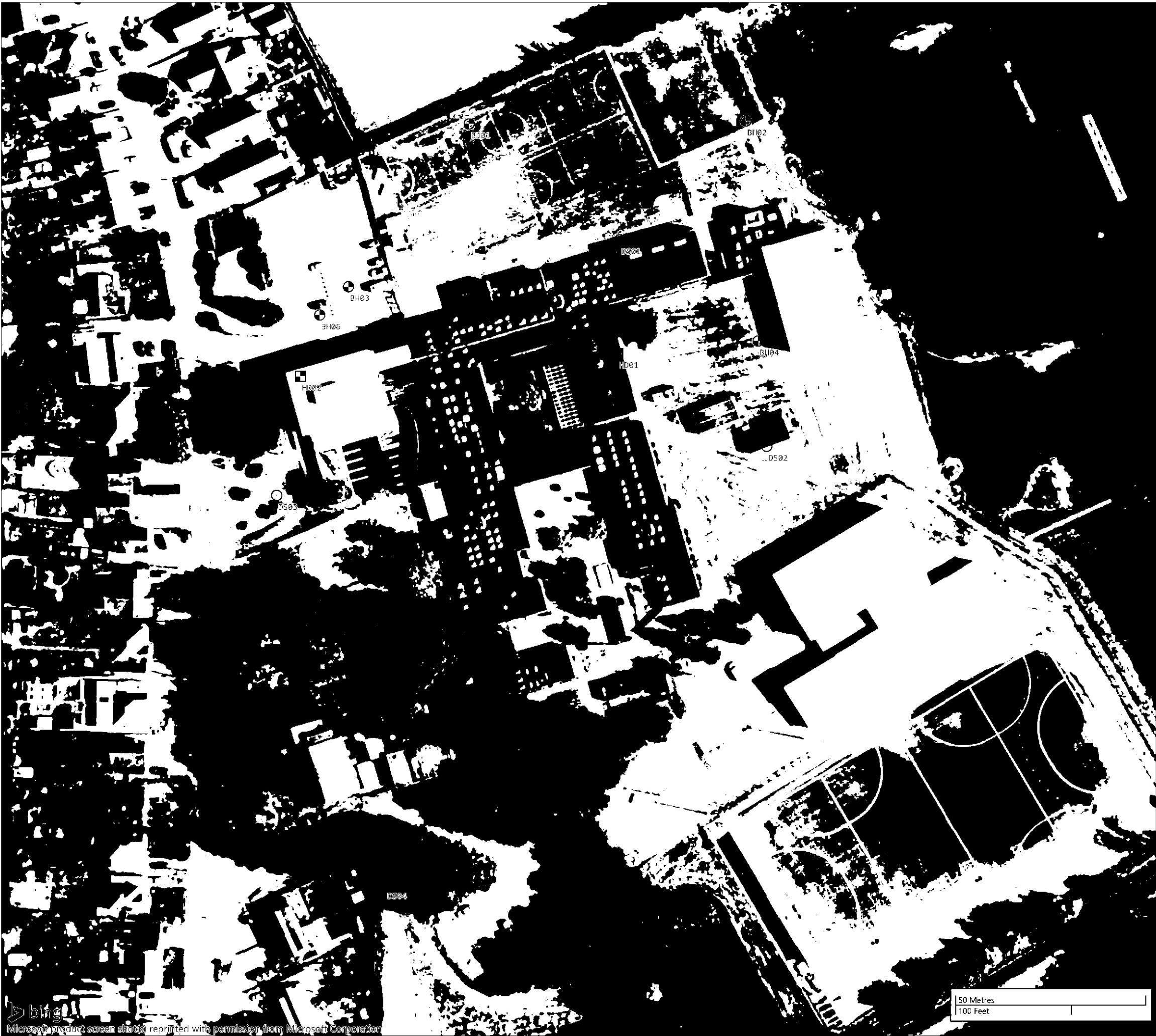
Ground Investigation
at
University Academy Long Sutton
for
Department for Education

GEOTECHNICS
geotechnical and geoenvironmental specialists



APPENDIX 2

Exploratory Hole Location Plan



Legend

- Locations By Type - CP
- Locations By Type - DS
- Locations By Type - TP

Note:
Please see location summary sheet for details of where Dynamic Cone Penetration tests were undertaken.

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Engineer:
MOTT MACDONALD LIMITED

Client:
DEPARTMENT FOR EDUCATION

Project:
UNIVERSITY ACADEMY LONG SUTTON

Drawing Title:
Exploratory Hole Location Plan

Scale: 1:1000 at A3	Date: 22/06/2023
Project No.: PC228532	Exploratory Hole Location Plan

FIELDWORK RESULTS - Location Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer MOTT MACDONALD LIMITED

Project No. PC228532

Client DEPARTMENT FOR EDUCATION

Location	Location Type	Easting (m)	Northing (m)	Ground Level (m OD)	Final Depth (m bgl)
BH01	CP	543713.7	324004.7	3.38	10.00
BH02	CP	543786.8	324007.6	3.62	19.30
BH03	CP	543682.9	323960.7	3.43	12.50
BH04	CP	543791.8	323949.6	3.76	10.00
BH05	CP	543675.5	323953.0	3.40	20.00
DS01	DS	543754.4	323975.2	3.46	4.45
DS02	DS	543794.9	323921.9	3.57	4.45
DS03	DS	543665.5	323905.0	3.64	4.45
DS04	DS	543697.5	323803.2	3.70	4.45
HD01	TP	543754.7	323945.2	3.51	1.00
HD02	TP	543670.9	323936.7	3.64	1.20
BH01-DCP	DCP	543713.7	324004.7	3.38	1.35
BH02-DCP	DCP	543786.8	324007.6	3.62	1.40
BH03-DCP	DCP	543682.9	323960.7	3.43	1.52
BH04-DCP	DCP	543791.8	323949.6	3.76	1.21
DS01-DCP	DCP	543754.4	323975.2	3.46	1.31
DS02-DCP	DCP	543794.9	323921.9	3.57	1.44
DS03-DCP	DCP	543665.5	323905.0	3.64	1.49

APPENDIX 3

Cable Percussive Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types	
B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties	
CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PID	Photo Ionisation Detection (ppm)
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content
(All other strengths from undrained triaxial testing)	
S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
*/- (mm)	Total blows/penetration
()	Extrapolated value

Groundwater	
Water Strike	
Depth Water Rose To	

Instrumentation	
Seal	
Filter	
Seal	

Strata	Legend
Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued	
Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials	
Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core	
RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NA	Non-applicable
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss
(where core recovery is unknown it is assumed to be at the base of the run)	

BOREHOLE RECORD - Cable Percussion

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543713.6 E 324004.7 N	Borehole	BH01
				Ground Level	3.38 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.10 - 0.20	D					MADE GROUND: Asphalt.	0.10		3.28
0.10 - 0.20	ES					MADE GROUND: Orangish brown sandy gravel with a low cobble content of subangular brick. Gravel is angular to subrounded fine to coarse brick, quartzite and flint.	0.30		3.08
0.10 - 0.30	B						0.50		2.88
0.30 - 0.40	D					MADE GROUND: Soft to firm light brown slightly gravelly sandy clay. Gravel is angular to subangular fine to medium brick.			
0.30 - 0.40	ES					Soft light brown sandy SILT.			
0.30 - 0.50	B					[TIDAL FLAT DEPOSITS]			
0.50 - 0.60	D					Below 1.20m, with many pockets (up to 10mm in size) of brown fine sand.			
0.50 - 0.60	ES								
0.50 - 0.90	B								
0.90	W								
1.00 - 1.10	D								
1.00 - 1.10	ES								
1.20 - 1.65		1.20 (DAMP)			S7				
1.20 - 1.65	D					Below 2.10m, becoming firm and brown, locally dark grey.			
1.20 - 1.70	B					At 2.20m, in parts varying to sandy clay.			
2.00 - 2.10	D								
2.20 - 2.65	UT15	2.20 (DAMP)			30				
2.20 - 2.70	B								
2.20 - 2.65									
2.60	W								
2.65 - 2.70	D					Below 3.20m, becoming dark grey.			
3.00 - 3.10	D								
3.20 - 3.65		3.20 (DAMP)			S11	Medium dense dark grey very silty fine to medium SAND. [TIDAL FLAT DEPOSITS]	3.50		-0.12
3.20 - 3.65	D								
3.20 - 3.70	B								
4.00 - 4.10	D								
4.50 - 4.95		4.50 (DAMP)			S18				
4.50 - 4.95	D								
4.50 - 5.00	B								
5.00 - 5.10	D				29				
5.70 - 6.15		5.70 (3.00)			S15	Medium dense dark grey silty fine SAND. [TIDAL FLAT DEPOSITS]	5.70		-2.32
5.70 - 6.15	D								
5.70 - 6.20	B								
6.20 - 6.30	D								
6.70 - 7.15		6.70 (3.80)			S30	Below 6.70m, becoming dense.			
6.70 - 7.15	D								
7.30 - 7.40	D								
7.50 - 7.95		7.50 (3.10)			S40				
7.50 - 7.95	D								
7.50 - 8.00	B				24				
8.30 - 8.40	D								
8.50 - 8.95		8.50 (3.40)			S36				
8.50 - 8.95	D								
8.50 - 9.00	B								
9.30 - 9.40	D								
9.50 - 9.95		9.50 (4.00)			S35				
9.50 - 10.00	B								
9.50 - 9.95	D								
End of Borehole							10.00		-6.62

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	ECAD
		ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.	Checked by	TNH
		Water was added to assist boring between 3.00m and 4.00m.	Figure	Sheet 1 of 1
		A 50mm standpipe was installed to 3.50m with a geowrapped slotted section from 1.50m to 3.50m with a flush cover installed.		28/07/2023
		Backfill details from base of hole: bentonite seal up to 3.50m, gravel filter up to 1.50m, bentonite seal up to 0.30m, concrete up to ground level.		
Logged in accordance with BS5930:2015 + A1:2020			 geotechnical and geoenvironmental specialists	

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.
 Water was added to assist boring between 3.00m and 4.00m.
 A 50mm standpipe was installed to 3.50m with a geowrapped slotted section from 1.50m to 3.50m with a flush cover installed.
 Backfill details from base of hole: bentonite seal up to 3.50m, gravel filter up to 1.50m, bentonite seal up to 0.30m, concrete up to ground level.
 Logged in accordance with BS5930:2015 + A1:2020

Logged by ECAD
 Checked by TNH
 Figure Sheet 1 of 1
 28/07/2023

BOREHOLE RECORD - Cable Percussion

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543786.8 E 324007.6 N	Borehole	BH02
				Ground Level	3.62 m OD

Sampling			Properties			Strata			Scale 1:50						
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)						
0.10 - 0.20	B	1.20 (DAMP)	31	25	27	MADE GROUND: Asphalt.	0.10		3.52						
0.10 - 0.20	D					MADE GROUND: Grey and black gravelly sand. Gravel is angular to subangular fine to medium asphalt, quartzite and flint.	0.20		3.42						
0.10 - 0.20	ES					Firm dark grey sandy SILT with rare shell fragments (up to 5mm in size).	0.60		3.02						
0.20 - 0.60	B					[TIDAL FLAT DEPOSITS]									
0.30 - 0.40	D					Below 0.30m, with occasional pockets (up to 10mm in size) of light brown fine sand.									
0.30 - 0.40	ES					2.30 (DAMP)	44		28	Soft light brown sandy SILT with occasional pockets/lenses (up to 10mm in size) of brown organic material.	2.60		1.02		
0.60 - 0.70	D									[TIDAL FLAT DEPOSITS]					
0.60 - 0.70	ES									At 1.20m, in parts varying to sandy clay.					
0.60 - 0.90	B									At 2.30m, very soft.					
1.00 - 1.10	D									Soft dark grey slightly sandy SILT with occasional black pockets/lenses (up to 50mm in size) of organic material..				3.80	
1.00 - 1.10	ES	[TIDAL FLAT DEPOSITS]													
1.20 - 1.65	UT20	Below 2.90m, in parts varying to slightly sandy silty clay.													
1.20 - 1.80	B	3.00 (DAMP)	31	S5	S10			S8							
1.65 - 1.70	D														Loose dark grey silty to very silty fine SAND.
1.90 - 2.00	D														[TIDAL FLAT DEPOSITS]
2.30 - 2.75	D														
2.30 - 2.75	W														
2.60 - 2.90	B														
2.90 - 3.00	D														
3.30 - 3.75	UT15														
3.30 - 3.75	B														
3.60 - 4.00	D														
3.75 - 3.80	D														
4.00 - 4.10	D														
4.50 - 4.95	D	4.50 (2.80)	31	S5	S10	S8									
4.50 - 4.95	B														
4.50 - 5.00	W														
5.00 - 5.10	D														
5.50 - 5.95	D														
5.50 - 5.95	B														
5.50 - 6.00	D														
6.00 - 6.10	D														
6.40 - 6.85	D														
6.40 - 6.85	B														
6.40 - 6.90	D														
7.00 - 7.10	D														
7.50 - 7.95	D	7.50 (3.60)	S47	S28	Below 8.80m, becoming medium dense and slightly silty.										
7.50 - 7.95	B														
7.50 - 8.00	D														
8.00 - 8.10	D														
8.80 - 9.25	D														
8.80 - 9.25	B														
8.80 - 9.30	D														
9.30 - 9.40	D														

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
1.20	0.40	Inspection Pit	DC/LC	0.00			17/04/23	08:00	1.30	1.20	1.30	20	
12.00	0.20	Cable Percussion	DC/LC	13.00	13.00	1.50	17/04/23	18:00	3.80	3.00	2.60	20	
19.30	0.15	Cable Percussion	DC/LC	13.00	13.00	1.50	18/04/23	08:00	14.00	13.70	5.00	20	15.00
				19.30	15.00	18.00	18/04/23	18:00					

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.
Water was added to assist boring between 1.20m and 12.00m.
A 50mm standpipe was installed to 11.50m with a geowrapped slotted section from 4.00m to 11.50m with a flush cover installed.
Unable to install to 13.00m due to sand invading the casing.
Backfill details from base of hole: bentonite seal up to 11.50m, gravel filter up to 4.00m, bentonite seal up to 0.30m, concrete up to ground level.
Logged in accordance with BS5930:2015 + A1:2020

Logged by ECAD
Checked by TNH
Figure Sheet 1 of 2
28/07/2023

Project	UNIVERSITY ACADEMY LONG SUTTON			Engineer	MOTT MACDONALD LIMITED			Project No.	PC228532								
Client	DEPARTMENT FOR EDUCATION			National Grid Coordinates	543786.8 E 324007.6 N			Borehole	BH02								
								Ground Level	3.62 m OD								
Sampling				Properties			Strata		Scale 1:50								
Depth		Sample type	Depth Cased & (to Water)	Strength kPa	wt%	SPT N	Description	Depth	Legend	Level (m OD)							
10.40 - 10.85			10.40 (5.30)			S24											
10.40 - 10.50		D															
10.40 - 10.85		D															
10.40 - 10.90		B															
11.50 - 11.60		D															
12.00 - 12.45			12.00 (6.00)			S32	Below 12.00m, becoming dense.										
12.00 - 12.45		D															
13.50 - 13.95			13.50 (1.50)			S26											
13.50 - 13.70		B															
13.50 - 13.95		D															
13.70 - 13.90		D			17												
13.70 - 14.00		B															
14.00 - 14.10		D															
14.00 - 14.30		B															
14.30 - 14.40		D															
14.30 - 14.60		B															
14.60 - 15.05		UT85	13.70 (5.00)	157	19		Grey sandy GRAVEL with many shell fragments (up to 20mm in size). Gravel is angular to subrounded fine to coarse flint and quartzite. [GLACIAL TILL]	13.50			-9.88						
14.60 - 15.05		D						13.70			-10.08						
15.05 - 15.10		D					Stiff grey, locally light brown, slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium chalk and flint. [GLACIAL TILL]	14.00			-10.38						
15.10 - 16.50		B						14.30			-10.68						
15.30 - 15.40		D					Greyish brown slightly gravelly slightly clayey SAND with occasional shell fragments (up to 20mm in size). Gravel is angular to subrounded fine to coarse flint and quartzite. [GLACIAL TILL]										
16.50 - 16.95			15.00 (16.00)			S33	Below 16.50m, becoming very stiff and dark grey.										
16.50 - 16.95		D															
16.50 - 17.00		B															
17.00 - 17.10		D															
18.00 - 18.45		UT90	15.00 (17.00)	54	18												
18.00 - 18.45																	
18.45 - 18.50		D															
18.80 - 19.25			15.00 (18.00)			S48											
18.80 - 19.25		D															
End of Borehole								19.30			-15.68						
Boring						Progress				Groundwater							
Depth	Hole Dia.	Technique		Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater		
															15.00m.		
Remarks																Logged by	ECAD
Symbols and abbreviations are explained on the accompanying key sheets.																Checked by	TNH
All dimensions are in metres.																Figure	Sheet 2 of 2
Logged in accordance with BS5930:2015 + A1:2020																	28/07/2023

Project	UNIVERSITY ACADEMY LONG SUTTON				Engineer	MOTT MACDONALD LIMITED				Project No.	PC228532								
Client	DEPARTMENT FOR EDUCATION				National Grid Coordinates	543682.9 E 323960.7 N				Borehole	BH03								
										Ground Level	3.42 m OD								
Sampling					Properties					Strata					Scale 1:50				
Depth		Sample type	Depth Cased & (to Water)	Strength kPa	wt%	SPT N	Description					Depth	Legend		Level (m OD)				
0.10 - 0.20		D					MADE GROUND: Asphalt.					0.10			3.32				
0.10 - 0.20		ES					MADE GROUND: Light brown sandy gravel with a low cobble content of subangular brick and concrete. Gravel is angular to subangular fine to					0.30			3.12				
0.10 - 0.30		B					subangular brick, concrete, quartzite and flint.					0.50			2.92				
0.30 - 0.40		D					MADE GROUND: Soft brown slightly gravelly sandy clay. Gravel is angular to												
0.30 - 0.40		ES					subrounded fine to coarse flint, quartzite and brick.												
0.30 - 0.50		B					Soft light brown very sandy SILT												
0.50 - 0.60		D			28		[TIDAL FLAT DEPOSITS]												
0.50 - 0.60		ES																	
0.50 - 0.80		B																	
1.00 - 1.10		D																	
1.00 - 1.10		ES																	
1.20 - 1.65		UT20	(1.10)		28														
1.20 - 1.65				44															
1.50 - 2.00		B																	
1.65 - 1.70		D																	
2.00 - 2.10		D																	
2.20 - 2.65			2.20			S3	Below 2.20m, very soft with occasional pockets (up to 20mm in size) of light grey fine sand.					2.50			0.92				
2.20 - 2.65			(DAMP)				Soft brown, locally grey, fine sandy SILT, varying in parts to sandy silty clay.												
2.20 - 2.65		D					[TIDAL FLAT DEPOSITS]												
2.50 - 3.00		B																	
3.00 - 3.10		D			33														
3.50 - 3.95		UT10	3.00		27														
3.50 - 3.95			(DAMP)	30															
3.70 - 4.10		B																	
3.95 - 4.00		D			32														
4.10 - 4.20		D										4.10			-0.68				
4.20		W					Medium dense dark grey, occasionally brown, silty to very silty fine SAND.												
4.20							[TIDAL FLAT DEPOSITS]												
5.00 - 5.45			5.00			S12													
5.00 - 5.45		D	(3.00)																
5.00 - 5.50		B																	
5.50 - 5.60		D																	
6.00 - 6.45			6.00			S14													
6.00 - 6.45			(3.00)																
6.00 - 6.45		D																	
6.00 - 6.50		B																	
6.50 - 6.60		D																	
7.00 - 7.45			7.00			S15													
7.00 - 7.45			(4.00)																
7.00 - 7.45		D																	
7.00 - 7.50		B																	
7.50 - 7.60		D																	
8.00 - 8.45			8.00			S23													
8.00 - 8.45			(5.00)																
8.00 - 8.45		D																	
8.00 - 8.50		B																	
8.50 - 8.60		D																	
9.00 - 9.																			

BOREHOLE RECORD - Cable Percussion

Project		UNIVERSITY ACADEMY LONG SUTTON		Engineer		MOTT MACDONALD LIMITED		Project No.		PC228532	
Client		DEPARTMENT FOR EDUCATION		National Grid Coordinates		543682.9 E 323960.7 N		Borehole		BH03	
								Ground Level		3.42 m OD	

Sampling			Properties			Strata			Scale 1:50		
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt(%)	SPT N	Description	Depth	Legend	Level (m OD)		
10.00 - 10.45	D	11.50 (6.20)			S27	Dense dark grey gravelly SAND with many shell fragments (up to 80mm in size). Gravel is angular to subrounded fine to coarse flint and quartzite. [GLACIAL TILL]	12.00		-8.57		
10.50 - 10.60	D										
11.50 - 11.95											
11.50 - 11.60	D										
11.50 - 11.95	D										
11.50 - 12.00	B										
12.00 - 12.10	D										
12.00 - 12.50	B										
End of Borehole						12.50		-9.07			

Boring				Progress					Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater

Remarks

Symbols and abbreviations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by

Checked by

Figure

ECAD

TNH

Sheet 2 of 2

28/07/2023

GEOTECHNICS

geotechnical and geoenvironmental specialists

BOREHOLE RECORD - Cable Percussion

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543791.8 E 323949.6 N	Borehole	BH04
				Ground Level	3.76 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.10 - 0.20	D	1.50 (DAMP)	26	C9	MADE GROUND: Soft dark brown slightly gravelly sandy clay with occasional rootlets. Gravel is angular to subrounded fine to coarse flint and quartzite.	At 1.00m, concrete boulder.	0.60		3.16	
0.10 - 0.20	ES									
0.10 - 0.50	B									
0.50 - 0.60	D									
0.50 - 0.60	ES									
0.60 - 0.70	D									
0.60 - 0.70	ES									
0.60 - 0.80	B									
1.00 - 1.10	D									
1.00 - 1.10	ES									
1.00 - 1.20	B	2.50 (2.40)	32	S2	MADE GROUND: Concrete**.	At 1.40m, concrete boulder.	1.20		2.56	
1.40 - 1.50	D									
1.50 - 1.95										
1.70 - 1.80	D									
1.70 - 1.80	ES									
1.70 - 2.00	B									
2.30 - 2.40	D									
2.40	W									
2.50 - 2.95										
2.50 - 2.90	B									
2.50 - 2.95	D	3.00 (3.00)	25	S7	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.40		2.36	
3.30 - 3.40	D									
3.50 - 3.95										
3.50 - 3.95	D									
3.50 - 4.00	B									
4.30 - 4.40	D									
4.50 - 4.95										
4.50 - 4.60	D									
4.50 - 4.95	D									
4.50 - 5.00	B									
5.50 - 5.95		5.50 (3.00)	25	S26	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.70		2.06	
5.50 - 5.95	D									
5.50 - 6.00	B									
6.30 - 6.40	D									
6.50 - 6.95										
6.50 - 6.95	D									
6.50 - 7.00	B									
7.30 - 7.40	D									
7.50 - 7.95										
7.50 - 7.60	D									
7.50 - 8.00	B	6.50 (3.50)	25	S28	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.70		2.06	
8.30 - 8.40	D									
8.50 - 8.95										
8.50 - 8.95	D									
8.50 - 9.00	B									
9.30 - 9.40	D									
9.50 - 9.95										
9.50 - 10.00	B									
9.50 - 9.95	D									
		7.50 (4.50)	25	S28	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.70		2.06	
		8.50 (5.50)	25	S28	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.70		2.06	
		9.50 (5.70)	25	S34	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.70		2.06	
		10.00 (6.24)	25	S28	MADE GROUND: Soft to firm brown slightly gravelly sandy clay with a low cobble content of subangular concrete. Gravel is angular to subangular fine to coarse concrete, brick and flint.	At 1.70m, concrete boulder.	1.70		2.06	

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
1.20	0.40	Inspection Pit	DC/LC	0.00			11/04/23	08:00	1.40	1.40	1.40	20	
10.00	0.15	Cable Percussion	DC/LC	10.00	10.00	5.70	11/04/23	18:00	2.50	2.50	2.40	20	
				10.00	10.00	3.50	12/04/23	08:00					
				10.00	10.00	3.50	12/04/23	18:00					

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
 ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.
 ** Drillers description.
 Chiselling: 1.20-1.40m for 60 minutes.
 Water was added to assist boring between 3.00m and 4.00m and then between 7.50m and 8.50m.
 A 50mm standpipe was installed to 1.70m with a geowrapped slotted section from 0.60m to 1.70m with a flush cover installed.
 Backfill details from base of hole: bentonite seal up to 1.70m, gravel filter up to 0.60m, bentonite seal up to 0.30m, concrete up to 1.00m.
 Logged in accordance with BS5930:2015 + A1:2020

Logged by ECAD
 Checked by TNH
 Figure Sheet 1 of 2
 28/07/2023

[illegible]

BOREHOLE RECORD - Cable Percussion

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543675.5 E 323953.0 N	Borehole	BH05
				Ground Level	3.40 m OD

Sampling			Properties			Coordinates			Scale 1:50					
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt(%)	SPT N	Description	Depth	Legend	Level (m OD)					
0.10 - 0.20	D	1.20 (DRY)		25	S8	MADE GROUND: Asphalt.	0.10		3.30					
0.10 - 0.20	ES					MADE GROUND: Light brown sandy gravel with a low cobble content of subangular brick. Gravel is angular to subangular fine to coarse brick, concrete, quartzite and flint.	0.30		3.10					
0.10 - 0.30	B						0.50		2.90					
0.30 - 0.40	D													
0.30 - 0.40	ES													
0.30 - 0.50	B													
0.50 - 0.60	D													
0.50 - 0.60	ES													
0.50 - 0.80	B													
1.00 - 1.10	D													
1.00 - 1.10	ES													
1.20 - 1.65		2.20 (DAMP)	26	S5	S13	Soft to firm light brown and brown very sandy SILT with rare pockets (up to 20mm in size) of light grey silt. [TIDAL FLAT DEPOSITS] At 1.20m, thickly laminated with occasional lenses/pockets (up to 10mm in size) of dark brown organic material.								
1.20 - 1.65	D													
1.20 - 1.70	B													
2.00 - 2.10	D													
2.20 - 2.65	UT17													
2.20 - 2.70	B													
2.65 - 2.70	D													
2.70	W													
3.00 - 3.10	D													
3.20 - 3.65						3.00 (DAMP)	30		S11	S18	Loose light brown, occasionally grey, very silty SAND varying in parts to sandy to very sandy silt. [TIDAL FLAT DEPOSITS]	3.00		0.40
3.20 - 3.65	D													
3.20 - 3.70	B													
4.00 - 4.10	D													
4.20 - 4.65		4.20 (4.00)						Below 4.20m, becoming medium dense.						
4.20 - 4.65	D													
4.20 - 4.70	B													
5.00 - 5.10	D													
5.30 - 5.75			5.30 (4.30)								Medium dense grey silty fine SAND. [TIDAL FLAT DEPOSITS]	5.00		
5.30 - 5.75	D													
5.30 - 5.80	B													
6.00 - 6.10	D													
6.40 - 6.85				6.40 (4.50)										
6.40 - 6.85	D													
6.40 - 6.90	B													
7.00 - 7.10	D													
7.50 - 7.95		7.50 (5.00)												
7.50 - 7.95	D													
7.50 - 8.00	B													
8.00 - 8.10	D													
8.60 - 9.05			8.60 (5.50)											
8.60 - 9.05	D													
8.60 - 9.10	B													
9.10 - 9.20	D													
9.50 - 9.95				9.50 (5.70)										
9.50 - 9.95	D													
9.50 - 9.95	B													
10.00 - 10.10	D													
10.00 - 10.10	D													
10.00 - 10.10	D													

Boring				Progress					Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	DC/LC	0.00			19/04/23	08:00	3.70	3.00	2.70	20		Slow inflow. Seepage.
12.00	0.20	Cable Percussion	DC/LC	12.00	12.00	1.50	19/04/23	18:00	17.00	16.00				
20.00	0.15	Cable Percussion	DC/LC	12.00	12.00	1.70	20/04/23	08:00						
				20.00	16.00	18.00	20/04/23	18:00						

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed
1.20	0.40	Inspection Pit	DC/LC	0.00			19/04/23	08:00	3.70	3.00	2.70	20	
12.00	0.20	Cable Percussion	DC/LC	12.00	12.00	1.50	19/04/23	18:00	17.00	16.00			
20.00	0.15	Cable Percussion	DC/LC	12.00	12.00	1.70	20/04/23	08:00					
				20.00	16.00	18.00	20/04/23	18:00					

Remarks	Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub. Water was added to assist boring between 1.20m and 1.50m. A 50mm standpipe was installed to 20.00m with a geowrapped slotted section from 14.00m to 20.00m with a flush cover installed. Backfill details from base of hole: gravel filter up to 14.00m, bentonite seal up to 0.30m, concrete up to ground level.	Logged by TL Checked by TNH Figure Sheet 1 of 2 28/07/2023
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Symbols and abbreviations are explained on the accompanying key sheets.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Project	UNIVERSITY ACADEMY LONG SUTTON		Engineer	MOTT MACDONALD LIMITED		Project No.	PC228532									
Client	DEPARTMENT FOR EDUCATION		National Grid Coordinates	543675.5 E 323953.0 N		Borehole	BH05									
						Ground Level	3.40 m OD									
Sampling			Properties			Strata			Scale 1:50							
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt%	SPT N	Description	Depth	Legend	Level (m OD)							
10.50 - 10.95		10.50 (5.00)			S30	Below 10.50m, becoming dense.										
10.50 - 10.95 10.50 - 11.00	D B															
11.70 - 11.80 11.70 - 12.00	D B			16		Greyish brown gravelly silty SAND with many shell fragments (up to 60mm in size). Gravel is subangular fine to coarse flint. [GLACIAL TILL]	11.70		-8.30							
13.00 - 13.10 13.00 - 13.50	D B					Stiff, recovered as soft to firm, greyish brown slightly gravelly sandy CLAY with occasional pockets (up to 30mm in size) of orange fine sand. Gravel is subangular to subrounded fine to coarse flint and chalk. [GLACIAL TILL]	13.00		-9.60							
13.50 - 13.95 13.50 - 13.95	UT70	13.00 (2.00)	134	17												
13.95 - 14.00 14.00 - 14.60	D B															
14.60 - 14.70	D			18												
15.00 - 15.45		15.00 (6.10)			S25											
15.00 - 15.45 15.00 - 15.50 15.70 - 15.80	D B D															
16.00 - 16.10	D					Very stiff grey slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse chalk and flint. [GLACIAL TILL]	16.00		-12.60							
16.40 - 16.85 16.40 - 16.85	UT90	16.00 (DAMP)	236	16												
16.85 - 16.90	D															
17.50 - 17.60	D															
18.00 - 18.45 18.00 - 18.45 18.00 - 18.50	D B	16.00 (DAMP)			S42											
19.00 - 19.10	D															
19.50 - 19.95 19.50 - 19.95 19.50 - 20.00	D B	16.00 (19.00)			S50											
						End of Borehole	20.00		-16.60							
Boring					Progress				Groundwater							
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater		
Remarks															Logged by TL	
Symbols and abbreviations are explained on the accompanying key sheets.															Checked by TNH	
All dimensions are in metres.															Figure Sheet 2 of 2	
Logged in accordance with BS5930:2015 + A1:2020															28/07/2023	
GEOTECHNICS geotechnical and geoenvironmental specialists																

FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
LIMITED

Project No.

PC228532

Client

DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH01	1.20	2.18	S		1	1	1	2	2	2	7					
BH01	3.20	0.18	S		1	-	1	1	4	5	11					
BH01	4.50	-1.12	S		1	4	3	5	5	5	18					
BH01	5.70	-2.32	S		2	2	3	3	4	5	15					
BH01	6.70	-3.32	S		3	5	5	6	8	11	30					
BH01	7.50	-4.12	S		5	10	10	10	10	10	40					
BH01	8.50	-5.12	S		4	6	8	8	10	10	36					
BH01	9.50	-6.12	S		2	3	7	10	9	9	35					
Hammer No.:			AR3999				Remarks									
Energy Ratio, Er (%):			73													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
LIMITED

Project No.

PC228532

Client

DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH02	2.30	1.32	S		1	-	-	-	-	-	0					
BH02	4.50	-0.88	S		1	-	1	1	1	2	5					
BH02	5.50	-1.88	S		1	2	2	2	3	3	10					
BH02	6.40	-2.78	S		1	1	2	2	2	2	8					
BH02	7.50	-3.88	S		4	7	8	10	13	16	47					
BH02	8.80	-5.18	S		3	3	4	6	8	10	28					
BH02	10.40	-6.78	S		2	3	5	5	6	8	24					
BH02	12.00	-8.38	S		2	2	5	7	9	11	32					
BH02	13.50	-9.88	S		2	3	4	5	6	11	26					
BH02	16.50	-12.88	S		4	4	7	7	9	10	33					
BH02	18.80	-15.18	S		4	7	10	10	13	15	48					
Hammer No.:			AR3999				Remarks									
Energy Ratio, Er (%):			73													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

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DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH03	2.20	1.23	S		1	-	1	-	1	1	3					
BH03	5.00	-1.58	S		3	5	2	3	3	4	12					
BH03	6.00	-2.58	S		3	5	3	4	3	4	14					
BH03	7.00	-3.58	S		2	3	3	4	4	4	15					
BH03	8.00	-4.58	S		11	7	4	5	6	8	23					
BH03	9.00	-5.58	S		5	4	5	5	5	8	23					
BH03	10.00	-6.58	S		8	5	4	6	6	7	23					
BH03	11.50	-8.08	S		3	5	5	6	8	8	27					
Hammer No.:			AR3999				Remarks									
Energy Ratio, Er (%):			73													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

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Project No.

PC228532

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DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH04	1.50	2.26	C		1	1	2	3	2	2	9					
BH04	2.50	1.26	S		1	-	1	-	1	-	2					
BH04	3.50	0.26	S		1	2	2	1	2	2	7					
BH04	4.50	-0.74	S		1	1	1	1	1	1	4					
BH04	5.50	-1.74	S		2	4	5	6	8	7	26					
BH04	6.50	-2.74	S		3	4	6	8	7	7	28					
BH04	7.50	-3.74	S		3	2	3	5	7	13	28					
BH04	8.50	-4.74	S		3	3	3	6	6	13	28					
BH04	9.50	-5.74	S		2	3	5	7	8	14	34					
Hammer No.:			AR3999				Remarks									
Energy Ratio, Er (%):			73													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
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Project No.

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DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
BH05	1.20	2.20	S		1	1	1	2	2	3	8					
BH05	3.20	0.20	S		1	1	1	1	1	2	5					
BH05	4.20	-0.81	S		2	3	3	3	3	4	13					
BH05	5.30	-1.91	S		3	4	2	3	3	3	11					
BH05	6.40	-3.01	S		3	4	5	5	4	4	18					
BH05	7.50	-4.11	S		3	5	4	5	6	7	22					
BH05	8.60	-5.21	S		5	7	7	8	6	8	29					
BH05	9.50	-6.11	S		6	5	5	6	6	7	24					
BH05	10.50	-7.11	S		6	8	8	7	7	8	30					
BH05	15.00	-11.61	S		3	4	5	6	6	8	25					
BH05	18.00	-14.61	S		4	8	9	10	10	13	42					
BH05	19.50	-16.11	S		5	8	11	11	12	16	50					
Hammer No.:			AR3999				Remarks									
Energy Ratio, Er (%):			73													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

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

SPT Hammer Ref: AR3999
Test Date: 13/05/2022
Report Date: 13/05/2022
File Name: AR3999.spt
Test Operator: CM

Instrumented Rod Data

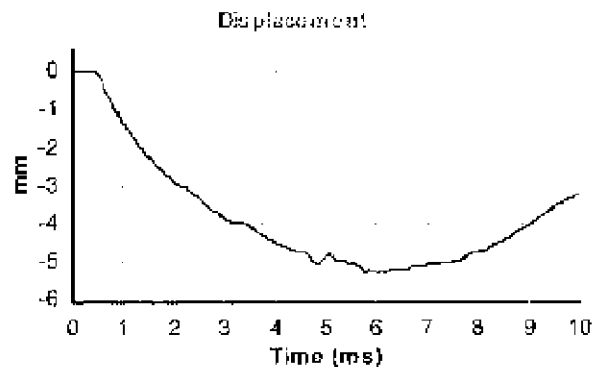
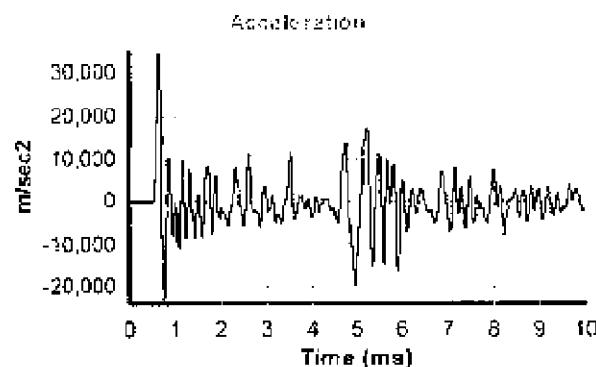
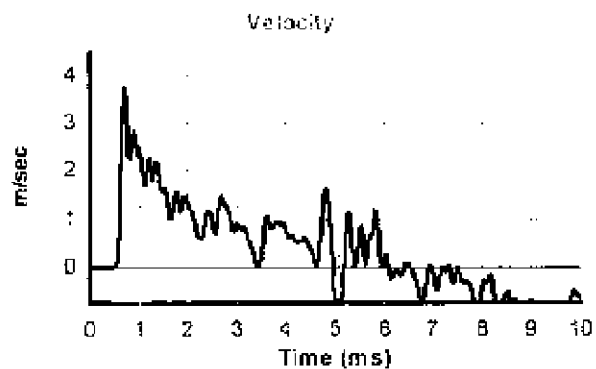
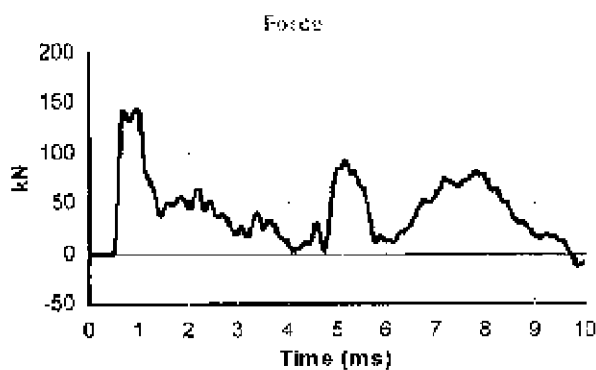
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.5
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 72572
Accelerometer No.2: 72757

SPT Hammer Information

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

Comments / Location

DG&K COWLING - 80339



Calculations

Area of Rod A (mm²): 970
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 346

Energy Ratio E_r (%): **73**

Signed: C. McCLUSKEY
Title: FITTER

APPENDIX 4

Dynamic Sample Borehole Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types	
B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties	
CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PID	Photo Ionisation Detection (ppm)
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content
(All other strengths from undrained triaxial testing)	
S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
*/-	Total blows/penetration (mm)
()	Extrapolated value

Groundwater	
Water Strike	
Depth Water Rose To	

Instrumentation	
Seal	
Filter	
Seal	

Strata	Legend
Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

Strata, Continued	
Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials	
Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core	
RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE	Maximum
SPACING (m)	Minimum
NA	Non-applicable
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss
(where core recovery is unknown it is assumed to be at the base of the run)	

BOREHOLE RECORD - Dynamic Sampler

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543754.4 E 323975.2 N	Borehole	DS01
				Ground Level	3.46 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.20	D					MADE GROUND: Asphalt.	0.17		3.29	
0.20	ES					MADE GROUND: Black, grey and red very gravelly slightly silty sand with a low cobble content of angular to subangular brick. Gravel is angular to	0.48		2.98	
0.20 - 0.40	B					subangular fine to coarse brick, concrete, quartzite and asphalt.				
0.60	D					Soft brown slightly sandy clayey SILT.				
0.60	ES					[TIDAL FLAT DEPOSITS]				
0.60 - 1.10	B									
1.00	D									
1.00	ES									
1.20 - 2.00			TR=90% (87mm)		S5					
1.20 - 1.65		(1.00)								
1.20 - 1.65	D									
1.20 - 2.00	B									
1.50	D					At 2.00m, very soft.				
2.00 - 3.00			TR=100% (67mm)		S2					
2.00 - 2.45		2.00 (DAMP)								
2.00	D									
2.00 - 3.00	B					Below 2.80m, becoming grey and sandy.				
2.50	D									
3.00 - 4.00			TR=100% (57mm)		S6	Loose grey very silty fine SAND. [TIDAL FLAT DEPOSITS]	3.00		0.46	
3.00 - 3.45		2.00 (DAMP)								
3.00	D									
3.00 - 3.45	D									
3.00 - 4.00	B									
3.50	D									
4.00 - 4.45		2.00 (DAMP)			S4					
4.00	D									
4.00 - 4.45	D					End of Borehole	4.45		-0.99	

Remarks Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.		Inspection pit hand excavated to 1.20m depth and no services were found.	Logged by	MJ
		ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.	Checked by	TNH
		Backfill details from base of hole: bentonite seal up to 0.17m, asphalt up to ground level.	Figure	Sheet 1 of 1 11/07/2023
Logged in accordance with R55930:2015 + A1:2020			 geotechnical and geo-environmental specialists	

Remarks Inspection pit hand excavated to 1.20m depth and no services were found.
ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.
Backfill details from base of hole: bentonite seal up to 0.17m, asphalt up to ground level.

Symbols and abbreviations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Logged by MJ
Checked by TNH
Figure Sheet 1 of 1
1/07/2023

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BOREHOLE RECORD - Dynamic Sampler

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543794.9 E 323921.9 N	Borehole	DS02
				Ground Level	3.57 m OD

Sampling			Properties			Strata		Scale 1:50		
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	w(%)	SPT N	Description	Depth	Legend	Level (m OD)	
0.20	D		TR=100% (77mm)		S6	TOPSOIL: Soft brown sandy clay with many rootlets.	0.15		3.42	
0.20	ES					Soft brown slightly sandy SILT. [TIDAL FLAT DEPOSITS]				
0.40 - 0.90	B									
0.50	D									
0.50	ES									
1.00	D	{DRY}	TR=100% (77mm)		S6	At 1.20m, loose.				
1.00	ES									
1.20 - 2.00										
1.20 - 1.65										
1.20 - 1.65	D									
1.20 - 2.00	B	{DRY}	TR=100% (67mm)		S3	At 2.00m, very soft.				
1.50	D									
2.00 - 3.00										
2.00 - 2.45										
2.00	D									
2.00 - 2.45	D	{DAMP}	TR=100% (57mm)		S3	Below 2.50m, becoming grey and sandy.				
2.00 - 3.00	B									
2.50	D									
3.00 - 4.00										
3.00 - 3.45						Very loose grey very silty fine SAND. [TIDAL FLAT DEPOSITS]	3.00		0.57	
3.00	D									
3.00 - 4.00	B									
3.50	D									
4.00 - 4.45		{DAMP}			S6	At 4.00m, loose.				
4.00	D									
						End of Borehole	4.45		-0.88	

Boring				Progress					Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	in Mins	Depth Sealed	Remarks on Groundwater
1.20	0.40	Inspection Pit	NS/LN	0.00			12/04/23	08:00	2.50					Seepage.
4.45	0.08	Dynamic Sample	NS/LN	4.45		DAMP	12/04/23	18:00						

Remarks Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub. Backfill details from base of hole: bentonite seal up to 0.50m, arisings up to ground level.										Logged by MJ Checked by TNH Figure Sheet 1 of 1 11/07/2023			
Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020										geotechnical and geoenvironmental specialists			

BOREHOLE RECORD - Dynamic Sampler

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543665.5 E 323905.0 N	Borehole	DS03
				Ground Level	3.64 m OD

Sampling			Properties			Strata		Scale 1:50	
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.20	D		TR=100% (77mm)		S7	TOPSOIL: Soft brown slightly sandy clay with many rootlets.	0.30		3.34
0.20	ES					Soft brown slightly sandy clayey SILT.			
0.50	D					[TIDAL FLAT DEPOSITS]			
0.50	ES								
0.50 - 1.00	B								
1.00	D	(DRY)	TR=100% (77mm)		S7				
1.00	ES								
1.20 - 2.00									
1.20 - 1.65									
1.20 - 1.65	D								
1.20 - 2.00	B	(WET)	TR=95% (67mm)		S3	At 2.00m, very soft.			
1.50	D								
2.00 - 3.00									
2.00 - 2.45	D								
2.00 - 2.45	D								
2.00 - 3.00	B	(WET)	TR=100% (57mm)		S6				
2.50	D								
3.00 - 4.00									
3.00 - 3.45	D								
3.00 - 4.00	B								
3.50	D	(WET)			S6				
4.00 - 4.45									
4.00	D					Loose grey very silty fine SAND.	4.00		-0.36
4.00 - 4.45	D					[TIDAL FLAT DEPOSITS]			
						End of Borehole	4.45		-0.81

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed
1.20	0.40	Inspection Pit	LN	0.00			12/04/23	08:00	2.00				
4.45	0.08	Dynamic Sample	LN	4.45		WET	12/04/23	18:00					

Remarks	Inspection pit hand excavated to 1.20m depth and no services were found. ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub. Backfill details from base of hole: bentonite seal up to 0.50m, arisings up to ground level.	Logged by MJ Checked by TNH Figure Sheet 1 of 1 11/07/2023
SYMBOLS AND ABBREVIATIONS ARE EXPLAINED ON THE ACCOMPANYING KEY SHEETS. All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020		
GEOTECHNICS geotechnical and geoenvironmental specialists		

BOREHOLE RECORD - Dynamic Sampler

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543697.5 E 323803.2 N	Borehole	DS04
				Ground Level	3.70 m OD

Sampling			Properties			Strata	Scale 1:50		
Depth	Sample type	Depth Cased & (to Water)	Strength kPa	wt(%)	SPT N	Description	Depth	Legend	Level (m OD)
0.20	D					TOPSOIL: Soft dark brown slightly sandy slightly gravelly clay with many rootlets. Gravel is subrounded fine to medium quartzite.	0.25		3.45
0.20	ES					Soft brown sandy clayey SILT.			
0.50	D					[TIDAL FLAT DEPOSITS]			
0.50	ES								
0.50 - 1.00	B								
1.00	D								
1.00	ES								
1.20 - 2.00			TR=100% (77mm)		S6				
1.20 - 1.65		(DRY)							
1.20 - 1.65	D								
1.20 - 2.00	B								
1.50	D								
2.00 - 3.00			TR=100% (67mm)		S3	At 2.00m, very soft.			
2.00 - 2.45		(DRY)							
2.00	D								
2.00 - 2.45	D								
2.00 - 3.00	B								
2.50	D								
3.00 - 4.00			TR=100% (57mm)		S6				
3.00 - 3.45		(WET)							
3.00	D								
3.00 - 3.45	D								
3.00 - 4.00	B								
3.50	D								
4.00 - 4.45		(WET)			S3	At 4.00m, very soft.			
4.00	D								
						End of Borehole	4.45		-0.75

Boring				Progress				Groundwater					
Depth	Hole Dia.	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	Date	Time	Depth Struck	Depth Cased	Rose to	In Mins	Depth Sealed
1.20	0.40	Inspection Pit	LN	0.00			12/04/23	08:00	3.00				
4.45	0.08	Dynamic Sample	LN	4.45		WET	12/04/23	18:00					

Remarks

Inspection pit hand excavated to 1.20m depth and no services were found.

ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub.

Backfill details from base of hole: bentonite seal up to 0.50m, arisings up to ground level.

Symbols and abbreviations are explained on the accompanying key sheets.

All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020

Checked by **TNH**

Figure **Sheet 1 of 1**

11/07/2023

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FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
LIMITED

Project No.

PC228532

Client

DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
DS01	1.20	2.26	S		1	1	1	1	1	2	5					
DS01	2.00	1.46	S		-	-	1	-	1	-	2					
DS01	3.00	0.46	S		1	-	1	2	1	2	6					
DS01	4.00	-0.54	S		1	-	1	1	1	1	4					
Hammer No.:			RG14 110-130				Remarks									
Energy Ratio, Er (%):			84.33													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

GEOTECHNICS
geotechnical and geoenvironmental specialists



Printed: 14/07/2023

FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
LIMITED

Project No.

PC228532

Client

DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
DS02	1.20	2.37	S		1	2	2	1	2	1	6					
DS02	2.00	1.57	S		1	1	-	1	1	1	3					
DS02	3.00	0.57	S		1	1	-	1	1	1	3					
DS02	4.00	-0.43	S		1	1	1	2	1	2	6					
Hammer No.:			RG14 110-130				Remarks									
Energy Ratio, Er (%):			84.33													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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Printed: 14/07/2023

FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
LIMITED

Project No.

PC228532

Client

DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
DS03	1.20	2.44	S		1	1	2	2	1	2	7					
DS03	2.00	1.64	S		1	-	1	1	-	1	3					
DS03	3.00	0.64	S		2	1	2	1	1	2	6					
DS03	4.00	-0.36	S		2	1	1	2	1	2	6					
Hammer No.:			RG14 110-130				Remarks									
Energy Ratio, Er (%):			84.33													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

GEOTECHNICS
geotechnical and geoenvironmental specialists



Printed: 14/07/2023

FIELDWORK RESULTS - SPT Results Summary

Project UNIVERSITY ACADEMY LONG SUTTON

Engineer

MOTT MACDONALD
LIMITED

Project No.

PC228532

Client

DEPARTMENT FOR EDUCATION

Hole	Depth (m bgl)	Level (m OD)	SPT Type	SWP (mm)	Seating Drive		Test Drive				SPT 'N' Value	Uncorrected SPT 'N' value				
					0 - 75 (mm)	75 - 150 (mm)	0 - 75 (mm)	75 - 150 (mm)	150 - 225 (mm)	225 - 300 (mm)		10	20	30	40	50
DS04	1.20	2.50	S		1	1	2	1	2	1	6					
DS04	2.00	1.70	S		1	-	1	-	1	1	3					
DS04	3.00	0.70	S		1	1	-	1	2	3	6					
DS04	4.00	-0.30	S		1	1	1	1	1	-	3					
Hammer No.:			RG14 110-130				Remarks									
Energy Ratio, Er (%):			84.33													

-/- Blows/penetration (mm) after seating

S - SPT with split spoon sampler

.*/- Total blows/penetration (mm)

C - SPT with cone

SWP Penetration under own weight (mm)

L - Split Spoon liner used

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Printed: 14/07/2023



SPT Calibration Report

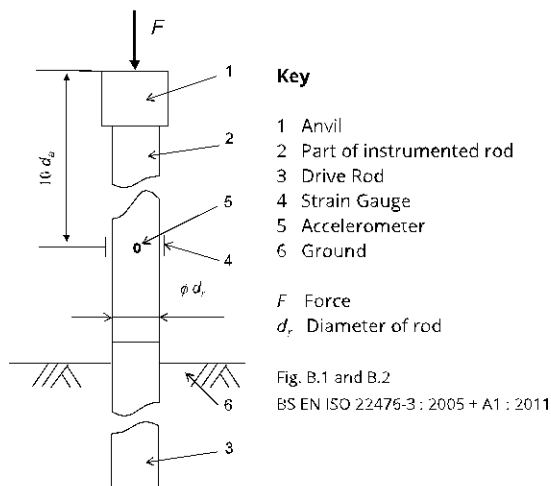
Hammer Energy Measurement Report

Type of Hammer PREMIER
Test No EQU2022_265
Client RGI

Test Depth (m) 7.20
Mass of hammer $m = 63.5\text{kg}$
Falling height $h = 0.76\text{m}$
 $E_{\text{theor}} = m \times g \times h = 473\text{J}$

Characteristics of the instrumented rod

Diameter $d_r = 0.052\text{ m}$
Length of instrumented rod 0.558 m
Area $A = 11.61\text{ cm}^2$
Modulus $E_a = 206843\text{ MPa}$



DATE OF TEST VALID UNTIL HAMMER ID

12/09/2022	12/09/2023	RGI14 110-130
------------	------------	---------------

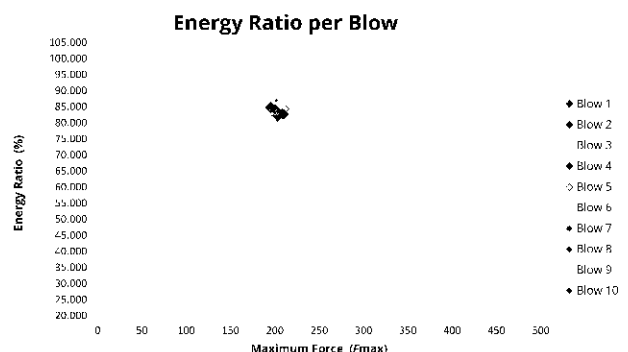
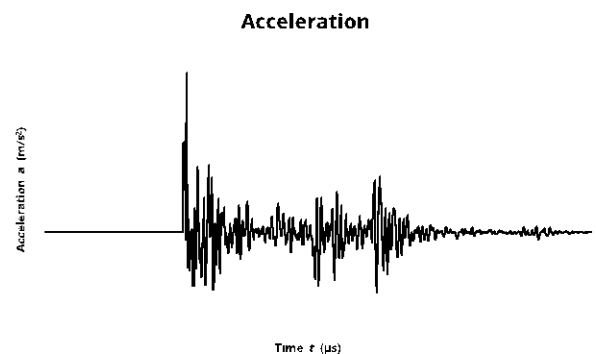
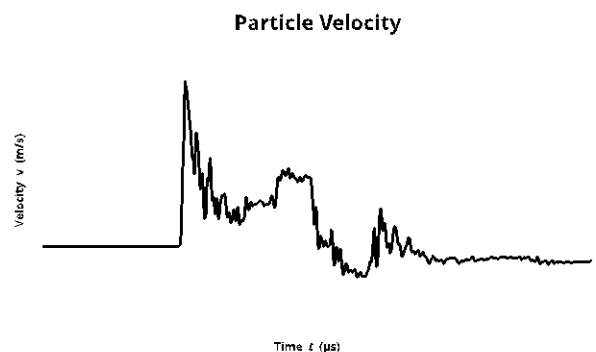
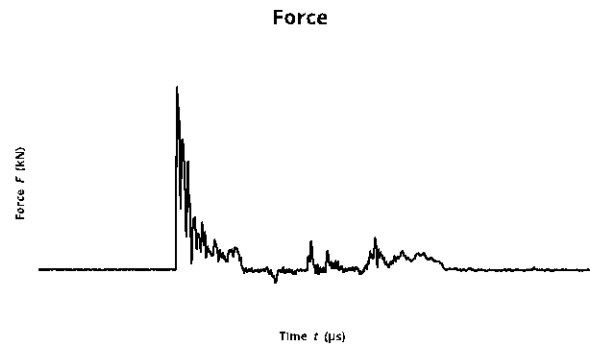
$E_{\text{meas}} = 0.399\text{ kN-m}$

$E_{\text{theor}} = 0.473\text{ kN-m}$

Comments

$$\text{Energy Ratio (Er)} = \frac{E_{\text{meas}}}{E_{\text{theor}}}$$

84.33%



Equipe SPT Analyzer Operator

AF

Certificate prepared by

[Signature]

Certificate checked by

[Signature]

Certificate date

20/09/2022

APPENDIX 5

Trial Pit Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types	
B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties	
CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PID	Photo Ionisation Detection (ppm)
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content
(All other strengths from undrained triaxial testing)	
S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
*/- (mm)	Total blows/penetration
()	Extrapolated value

Groundwater	
Water Strike	
Depth Water Rose To	

Instrumentation	
Seal	
Filter	
Seal	

Strata	Legend
Made Ground Granular	
Made Ground Cohesive	
Topsoil	
Cobbles and Boulders	
Gravel	
Sand	
Silt	
Clay	
Peat	

Note: Composite soil types shown by combined symbols

Chalk	
Limestone	
Sandstone	
Coal	

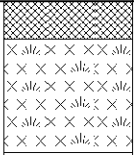
Strata, Continued	
Mudstone	
Siltstone	
Metamorphic Rock	
Fine Grained	
Medium Grained	
Coarse Grained	
Igneous Rock	
Fine Grained	
Medium Grained	
Coarse Grained	

Backfill Materials	
Arisings	
Bentonite Seal	
Concrete	
Fine Gravel Filter	
General Fill	
Gravel Filter	
Grout	
Sand Filter	
Tarmacadam	

Rotary Core	
RQD	Rock Quality Designation (% of intact core >100mm)
FRACTURE INDEX	
Fractures/metre	
FRACTURE SPACING (m)	Maximum
NA	Non-applicable
NI	Non-intact core
NR	No core recovery
AZCL	Assumed zone of core loss
(where core recovery is unknown it is assumed to be at the base of the run)	

TRIAL PIT RECORD - Trial Pit

Project	UNIVERSITY ACADEMY LONG SUTTON	Engineer	MOTT MACDONALD LIMITED	Project No.	PC228532
Client	DEPARTMENT FOR EDUCATION	National Grid Coordinates	543754.7 E 323945.2 N	Location ID	HD01
				Ground Level	3.51 m OD

Samples and Tests				Strata		Scale 1:50	
Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
0.20	D			MADE GROUND: Soft dark brown slightly sandy slightly gravelly clay with many rootlets and occasional roots (up to 10mm in diameter). Gravel is angular to subrounded fine to coarse brick and quartzite.	0.25		3.26
0.20	ES			Between 0.00-0.26m, concrete foundation extending 0.24m into pit.			
0.60	D			Soft brown slightly sandy clayey SILT.			
0.60	ES			[POSSIBLE TIDAL FLAT DEPOSITS]			
1.00	ES			End of Excavation	1.00		2.51

Excavation				Groundwater			
Plant	Hand Tools.	Width (B)	1.00	Depth Observed	Depth of Pit	Rose to	in Mins
Date	13/04/2023	Length (C)	1.00				
Shoring	None.	Date Backfilled	13/04/2023				
Stability	Stable during excavation.						

Remarks	 Inspection pit hand excavated to 1.00m depth and no services were found. ES sample = 2 x 60ml glass vial, 1 x 258ml amber glass jars and 1 x 1 litre plastic tub. For details of exposed foundations, see accompanying sketch. Backfill details from base of hole: arisings up to ground level.	Logged by MJ Checked by TNH Figure Sheet 1 of 1 1/07/2023
---------	---	--

Symbols and abbreviations are explained on the accompanying key sheets.
All dimensions are in metres.

Logged in accordance with BS5930:2015 + A1:2020


geotechnical and geoenvironmental specialists

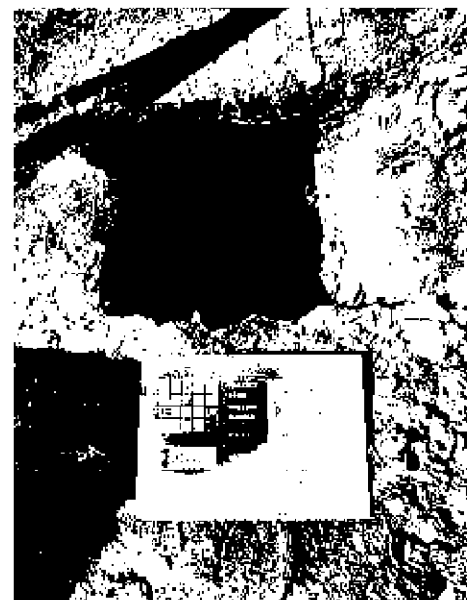
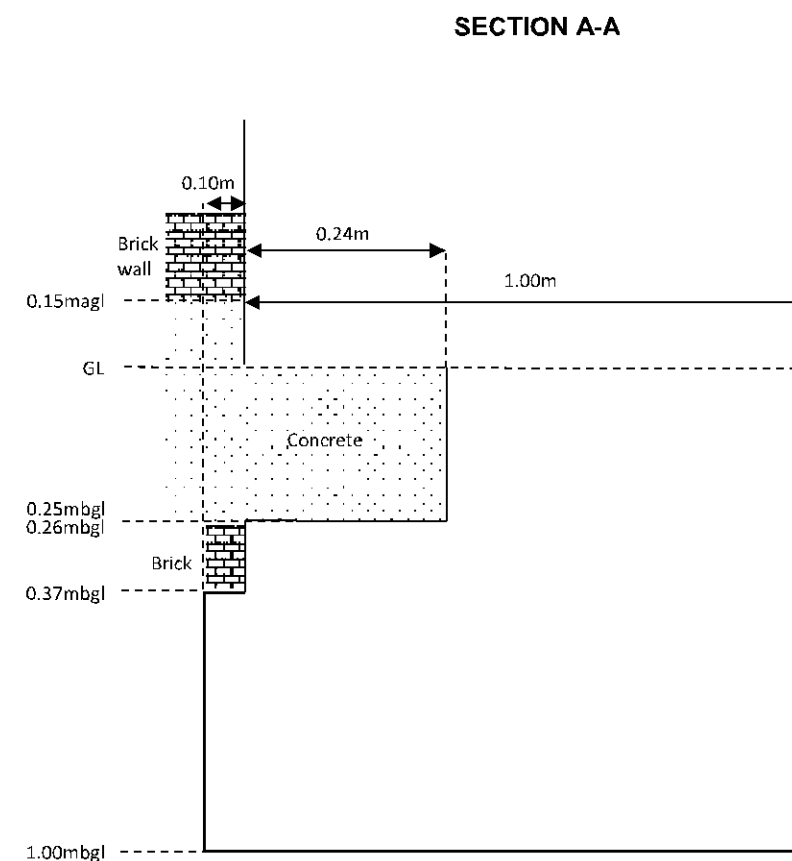
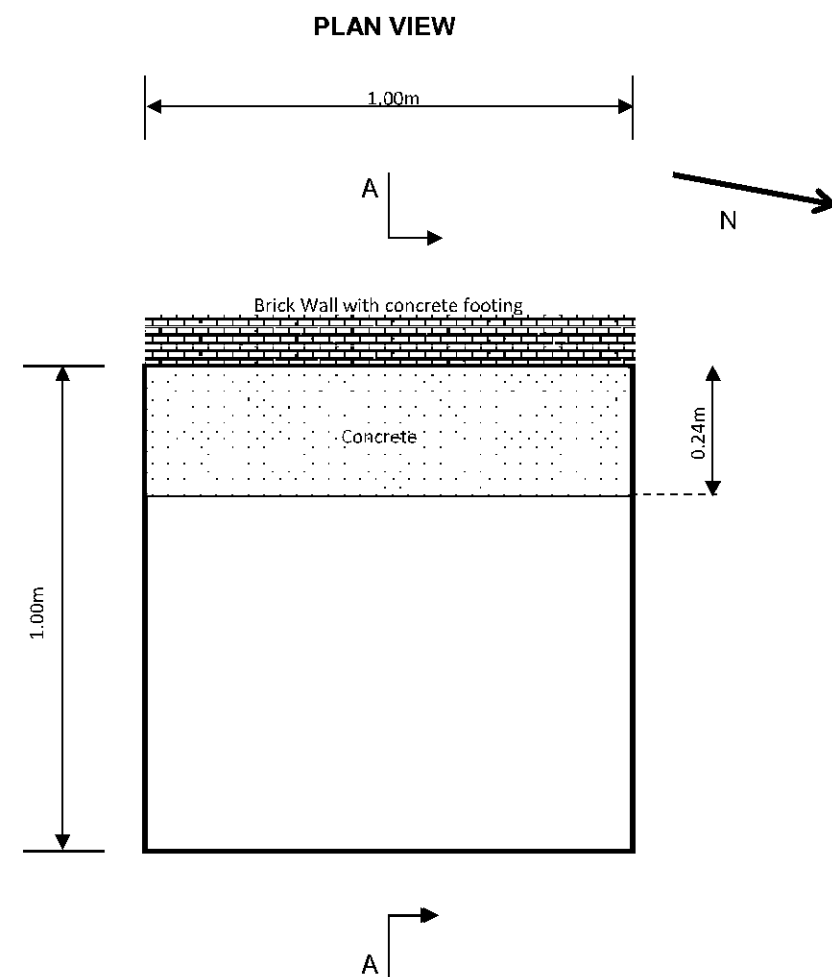


PHOTO 1



PHOTO 2



PHOTO 3

Strata Descriptions:

Strata 1:
MADE GROUND: Soft dark brown slightly sandy slightly graevlly clay with many rootlets and occasional roots.
Strata 2:
Soft brown slightly sandy SILT.

For details of the exposed strata and the samples obtained see Record for HD01.

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

DEPARTMENT FOR EDUCATION

Project:

UNIVERSITY ACADEMY LONG SUTTON

Project No: PC228532

Title: HD01 Sketch

View: Plan & Section

Date Excavated: 13/04/2023

Drawn by: LC

Date Drawn: 14/07/2023

Contact: schapman@geotechnics.co.uk



The Geotechnical Centre
203 Torrington Avenue
Tile Hill
Coventry
CV4 9UT

[illegible]

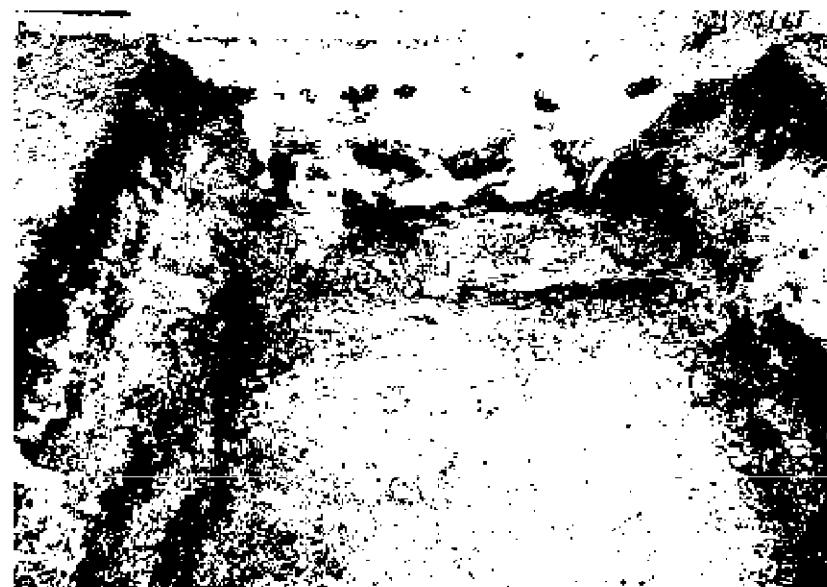
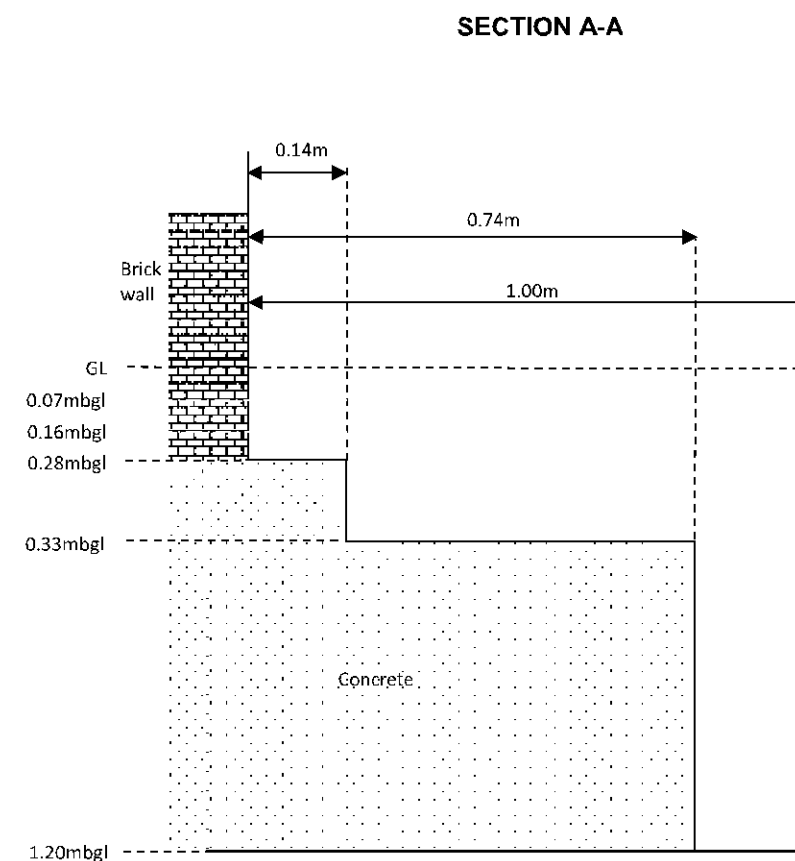
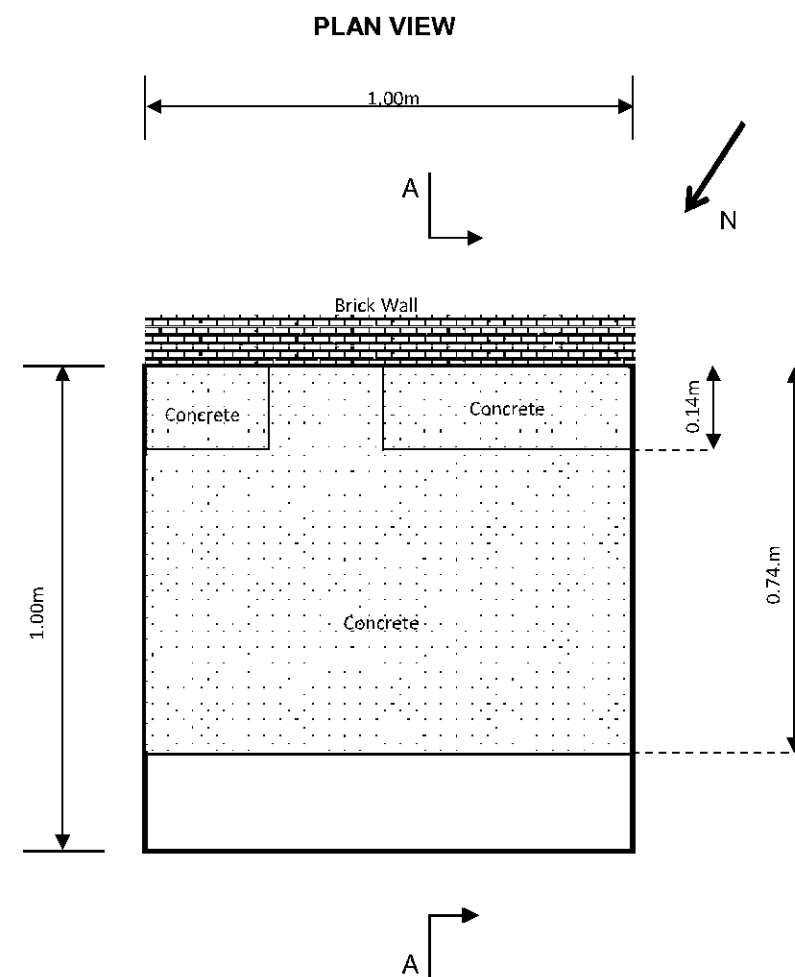


PHOTO 1



PHOTO 2



PHOTO 3

Strata Descriptions:

- Strata 1:
MADE GROUND: Asphalt
- Strata 2:
MADE GROUND: Orangish brown gravelly silty sand.
- Strata 3:
Soft brown sandy clayey SILT

For details of the exposed strata and the samples obtained see Record for HD01.

NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

DEPARTMENT FOR EDUCATION

Project:

UNIVERSITY ACADEMY LONG SUTTON

Project No: PC228532

Title: HD02 Sketch

View: Plan & Section

Date Excavated: 13/04/2023

Drawn by: LC

Date Drawn: 14/07/2023

Contact: schapman@geotechnics.co.uk



The Geotechnical Centre
203 Torrington Avenue
Tile Hill
Coventry
CV4 9UT

APPENDIX 6

Dynamic Cone Penetration Test Results

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. BH01-DCP

Client DEPARTMENT FOR EDUCATION

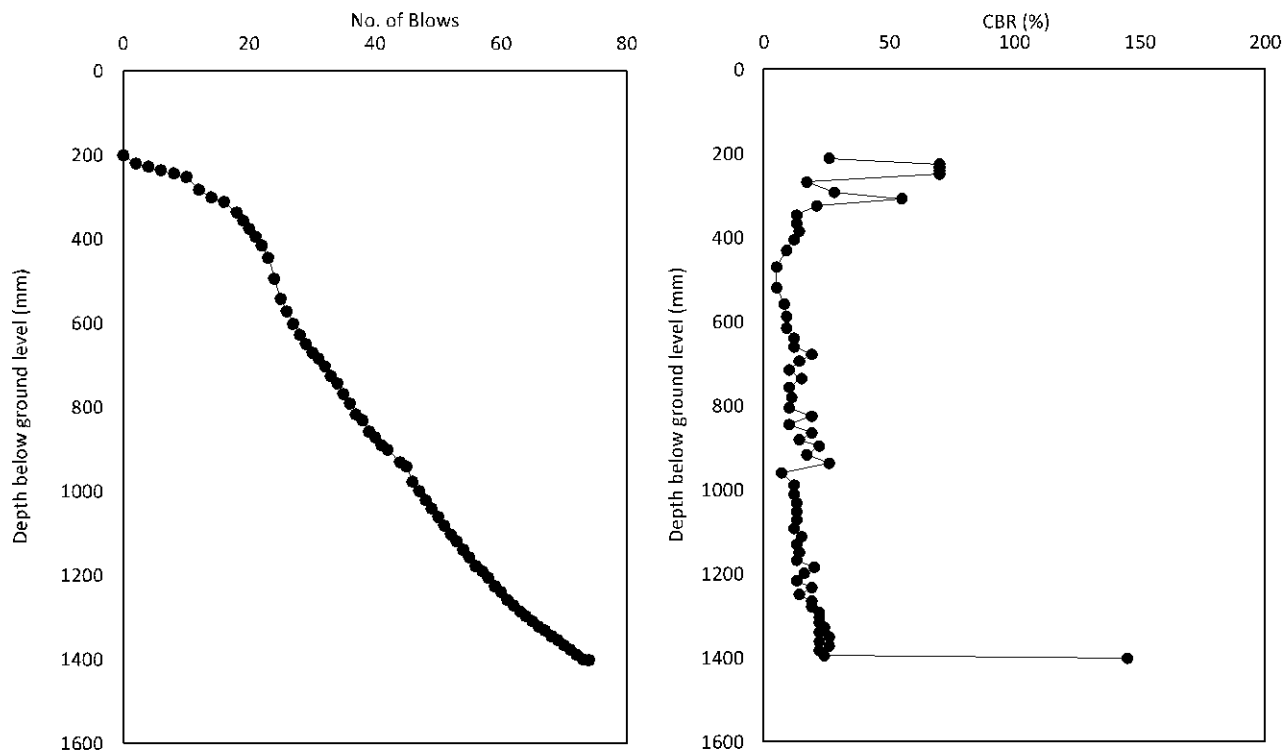
Project No. PC228532

Test No. 1

Ground Level 3.38 m OD

Test Date 13/04/2023

Test started at 0.20m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	280	200	1	29	729	649	1	50	1141	1061
2	2	300	220	1	30	750	670	1	51	1161	1081
2	4	308	228	1	31	764	684	1	52	1182	1102
2	6	316	236	1	32	782	702	1	53	1199	1119
2	8	324	244	1	33	806	726	1	54	1219	1139
2	10	332	252	1	34	823	743	1	55	1237	1157
2	12	362	282	1	35	848	768	1	56	1257	1177
2	14	381	301	1	36	871	791	1	57	1270	1190
2	16	391	311	1	37	897	817	1	58	1286	1206
2	18	416	336	1	38	911	831	1	59	1305	1225
1	19	435	355	1	39	937	857	1	60	1319	1239
1	20	455	375	1	40	951	871	1	61	1337	1257
1	21	473	393	1	41	969	889	1	62	1351	1271
1	22	495	415	1	42	981	901	1	63	1365	1285
1	23	524	444	2	44	1011	931	1	64	1377	1297
1	24	574	494	1	45	1021	941	1	65	1389	1309
1	25	622	542	1	46	1057	977	1	66	1401	1321
1	26	652	572	1	47	1079	999	1	67	1412	1332
1	27	681	601	1	48	1101	1021	1	68	1424	1344
1	28	708	628	1	49	1121	1041	1	69	1434	1354



Remarks

Printed: 28/07/2023

Test completed adjacent to BH01. Test commenced below hardstanding.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. BH01-DCP

Client DEPARTMENT FOR EDUCATION

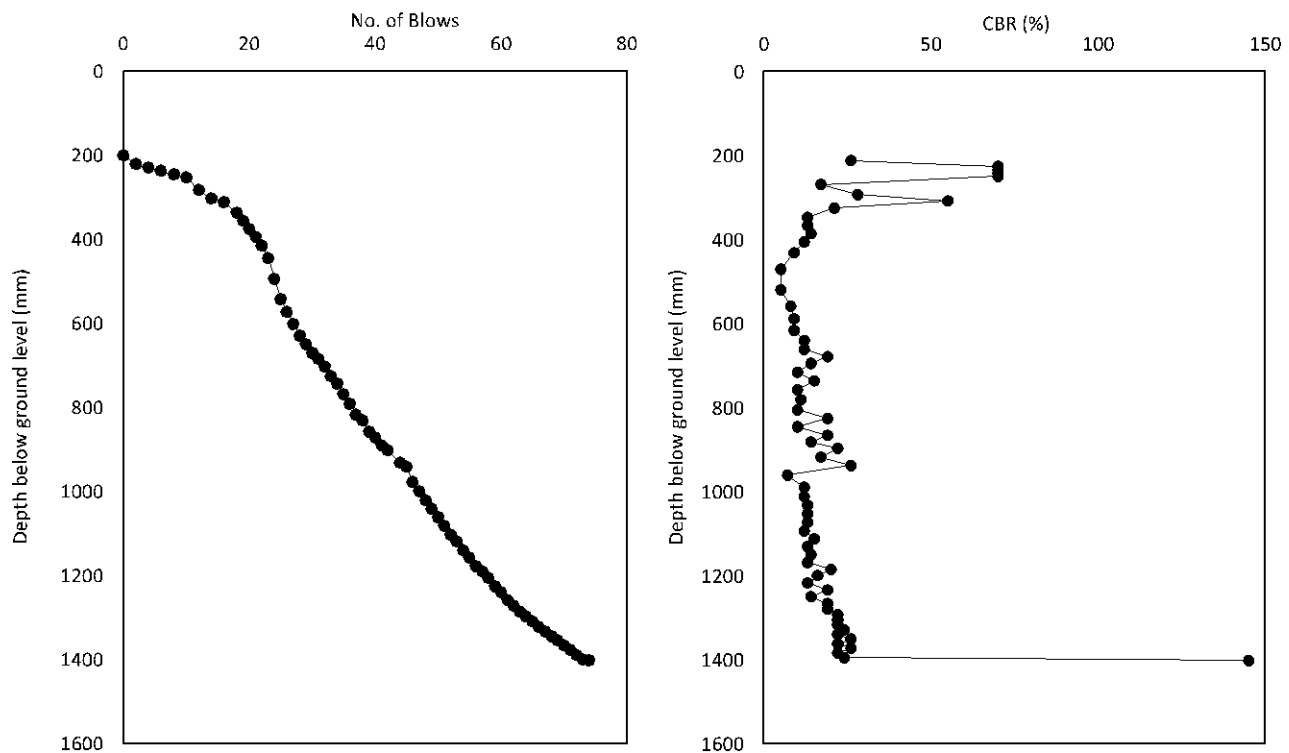
Project No. PC228532

Test No. 1

Ground Level 3.38 m OD

Test Date 13/04/2023

Test started at				Operator				Checked By			
0.20m bgl				MJ				LC			
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
1	70	1446	1366								
1	71	1456	1376								
1	72	1468	1388								
1	73	1479	1399								
1	74	1481	1401								



Remarks

Printed: 28/07/2023

Test completed adjacent to BH01. Test commenced below hardstanding.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

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In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. BH02-DCP

Client DEPARTMENT FOR EDUCATION

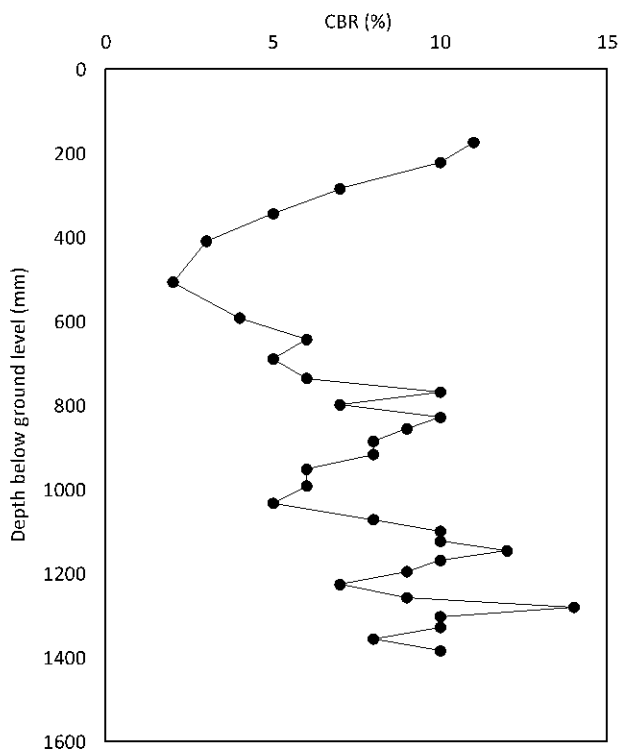
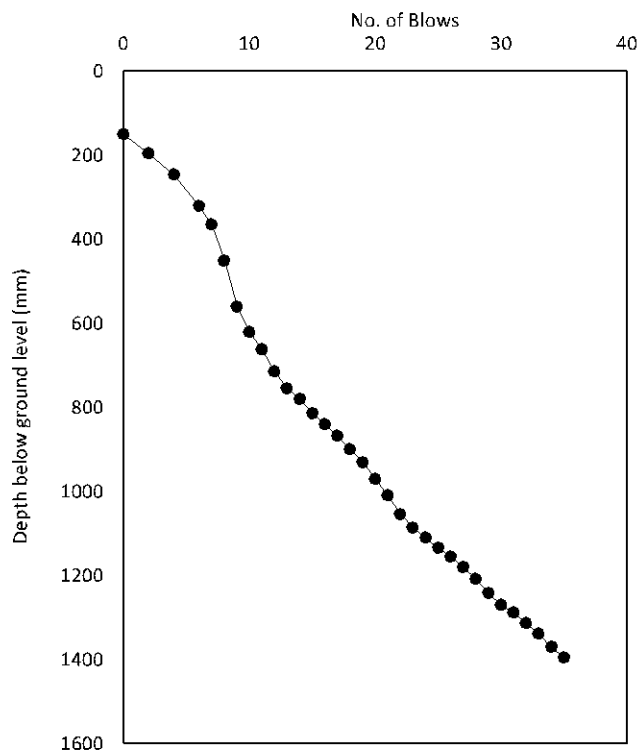
Project No. PC228532

Test No. 1

Ground Level 3.62 m OD

Test Date 13/04/2023

Test started at 0.15m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	250	150	1	23	1186	1086				
2	2	295	195	1	24	1210	1110				
2	4	346	246	1	25	1234	1134				
2	6	420	320	1	26	1255	1155				
1	7	465	365	1	27	1280	1180				
1	8	550	450	1	28	1308	1208				
1	9	660	560	1	29	1342	1242				
1	10	721	621	1	30	1370	1270				
1	11	762	662	1	31	1388	1288				
1	12	814	714	1	32	1414	1314				
1	13	854	754	1	33	1439	1339				
1	14	880	780	1	34	1470	1370				
1	15	914	814	1	35	1495	1395				
1	16	940	840								
1	17	968	868								
1	18	1000	900								
1	19	1030	930								
1	20	1071	971								
1	21	1109	1009								
1	22	1154	1054								



Remarks

Printed: 28/07/2023

Test completed adjacent to BH02. Test commenced below hardstanding.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. BH03-DCP

Client DEPARTMENT FOR EDUCATION

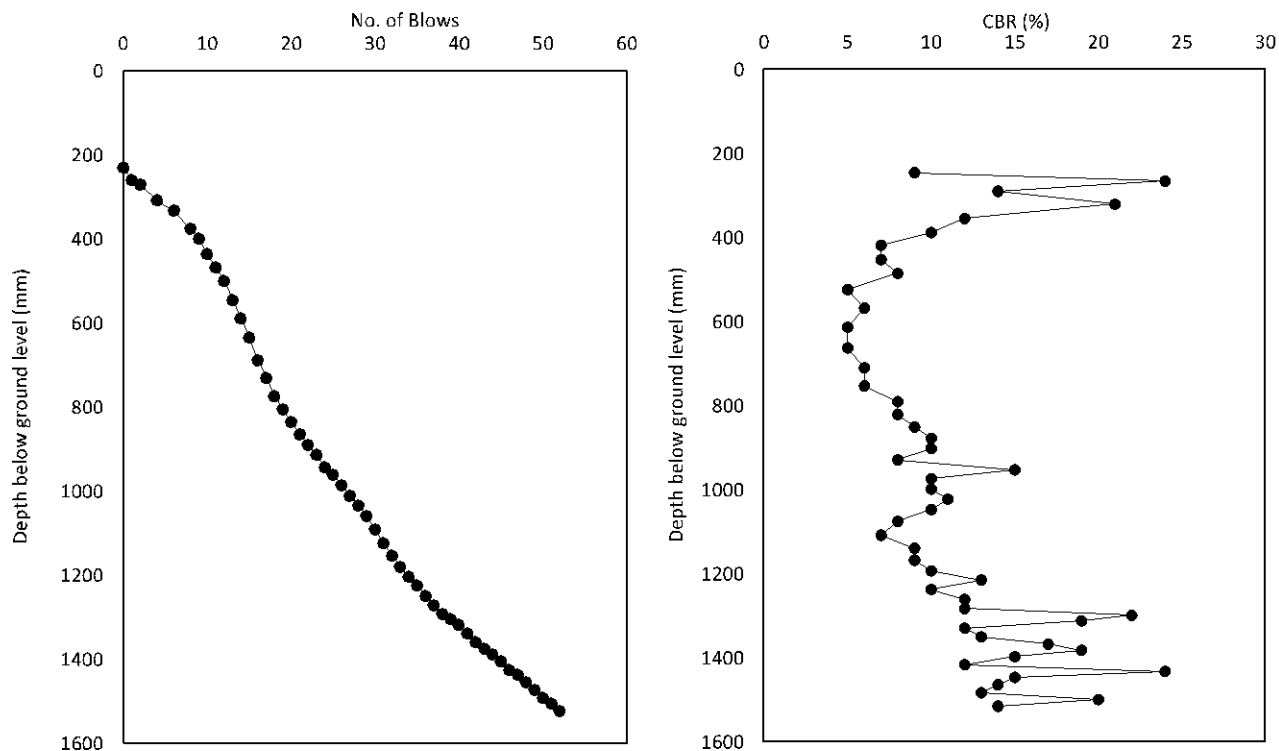
Project No. PC228532

Test No. 1

Ground Level 3.43 m OD

Test Date 13/04/2023

Test started at 0.23m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	235	230	1	23	918	913	1	43	1379	1374
1	1	264	259	1	24	948	943	1	44	1393	1388
1	2	275	270	1	25	965	960	1	45	1410	1405
2	4	312	307	1	26	990	985	1	46	1431	1426
2	6	337	332	1	27	1015	1010	1	47	1442	1437
2	8	380	375	1	28	1038	1033	1	48	1459	1454
1	9	404	399	1	29	1064	1059	1	49	1477	1472
1	10	440	435	1	30	1095	1090	1	50	1497	1492
1	11	473	468	1	31	1129	1124	1	51	1510	1505
1	12	505	500	1	32	1158	1153	1	52	1528	1523
1	13	550	545	1	33	1185	1180				
1	14	594	589	1	34	1209	1204				
1	15	640	635	1	35	1229	1224				
1	16	693	688	1	36	1254	1249				
1	17	735	730	1	37	1276	1271				
1	18	779	774	1	38	1297	1292				
1	19	810	805	1	39	1309	1304				
1	20	840	835	1	40	1323	1318				
1	21	869	864	1	41	1344	1339				
1	22	894	889	1	42	1364	1359				



Remarks

Printed: 28/07/2023

Test completed adjacent to BH03. Test commenced below hardstanding.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. BH04-DCP

Client DEPARTMENT FOR EDUCATION

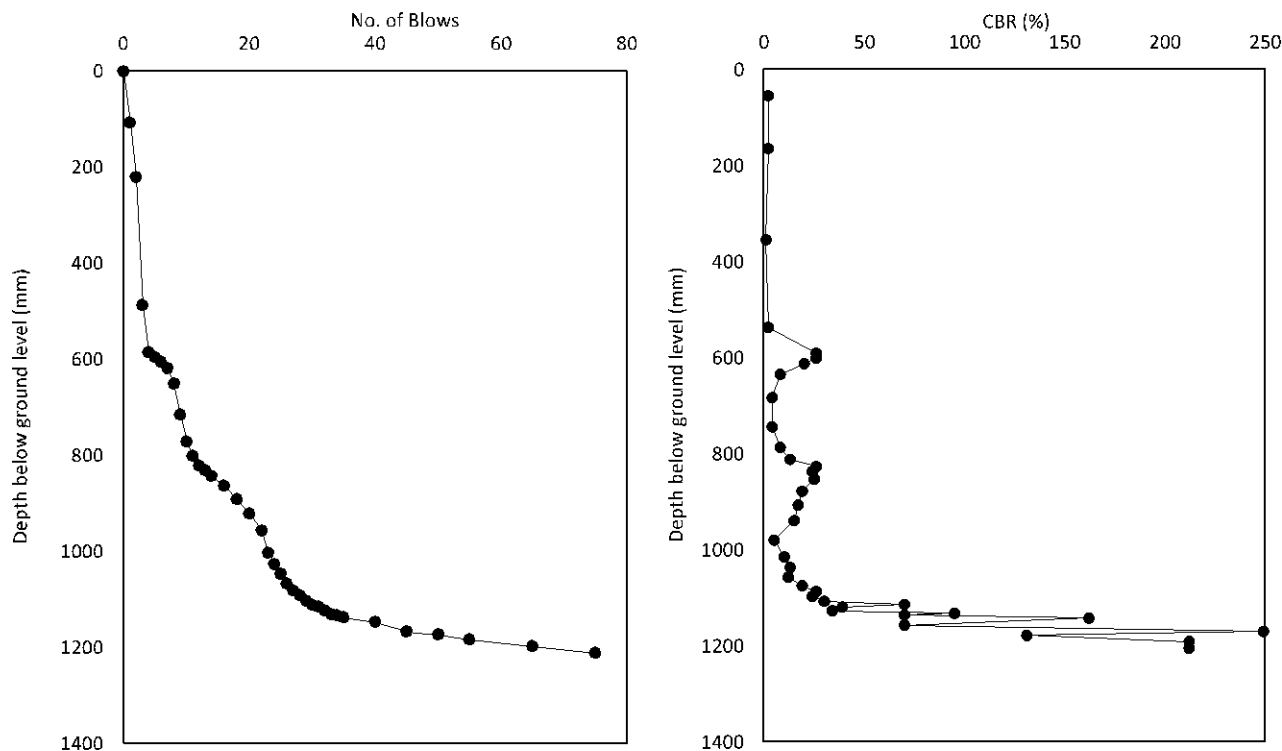
Project No. PC228532

Test No. 1

Ground Level 3.76 m OD

Test Date 13/04/2023

Test started at 0.00m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	155	0	1	24	1181	1026				
1	1	262	107	1	25	1201	1046				
1	2	375	220	1	26	1222	1067				
1	3	642	487	1	27	1236	1081				
1	4	740	585	1	28	1246	1091				
1	5	750	595	1	29	1257	1102				
1	6	760	605	1	30	1266	1111				
1	7	773	618	1	31	1270	1115				
1	8	805	650	1	32	1277	1122				
1	9	870	715	1	33	1285	1130				
1	10	926	771	1	34	1288	1133				
1	11	956	801	1	35	1292	1137				
1	12	976	821	5	40	1301	1146				
1	13	986	831	5	45	1321	1166				
1	14	997	842	5	50	1327	1172				
2	16	1018	863	5	55	1338	1183				
2	18	1046	891	10	65	1352	1197				
2	20	1076	921	10	75	1366	1211				
2	22	1111	956								
1	23	1157	1002								



Remarks

Test completed adjacent to BH04.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

Printed: 28/07/2023

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. DS01-DCP

Client DEPARTMENT FOR EDUCATION

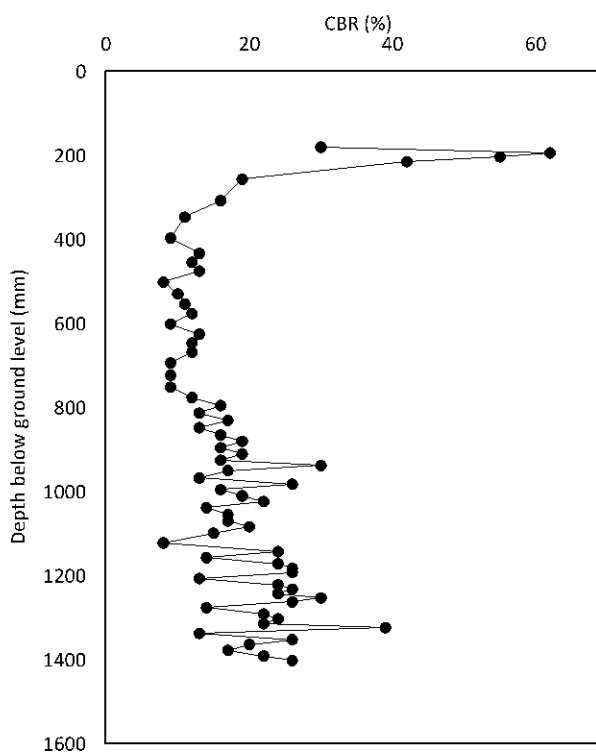
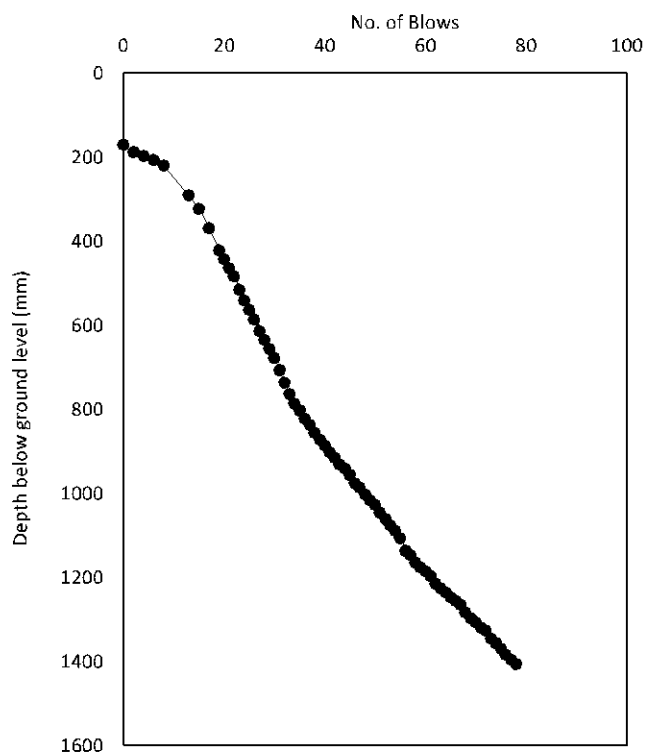
Project No. PC228532

Test No. 1

Ground Level 3.46 m OD

Test Date 12/04/2023

Test started at 0.17m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	256	170	1	31	793	707	1	51	1132	1046
2	2	274	188	1	32	822	736	1	52	1147	1061
2	4	283	197	1	33	850	764	1	53	1162	1076
2	6	293	207	1	34	872	786	1	54	1175	1089
2	8	306	220	1	35	888	802	1	55	1192	1106
5	13	376	290	1	36	908	822	1	56	1222	1136
2	15	408	322	1	37	923	837	1	57	1233	1147
2	17	455	369	1	38	942	856	1	58	1251	1165
2	19	508	422	1	39	958	872	1	59	1262	1176
1	20	528	442	1	40	972	886	1	60	1272	1186
1	21	550	464	1	41	988	902	1	61	1282	1196
1	22	570	484	1	42	1002	916	1	62	1301	1215
1	23	602	516	1	43	1018	932	1	63	1312	1226
1	24	627	541	1	44	1027	941	1	64	1322	1236
1	25	650	564	1	45	1042	956	1	65	1333	1247
1	26	672	586	1	46	1062	976	1	66	1342	1256
1	27	700	614	1	47	1072	986	1	67	1352	1266
1	28	720	634	1	48	1088	1002	1	68	1370	1284
1	29	742	656	1	49	1102	1016	1	69	1382	1296
1	30	764	678	1	50	1114	1028	1	70	1393	1307



Remarks

Printed: 28/07/2023

Test completed adjacent to DS01. Test commenced below hardstanding.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. DS01-DCP

Client DEPARTMENT FOR EDUCATION

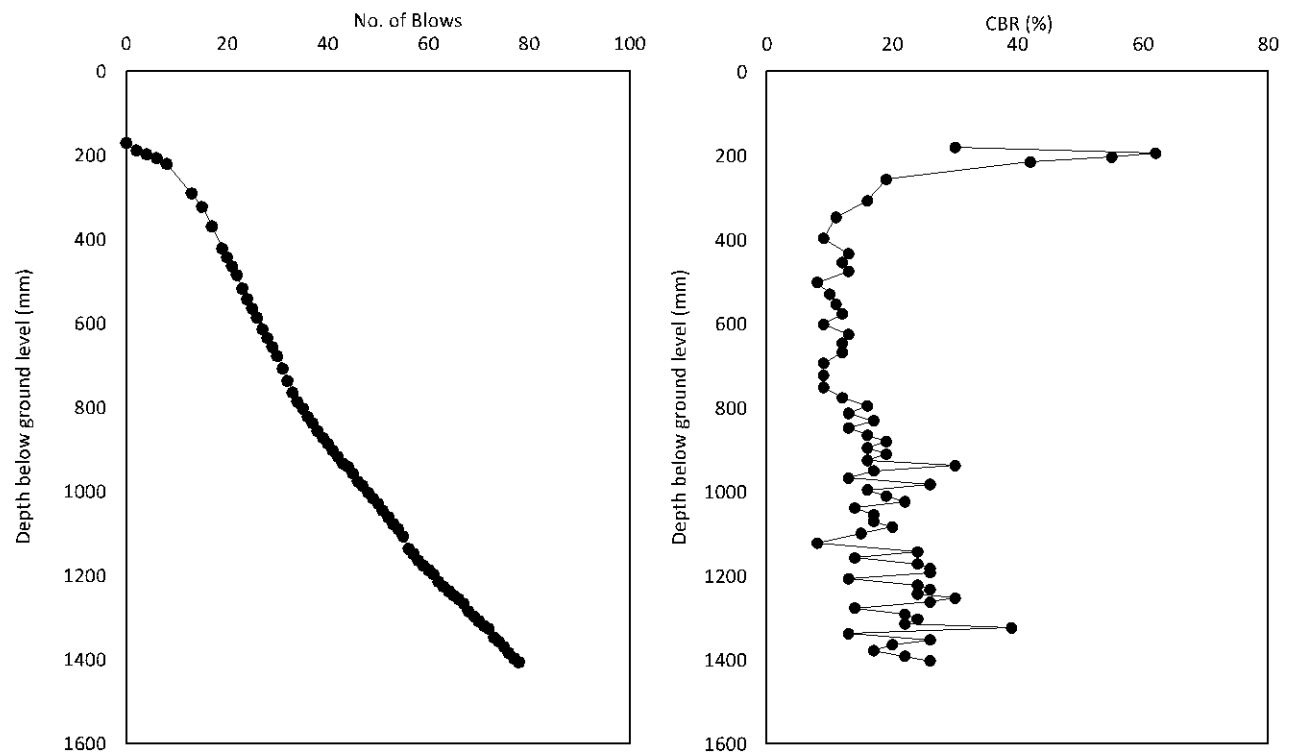
Project No. PC228532

Test No. 1

Ground Level 3.46 m OD

Test Date 12/04/2023

Test started at		0.17m bgl		Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
1	71	1405	1319								
1	72	1412	1326								
1	73	1432	1346								
1	74	1442	1356								
1	75	1455	1369								
1	76	1470	1384								
1	77	1482	1396								
1	78	1492	1406								



Remarks

Printed: 28/07/2023

Test completed adjacent to DS01. Test commenced below hardstanding.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

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In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. DS02-DCP

Client DEPARTMENT FOR EDUCATION

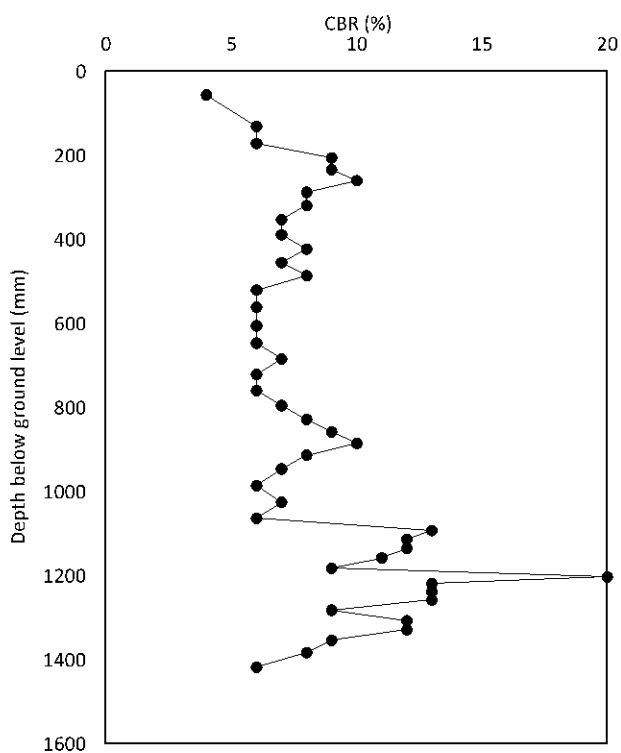
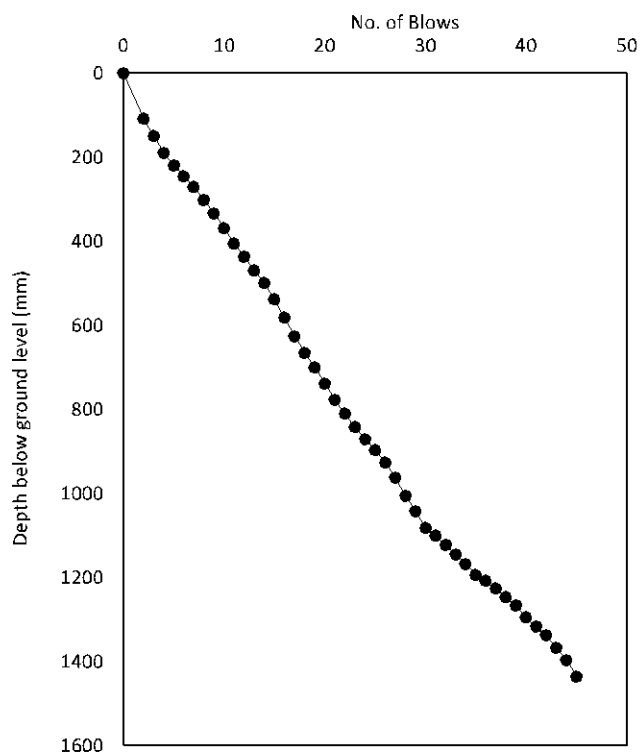
Project No. PC228532

Test No. 1

Ground Level 3.57 m OD

Test Date 12/04/2023

Test started at 0.00m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	85	0	1	21	862	777	1	41	1402	1317
2	2	194	109	1	22	896	811	1	42	1423	1338
1	3	235	150	1	23	927	842	1	43	1452	1367
1	4	275	190	1	24	956	871	1	44	1482	1397
1	5	304	219	1	25	982	897	1	45	1521	1436
1	6	331	246	1	26	1012	927				
1	7	356	271	1	27	1048	963				
1	8	387	302	1	28	1091	1006				
1	9	419	334	1	29	1127	1042				
1	10	454	369	1	30	1167	1082				
1	11	491	406	1	31	1186	1101				
1	12	522	437	1	32	1208	1123				
1	13	555	470	1	33	1230	1145				
1	14	585	500	1	34	1253	1168				
1	15	623	538	1	35	1280	1195				
1	16	667	582	1	36	1293	1208				
1	17	711	626	1	37	1312	1227				
1	18	750	665	1	38	1332	1247				
1	19	786	701	1	39	1352	1267				
1	20	824	739	1	40	1380	1295				



Remarks

Printed: 28/07/2023

Test completed adjacent to DS02.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

In Situ Testing - Dynamic Cone Penetration Test

Project UNIVERSITY ACADEMY LONG SUTTON

Location No. DS03-DCP

Client DEPARTMENT FOR EDUCATION

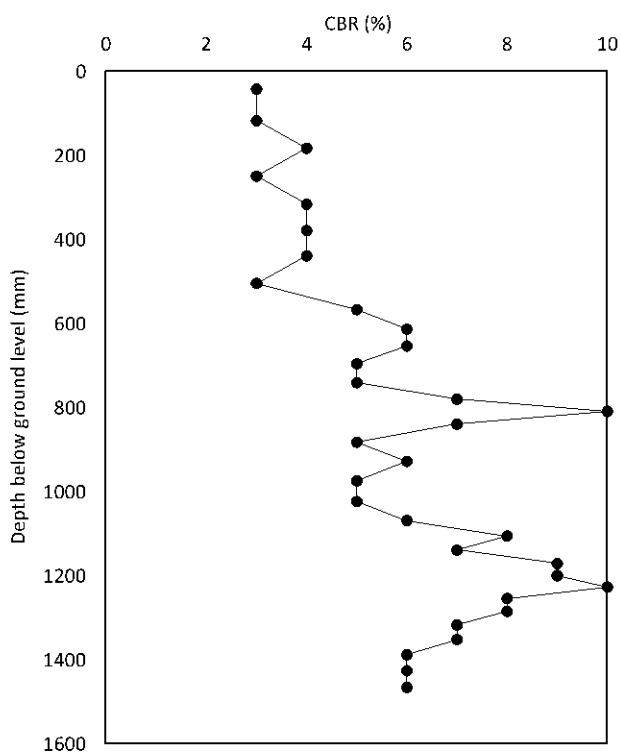
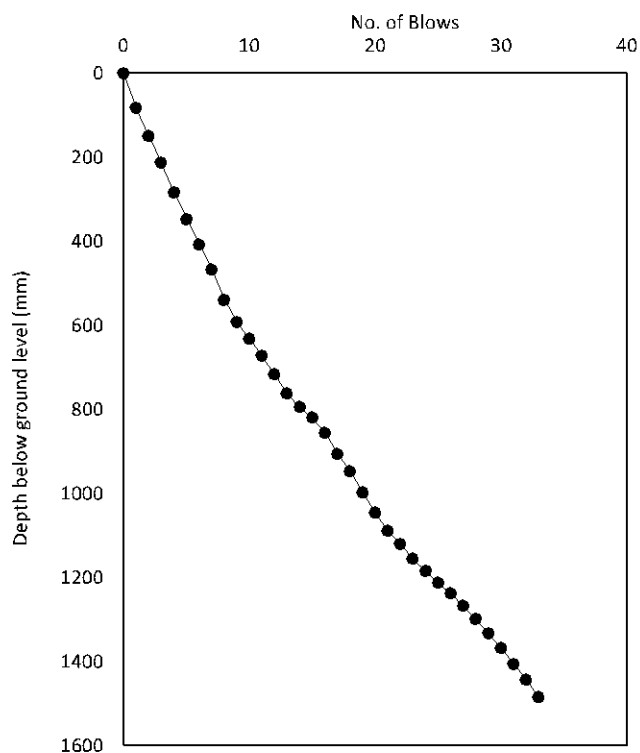
Project No. PC228532

Test No. 1

Ground Level 3.64 m OD

Test Date 12/04/2023

Test started at 0.00m bgl				Operator		MJ		Checked By		LC	
Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)	Blows No.	Blows Total	Reading (mm)	Corrected Depth (mm)
0	0	128	0	1	20	1174	1046				
1	1	210	82	1	21	1217	1089				
1	2	278	150	1	22	1248	1120				
1	3	341	213	1	23	1284	1156				
1	4	411	283	1	24	1312	1184				
1	5	475	347	1	25	1341	1213				
1	6	536	408	1	26	1366	1238				
1	7	595	467	1	27	1396	1268				
1	8	667	539	1	28	1427	1299				
1	9	720	592	1	29	1461	1333				
1	10	760	632	1	30	1496	1368				
1	11	800	672	1	31	1534	1406				
1	12	845	717	1	32	1572	1444				
1	13	890	762	1	33	1613	1485				
1	14	923	795								
1	15	948	820								
1	16	984	856								
1	17	1034	906								
1	18	1076	948								
1	19	1126	998								



Remarks

Test completed adjacent to DS03.

CBR estimated using the correlation in the HA Manual for Roads and Bridges, CS229, Rev. 0, 2020 between each test point on the 'No. of Blows vs. Depth' plot

Printed: 28/07/2023

APPENDIX 7

Monitoring Results

FIELDWORK - In Situ Gas Monitoring - Hole Record**Project** UNIVERSITY ACADEMY LONG SUTTON**Project No.** PC228532**Client** DEPARTMENT FOR EDUCATION**Location ID** BH01 (P1)**Sheet No.** 1

Installation Details	Type	SP (50mm)					
	Depth to Base (m)	3.50					
	Ground Level (mOD)	3.38					
	Filter Zone (m)	1.50 - 3.50					
	Date Installed	14/04/2023					
	Cover Type	Flush lockable					
Date of Reading (dd/mm/yyyy) (hh:mm:ss)		28/04/2023	03/05/2023	11/05/2023	18/05/2023		
Weather	Wind						
	Precipitation						
	Cloud Cover						
Atmospheric Pressure Trend							
Site Conditions	Temperature (°C)	13	12	19	18		
	Ground Condition						
Equipment used		Gas Data GFM435	Gas Data GFM435	Gas Data GFM435	Gas Data GFM435		
Monitored by							
Depth to Water	m bgl	1.43	1.36	0.75	1.59		
Methane (Peak) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Methane (Steady) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Peak)	% VOL	0.1	0.3	0.8	<0.1		
Carbon Dioxide (Steady)	% VOL	0.1	0.3	0.8	<0.1		
Oxygen (Peak)	% VOL	20.3	20.1	16.3	20.5		
Oxygen (Steady)	% VOL	20.3	20.1	16.3	20.5		
Hydrogen Sulphide (H ₂ S)	ppm	<1	<1	<1	<1		
Carbon Monoxide (CO)	ppm	<1	4	<1	<1		
Barometric Pressure	mbar	1013	1031	1020	1032		
Differential Pressure	Pa	-1159	-160	-506	-1193		
Flow Rate (Peak)	l/hr	-71.0	-24.0	-51.0	-71.0		
Flow Rate (Steady)	l/hr	<0.1	<0.1	-3.3	-3.0		
PID Reading	ppm						
Remarks		Flow stabilised after 5 minutes		5 minutes to stabilise	6 minutes to stabilise		

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FIELDWORK - In Situ Gas Monitoring - Hole Record**Project** UNIVERSITY ACADEMY LONG SUTTON**Project No.** PC228532**Client** DEPARTMENT FOR EDUCATION**Location ID** BH02 (P1)**Sheet No.** 2

Installation Details	Type	SP (50mm)					
	Depth to Base (m)	11.50					
	Ground Level (mOD)	3.62					
	Filter Zone (m)	4.00 - 11.50					
	Date Installed	18/04/2023					
	Cover Type	Flush lockable					
Date of Reading (dd/mm/yyyy) (hh:mm:ss)		28/04/2023	03/05/2023	11/05/2023	18/05/2023		
Weather	Wind						
	Precipitation						
	Cloud Cover						
Atmospheric Pressure Trend							
Site Conditions	Temperature (°C)	13	12	19	18		
	Ground Condition						
Equipment used		Gas Data GFM435	Gas Data GFM435	Gas Data GFM435	Gas Data GFM435		
Monitored by							
Depth to Water	m bgl	1.81	1.88	1.65	1.94		
Methane (Peak) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Methane (Steady) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Peak)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Steady)	% VOL	<0.1	<0.1	<0.1	<0.1		
Oxygen (Peak)	% VOL	20.3	20.4	20.6	20.8		
Oxygen (Steady)	% VOL	20.4	20.4	20.6	20.8		
Hydrogen Sulphide (H ₂ S)	ppm	<1	<1	<1	<1		
Carbon Monoxide (CO)	ppm	1	1	<1	<1		
Barometric Pressure	mbar	1013	1033	1021	1034		
Differential Pressure	Pa	<1	<1	<1	<1		
Flow Rate (Peak)	l/hr	<0.1	<0.1	<0.1	<0.1		
Flow Rate (Steady)	l/hr	<0.1	<0.1	<0.1	<0.1		
PID Reading	ppm						
Remarks							
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FIELDWORK - In Situ Gas Monitoring - Hole Record**Project** UNIVERSITY ACADEMY LONG SUTTON**Project No.** PC228532**Client** DEPARTMENT FOR EDUCATION**Location ID** BH03 (P1)**Sheet No.** 3

Installation Details	Type	SP (50mm)					
	Depth to Base (m)	9.00					
	Ground Level (mOD)	3.43					
	Filter Zone (m)	3.50 - 9.00					
	Date Installed	13/04/2023					
	Cover Type	Flush lockable					
Date of Reading (dd/mm/yyyy) (hh:mm:ss)		28/04/2023	03/05/2023	11/05/2023	18/05/2023		
Weather	Wind						
	Precipitation						
	Cloud Cover						
Atmospheric Pressure Trend							
Site Conditions	Temperature (°C)	13	12	19	18		
	Ground Condition						
Equipment used		Gas Data GFM435	Gas Data GFM435	Gas Data GFM435	Gas Data GFM435		
Monitored by							
Depth to Water	m bgl	1.67	1.79	1.54	1.87		
Methane (Peak) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Methane (Steady) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Peak)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Steady)	% VOL	<0.1	<0.1	<0.1	<0.1		
Oxygen (Peak)	% VOL	12.6	19.1	20.6	20.8		
Oxygen (Steady)	% VOL	12.6	19.2	20.6	21.0		
Hydrogen Sulphide (H ₂ S)	ppm	<1	<1	<1	<1		
Carbon Monoxide (CO)	ppm	18	4	<1	<1		
Barometric Pressure	mbar	1014	1029	1021	1031		
Differential Pressure	Pa	<1	<1	-18	<1		
Flow Rate (Peak)	l/hr	<0.1	<0.1	-5.6	<0.1		
Flow Rate (Steady)	l/hr	<0.1	<0.1	<0.1	<0.1		
PID Reading	ppm						
Remarks		7 minutes to stabilise					

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FIELDWORK - In Situ Gas Monitoring - Hole Record**Project** UNIVERSITY ACADEMY LONG SUTTON**Project No.** PC228532**Client** DEPARTMENT FOR EDUCATION**Location ID** BH04 (P1)**Sheet No.** 4

Installation Details	Type	SP (50mm)					
	Depth to Base (m)	1.70					
	Ground Level (mOD)	3.76					
	Filter Zone (m)	0.60 - 1.70					
	Date Installed	12/04/2023					
	Cover Type	Flush lockable					
Date of Reading (dd/mm/yyyy) (hh:mm:ss)		28/04/2023	03/05/2023	11/05/2023	18/05/2023		
Weather	Wind						
	Precipitation						
	Cloud Cover						
Atmospheric Pressure Trend							
Site Conditions	Temperature (°C)	13	12	19	18		
	Ground Condition						
Equipment used		Gas Data GFM435	Gas Data GFM435	Gas Data GFM435	Gas Data GFM435		
Monitored by							
Depth to Water	m bgl	1.80	1.81	1.41	1.64		
Methane (Peak) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Methane (Steady) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Peak)	% VOL	0.6	1.5	2.0	2.3		
Carbon Dioxide (Steady)	% VOL	0.6	1.5	2.0	2.3		
Oxygen (Peak)	% VOL	19.8	17.1	16.3	16.5		
Oxygen (Steady)	% VOL	19.8	17.1	16.3	16.5		
Hydrogen Sulphide (H ₂ S)	ppm	<1	<1	<1	<1		
Carbon Monoxide (CO)	ppm	<1	<1	<1	<1		
Barometric Pressure	mbar	1014	1031	1020	1033		
Differential Pressure	Pa	<1	<1	<1	<1		
Flow Rate (Peak)	l/hr	<0.1	0.3	<0.1	<0.1		
Flow Rate (Steady)	l/hr	<0.1	<0.1	<0.1	<0.1		
PID Reading	ppm						
Remarks		Infested with Ant nest	Insufficient water to sample.				

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FIELDWORK - In Situ Gas Monitoring - Hole Record**Project** UNIVERSITY ACADEMY LONG SUTTON**Project No.** PC228532**Client** DEPARTMENT FOR EDUCATION**Location ID** BH05 (P1)**Sheet No.** 5

Installation Details	Type	SP (50mm)					
	Depth to Base (m)	20.00					
	Ground Level (mOD)	3.40					
	Filter Zone (m)	14.00 - 20.00					
	Date Installed	20/04/2023					
	Cover Type	Flush lockable					
Date of Reading (dd/mm/yyyy) (hh:mm:ss)		28/04/2023	03/05/2023	11/05/2023	18/05/2023		
Weather	Wind						
	Precipitation						
	Cloud Cover						
Atmospheric Pressure Trend							
Site Conditions	Temperature (°C)	13	12	19	18		
	Ground Condition						
Equipment used		Gas Data GFM435	Gas Data GFM435	Gas Data GFM435	Gas Data GFM435		
Monitored by							
Depth to Water	m bgl	1.83	1.91	1.60	1.92		
Methane (Peak) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Methane (Steady) (CH ₄)	% VOL	<0.1	<0.1	<0.1	<0.1		
Carbon Dioxide (Peak)	% VOL	0.1	<0.1	0.1	<0.1		
Carbon Dioxide (Steady)	% VOL	<0.1	<0.1	<0.1	<0.1		
Oxygen (Peak)	% VOL	20.0	20.7	20.6	21.0		
Oxygen (Steady)	% VOL	20.3	20.7	20.7	21.2		
Hydrogen Sulphide (H ₂ S)	ppm	<1	<1	<1	<1		
Carbon Monoxide (CO)	ppm	2	2	<1	<1		
Barometric Pressure	mbar	1014	1029	1020	1031		
Differential Pressure	Pa	<1	<1	<1	<1		
Flow Rate (Peak)	l/hr	<0.1	<0.1	<0.1	<0.1		
Flow Rate (Steady)	l/hr	<0.1	<0.1	<0.1	<0.1		
PID Reading	ppm						
Remarks							
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FIELDWORK - In Situ Groundwater Monitoring - Visit Record

Project UNIVERSITY ACADEMY LONG SUTTON

Client DEPARTMENT FOR EDUCATION

Project No. PC228532

Instrument used Hanna HI-9829

Date 03/05/2023

Meteorological Conditions:

Ground Condition: Precipitation: Wind: Cloud Cover: Atmospheric Pressure Trend: [illegible]

FIELDWORK - Water Level Monitoring

Project UNIVERSITY ACADEMY LONG SUTTON

Project No. PC228532

Client DEPARTMENT FOR EDUCATION

Sheet No. 1

Location ID		BH01		BH02		BH03		BH04		BH05			
Instrument diameter		50 mm		50 mm		50 mm		50 mm		50 mm			
Depth to base (m bgl)		3.50		11.50		9.00		1.70		20.00			
Filter zone (m bgl)		1.50 - 3.50		4.00 - 11.50		3.50 - 9.00		0.60 - 1.70		14.00 - 20.00			
Level (m OD)		3.38		3.62		3.43		3.76		3.40			
Date	Time	Depth (m)	Level (m OD)	Depth (m)	Level (m OD)	Depth (m)	Level (m OD)	Depth (m)	Level (m OD)	Depth (m)	Level (m OD)		
28 Apr 2023		1.43	1.95	1.81	1.81	1.67	1.76	1.80	1.96	1.83	1.57		
03 May 2023		1.36	2.02	1.88	1.74	1.79	1.64	1.81	1.95	1.91	1.49		
11 May 2023		0.75	2.63	1.65	1.97	1.54	1.89	1.41	2.35	1.60	1.80		
18 May 2023		1.59	1.79	1.94	1.68	1.87	1.56	1.64	2.12	1.92	1.48		

Symbols and abbreviations are explained on the accompanying key sheets.

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APPENDIX 8

Geotechnical Laboratory Test Results

Classification and Strength

Symbol	C - Clay (0 - containing organic matter) Plasticity	M - Silt L - Low I - Intermediate H - High V - Very High E - Extremely High
I_p	Plasticity Index	
%	% retained on 425 μ m sieve, shown under I_p value	
w_L	Liquid Limit	
w_p	Plastic Limit	
NP	Non-Plastic	
NAT	Sample tested in natural state	
w	Water Content	
p_d	Particle Density	
Test	Quick undrained triaxial tests	
	SS	Single stage - 102mm diameter.
	S3	Single stage - set of 3 38mm diameter.
	MS	Multistage - 102mm diameter.
	D	Drained Test
	HV	Hand Vane
	PP	Pocket Penetrometer (kg/cm ²)
	NST	Not suitable for test
γ_b	Bulk Density	
σ_3	Triaxial Cell Pressure	
$\sigma_1 - \sigma_3$	Deviator Stress	
###	Excessive Strain	
c_u	Undrained Cohesion	
c	Cohesion Intercept	
ϕ	Angle of Shearing Resistance	
Linear Shrink	Linear Shrinkage	
Stab add-	Stabiliser which is added	

Consolidation

m_v	Coefficient of Volume Compressibility
c_{vs0}	Coefficient of Consolidation - Log t
c_{v90}	Coefficient of Consolidation - $\sqrt{t}$

Rock

UF	Unacceptable Failure
----	----------------------

Chemical Analysis

Acid Soluble	Total sulphate in specimen, expressed as SO ₃ %, value in brackets expressed as SO ₄ %
Water Soluble	Soluble sulphate in 2:1 water : soil extract, expressed as SO ₃ g/l, value in brackets expressed as SO ₄ g/l
In Water	Sulphate content of groundwater, expressed as SO ₃ g/l, value in brackets expressed as SO ₄ g/l
pH	pH value
Organic content	Organic content expressed as a percentage of dry weight
Chloride	Chloride Ion content expressed as a percentage of dry weight

MCV, Compaction, CBR

MCV	Moisture Condition Value at natural water content
MCC	Moisture Condition Calibration
CCV	Chalk Crushing Value

Compaction

Type	2.5	=	2.5 kg Rammer
	4.5	=	4.5 kg Rammer
	V	=	Vibrating Hammer
γ_b	Bulk Density		
γ_d	Dry Density		
CBR California Bearing Ratio			
Type	2.5	=	Test on Specimen Recompacted using 2.5 kg Rammer
	4.5	=	As above but using 4.5 kg Rammer
	V	=	As above but using Vibrating Hammer
	M	=	Test on open drive mould specimen cut in field
	S	=	Soaked Specimen

Top	CBR at top of mould
Bottom	CBR at bottom of mould
ND	None Detected

* In the Sample Description denotes a laboratory only description

Laboratory Test Certificate

Form REP008 Rev 4

Issued from:	Geotechnics Ltd The Geotechnical Centre 203 Torrington Avenue Tile Hill Coventry, CV4 9AP	Date of issue	09.07.23
		Issue No.	1
		Client Ref. No.	N/A
		Samples / Material Source	
Testing Start Date	14.06.23	Samples Recv'd	25.05.23
Testing Complete	07.07.23	Sample State	As received
Comments		Sampled by	Geotechnics Limited
Project No	PC228532		
Project Name	University Academy, Long Sutton		

Summary of Tests

Standard	Test Description	Test Quantity	UKAS
BS EN ISO 17892-1:2014	Water Content	30	Yes
BS EN ISO 17892-12:2018 Cl. 5.3 & 5.5	Liquid Limit and Plastic Limit (4 Points Method)	13	Yes
BS EN ISO 17892-4:2016 Cl. 5.2	Particle Size Distribution by Sieving Method	10	Yes
BS EN ISO 17892-4:2016 Cl. 5.4	Particle Size Distribution by Pipette Method	6	Yes
BS EN ISO 17892-8:2018	Shear Strength by Unconsolidated Undrained Triaxial Test - Single Stage	8	Yes
BS EN ISO 17892-5:2017	Incremental Loading Oedometer	2	Yes

Note: Any descriptions, opinions or interpretations are outside the scope of UKAS accreditation.
The results within this report relate only to the samples tested and received from the client.



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Test Results checked and approved for issue.
Signed for and on behalf of Geotechnics Limited

Paul Smart (Laboratory Testing Manager)

GEOTECHNICS
geotechnical and geoenvironmental specialists

203 Torrington Avenue, Tile Hill,
Coventry, CV4 9UT

					Summary of Classification Test Results							
Project Number: PC228532					Project Name: UNIVERSITY ACADEMY LONG SUTTON							
Hole Number	Sample				Specimen Description	w %	Passing 425µm %	LL (Factor) %	PL %	PI %	Particle Density Mg/m³	Remarks
	Sample ID	Top (m)	Base (m)	Type								
BH01		0.50	0.60	D	Brown slightly sandy SILT.	27.6	100	33 4pt	NP			
BH01		2.20	2.65	UT	Brown sandy CLAY.	29.7	99	35 4pt	18	17		
BH01		4.50	5.00	B	Dark grey mottled brown very silty clayey SAND.	28.9						
BH01		7.50	8.00	B	Dark grey mottled brown silty SAND.	24.4						
BH02		0.30	0.40	D	Brown slightly gravelly SILT.	24.5	98	38 4pt	NP			
BH02		1.20	1.65	UT	Reddish brown CLAY	27.0	99	35 4pt	19	16		
BH02		2.90	3.00	D	Brown mottled grey CLAY.	44.0						
BH02		3.30	3.75	UT	Dark grey sandy CLAY.	28.3						
BH02		4.50	5.00	B	Dark grey mottled brown silty slightly clayey SAND.	30.9						
BH02		8.80	9.30	B	Brown mottled grey SAND.	24.7						
BH02		13.70	13.90	D	Brown mottled grey slightly sandy slightly gravelly CLAY.	17.0	88	26 4pt	13	13		
BH02		14.60	15.05	UT	Grey slightly gravelly CLAY.	18.7	85	34 4pt	16	18		
BH02		18.00	18.45	UT	Grey gravelly CLAY.	18.1						
BH03		0.50	0.60	D	Brown slightly sandy SILT.	27.8						
BH03		1.20	1.65	UT	Brown sandy CLAY.	28.2	99	33 4pt	NP			
BH03		3.00	3.10	D	Brown mottled grey slightly sandy SILT.	32.7	100	33 4pt	NP			
BH03		3.50	3.95	UT	Brown sandy CLAY.	26.9						
BH03		3.95	4.00	D	Brown mottled grey slightly sandy SILT.	31.7						
BH03		9.00	9.50	B	Dark grey mottled brown SAND.	26.6						
BH04		1.70	1.80	D	Brown slightly sandy SILT.	26.2	87	34 4pt	NP			
BH04		2.50	2.90	B	Brown slightly clayey very silty SAND	32.4						
BH04		5.50	6.00	B	Brown mottled dark grey very silty slightly clayey SAND.	25.4						
BH05		0.50	0.60	D	Brown slightly sandy SILT.	25.4	100	36 4pt	20	16		
BH05		1.00	1.10	D	Brown slightly sandy SILT.	25.6						
BH05		2.20	2.65	UT	Reddish brown CLAY	26.3	100	34 4pt	NP			
All tests performed in accordance with BS EN ISO 17892 unless specified otherwise.												
Key: <u>Liquid Limit</u> 80g / 30deg fall cone with increasing water content unless specified otherwise Sample washed through 0.425mm sieve unless specified otherwise 1pt - single point test (including factor) * BS1377 method						<u>Particle density</u> sp - small pykno gj - gas jar BS1377		Printed 09/07/2023				 1365

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

[illegible]

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PARTICLE SIZE DISTRIBUTION

Hole No.

BH01

Sample No.

Project Number:

PC228532

Depth

m

4.50 - 5.00

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

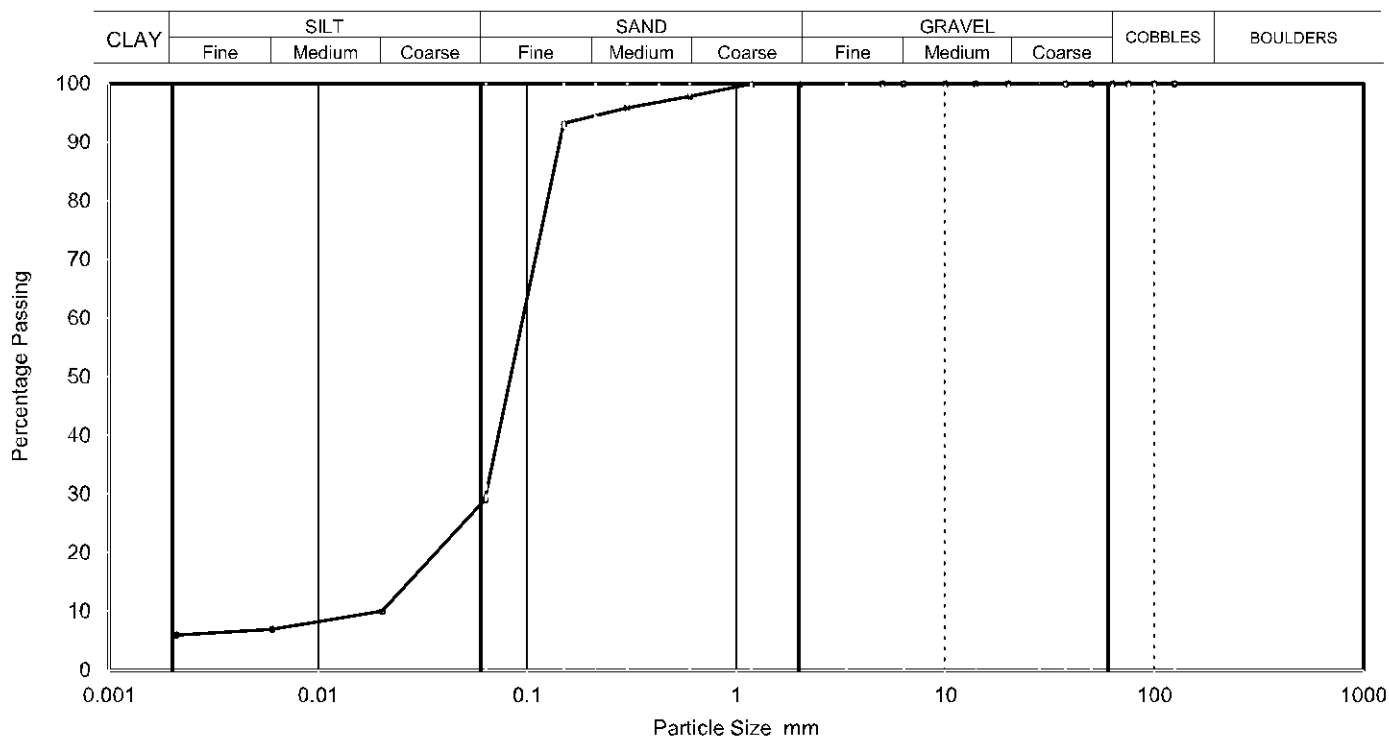
Dark grey mottled brown very silty clayey SAND.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving and pipette sedimentation



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.020	10
100	100	0.006	7
75	100	0.002	6
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	98		
0.3	96		
0.15	93	Particle density (assumed) 2.65 Mg/m3	
0.063	29		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	70
Silt	24
Clay	6

Grading Analysis		
D100	mm	5
D60	mm	0.0957
D30	mm	0.0637
D10	mm	0.0172
Uniformity Coefficient		5.6

Remarks

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PARTICLE SIZE DISTRIBUTION

Hole No.

BH01

Sample No.

Project Number:

PC228532

Depth

m

7.50 - 8.00

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

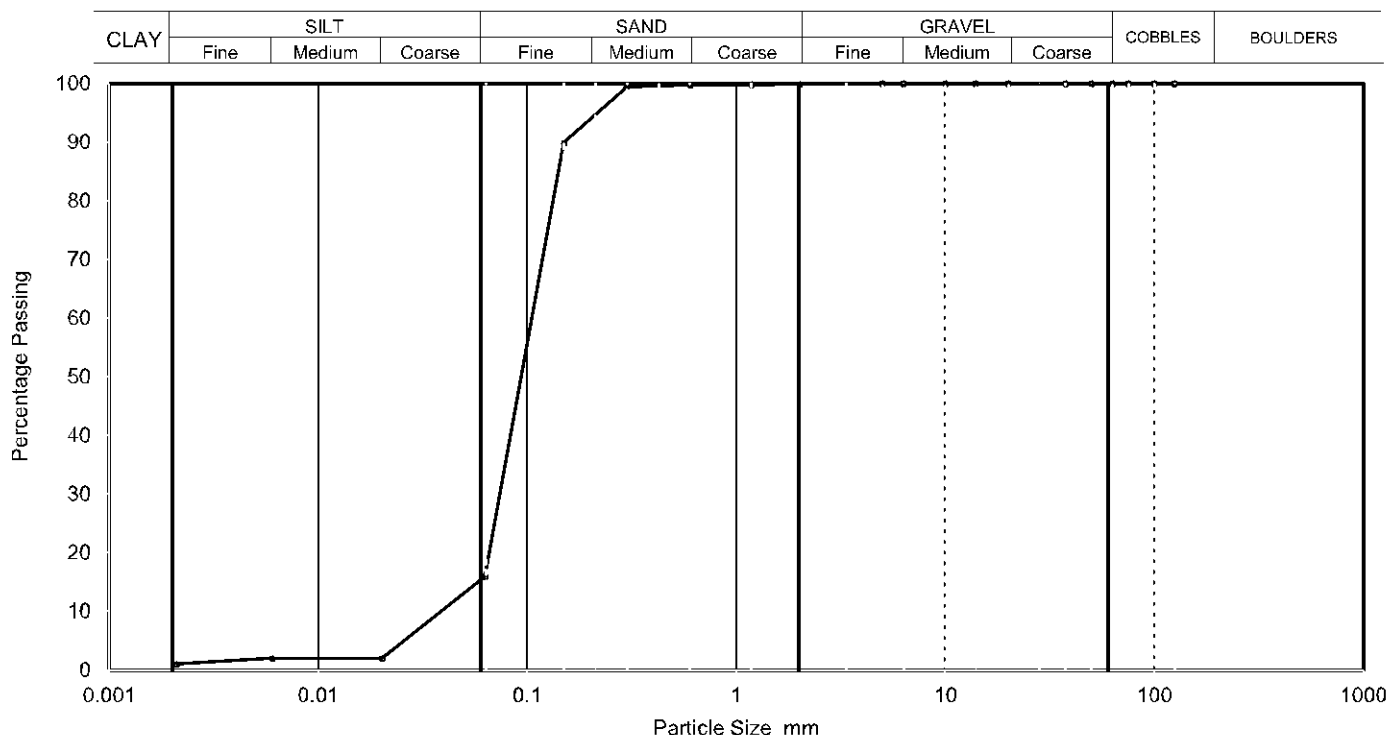
Dark grey mottled brown silty SAND.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving and pipette sedimentation



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.020	2
100	100	0.006	2
75	100	0.002	1
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	100		
0.15	90	Particle density (assumed) 2.65 Mg/m3	
0.063	16		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	84
Silt	15
Clay	1

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	

Remarks

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PARTICLE SIZE DISTRIBUTION

Hole No.

BH02

Sample No.

Project Number:

PC228532

Depth

m

4.50 - 5.00

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

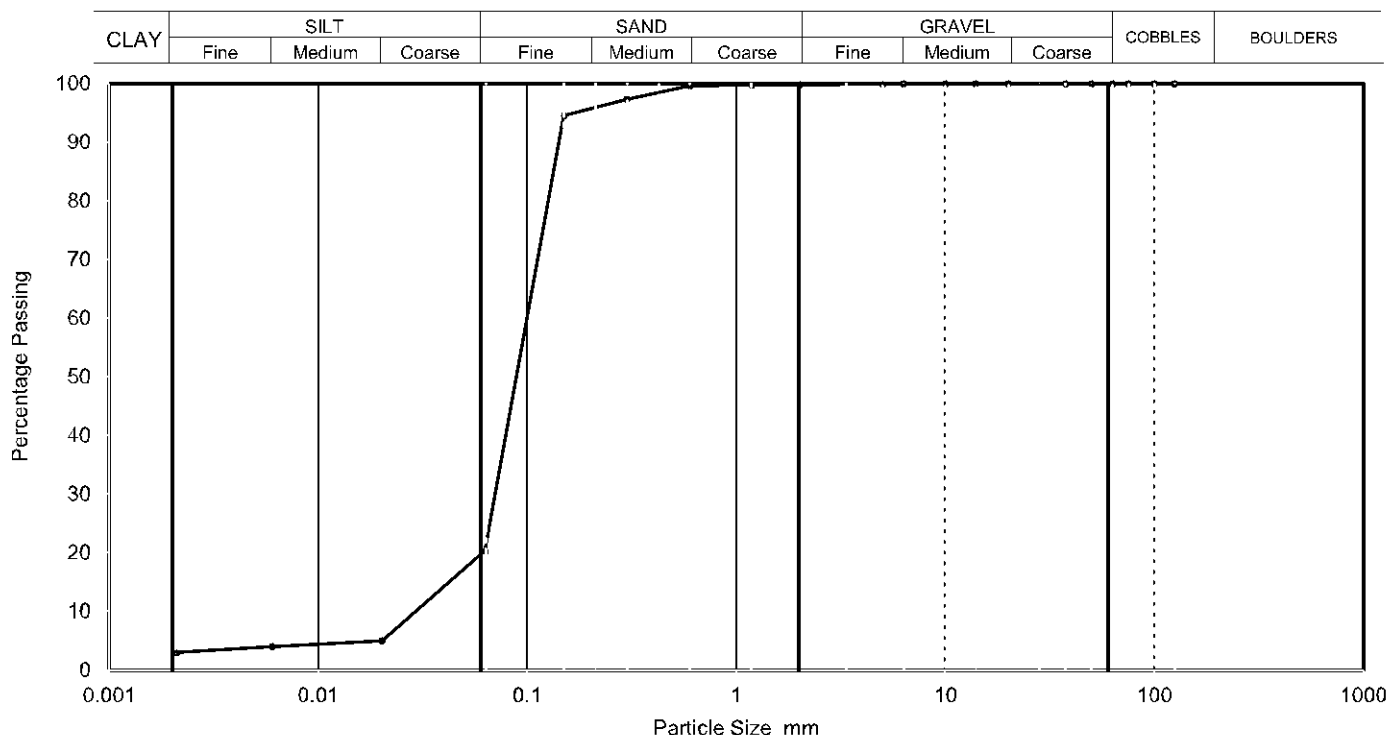
Dark grey mottled brown silty SAND.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving and pipette sedimentation



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.020	5
100	100	0.006	4
75	100	0.002	3
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	97		
0.15	95	Particle density (assumed) 2.65 Mg/m3	
0.063	20		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	80
Silt	17
Clay	3

Grading Analysis	
D100	mm 6.3
D60	mm 0.1
D30	mm 0.0705
D10	mm 0.0291
Uniformity Coefficient	3.4

Remarks

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PARTICLE SIZE DISTRIBUTION

Hole No.

BH02

Sample No.

Project Number:

PC228532

Depth

m

8.80 - 9.30

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

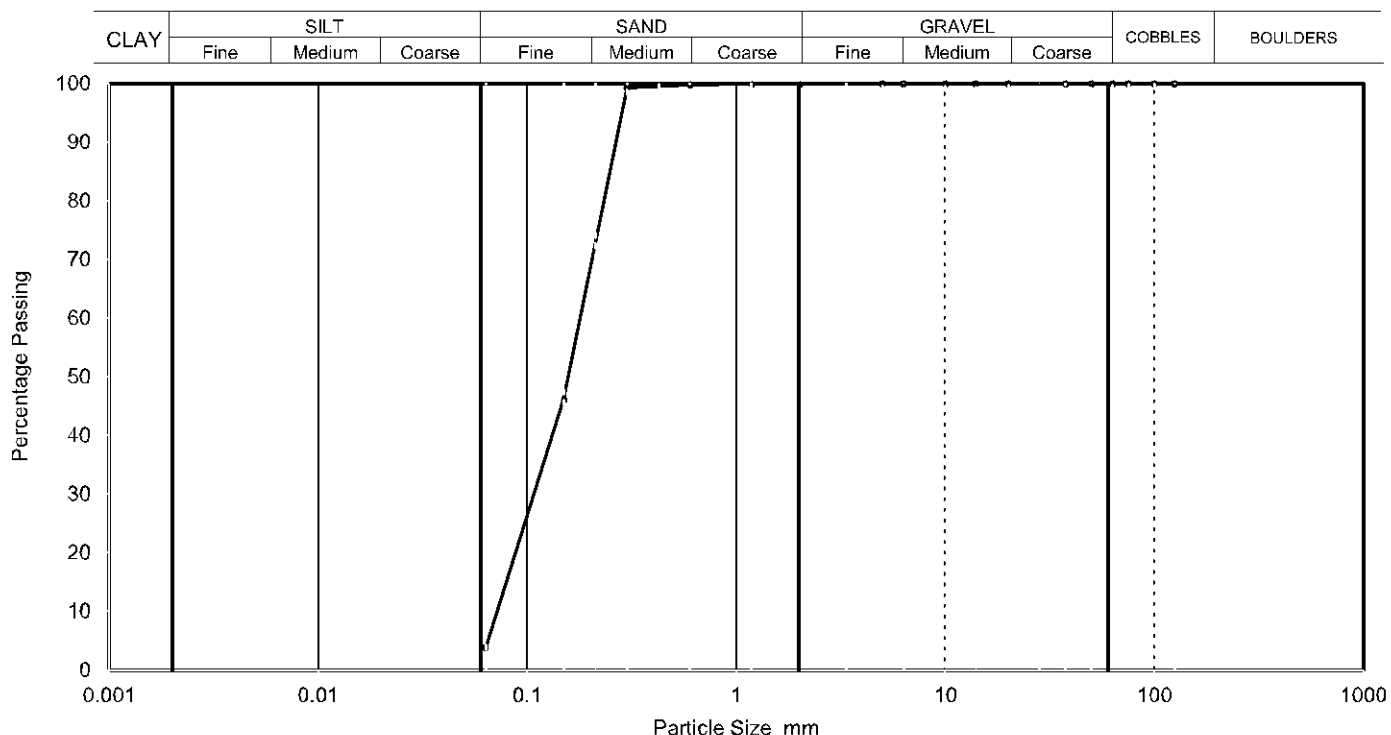
Brown mottled gray SAND.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving on as received or wet sample



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
100	100		
75	100		
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	99		
0.15	46		
0.063	4		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	96
Fines <0.063mm	4

Grading Analysis		
D100	mm	5
D60	mm	0.18
D30	mm	0.108
D10	mm	0.0714
Uniformity Coefficient		2.5

Remarks

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PARTICLE SIZE DISTRIBUTION

Hole No.

BH03

Sample No.

Project Number:

PC228532

Depth

m

3.70 - 4.10

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

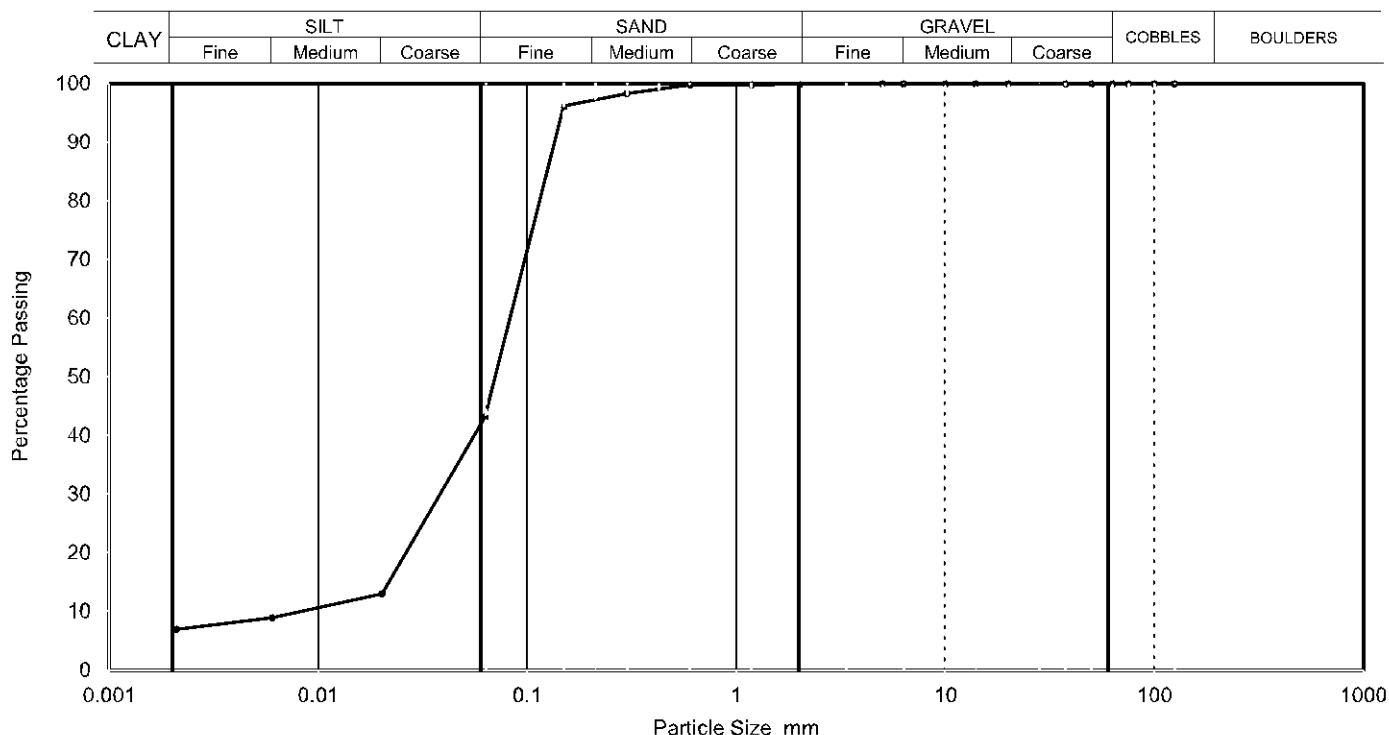
Brown mottled grey sandy SILT.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving and pipette sedimentation



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.020	13
100	100	0.006	9
75	100	0.002	7
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	98		
0.15	96		
0.063	43		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	57
Silt	36
Clay	7

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	

 Particle density (assumed)
 2.65 Mg/m3

Remarks

Printed

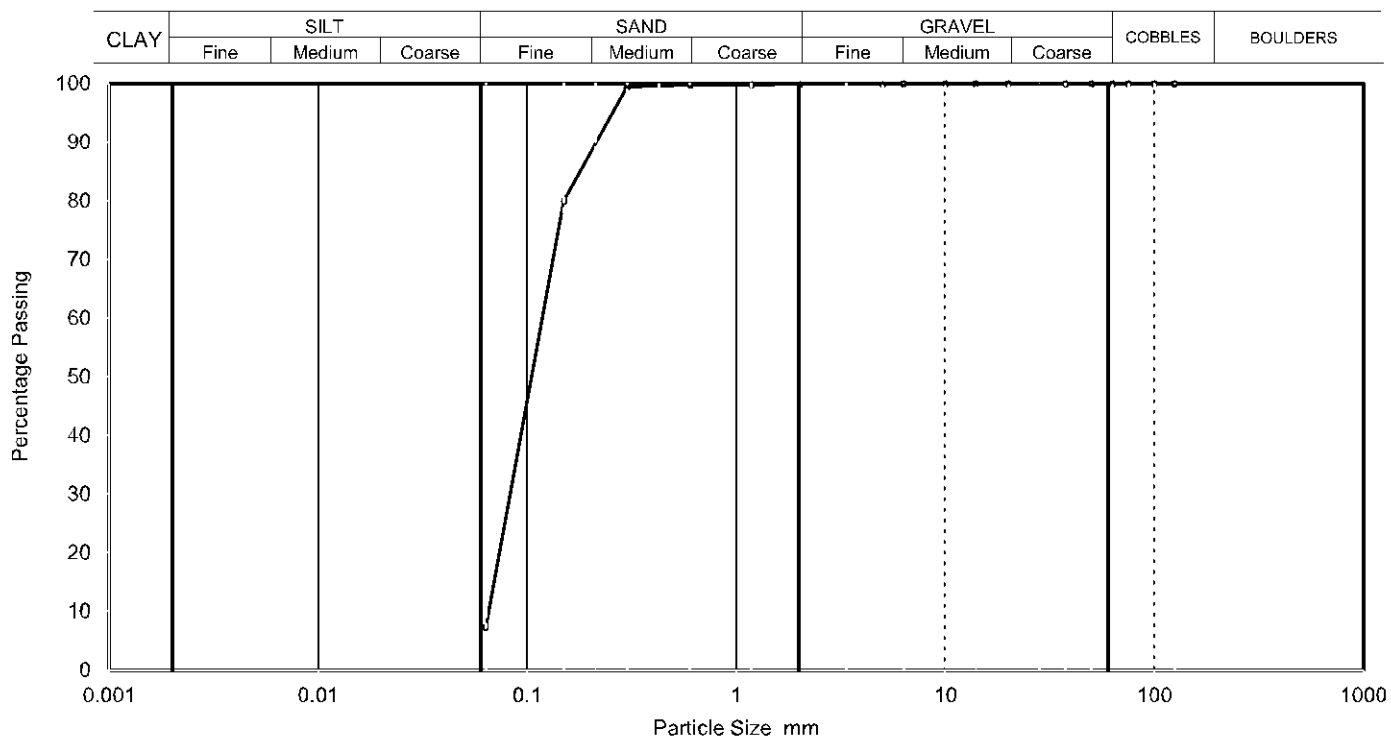
14/07/2023



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PARTICLE SIZE DISTRIBUTION

Hole No.	BH03
Sample No.	
Depth m	9.00 - 9.50
Sample Type	B
Specimen Depth m	
Test Method	ISO 17892 -4, by sieving on as received or wet sample



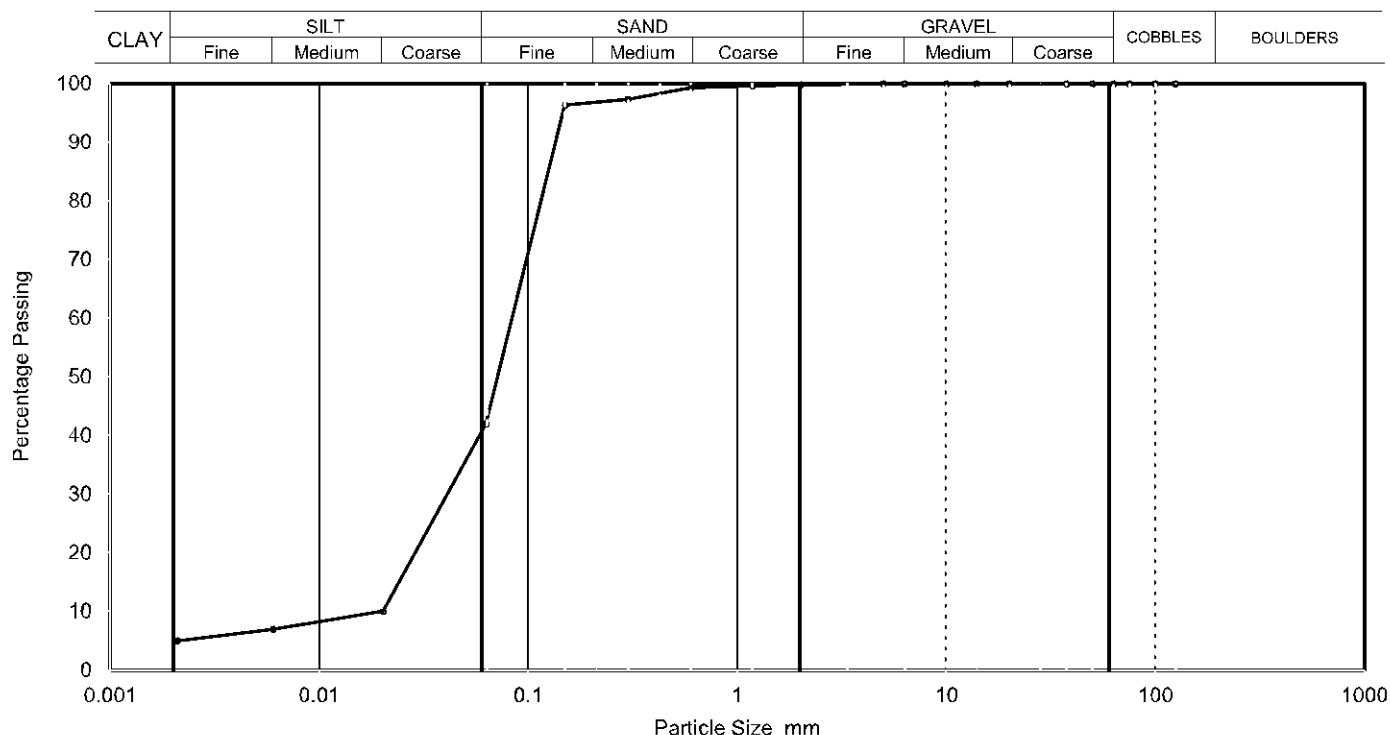
Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
100	100		
75	100		
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	99		
0.15	80		
0.063	7		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	93
Fines <0.063mm	7

Grading Analysis	
D100	mm 6.3
D60	mm 0.118
D30	mm 0.0826
D10	mm 0.065
Uniformity Coefficient	1.8

PARTICLE SIZE DISTRIBUTION

Hole No.	BH04
Sample No.	
Depth m	2.50 - 2.90
Sample Type	B
Specimen Depth m	
Test Method	ISO 17892 -4, by sieving and pipette sedimentation



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.020	10
100	100	0.006	7
75	100	0.002	5
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	99		
0.3	97		
0.15	96		
0.063	42		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	58
Silt	37
Clay	5

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	

PARTICLE SIZE DISTRIBUTION

Hole No.

BH04

Sample No.

Project Number:

PC228532

Depth

m

5.50 - 6.00

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

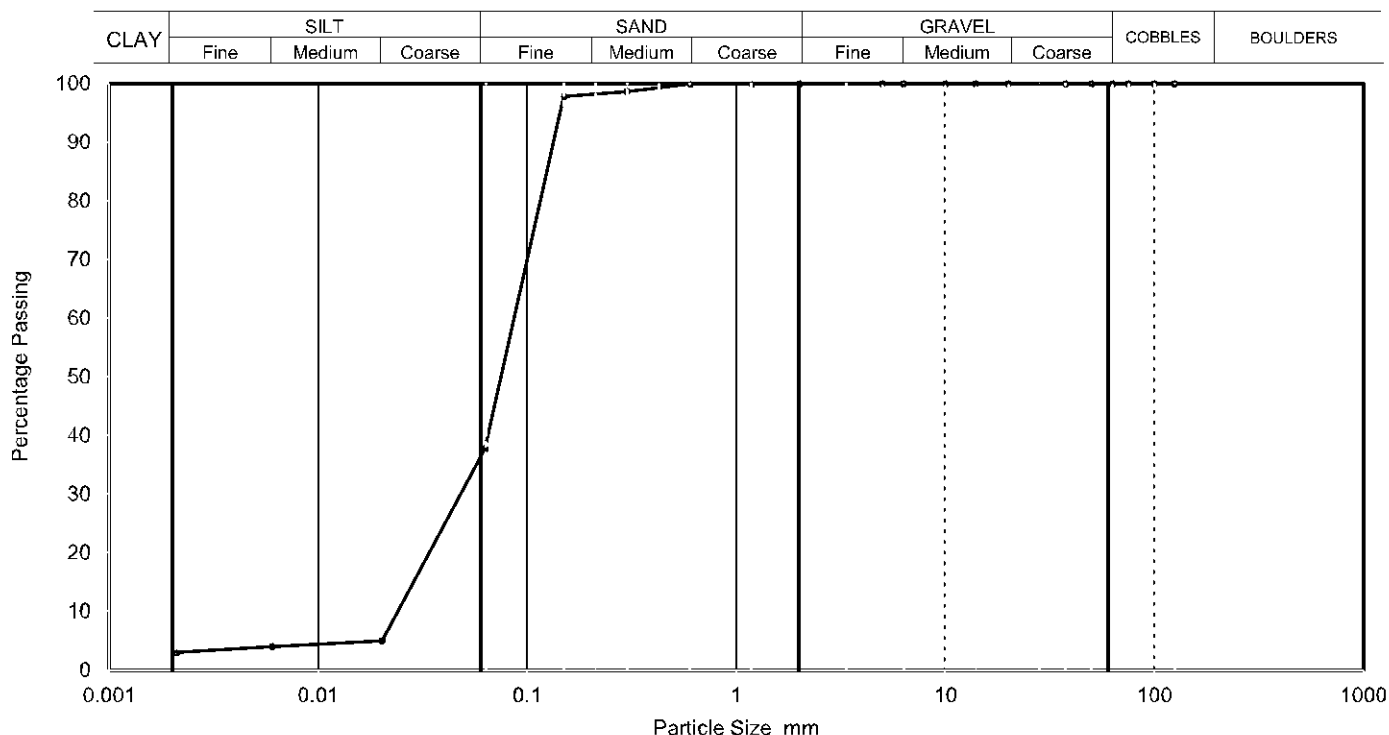
Brown mottled dark grey sandy SILT.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving and pipette sedimentation



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.020	5
100	100	0.006	4
75	100	0.002	3
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	99		
0.15	98	Particle density (assumed) 2.65 Mg/m3	
0.063	38		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	62
Silt	35
Clay	3

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	

Remarks

Printed

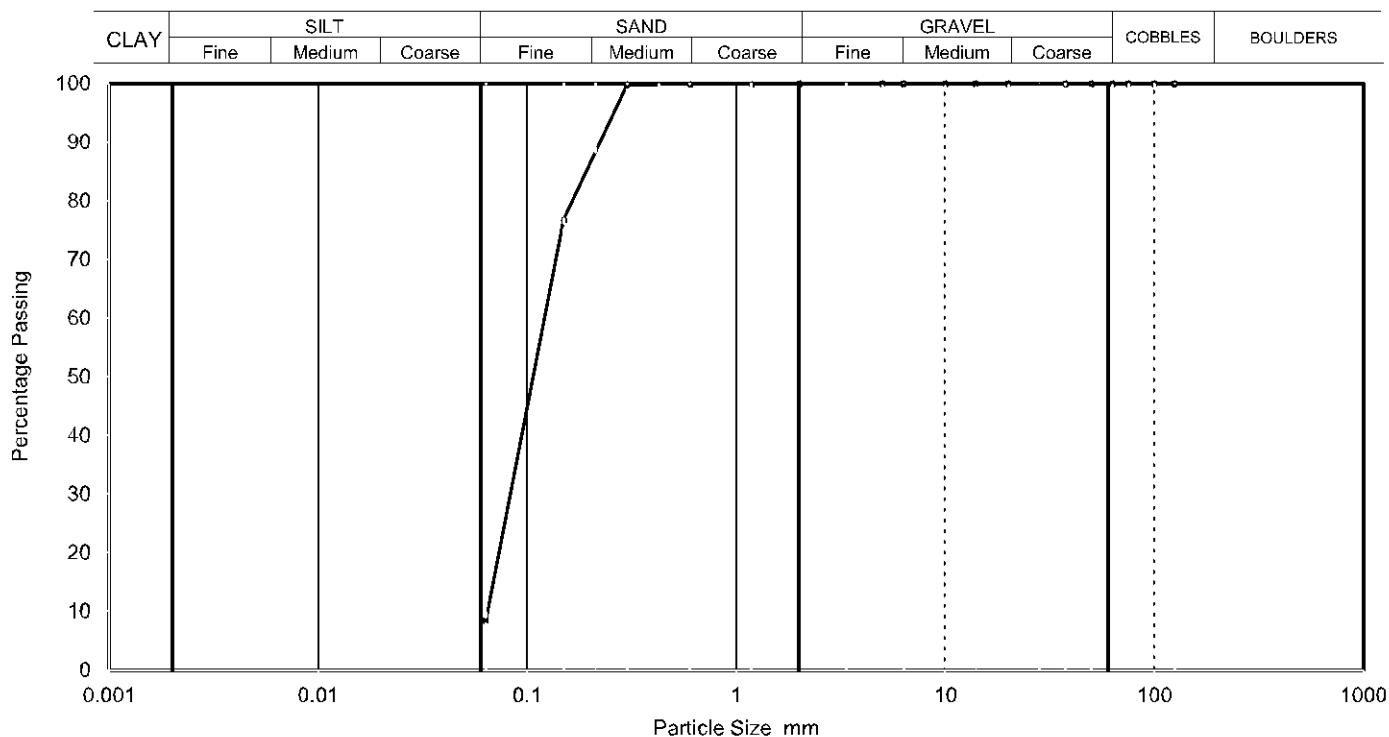
14/07/2023



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PARTICLE SIZE DISTRIBUTION

Hole No.	BH05
Sample No.	
Depth m	5.30 - 5.80
Sample Type	B
Specimen Depth m	
Test Method	ISO 17892 -4, by sieving on as received or wet sample



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
100	100		
75	100		
63	100		
50	100		
37.5	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
2	100		
1.18	100		
0.6	100		
0.3	100		
0.15	77		
0.063	9		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	91
Fines <0.063mm	9

Grading Analysis	
D100	mm 2
D60	mm 0.121
D30	mm 0.0828
D10	mm 0.0642
Uniformity Coefficient	1.9

PARTICLE SIZE DISTRIBUTION

Hole No.

BH05

Sample No.

Project Number:

PC228532

Depth

m

11.70 - 12.00

Project Name:

UNIVERSITY ACADEMY LONG SUTTON

Sample Type

B

Specimen Description

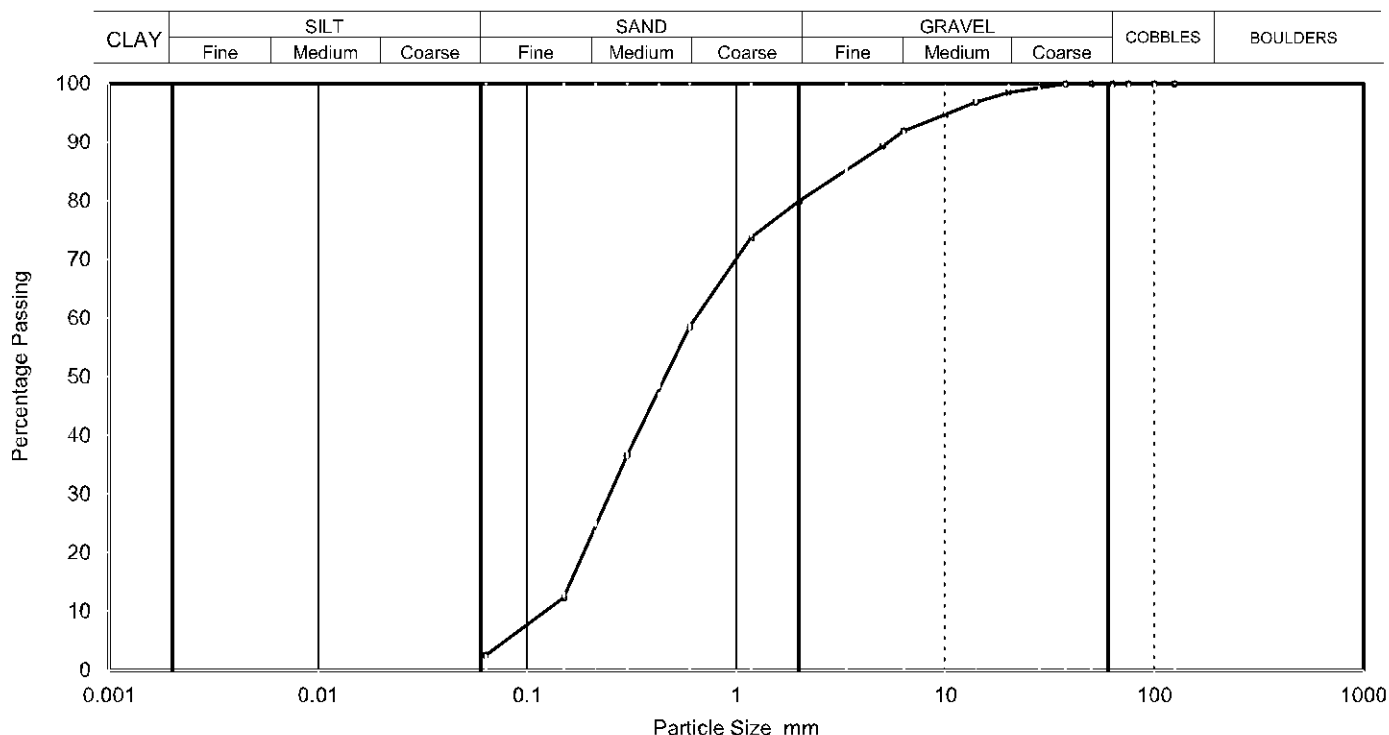
Brown gravelly SAND.

Specimen Depth

m

Test Method

ISO 17892 -4, by sieving on as received or wet sample



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
100	100		
75	100		
63	100		
50	100		
37.5	100		
20	99		
14	97		
10	95		
6.3	92		
5	89		
2	80		
1.18	74		
0.6	59		
0.3	37		
0.15	12		
0.063	3		

Sample Proportions	% dry mass
Cobbles	0
Gravel	20
Sand	77
Fines <0.063mm	3

Grading Analysis		
D100	mm	37.5
D60	mm	0.642
D30	mm	0.248
D10	mm	0.122
Uniformity Coefficient		5.3

Remarks

Printed

14/07/2023



1365

Test Number

1

Length

210.3

mm

Diameter

102.5

mm

Bulk Density

1.98

Mg/m³

Water Content

29.7

%

Dry Density

1.53

Mg/m³

Rate of Strain

1.8

%/min

Cell Pressure

30

kPa

At failure

20.0

%

Axial Strain

34

kPa

Deviator Stress, $(\sigma_1 - \sigma_3)_f$

17

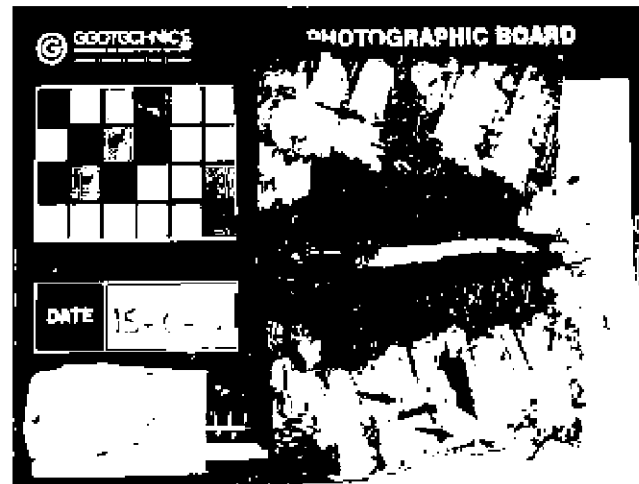
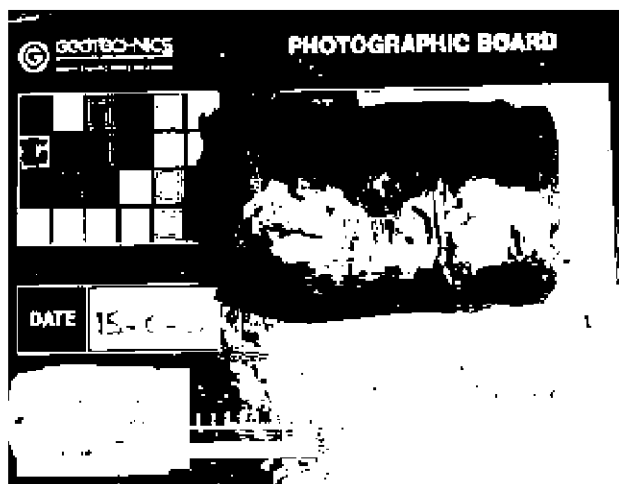
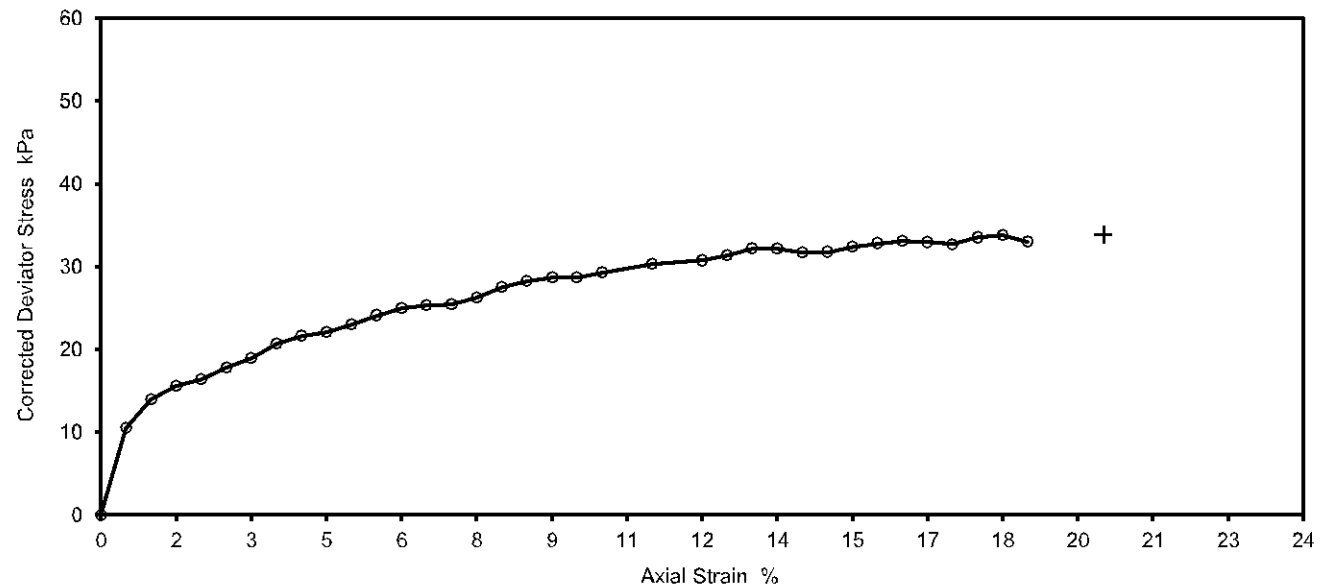
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Undrained Shear Strength, c_u

Plastic

Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 32.0%

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09/07/2023



Project No.	PC228532
Hole No.	BH02
Sample ID.	
Depth m	3.30 - 3.75
Sample Type	UT
Date of Test	15/06/2023

Project Name	UNIVERSITY ACADEMY LONG SUTTON		
Specimen Reference	4	Specimen Depth (m)	3.54
Specimen Description	Dark grey sandy CLAY.		
Test Method	BS EN ISO 17892-8		

Test Number
Length
Diameter
Bulk Density
Water Content
Dry Density

1
210.4
102.6
1.98
28.3
1.54

mm

mm

Mg/m³

%

Mg/m³

Rate of Strain
Cell Pressure
At failure

1.8
70
10.0
62
31
Compound

%/min

kPa

%

kPa

kPa $\frac{1}{2}(\sigma_1 - \sigma_3)$ f

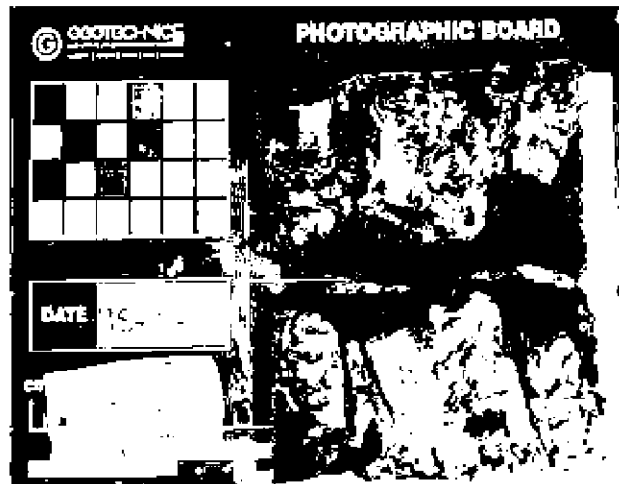
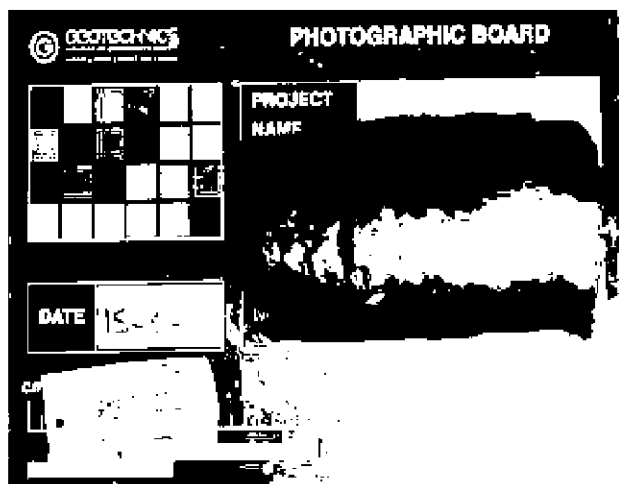
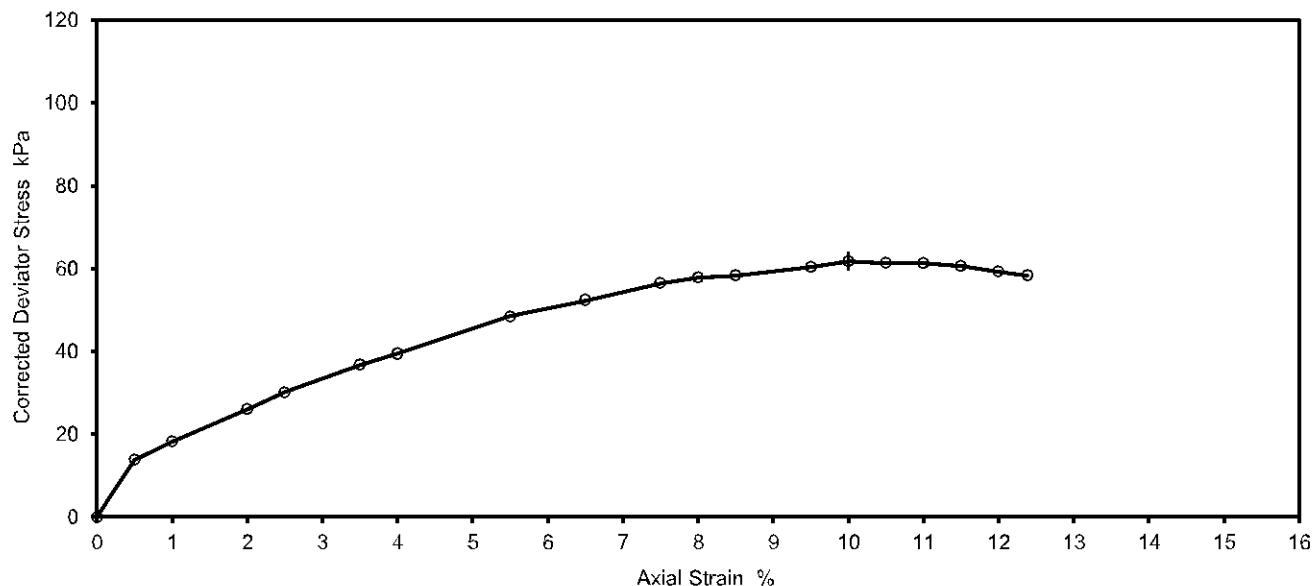
Axial Strain

Deviator Stress, $(\sigma_1 - \sigma_3)$ f

Undrained Shear Strength, c_u

Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 30.6%

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09/07/2023



Test Number
Length
Diameter
Bulk Density
Water Content
Dry Density

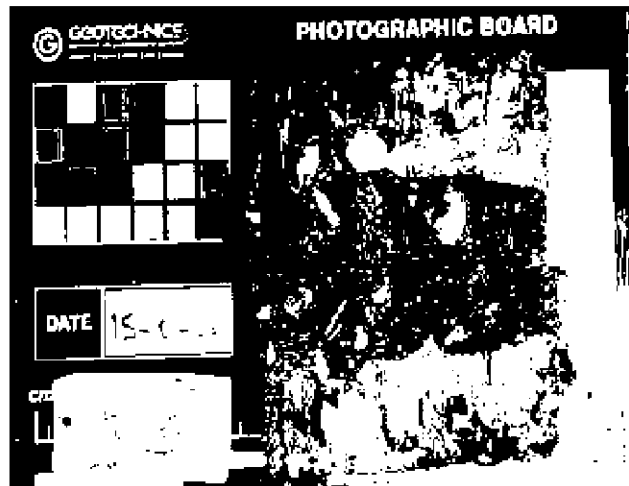
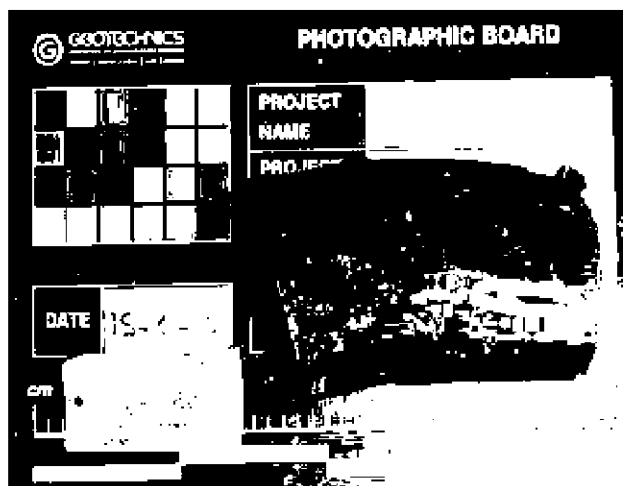
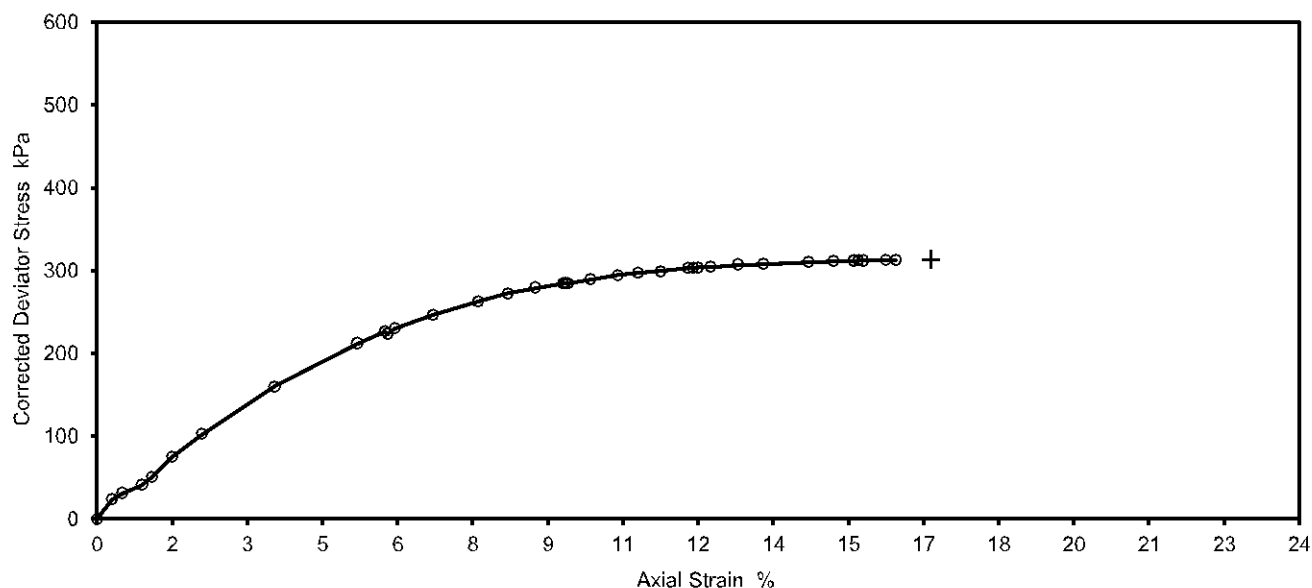
1	
210.3	mm
102.8	mm
2.15	Mg/m ³
18.7	%
1.81	Mg/m ³

Rate of Strain
Cell Pressure
At failure

1.8	%/min
300	kPa
16.6	%
313	kPa
157	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Plastic	

Axial Strain
Deviator Stress, $(\sigma_1 - \sigma_3)_f$
Undrained Shear Strength, c_u
Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 18.9%

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09/07/2023



Test Number

1

Length

162.7

mm

Diameter

102.2

mm

Bulk Density

2.13

Mg/m³

Water Content

18.1

%

Dry Density

1.81

Mg/m³

Rate of Strain

1.8

%/min

Cell Pressure

360

kPa

At failure

20.0

%

Axial Strain

109

kPa

Deviator Stress, $(\sigma_1 - \sigma_3)/f$

54

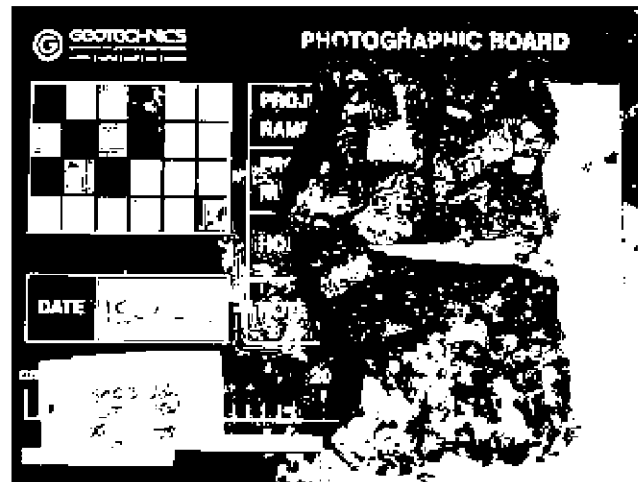
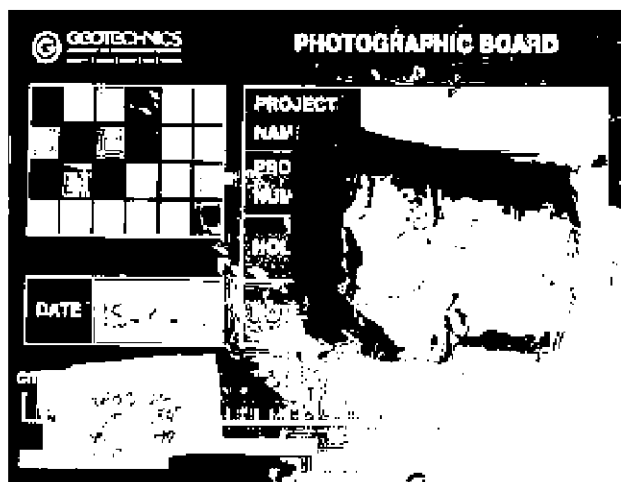
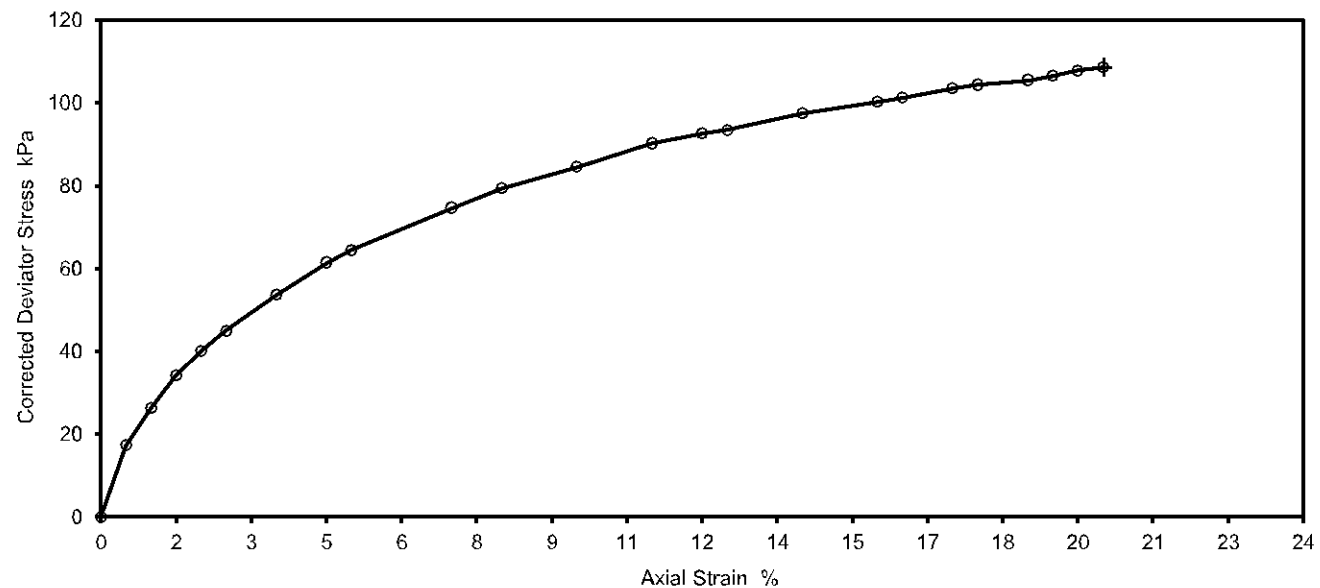
kPa $1/2(\sigma_1 - \sigma_3)/f$

Undrained Shear Strength, c_u

Plastic

Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 17.7%

Printed

09/07/2023



Test Number

1

Length

210.3

mm

Diameter

102.6

mm

Bulk Density

1.96

Mg/m³

Water Content

28.2

%

Dry Density

1.53

Mg/m³

Rate of Strain

1.8

%/min

Cell Pressure

30

kPa

At failure

13.0

%

Axial Strain

88

kPa

Deviator Stress, $(\sigma_1 - \sigma_3)/f$

44

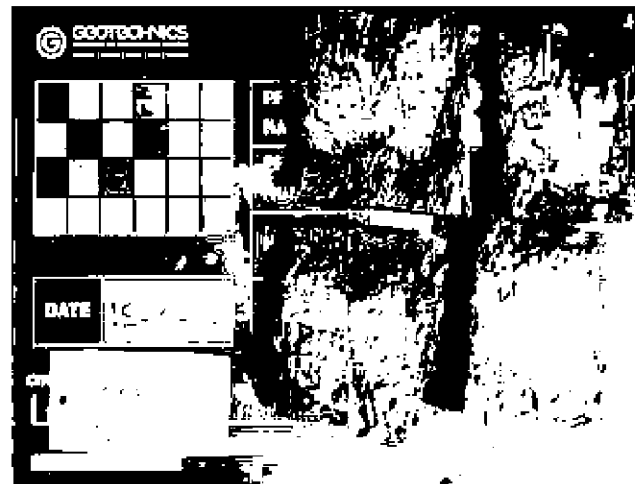
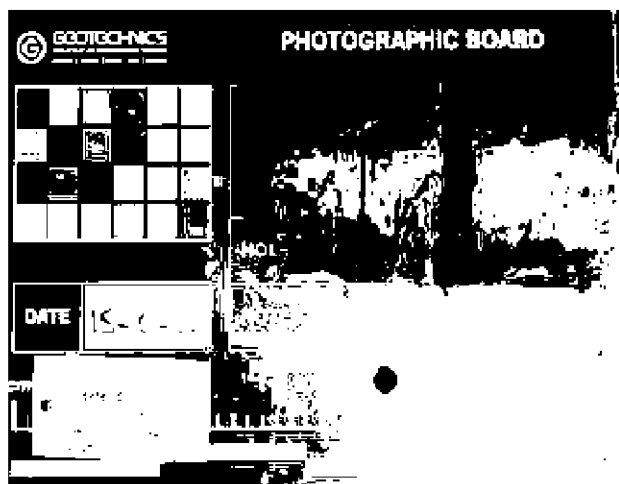
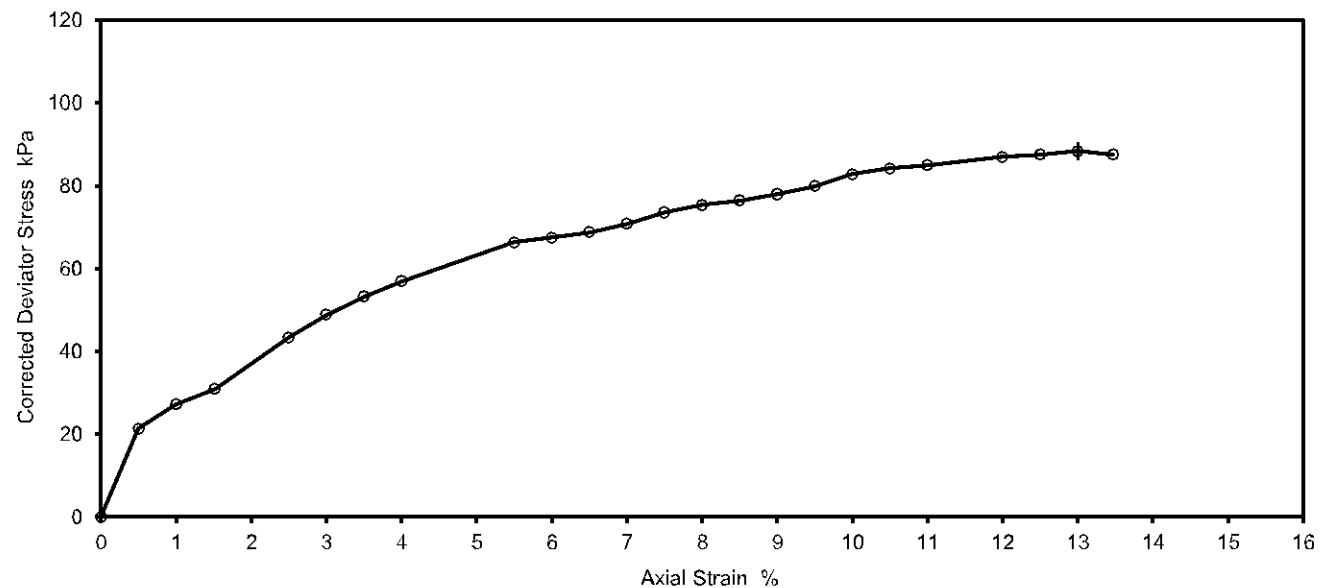
kPa $1/2(\sigma_1 - \sigma_3)/f$

Undrained Shear Strength, c_u

Plastic

Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 30.3%

Printed

09/07/2023



Test Number

1

Length

210.2

mm

Diameter

102.3

mm

Bulk Density

1.94

Mg/m³

Water Content

29.3

%

Dry Density

1.50

Mg/m³

Rate of Strain

1.8

%/min

Cell Pressure

70

kPa

At failure

8.5

%

Axial Strain

60

kPa

Deviator Stress, $(\sigma_1 - \sigma_3)_f$

30

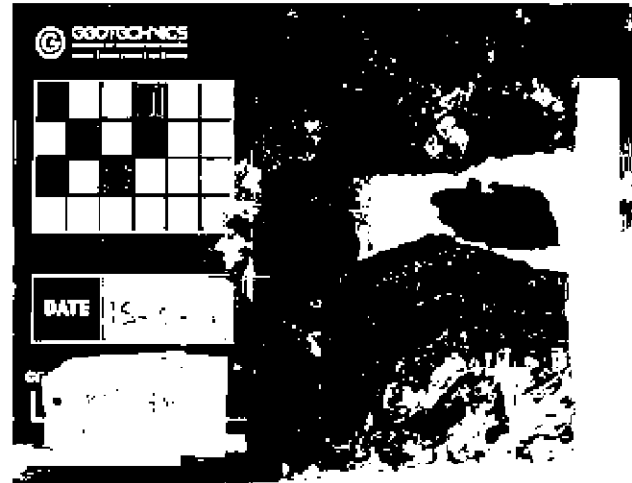
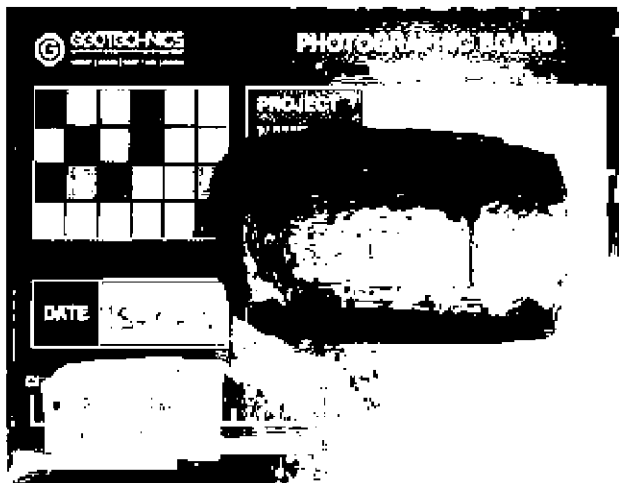
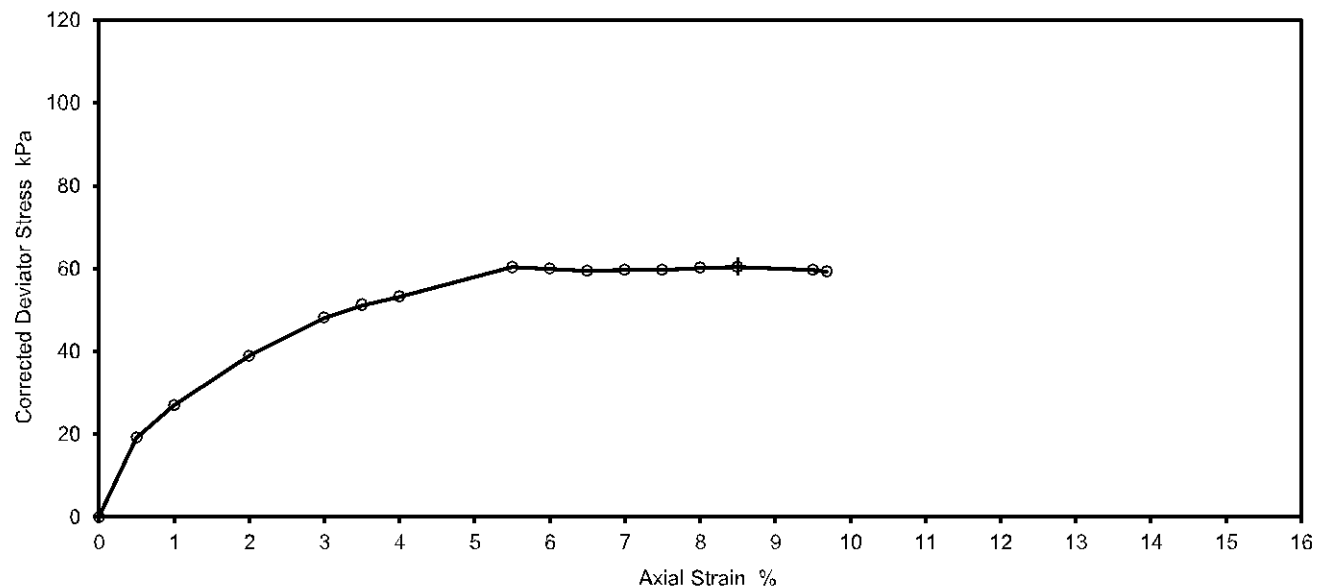
kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Undrained Shear Strength, c_u

Compound

Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 26.6%

Printed

09/07/2023



Project No.	PC228532
Hole No.	BH05
Sample ID.	
Depth m	13.50 - 13.95
Sample Type	UT
Date of Test	14/06/2023

Project Name	UNIVERSITY ACADEMY LONG SUTTON		
Specimen Reference	6	Specimen Depth (m)	13.74
Specimen Description	Brown slightly gravelly CLAY.		
Test Method	BS EN ISO 17892-8		

Test Number
Length
Diameter
Bulk Density
Water Content
Dry Density

1
210.6
103.3
2.22
16.8
1.90

mm

mm

Mg/m³

%

Mg/m³

Rate of Strain
Cell Pressure
At failure

1.8
270
20.0
268
134
Plastic

%/min

kPa

%

kPa

kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Plastic

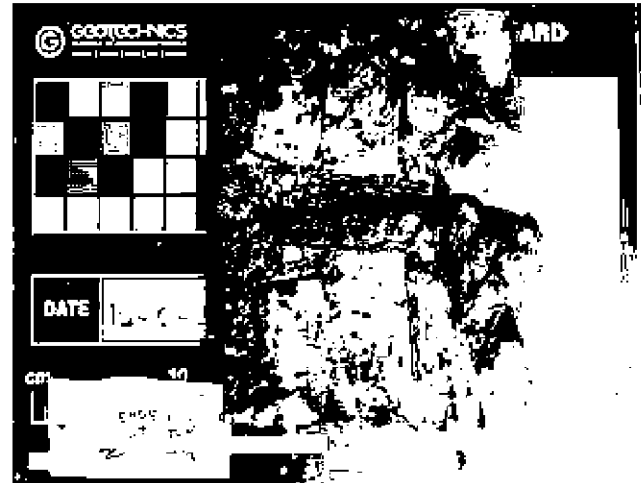
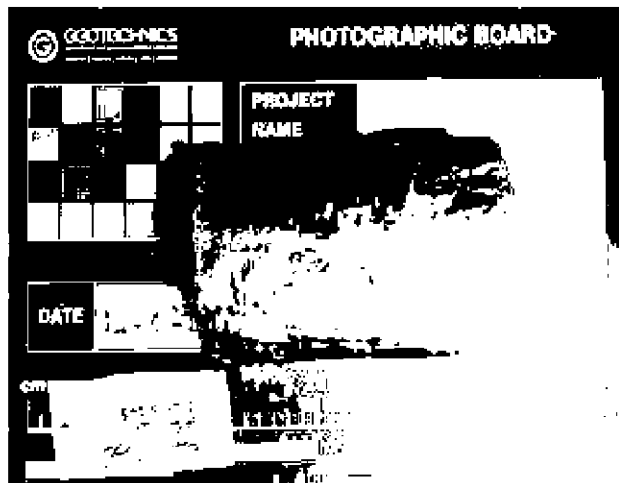
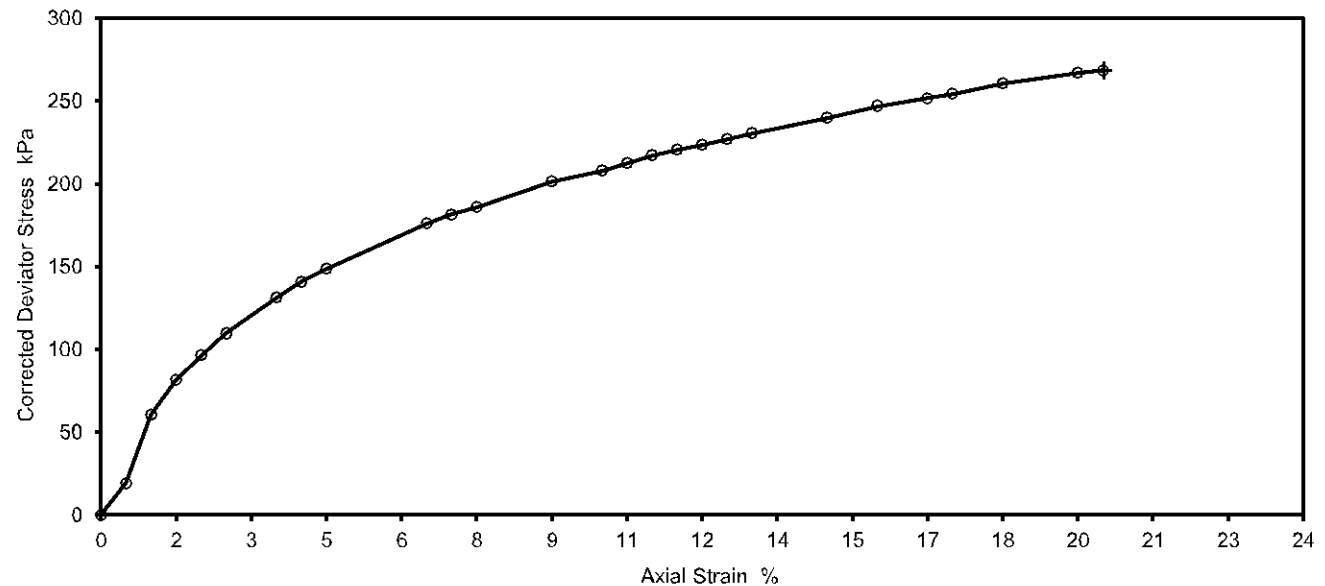
Axial Strain

Deviator Stress, $(\sigma_1 - \sigma_3)_f$

Undrained Shear Strength, c_u

Mode of Failure

Deviator Stress v Axial Strain



Remarks

WC at failure Zone = 16.2%

Printed

09/07/2023



Test Number

1

Length

210.9 mm

Diameter

102.6 mm

Bulk Density

2.23 Mg/m³

Water Content

16.0 %

Dry Density

1.92 Mg/m³

Rate of Strain

1.8 %/min

Cell Pressure

330 kPa

At failure

Axial Strain

13.5 %

Deviator Stress, $(\sigma_1 - \sigma_3)_f$

472 kPa

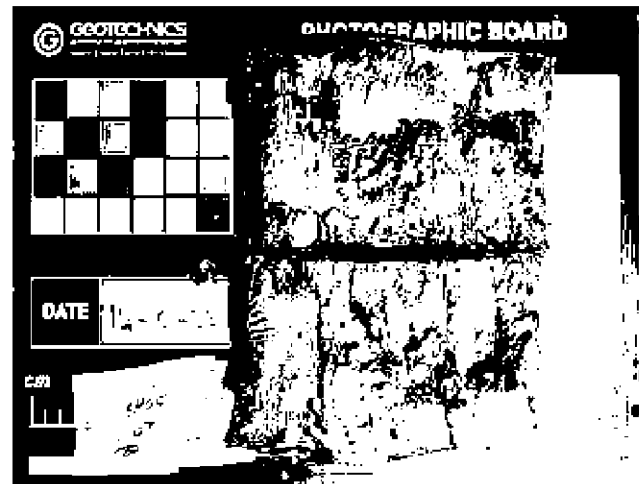
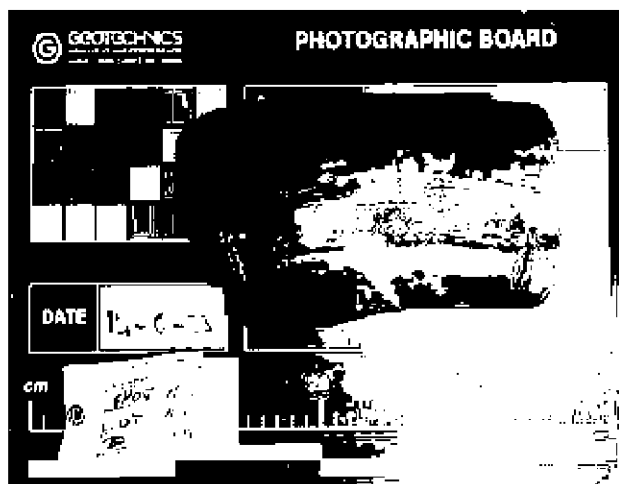
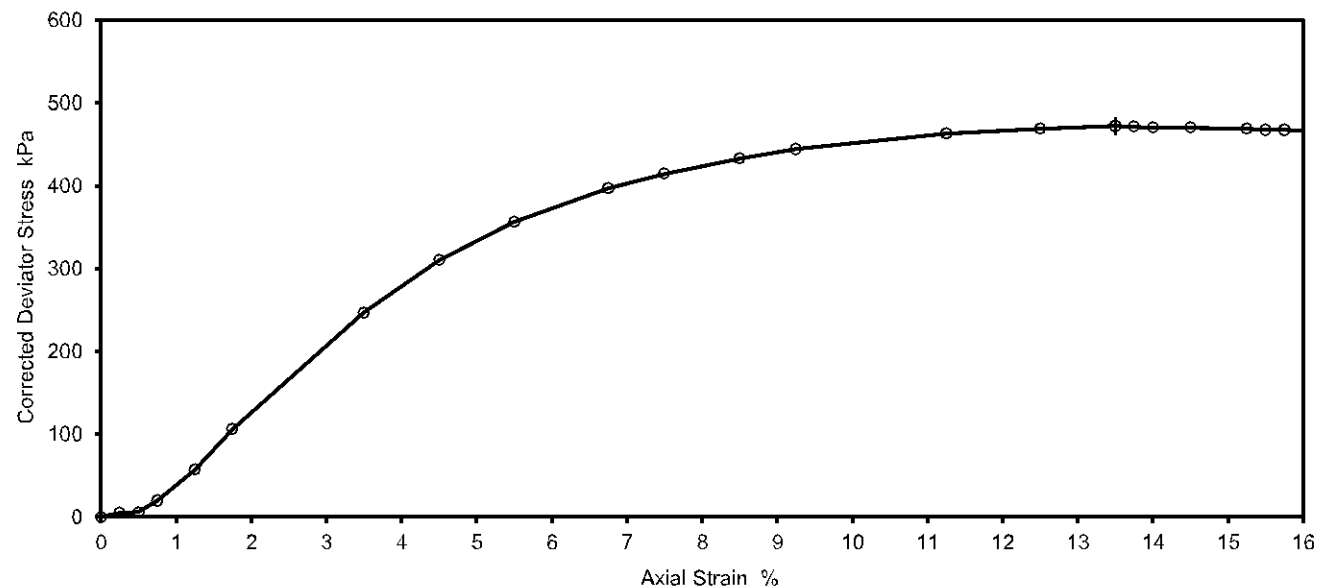
Undrained Shear Strength, c_u

236 kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$

Mode of Failure

Plastic

Deviator Stress v Axial Strain



Remarks

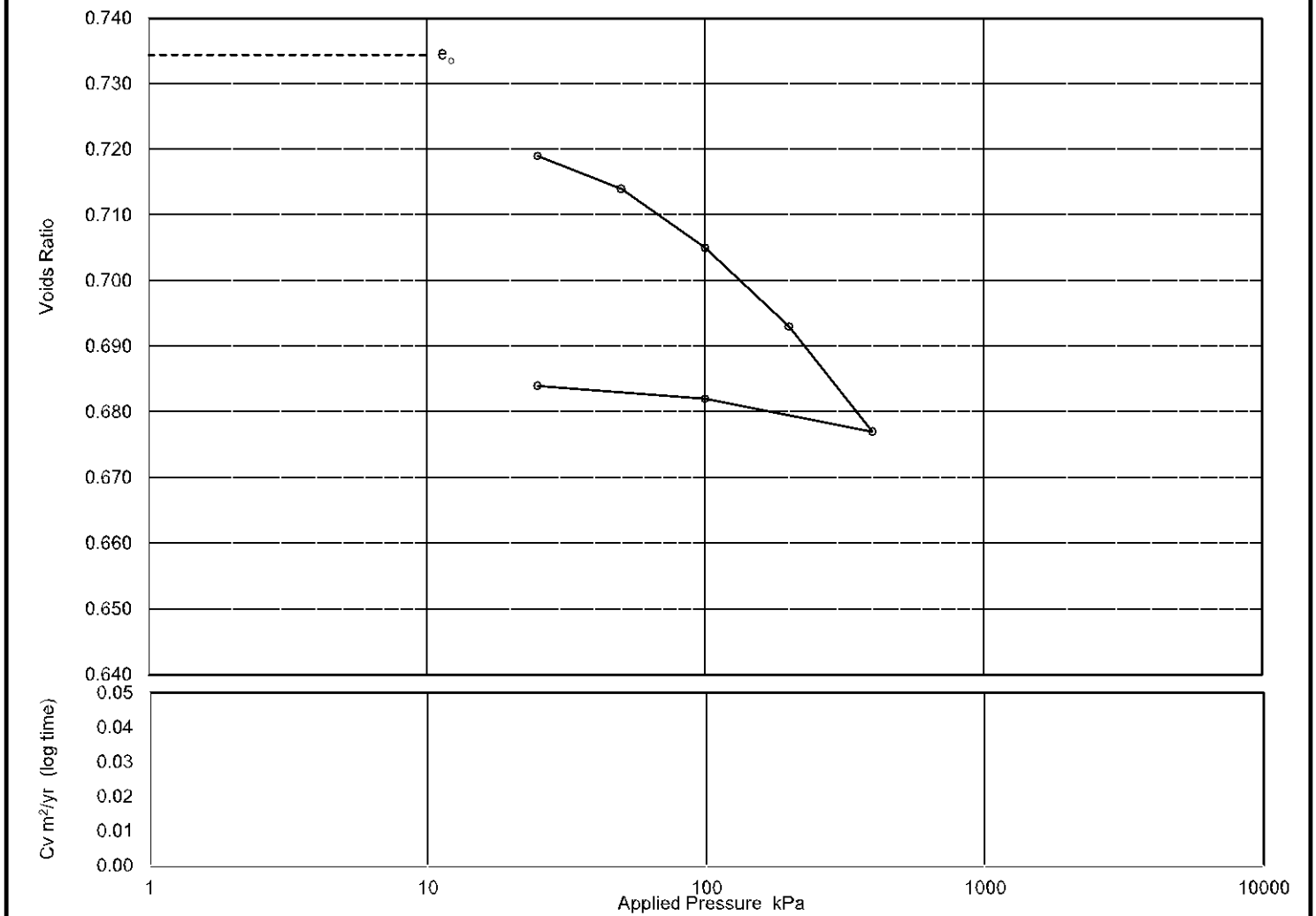
WC at failure Zone = 16.3%

Printed

09/07/2023



ONE DIMENSIONAL CONSOLIDATION TEST BS EN ISO 17892-5				Project No.	PC228532
				Hole No.	BH05
Project Name	UNIVERSITY ACADEMY LONG SUTTON			Sample No.	
Specimen Description	Reddish brown CLAY			Depth m	2.20 - 2.65
Specimen Reference	6	Specimen Depth	2.60 m	Sample Type	UT
				Date started	12.06.23



Applied Pressure kPa	Voids ratio	Mv m²/MN	Cv (t50 log) m²/yr	Cv (t90 root) m²/yr	Preparation	Specimen cut vertically from base of sample		
0.0	0.734	-	-	-				
25.0	0.719	0.35						
50.0	0.714	0.13		5.2	Particle density	Assumed	2.65	Mg/m3
100.0	0.705	0.10		6.6	Specimen details	Initial	Final	
200.0	0.693	0.07		6.7	Diameter	75.02	-	mm
400.0	0.677	0.05		5.4	Height	20.05	19.47	mm
100.0	0.682	0.01			Moisture Content	27.5	26.6	%
25.0	0.684	0.02			Bulk density	1.95		Mg/m3
					Dry density	1.53		Mg/m3
					Voids Ratio	0.734		
								%
					Average temperature for test	20.0		oC
					Swelling Pressure			kPa
					Settlement on saturation			%
					Remarks			

Where Cv data is unavailable the curve fitting was unsuitable

Certificate of Analysis

Certificate Number 23-13081

Issued: 12-Jun-23

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 23-13081

Client Reference PC228532

Order No OC37309

Contract Title Uni Academy Long Sutton

Description 11 Soil samples.

Date Received 02-Jun-23

Date Started 02-Jun-23

Date Completed 12-Jun-23

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

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

Approved By



Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-13081

Client Ref PC228532

Contract Title Uni Academy Long Sutton

Lab No	2180790	2180791	2180792	2180793	2180794	2180795	2180796	2180797	2180798	2180799	2180800
Sample ID	BH01	BH01	BH02	BH02	BH02	BH03	BH04	BH04	BH04	BH05	BH05
Depth	0.30-0.40	1.00-1.10	2.30-2.70	6.40-6.85	15.30-15.40	4.10-4.20	0.50-0.60	0.60-0.70	3.50-3.95	1.20-1.65	16.40-16.85
Other ID											
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023	21/04/2023
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units											
Inorganics														
pH	DETSO 2008#		pH	8.1	8.2	7.6	8.2	8.1	8.1	7.8	9.0	8.2	8.2	8.3
Total Organic Carbon	DETSO 2084#	0.5	%		0.7	1.0			0.6			0.7		
Organic matter	DETSO 2002#	0.1	%		1.0	1.4			0.9			1.0		
Sulphate Aqueous Extract as SO4 (2:1)	DETSO 2076#	10	mg/l	14	16	360	100	480	130	18	52	92	28	320
Sulphur as S, Total	DETSO 2320	0.01	%	0.02	0.04	0.31	0.12	0.47	0.12	0.02	0.03	0.08	0.01	0.55
Sulphate as SO4, Total	DETSO 2321#	0.01	%	0.03	0.03	0.13	0.05	0.22	0.07	0.04	0.07	0.06	0.02	0.18

Information in Support of the Analytical Results

Our Ref 23-13081

Client Ref PC228532

Contract Uni Academy Long Sutton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2180790	BH01 0.30-0.40 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
2180791	BH01 1.00-1.10 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Organic Matter (Auto) (28 days), pH + Conductivity (7 days)	
2180792	BH02 2.30-2.70 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Organic Matter (Auto) (28 days), pH + Conductivity (7 days)	
2180793	BH02 6.40-6.85 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
2180794	BH02 15.30-15.40 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
2180795	BH03 4.10-4.20 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Organic Matter (Auto) (28 days), pH + Conductivity (7 days)	
2180796	BH04 0.50-0.60 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
2180797	BH04 0.60-0.70 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
2180798	BH04 3.50-3.95 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), Organic Matter (Auto) (28 days), pH + Conductivity (7 days)	
2180799	BH05 1.20-1.65 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	
2180800	BH05 16.40-16.85 SOIL	21/04/23	PT 1L	Anions 2:1 (30 days), Total Sulphur ICP (7 days), Total Sulphate ICP (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

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

Information in Support of the Analytical Results

Our Ref 23-13081
Client Ref PC228532
Contract Uni Academy Long Sutton

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.
Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 9

Chemical Laboratory Test Results

Certificate of Analysis

Certificate Number 23-09002

Issued: 25-Apr-23

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 23-09002

Client Reference PC228532

Order No OC36864

Contract Title University Academy, Long Sutton

Description 7 Soil samples, 1 Leachate sample.

Date Received 17-Apr-23

Date Started 17-Apr-23

Date Completed 25-Apr-23

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

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

Approved By



Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-09002

Client Ref PC228532

Contract Title University Academy, Long Sutton

Lab No	2156781	2156782	2156783	2156784	2156785	2156786	2156787
Sample ID	BH04	BH04	DS01	DS03	DS04	DS04	DS02
Depth	0.50-0.60	1.00-1.10	0.20	0.20	0.50	1.00	0.50
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	11/04/2023	11/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units							
Metals										
Antimony	DETSC 2301*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		1.1
Arsenic	DETSC 2301#	0.2	mg/kg	12	8.1	5.8	12	9.7		12
Barium	DETSC 2301#	1.5	mg/kg	58	36	480	51	77		69
Beryllium	DETSC 2301#	0.2	mg/kg	0.5	0.3	0.8	0.4	0.5		0.5
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.7	0.2	0.5	0.4	0.5		0.7
Chromium III	DETSC 2301*	0.15	mg/kg	18	8.7	15	17	17		19
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg	14	8.4	18	14	9.7		14
Iron	DETSC 2301	25	mg/kg	20000	13000	15000	18000	19000		20000
Lead	DETSC 2301#	0.3	mg/kg	15	3.5	12	17	9.9		220
Molybdenum	DETSC 2301#	0.4	mg/kg	1.0	< 0.4	0.7	0.7	0.6		0.7
Nickel	DETSC 2301#	1	mg/kg	16	7.5	13	14	16		16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5		< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	32	20	28	30	31		33
Zinc	DETSC 2301#	1	mg/kg	48	20	45	45	39		58
Inorganics										
pH	DETSC 2008#		pH	8.1	11.8	8.7	8.7	8.1		8.0
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.1	< 0.1		< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	1.0	< 0.5	5.3	1.5	0.8		1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	< 10	28	38	22	14		11
Sulphur as S, Total	DETSC 2320	0.01	%	0.01	0.11	0.04	0.02	0.01		0.02
Petroleum Hydrocarbons										
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5		< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2		< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5		< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	51	17	< 3.4		< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	51	17	< 10		< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9		< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	27	< 0.5	< 0.5		< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	140	< 0.6	< 0.6		< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	230	39	13		5.1
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	400	39	13		< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	450	56	13		< 10
PAHs										
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	37	< 0.03	< 0.03		< 0.03

Summary of Chemical Analysis

Soil Samples

Our Ref 23-09002

Client Ref PC228532

Contract Title University Academy, Long Sutton

Lab No	2156781	2156782	2156783	2156784	2156785	2156786	2156787
Sample ID	BH04	BH04	DS01	DS03	DS04	DS04	DS02
Depth	0.50-0.60	1.00-1.10	0.20	0.20	0.50	1.00	0.50
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	11/04/2023	11/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units							
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	8.1	< 0.03	< 0.03		< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	5.6	< 0.03	< 0.03		< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	19	< 0.03	< 0.03		< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	24	0.21	< 0.03		0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.30	0.06	< 0.03		< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	1.6	0.30	< 0.03		0.07
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	0.05	20	0.28	< 0.03		0.06
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.49	0.13	0.03		0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	0.49	0.13	< 0.03		0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.30	0.12	< 0.03		0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.30	0.04	< 0.03		< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.30	0.10	< 0.03		< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.30	0.04	< 0.03		< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.30	< 0.03	< 0.03		< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.30	0.04	< 0.03		< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10	0.16	120	1.5	< 0.10		0.13
PCBs										
PCB 77	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 81	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 105	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 114	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 118	DETSC 3401#	0.01	mg/kg					< 0.01	< 0.01	
PCB 123	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 126	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 156	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 157	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 167	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 169	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
PCB 189	DETSC 3401*	0.01	mg/kg					< 0.01	< 0.01	
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3		< 0.3
VOCs										
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01

Summary of Chemical Analysis

Soil Samples

Our Ref 23-09002

Client Ref PC228532

Contract Title University Academy, Long Sutton

Lab No	2156781	2156782	2156783	2156784	2156785	2156786	2156787
Sample ID	BH04	BH04	DS01	DS03	DS04	DS04	DS02
Depth	0.50-0.60	1.00-1.10	0.20	0.20	0.50	1.00	0.50
Other ID							
Sample Type	ES	ES	ES	ES	ES	ES	ES
Sampling Date	11/04/2023	11/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023	12/04/2023
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units							
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-09002

Client Ref PC228532

Contract Title University Academy, Long Sutton

Lab No	2156788
Sample ID	BH04
Depth	1.00-1.10
Other ID	
Sample Type	ES
Sampling Date	11/04/2023
Sampling Time	n/s

Test	Method	LOD	Units	
Preparation				
BS EN 12457 10:1	DETSC 1009*			Y
Metals				
Antimony, Dissolved	DETSC 2306	0.17	ug/l	0.19
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	< 0.16
Barium, Dissolved	DETSC 2306	0.26	ug/l	62
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12
Calcium, Dissolved	DETSC 2306	0.09	mg/l	100
Chromium, Dissolved	DETSC 2306	0.25	ug/l	5.4
Chromium III, Dissolved	DETSC 2306*	1	ug/l	5.4
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	7.1
Iron, Dissolved	DETSC 2306	5.5	ug/l	< 5.5
Lead, Dissolved	DETSC 2306	0.09	ug/l	14
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	0.06
Manganese, Dissolved	DETSC 2306	0.22	ug/l	< 0.22
Molybdenum, Dissolved	DETSC 2306	1.1	ug/l	12
Nickel, Dissolved	DETSC 2306	0.5	ug/l	1.4
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	1.0
Zinc, Dissolved	DETSC 2306	1.3	ug/l	2.4
Inorganics				
pH	DETSC 2008		pH	7.1
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Cyanide, Free	DETSC 2130	20	ug/l	< 20
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.22
Chloride	DETSC 2055	0.1	mg/l	0.61
Fluoride	DETSC 2055*	0.1	mg/l	< 0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	6.2
Sulphide	DETSC 2208	10	ug/l	< 10
Phenols				
Phenol	DETSC 3451*	0.1	ug/l	< 0.10
4-Chloro-3-methylphenol	DETSC 3451*	0.1	ug/l	< 0.10
2,4-Dichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10
2,4-Dimethylphenol	DETSC 3451*	0.1	ug/l	< 0.10
p-cresol	DETSC 3451*	0.1	ug/l	< 0.10
2,6-Dimethylphenol	DETSC 3451*	0.1	ug/l	< 0.10
2,6-Dichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10
2,4,6-Trichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10

Summary of Asbestos Analysis

Soil Samples

Our Ref 23-09002

Client Ref PC228532

Contract Title University Academy, Long Sutton

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2156781	BH04 0.50-0.60	SOIL	NAD	none	Barry Kelly
2156782	BH04 1.00-1.10	SOIL	NAD	none	Barry Kelly
2156783	DS01 0.20	SOIL	NAD	none	Barry Kelly
2156784	DS03 0.20	SOIL	NAD	none	Barry Kelly
2156785	DS04 0.50	SOIL	NAD	none	Barry Kelly
2156787	DS02 0.50	SOIL	NAD	none	Barry Kelly

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-09002
 Client Ref PC228532
 Contract University Academy, Long Sutton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2156781	BH04 0.50-0.60 SOIL	11/04/23	GJ 250ml, GJ 60ml x2, PT 1L		
2156782	BH04 1.00-1.10 SOIL	11/04/23	GJ 250ml, GJ 60ml x2, PT 1L		
2156783	DS01 0.20 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		
2156784	DS03 0.20 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		
2156785	DS04 0.50 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		
2156786	DS04 1.00 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		
2156787	DS02 0.50 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		
2156788	BH04 1.00-1.10 LEACHATE	11/04/23	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

Certificate of Analysis

Certificate Number 23-09398

Issued: 28-Apr-23

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 23-09398

Client Reference PC228532

Order No OC36905

Contract Title UNI ACADEMY LONG SUTTON

Description 3 Soil samples, 2 Leachate samples.

Date Received 20-Apr-23

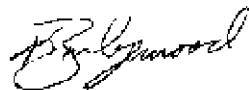
Date Started 20-Apr-23

Date Completed 28-Apr-23

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

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

Approved By



Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-09398

Client Ref PC228532

Contract Title UNI ACADEMY LONG SUTTON

Lab No	2159093	2159094	2159095
Sample ID	BH01	BH03	BH03
Depth	0.30-0.40	0.10-0.20	0.50-0.60
Other ID			
Sample Type	ES	ES	ES
Sampling Date	13/04/2023	12/04/2023	12/04/2023
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	< 1.0	1.4	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	11	10	11
Barium	DETSC 2301#	1.5	mg/kg	110	220	93
Beryllium	DETSC 2301#	0.2	mg/kg	0.5	0.6	0.6
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.6	0.2	1.0
Chromium III	DETSC 2301*	0.15	mg/kg	18	10	21
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	11	13	11
Iron	DETSC 2301	25	mg/kg	23000	16000	25000
Lead	DETSC 2301#	0.3	mg/kg	12	74	13
Molybdenum	DETSC 2301#	0.4	mg/kg	0.8	0.8	1.1
Nickel	DETSC 2301#	1	mg/kg	17	8.1	19
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	36	21	38
Zinc	DETSC 2301#	1	mg/kg	47	100	50
Inorganics						
pH	DETSC 2008#		pH	8.1	9.2	8.4
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	0.6	< 0.5	0.6
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	11	31	19
Sulphur as S, Total	DETSC 2320	0.01	%	0.01	0.04	0.01
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10
PAHs						
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03

Summary of Chemical Analysis

Soil Samples

Our Ref 23-09398

Client Ref PC228532

Contract Title UNI ACADEMY LONG SUTTON

Lab No	2159093	2159094	2159095
Sample ID	BH01	BH03	BH03
Depth	0.30-0.40	0.10-0.20	0.50-0.60
Other ID			
Sample Type	ES	ES	ES
Sampling Date	13/04/2023	12/04/2023	12/04/2023
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	0.10	0.08	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	0.06	0.05	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.99	0.53	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	0.18	0.09	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.72	1.4	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.63	1.3	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.14	0.50	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.22	0.56	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.12	0.56	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.05	0.23	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.08	0.41	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.05	0.15	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.05	0.18	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	3.4	6.1	< 0.10
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3
VOCs						
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Soil Samples

Our Ref 23-09398

Client Ref PC228532

Contract Title UNI ACADEMY LONG SUTTON

Lab No	2159093	2159094	2159095
Sample ID	BH01	BH03	BH03
Depth	0.30-0.40	0.10-0.20	0.50-0.60
Other ID			
Sample Type	ES	ES	ES
Sampling Date	13/04/2023	12/04/2023	12/04/2023
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-09398

Client Ref PC228532

Contract Title UNI ACADEMY LONG SUTTON

Lab No	2159096	2159097
Sample ID	BH01	BH03
Depth	0.30-0.40	0.10-0.20
Other ID		
Sample Type	ES	ES
Sampling Date	13/04/2023	12/04/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
BS EN 12457 10:1	DETSC 1009*			Y	Y
Metals					
Antimony, Dissolved	DETSC 2306	0.17	ug/l	< 0.17	1.3
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.0	2.4
Barium, Dissolved	DETSC 2306	0.26	ug/l	12	10
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Calcium, Dissolved	DETSC 2306	0.09	mg/l	8.2	6.5
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.38	4.6
Chromium III, Dissolved	DETSC 2306*	1	ug/l	< 1.0	4.5
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.9	3.0
Iron, Dissolved	DETSC 2306	5.5	ug/l	87	55
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.12	2.4
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	0.63	0.50
Manganese, Dissolved	DETSC 2306	0.22	ug/l	2.2	1.3
Molybdenum, Dissolved	DETSC 2306	1.1	ug/l	< 1.1	< 1.1
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	2.1	4.9
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	1.5
Inorganics					
pH	DETSC 2008		pH	6.9	7.7
Cyanide, Total	DETSC 2130	40	ug/l	< 40	55
Cyanide, Free	DETSC 2130	20	ug/l	< 20	< 20
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	0.031	0.047
Chloride	DETSC 2055	0.1	mg/l	16	5.6
Fluoride	DETSC 2055*	0.1	mg/l	0.11	0.10
Sulphate as SO4	DETSC 2055	0.1	mg/l	2.0	4.6
Sulphide	DETSC 2208	10	ug/l	< 10	< 10
Phenols					
Phenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
4-Chloro-3-methylphenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,4-Dichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,4-Dimethylphenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
p-cresol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,6-Dimethylphenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,6-Dichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,4,6-Trichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10

Summary of Asbestos Analysis Soil Samples

Our Ref 23-09398
Client Ref PC228532
Contract Title UNI ACADEMY LONG SUTTON

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2159093	BH01 0.30-0.40	SOIL	NAD	none	Robertas Ciparis
2159094	BH03 0.10-0.20	SOIL	Chrysotile Amosite	Chrysotile and Amosite present as fibre bundles	Robertas Ciparis
2159095	BH03 0.50-0.60	SOIL	NAD	none	Robertas Ciparis
Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.					

Information in Support of the Analytical Results

Our Ref 23-09398
 Client Ref PC228532
 Contract UNI ACADEMY LONG SUTTON

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2159093	BH01 0.30-0.40 SOIL	13/04/23	GJ 250ml, GJ 60ml x2, PT 1L		
2159094	BH03 0.10-0.20 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days), VOC (7 days)	
2159095	BH03 0.50-0.60 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days), VOC (7 days)	
2159096	BH01 0.30-0.40 LEACHATE	13/04/23	GJ 250ml, GJ 60ml x2, PT 1L		
2159097	BH03 0.10-0.20 LEACHATE	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

Certificate of Analysis

Certificate Number 23-09920

Issued: 04-May-23

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 23-09920

Client Reference PC228532

Order No OC36955

Contract Title University Academy Long Sutton

Description 3 Soil samples, 2 Leachate samples.

Date Received 26-Apr-23

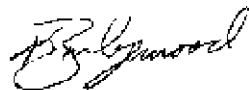
Date Started 26-Apr-23

Date Completed 04-May-23

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

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

Approved By



Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Soil Samples

Our Ref 23-09920

Client Ref PC228532

Contract Title University Academy Long Sutton

Lab No	2162045	2162046	2162047
Sample ID	BH02	BH02	BH05
Depth	0.10-0.20	0.60-0.70	0.30-0.40
Other ID			
Sample Type	ES	ES	ES
Sampling Date	17/04/2023	17/04/2023	19/04/2023
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Antimony	DETSC 2301*	1	mg/kg	1.2	< 1.0	< 1.0
Arsenic	DETSC 2301#	0.2	mg/kg	6.9	13	11
Barium	DETSC 2301#	1.5	mg/kg	820	100	74
Beryllium	DETSC 2301#	0.2	mg/kg	3.4	0.6	0.5
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.3	0.6	1.4
Chromium III	DETSC 2301*	0.15	mg/kg	16	22	20
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	40	13	13
Iron	DETSC 2301	25	mg/kg	27000	25000	23000
Lead	DETSC 2301#	0.3	mg/kg	16	14	14
Molybdenum	DETSC 2301#	0.4	mg/kg	1.1	0.7	0.6
Nickel	DETSC 2301#	1	mg/kg	26	20	19
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	51	39	37
Zinc	DETSC 2301#	1	mg/kg	180	53	49
Inorganics						
pH	DETSC 2008#		pH	9.4	8.3	8.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	3.2	0.7	1.1
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	22	190	14
Sulphur as S, Total	DETSC 2320	0.01	%	0.04	0.03	0.02
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	2.3	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	310	30	3.6
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	320	30	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	10	9.1	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	400	29	6.8
Aromatic C5-C35	DETSC 3072*	10	mg/kg	410	38	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	730	68	< 10
PAHs						
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03

Summary of Chemical Analysis

Soil Samples

Our Ref 23-09920

Client Ref PC228532

Contract Title University Academy Long Sutton

Lab No	2162045	2162046	2162047
Sample ID	BH02	BH02	BH05
Depth	0.10-0.20	0.60-0.70	0.30-0.40
Other ID			
Sample Type	ES	ES	ES
Sampling Date	17/04/2023	17/04/2023	19/04/2023
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Acenaphthylene	DETSC 3303#	0.03	mg/kg	0.10	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	0.10	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.07	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.04	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.10	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.12	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.06	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.10	< 0.03	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	0.94	< 0.10	< 0.10
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3
VOCs						
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Soil Samples

Our Ref 23-09920

Client Ref PC228532

Contract Title University Academy Long Sutton

Lab No	2162045	2162046	2162047
Sample ID	BH02	BH02	BH05
Depth	0.10-0.20	0.60-0.70	0.30-0.40
Other ID			
Sample Type	ES	ES	ES
Sampling Date	17/04/2023	17/04/2023	19/04/2023
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Leachate Samples

Our Ref 23-09920

Client Ref PC228532

Contract Title University Academy Long Sutton

Lab No	2162048	2162049
Sample ID	BH02	BH05
Depth	0.10-0.20	0.30-0.40
Other ID		
Sample Type	ES	ES
Sampling Date	17/04/2023	19/04/2023
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Preparation					
BS EN 12457 10:1	DETSC 1009*			Y	Y
Metals					
Antimony, Dissolved	DETSC 2306	0.17	ug/l	< 0.17	< 0.17
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.79	0.99
Barium, Dissolved	DETSC 2306	0.26	ug/l	13	5.1
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Calcium, Dissolved	DETSC 2306	0.09	mg/l	5.3	4.1
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.31	< 0.25
Chromium III, Dissolved	DETSC 2306*	1	ug/l	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.7	1.9
Iron, Dissolved	DETSC 2306	5.5	ug/l	58	86
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.26	0.18
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	0.42	0.40
Manganese, Dissolved	DETSC 2306	0.22	ug/l	2.2	2.5
Molybdenum, Dissolved	DETSC 2306	1.1	ug/l	< 1.1	< 1.1
Nickel, Dissolved	DETSC 2306	0.5	ug/l	< 0.5	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	1.6	1.1
Zinc, Dissolved	DETSC 2306	1.3	ug/l	< 1.3	< 1.3
Inorganics					
pH	DETSC 2008		pH	7.3	7.1
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Cyanide, Free	DETSC 2130	20	ug/l	< 20	< 20
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	< 0.015	0.096
Chloride	DETSC 2055	0.1	mg/l	0.96	4.2
Fluoride	DETSC 2055*	0.1	mg/l	< 0.10	0.28
Sulphate as SO4	DETSC 2055	0.1	mg/l	2.9	1.7
Sulphide	DETSC 2208	10	ug/l	< 10	< 10
Phenols					
Phenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
4-Chloro-3-methylphenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,4-Dichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,4-Dimethylphenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
p-cresol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,6-Dimethylphenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,6-Dichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10
2,4,6-Trichlorophenol	DETSC 3451*	0.1	ug/l	< 0.10	< 0.10

Summary of Asbestos Analysis Soil Samples

Our Ref 23-09920
Client Ref PC228532
Contract Title University Academy Long Sutton

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2162045	BH02 0.10-0.20	SOIL	NAD	none	Vicky Convery
2162046	BH02 0.60-0.70	SOIL	NAD	none	Vicky Convery
2162047	BH05 0.30-0.40	SOIL	NAD	none	Vicky Convery

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-09920
 Client Ref PC228532
 Contract University Academy Long Sutton

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2162045	BH02 0.10-0.20 SOIL	17/04/23	GJ 250ml, GJ 60ml x2, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days), VOC (7 days)	
2162046	BH02 0.60-0.70 SOIL	17/04/23	GJ 250ml, GJ 60ml x2, PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days), VOC (7 days)	
2162047	BH05 0.30-0.40 SOIL	19/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		
2162048	BH02 0.10-0.20 LEACHATE	17/04/23	GJ 250ml, GJ 60ml x2, PT 1L		
2162049	BH05 0.30-0.40 LEACHATE	19/04/23	GJ 250ml, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar T-Tub

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

Certificate of Analysis

Certificate Number 23-13079

Issued: 05-Jun-23

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 23-13079

Client Reference PC228532

Order No OC36905

Contract Title UNI ACADEMY LONG SUTTON

Description One Soil sample.

Date Received 20-Apr-23

Date Started 02-Jun-23

Date Completed 05-Jun-23

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

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

Approved By



Kirk Bridgewood
General Manager



Summary of Asbestos Analysis Samples

Our Ref 23-13079
Client Ref PC228532
Contract Title UNI ACADEMY LONG SUTTON

Lab No	Sample ID	Sample Location	Material Type	Result	Comment*	Analyst
Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.						

Summary of Asbestos Quantification Analysis

Soil Samples

Our Ref 23-13079

Client Ref PC228532

Contract Title UNI ACADEMY LONG SUTTON

Lab No	2180765
Sample ID	BH03
Depth	0.10-0.20
Other ID	
Sample Type	ES
Sampling Date	12/04/2023
Sampling Time	

Test	Method	Units	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	0.002
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	0.002
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	30.55
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	<0.001
% Chrysotile bundles in sample		Mass %	0.001
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Chrysotile fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
 % asbestos in Asbestos Containing Materials (ACMs) is determined by
 by reference to HSG 264.
 Recommended sample size for quantification is approximately 1kg
 # denotes deviating sample

Information in Support of the Analytical Results

Our Ref 23-13079
Client Ref PC228532
Contract UNI ACADEMY LONG SUTTON

Containers Received & Deviating Samples

Lab No	Sample ID	Date		Holding time exceeded for tests	Inappropriate container for tests
		Sampled	Containers Received		
2180765	BH03 0.10-0.20 SOIL	12/04/23	GJ 250ml, GJ 60ml x2, PT 1L		
Key: G-Glass P-Plastic J-Jar T-Tub DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.					

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Certificate of Analysis

Certificate Number 23-10768

Issued: 16-May-23

Client Geotechnics LTD
203 Torrington Avenue
Tile Hill
Coventry
CV4 9AP

Our Reference 23-10768

Client Reference PC228532

Order No OC36940

Contract Title University Academy Long Sutton

Description 4 Water samples.

Date Received 05-May-23

Date Started 05-May-23

Date Completed 16-May-23

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

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

Approved By



Kirk Bridgewood
General Manager



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Summary of Chemical Analysis

Water Samples

Our Ref 23-10768

Client Ref PC228532

Contract Title University Academy Long Sutton

Lab No	2167200	2167201	2167202	2167203
Sample ID	BH01	BH02	BH03	BH05
Depth				
Other ID				
Sample Type	W	W	W	W
Sampling Date	03/05/2023	03/05/2023	03/05/2023	03/05/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Antimony, Dissolved	DETSC 2306	0.17	ug/l	0.44	0.28	0.55	< 0.17
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	0.71	5.5	5.9	4.5
Barium, Dissolved	DETSC 2306	0.26	ug/l	200	200	170	160
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	56	240	110	630
Calcium, Dissolved	DETSC 2306	0.09	mg/l	89	110	77	100
Chromium, Dissolved	DETSC 2306	0.25	ug/l	24	< 0.25	< 0.25	< 0.25
Chromium III, Dissolved	DETSC 2306*	1	ug/l	25	< 1.0	< 1.0	< 1.0
Chromium, Hexavalent	DETSC 2203	7	ug/l	< 7.0	< 7.0	< 7.0	< 7.0
Copper, Dissolved	DETSC 2306	0.4	ug/l	1.0	0.8	0.6	0.4
Iron, Dissolved	DETSC 2306	5.5	ug/l	13	190	12	7.0
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.11	0.09	< 0.09	< 0.09
Magnesium, Dissolved	DETSC 2306	0.02	mg/l	9.2	35	18	60
Manganese, Dissolved	DETSC 2306	0.22	ug/l	37	260	69	140
Molybdenum, Dissolved	DETSC 2306	1.1	ug/l	4.2	3.2	8.2	2.8
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.8	1.2	0.8	0.6
Selenium, Dissolved	DETSC 2306	0.25	ug/l	1.0	0.40	< 0.25	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	1.2	< 0.6	4.0	< 0.6
Zinc, Dissolved	DETSC 2306	1.3	ug/l	37	39	20	36
Inorganics							
pH	DETSC 2008		pH	7.1	7.3	8.0	7.4
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40	< 40	< 40
Cyanide, Free	DETSC 2130	20	ug/l	< 20	< 20	< 20	< 20
Total Hardness as CaCO3	DETSC 2303	0.1	mg/l	259	416	267	507
Ammoniacal Nitrogen as N	DETSC 2207	0.015	mg/l	1500	0.12	0.017	0.55
Chloride	DETSC 2055	0.1	mg/l	130	91	110	480
Fluoride	DETSC 2055*	0.1	mg/l	< 1.00	< 2.00	< 2.00	< 5.00
Sulphate as SO4	DETSC 2055	0.1	mg/l	23	59	46	200
Sulphide	DETSC 2208	10	ug/l	26	28	29	23

Summary of Chemical Analysis

Water Samples

Our Ref 23-10768

Client Ref PC228532

Contract Title University Academy Long Sutton

Lab No	2167200	2167201	2167202	2167203
Sample ID	BH01	BH02	BH03	BH05
Depth				
Other ID				
Sample Type	W	W	W	W
Sampling Date	03/05/2023	03/05/2023	03/05/2023	03/05/2023
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	ug/l	< 10	< 10	< 10	< 10
PAHs							
Naphthalene	DETSC 3304	0.05	ug/l	< 0.05	0.05	0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01	0.02	0.02	< 0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	0.01	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.06	0.05	0.02	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	0.02	< 0.01	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.18	0.02	0.07	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	0.24	0.01	0.05	< 0.01
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	0.10	< 0.01	0.03	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	0.14	< 0.01	0.04	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	0.21	< 0.01	0.05	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	0.09	< 0.01	0.02	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	0.20	< 0.01	0.04	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	0.16	< 0.01	0.03	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	0.03	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	0.16	< 0.01	0.03	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	1.6	< 0.20	0.44	< 0.20

Information in Support of the Analytical Results

Our Ref 23-10768
Client Ref PC228532
Contract University Academy Long Sutton

Containers Received & Deviating Samples

Lab No	Sample ID	Date			Inappropriate container for tests
		Sampled	Containers Received	Holding time exceeded for tests	
2167200	BH01 WATER	03/05/23	GB 1L, GV x2, PB 1L	pH/Cond/TDS (1 days)	
2167201	BH02 WATER	03/05/23	GB 1L, GV x2, PB 1L	pH/Cond/TDS (1 days)	
2167202	BH03 WATER	03/05/23	GB 1L, GV x2, PB 1L	pH/Cond/TDS (1 days)	
2167203	BH05 WATER	03/05/23	GB 1L, GV x2, PB 1L	pH/Cond/TDS (1 days)	

Key: G-Glass P-Plastic B-Bottle V-Vial

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

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

APPENDIX 10

Geotechnical Plots and Tables

DATA SHEET

Project: University Academy Long Sutton
Project No.: PC228532

**Table 1: Summary of Measured and Derived Parameters
Made Ground**

Parameter	Number of Tests	Range	Average	Figure Number	Remarks
<u>Chemical Conditions</u>					
pH	11	7.8 - 11.8	8.8		
Water soluble sulphate content (mg/l)	10	11 - 52	25		
Total sulphate (%)	3	0.03 - 0.07	0.05		
Total Sulphur (%)	11	0.01 - 0.11	0.03		

DATA SHEET

Project: University Academy Long Sutton
Project No.: PC228532

**Table 2: Summary of Measured and Derived Parameters
Tidal Flat Deposits (Upper Silt)**

Parameter	Number of Tests	Range	Average	Figure Number	Remarks
Water Content (%)	17	24.5 - 44	29	2	
<u>Atterberg Limits</u>				3	
Liquid Limit (%)	9	33 - 38	35		6 tests found to be Non-Plastic
Plastic Limit (%)	3	18 - 20	19		
Plasticity Index (%)	3	16 - 17	16		
Modified Plasticity Index (%)	3	16 - 17	16		After NHBC Standards Chapter 4.2
<u>Particle Size Distribution</u>				4	
% Cobbles	3	0			
% Gravel	3	0			
% Sand	3	57 - 62	59		
% Silt	3	35 - 37	36		
% Clay	3	3 - 7	5		
% Silt and Clay	3	38 - 43	41		
Bulk Density	4	1.94 - 1.98 1.95 & 1.99	1.97 1.97		From triaxial test specimens From oedometer test specimens
SPT N Value	23	0 - 26	6	1	1 test (BH02-2.30m) penetrated 450mm under 1st seating blow, given N=0.
<u>Undrained Shear Strength (kN/m²)</u>					
From Quick Undrained Triaxial tests	4	17 - 44	30	6	100mm dia. Specimens. Single stage tests.
<u>Chemical Conditions</u>					
pH	7	7.6 - 8.4	8.1		
Water soluble sulphate content (mg/l)	7	11 - 360	100		
Total sulphate (%)	3	0.03 - 0.93	0.43		
Total Sulphur (%)	7	0.01 - 0.31	0.07		
Organic Matter (%)	3	1.0 - 1.4	1.1		

DATA SHEET

Project: University Academy Long Sutton
Project No.: PC228532

**Table 3: Summary of Measured and Derived Parameters
Tidal Flat Deposits (Lower Sand)**

Parameter	Number of Tests	Range	Average	Figure Number	Remarks
Water Content (%)	6	24 - 31	28	2	
Particle Size Distribution				4	
% Cobbles	6	0			
% Gravel	6	0			
% Sand	6	80 - 96	89		
% Silt	3	4 - 17	9		
% Clay	3	0 - 6	2		
% Silt and Clay	6	0 - 10	3		
SPT N Value	37	3 - 47	21	1	
Chemical Conditions					
pH	2	8.1 & 8.2	8.2		
Water soluble sulphate content (mg/l)	2	100 & 130	115		
Total sulphate (%)	2	0.05 & 0.07	0.06		
Total Sulphur (%)	2	0.12	0.12		
Organic Matter (%)	1	0.9			

DATA SHEET

Project: University Academy Long Sutton
Project No.: PC228532

**Table 4: Summary of Measured and Derived Parameters
Glacial Till (Granular Soils)**

Parameter	Number of Tests	Range	Average	Figure Number	Remarks
Water Content (%)	1	16		2	
Particle Size Distribution				4	
% Cobbles	1	0			
% Gravel	1	20			
% Sand	1	77			
% Silt	1	3			
% Clay	1	0			

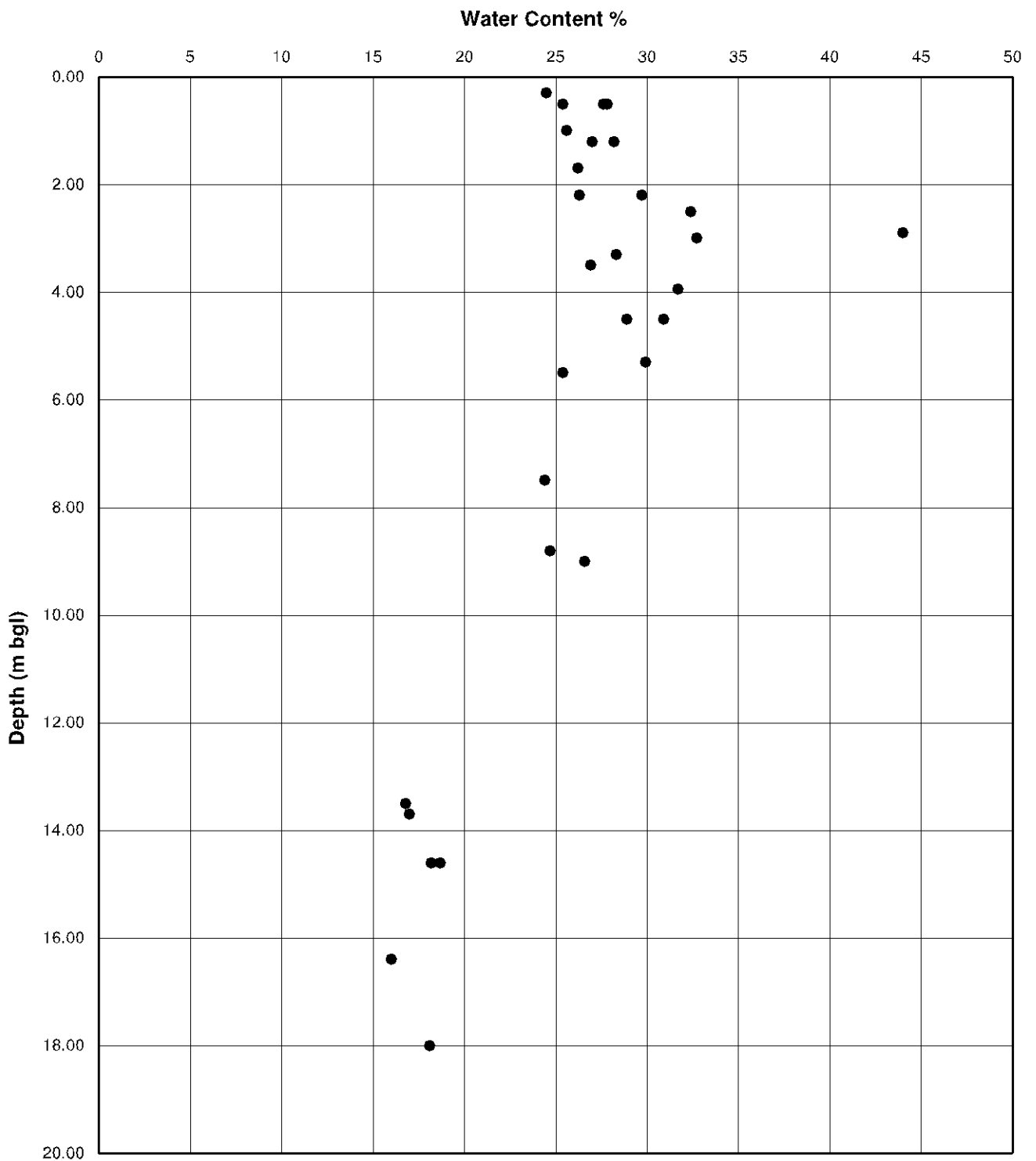
DATA SHEET

Project: University Academy Long Sutton

Project No.: PC228532

**Table 5: Summary of Measured and Derived Parameters
Glacial Till (Clay Soils)**

Parameter	Number of Tests	Range	Average	Figure Number	Remarks
Water Content (%)	6	16 - 19	18	2	
<u>Atterberg Limits</u>				3	
Liquid Limit (%)	4	26 - 34	30		
Plastic Limit (%)	4	13 - 16	15		
Plasticity Index (%)	4	13 - 18	15		
Modified Plasticity Index (%)	4	11 - 15	13		After NHBC Standards Chapter 4.2
Bulk Density	4	2.13 - 2.23	2.18	5	From triaxial test specimens
SPT N Value	6	25 - 50	37	1	
<u>Undrained Shear Strength (kN/m²)</u>				6	
From Quick Undrained Triaxial tests	4	54 - 236	145	6	100mm dia. Specimens. Single stage tests.
Estimated from SPT N Values	6	162 - 325	245		After Stroud & Butler (1978)
<u>Chemical Conditions</u>					
pH	2	8.1 & 8.3	8.2		
Water soluble sulphate content (mg/l)	2	320 & 480	400		
Total sulphate (%)	2	0.18 & 0.22	0.20		
Total Sulphur (%)	2	0.47 & 0.55	0.51		



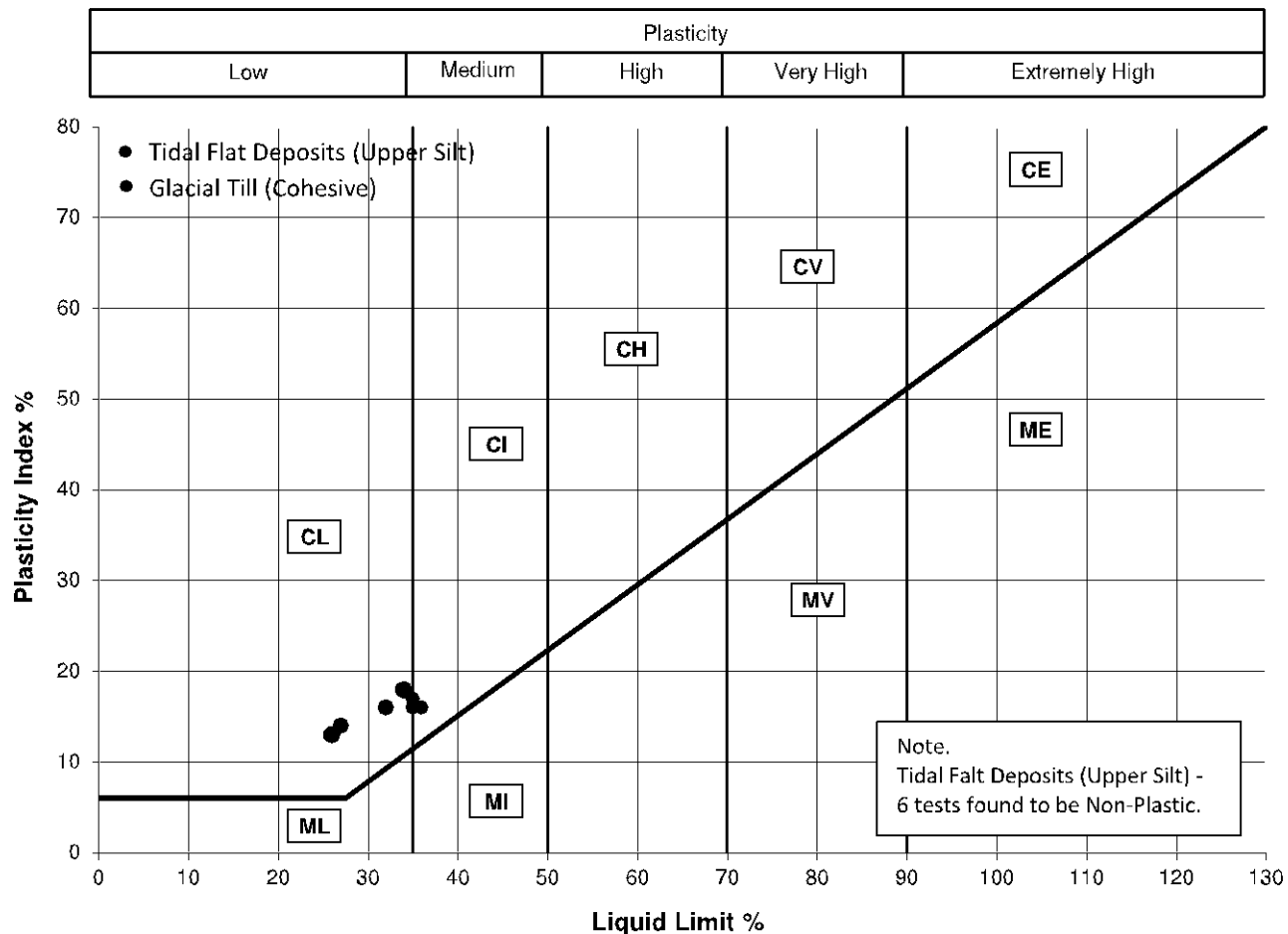
- Tidal Flat Deposits (Upper Silt)
- Tidal Flat Deposits (Lower Sand)
- Glacial Till (Granular Soils)
- Glacial Till (Clay Soils)

All Strata

Job No PC228532
Date 14/07/2023
Figure 2

UNIVERSITY ACADEMY LONG SUTTON
 Plot of Moisture Content - Depth Profile

GEOTECHNICS



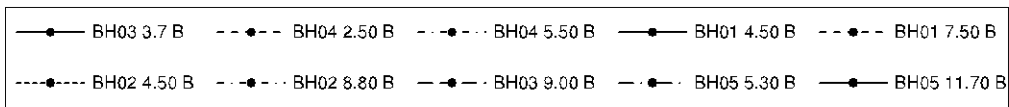
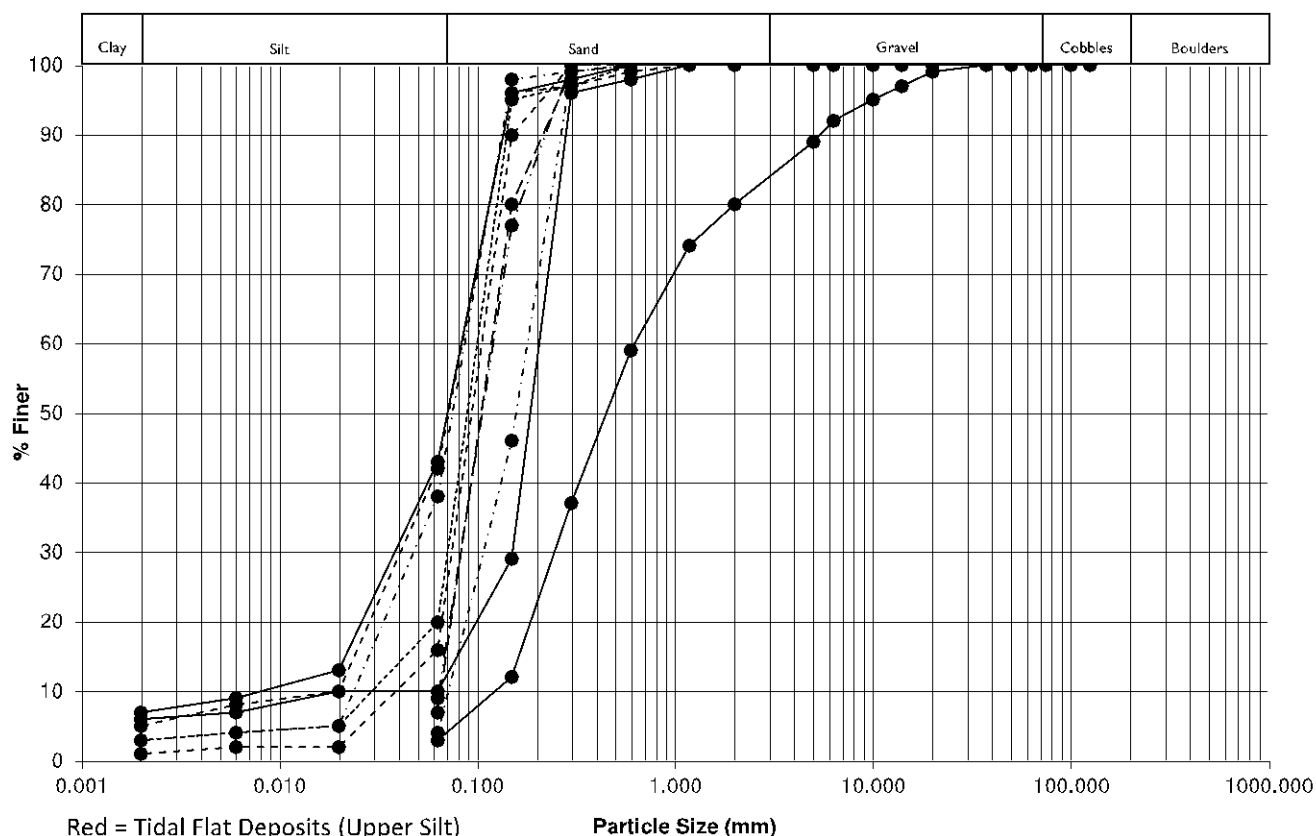
Soil Type	Plasticity Characteristics
C Clay	L Low
	I Intermediate
M Silt	H High
	V Very High
	E Extremely High

All Strata

Job No PC228532
Date 14/07/2023
Figure 3

UNIVERSITY ACADEMY LONG SUTTON
 Plasticity Chart

GEOTECHNICS

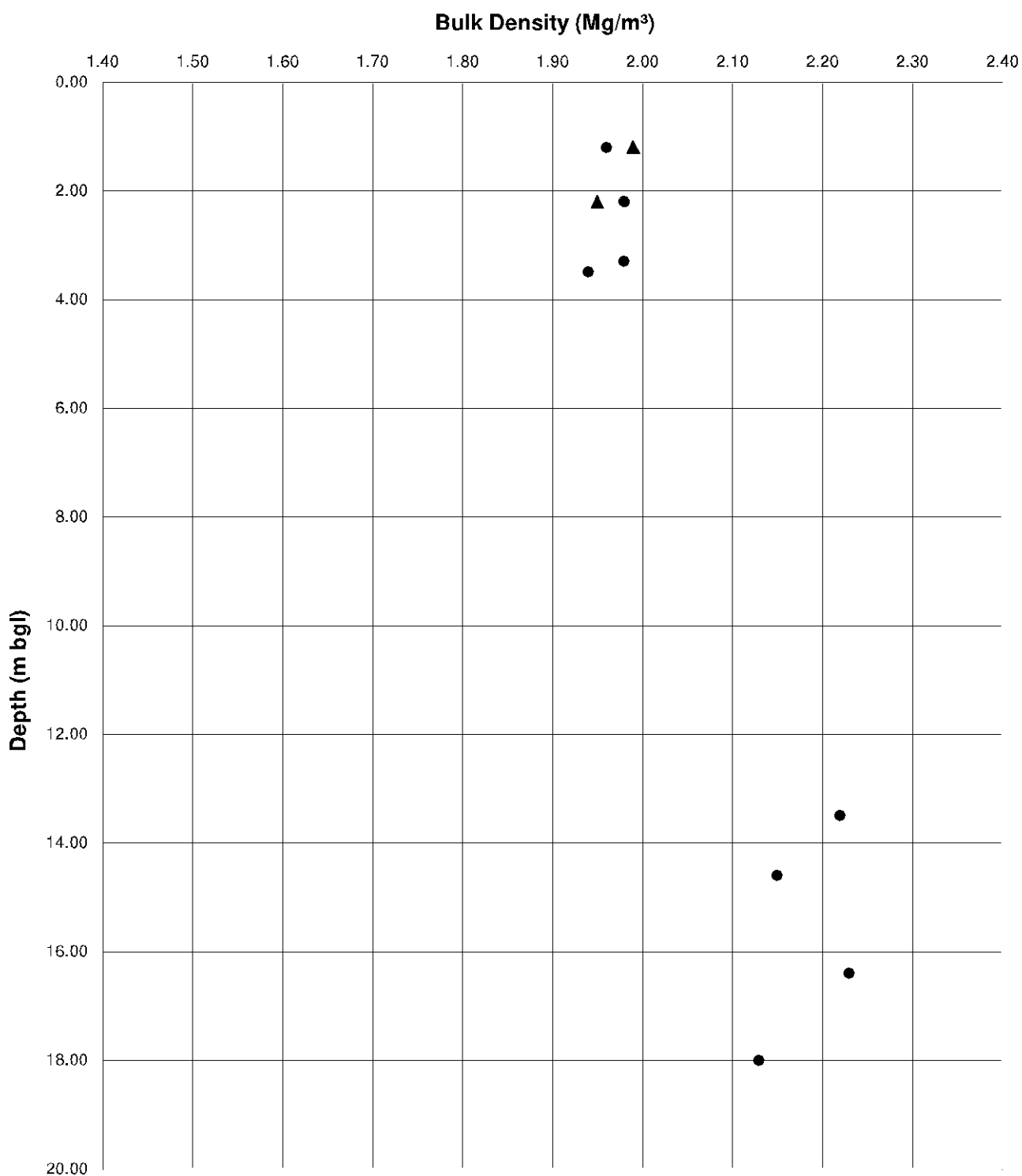


All Strata

Job No PC228532
 Date 14/07/2023
 Figure 4

University Academy Long Sutton
 Summary of Particle Size Distribution
 Analyses

GEOTECHNICS

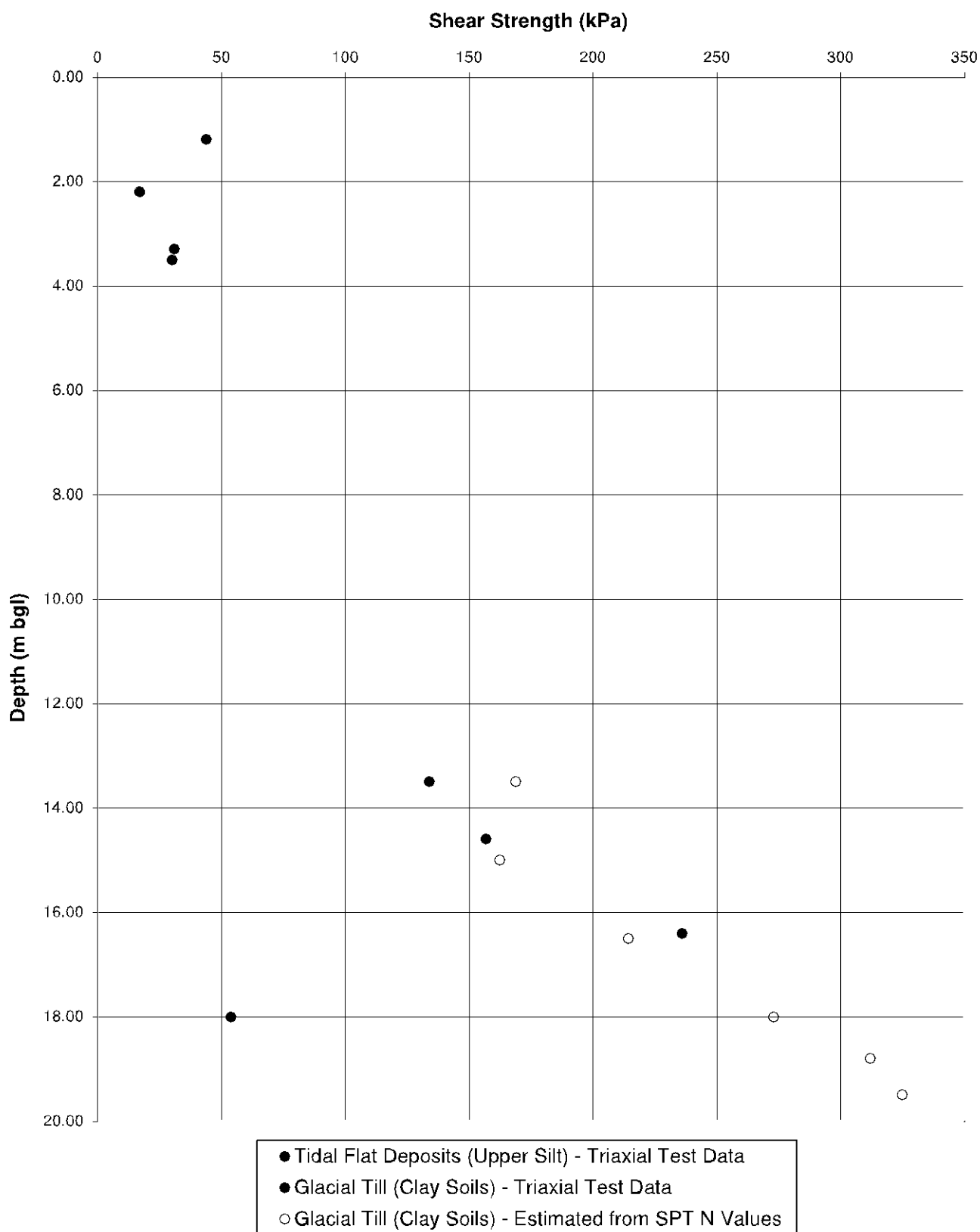


- Tidal Flat Deposits - From Triaxial Test Data
- ▲ Tidal Flat Deposits - From Oedometer Test Data
- Glacial Till (Clay Soils) - From Triaxial Test Data

All Strata

Job No	PC228532	UNIVERSITY ACADEMY LONG SUTTON	GEOTECHNICS
Date	14/07/2023		
Figure	5		

Plot of Bulk Density - Depth Profile



All Strata

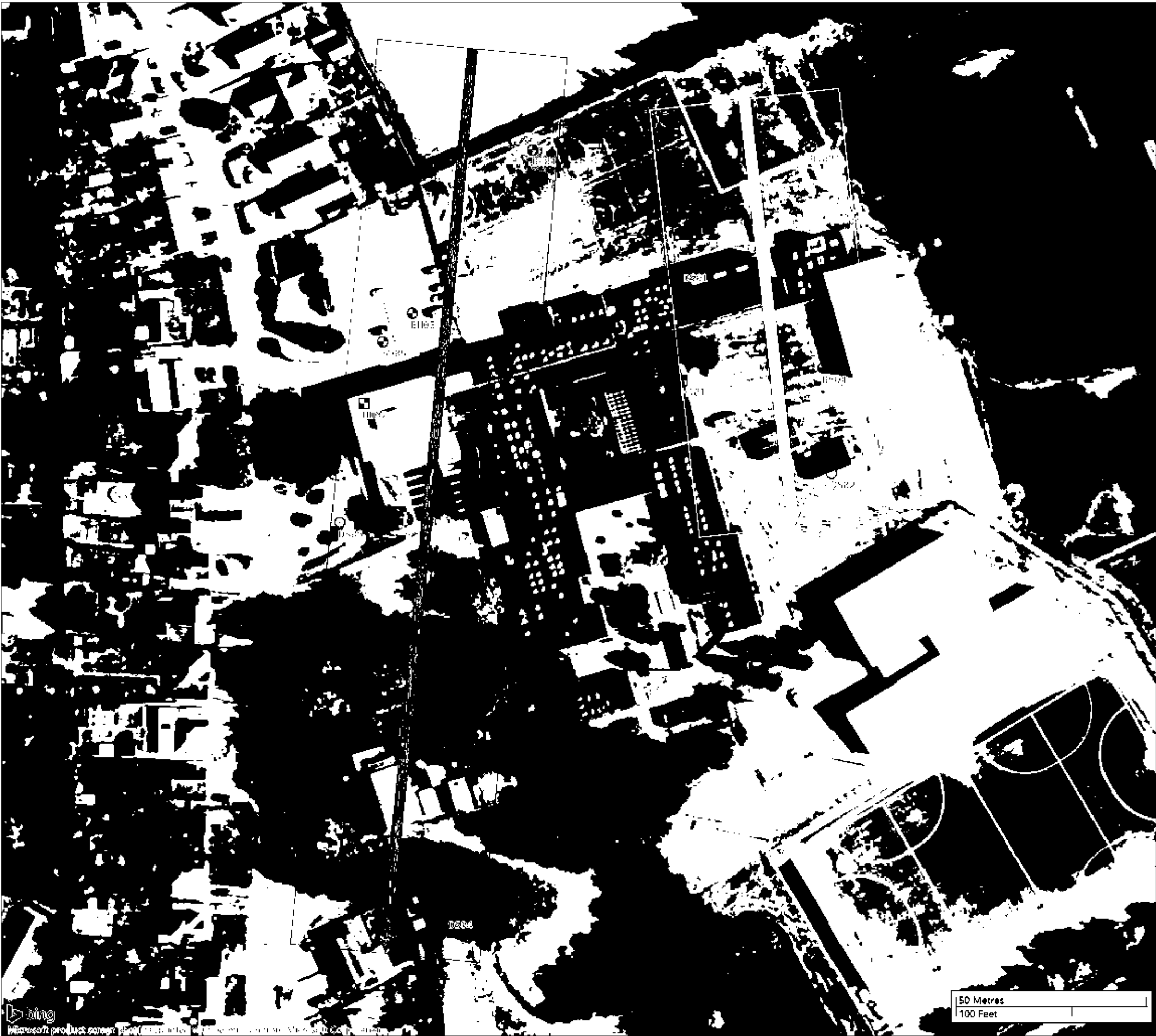
Job No PC228532
Date 14/07/2023
Figure 6

UNIVERSITY ACADEMY LONG SUTTON
 Plot of Shear Strength - Depth Profile

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APPENDIX II

Section Lines



Legend

- Sections - Section line 1
- Sections - Section line 2
- Locations By Type - CP
- Locations By Type - DCP
- Locations By Type - DS
- Locations By Type - TP

GEOTECHNICS

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Engineer:
MOTT MACDONALD LIMITED

Client:
DEPARTMENT FOR EDUCATION

Project:
UNIVERSITY ACADEMY LONG SUTTON

Drawing Title:
Exploratory Hole Location Plan

Scale:
1:1000 at A3

Date:
28/07/2023

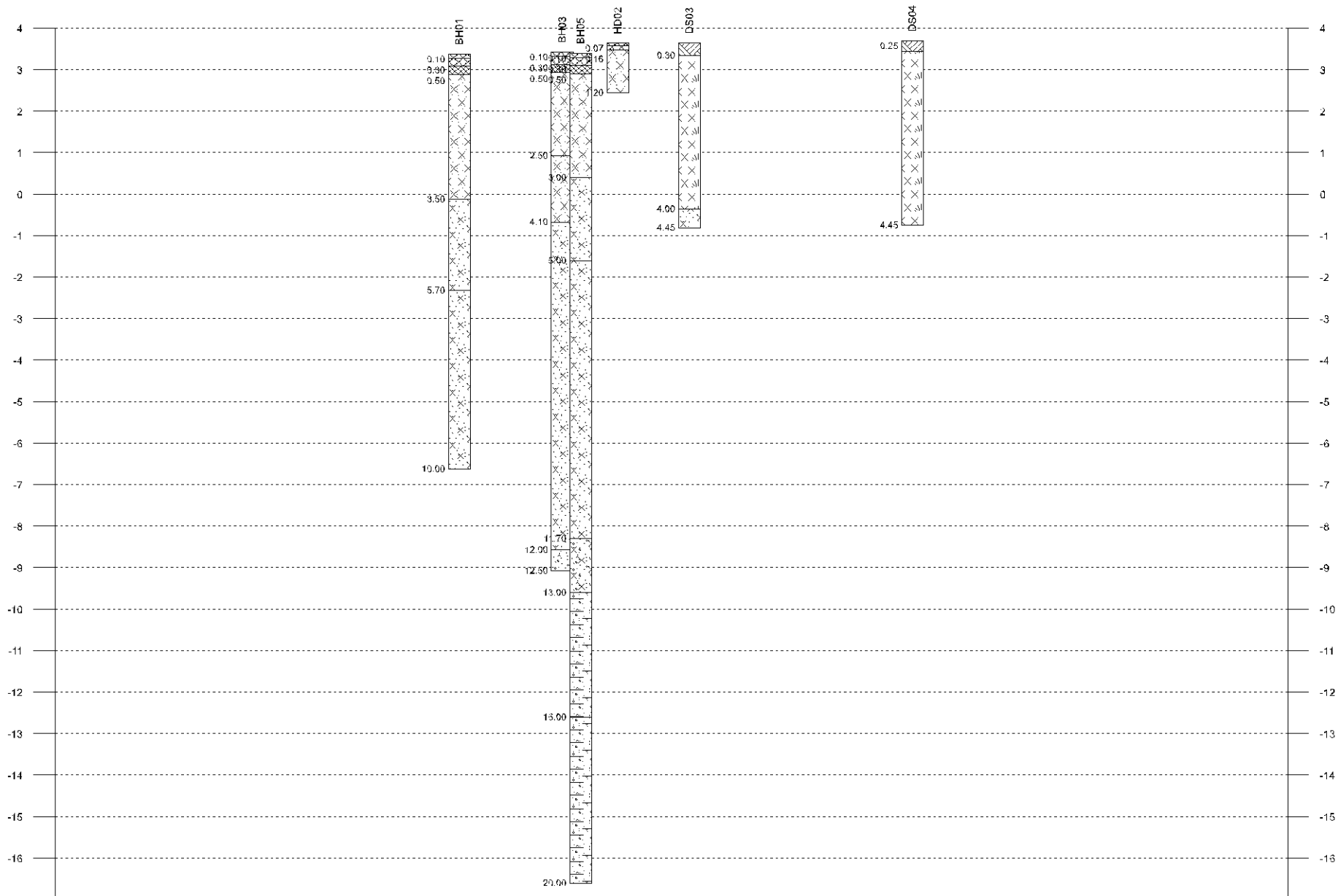
Project No.:
PC228532

**Exploratory Hole
Location Plan**

Project: UNIVERSITY ACADEMY LONG SUTTON	Title: Section Line 1	203 Torrington Avenue Tile Hill Coventry CV4 9AP	Phone: 024 7669 4664 Email: mail@geotechnics.co.uk www.geotechnics.co.uk	 geotechnical and geoenvironmental specialists
	Vertical Scale: 1:133			
Project No.: PC228532	Horizontal Scale: 1:2463			
Client: DEPARTMENT FOR EDUCATION	Engineer: MOTT MACDONALD LIMITED			

Legend Key

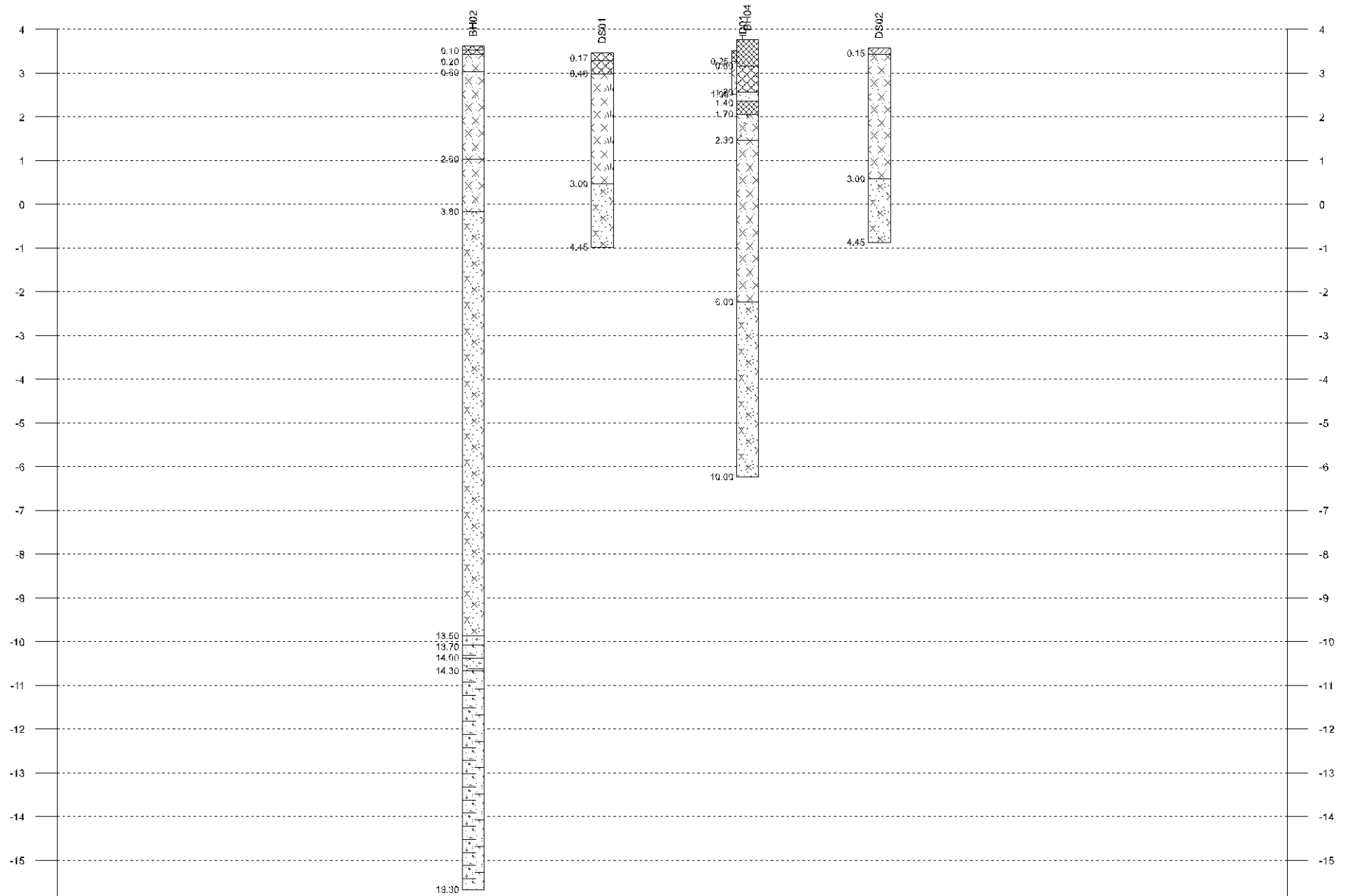
	TOPSOIL
	MADE GROUND - Granular
	Sandy SILT
	Clayey sandy SILT
	MADE GROUND - Cohesive
	Silty SAND
	Silty gravelly SAND
	Gravelly SAND
	Sandy gravelly CLAY



Project: UNIVERSITY ACADEMY LONG SUTTON	Title: Section Line 2	203 Torrington Avenue Tile Hill Coventry CV4 9AP	Phone: 024 7669 4664 Email: mail@geotechnics.co.uk www.geotechnics.co.uk	 GEOTECHNICS geotechnical and geoenvironmental specialists
	Vertical Scale: 1:126			
	Horizontal Scale: 1:1167			
Project No.: PC228532	Engineer: MOTT MACDONALD LIMITED			
Client: DEPARTMENT FOR EDUCATION				

Legend Key

	MADE GROUND - Cohesive
	MADE GROUND - Granular
	TOPSOIL
	Sandy SILT
	Clayey sandy SILT
	CONCRETE
	Sandy gravelly SILT
	Silty SAND
	Sandy GRAVEL
	Sandy gravelly CLAY
	Clayey gravelly SAND



APPENDIX 12

Chemical Analysis Tables

Site: Long Sutton

CHEMICAL STATISTICAL ANALYSIS - based on CLEA v1.06 (Sandy Loam 2.5% SOM)

Job No: PC228532

[illegible]

Below Detection Limit:
Exceeded GACSGV
Exceeded SML
Assessment criteria for e.1. Sublethal and Sublethal are not based on human health. Sublethal criteria assume "D51" "AEC-1" classification for resources.

Notes:

1. **Student Confidence Assessment:** Students have been asked what percentage of the current $\text{FA} \pm 1.36$ standard deviation values, given here (95QM), they do not FA against, and the value has been identified as incorrect has been none. The results presented show that most of the students did not agree with the FA against, and the value has been identified as incorrect has been none. This is an example of a possible malfunction of the test or data input, as to how to design and structure the test.

average

3. When the test result is recorded as being less than the detection limit, the result used for the analysis is the detection limit.

1. Creating (installing) the database of a GOAC based on input CI FA 1.05 Model, die Adress-URL-Value for Cytosine-Meer has been used.

6. aC4SL based on adjusted variances and exposure assumptions

7. DC401 for battery assumes 5% SOM

Site: Long Sutton

Summary of Water Analysis - Tier I Screening



Summary of Water Analysis - Tier 1 Screening														
Sample Location	Units	Minimum Reporting Value	Drinking Water Standard (or cleanest value)	EQS Freshwater	Estuaries and coastal waters	Soil Leaching Analysis					Groundwater Analysis			
						SWR	R-10	R-100	R-1000	R-10	R-100	R-1000	R-10	R-100
						1/20/10	3/25/10	3/100/75	1/10/10	3/25/10	3/100/75	1/20/10	3/25/10	3/100/75
						1/10/10	3/25/10	3/100/75	1/10/10	3/25/10	3/100/75	1/10/10	3/25/10	3/100/75
Water Quality														
pH	pH units	-	-	-	-	7.1	6.9	7.7	7.3	7.1	7.1	7.3	8.0	7.4
Metals														
Aluminum	ug	-	15	50	15	<0.15	1.0	2.4	0.79	0.99	0.71	5.5	5.9	4.3
Chromium (Total)	ug	-	30	100	30	5.4	0.38	4.6	0.31	<0.25	24	<0.25	<0.25	<0.25
Chromium (VI)	ug	-	20	10	20	<1.0	<1.0	4.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (VI)	ug	-	20	10	20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Copper	ug	-	700	10	10	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)	170 (when FOC <1mg/L)
Iron	ug	-	700	100	100	<5.5	47	55	58	66	13	180	12	70
Lead	ug	-	10	1.0	1.0	14	0.17	0.75	0.19	0.11	0.09	<0.09	<0.09	<0.09
Manganese	ug	-	20	100	100	<0.22	2.2	1.3	2.2	2.5	37	59	59	59
Nitrate	ug	-	70	47	85	1.4	<0.5	<0.5	<0.5	<0.5	0.8	1.2	0.8	0.6
Selenium	ug	-	10	10	10	<0.75	<0.75	<0.75	<0.75	<0.75	1.0	0.40	<0.75	<0.75
Zinc	ug	-	1000	100	100	2.4	<1.3	1.3	<1.3	<1.3				
Inorganic														
Chloride	mg	-	350			0.61	16	5.6	0.96	4.7	130	91	110	480
Nitrate-N	mg	-	20	1	1	0.22	0.331	0.047	<0.015	0.396	1500	0.12	0.317	0.55
Total Chloride	ug	-	30	1	1	<40	<40	55	<40	<40	<40	<40	<40	<40
Organics														
Benzene	ug	0.1	-	77	77	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
Chlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
1,4-Dichlorobenzene	ug	0.1	-	4.0	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
2,4-Dichlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
1,2-Dichlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
1,3-Dichlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
1,4-Dichlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
1,2-Dichlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
1,3-Dichlorobenzene	ug	-	-	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	-	-	-	-
PAHs														
Naphthalene	ug	-	-	-	-						<0.35	0.05	0.05	<0.35
Acenaphthylene	ug	-	-	-	-						<0.31	<0.01	<0.01	<0.31
Acenaphthene	ug	-	-	-	-						<0.31	0.02	0.02	<0.31
Fluorene	ug	-	-	-	-						<0.31	0.01	<0.01	<0.31
Fluoranthene	ug	-	-	-	-						0.36	0.05	0.02	<0.31
Anthracene	ug	-	-	0.1	0.1						0.32	<0.01	<0.01	<0.31
Pyrene	ug	-	-	0.02	0.02							<0.01	<0.01	<0.31
Benzo[a]anthracene	ug	-	-	-	-						0.24	0.01	0.05	<0.31
Chrysene	ug	-	-	-	-						0.10	0.01	0.03	<0.31
Benzo[e]pyrene	ug	-	0.10	0.01	0.01						0.14	<0.01	<0.01	<0.31
Benzo[a]pyrene	ug	-	0.10	0.01	0.01						0.21	<0.01	<0.01	<0.31
Benzo[k]fluoranthene	ug	-	0.01	0.0017	0.0017						0.70	<0.01	<0.01	<0.31
Indeno[1,2,3-cd]pyrene	ug	-	0.10	0.01	0.01						0.16	<0.01	<0.01	<0.31
Dibenz[a,h]anthracene	ug	-	-	-	-						0.38	<0.01	<0.01	<0.31
Benzo[ghi]perylene	ug	-	-	0.01	0.01							<0.01	<0.01	<0.31
Polycyclic Hydrocarbons														
Anthracene C1-C6	ug	-	10	10	10						<0.1	<0.1	<0.1	<0.1
Anthracene C7-C9	ug	-	10	10	10						<0.1	<0.1	<0.1	<0.1
Anthracene C10-C13	ug	-	10	10	10						<0.1	<0.1	<0.1	<0.1
Anthracene C14-C16	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C17-C19	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C20-C21	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C22-C23	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C24-C25	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C26-C27	ug	-	10	10	10						<0.1	<0.1	<0.1	<0.1
Anthracene C28-C29	ug	-	10	10	10						<0.1	<0.1	<0.1	<0.1
Anthracene C30-C31	ug	-	10	10	10						<0.1	<0.1	<0.1	<0.1
Anthracene C32-C33	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C34-C35	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C36-C37	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C38-C39	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C40-C41	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C42-C43	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C44-C45	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C46-C47	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C48-C49	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C50-C51	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C52-C53	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C54-C55	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C56-C57	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C58-C59	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C60-C61	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C62-C63	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C64-C65	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C66-C67	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C68-C69	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C70-C71	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C72-C73	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C74-C75	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C76-C77	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C78-C79	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C80-C81	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C82-C83	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C84-C85	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C86-C87	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C88-C89	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C90-C91	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C92-C93	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C94-C95	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C96-C97	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C98-C99	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C100-C101	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C102-C103	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C104-C105	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C106-C107	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C108-C109	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C110-C111	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C112-C113	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C114-C115	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C116-C117	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C118-C119	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C120-C121	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C122-C123	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C124-C125	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C126-C127	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C128-C129	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C130-C131	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C132-C133	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C134-C135	ug	-	10	10	10						<1.0	<1.0	<1.0	<1.0
Anthracene C136-C137	ug	-	10	10</										

Naccì

Part: Above JN P02

FEEL ABOVE JK DNG

Revised 12-20-2006

EQC for calcium is dependent on hardness (<4 mg/l - 0.20 mg, 4 to <5 mg/l 0.08 mg, 5 to <10 mg/l 0.09 mg, 10 to <20 mg - 0.15 mg, >20 mg - 0.25 mg).

^a EQQ materials based on Ca(OH)₂ hardness and second stage assessment with a BA™ will required if exceeded

[illegible]

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— 364 —

- a beautiful title

APPENDIX I3

Investigation Techniques and General Notes

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPTs) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

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7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.
8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.
9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.
10. Any unavoidable variations from specified procedures are identified in the report.
11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated
12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.
13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.
14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.
15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.
16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.
17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.
18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.
19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.
20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.
21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.