APPLiED GEOLOGY

REPORT ON
GROUND INVESTIGATION
AT
THOMAS TELFORD UTC,
WOLVERHAMPTON

REPORT STATUS SHEET

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CONTENTS

1.0 INTRODUCTION 1
1.1 Objectives and Scope of Investigation 1
1.2 Report Layout 2
2.0 SITE DESCRIPTION AND PROPOSALS 2
2.1 Site Description 2
2.2 Site Proposals 2
3.0 PURPOSE OF INVESTIGATION 3
4.0 GROUND INVESTIGATION WORKS 3
4.1 Fieldwork 3
4.2 Instrumentation and Monitoring 5
4.3 Laboratory Testing 5
4.4 Soil Engineering Factual Ground Investigation 6
5.0 GROUND CONDITIONS 7
5.1 Strata Encountered 7
5.2 Hardstanding and Subbase 7
5.3 Topsoil / Made Ground 8
5.4 Made Ground 8
5.5 Glacial Till 10
5.6 Clent Formation and Enville Formation 11
5.7 Groundwater 12
5.8 Contamination 12
5.9 Soil Gas 13
6.0 GEOENVIRONMENTAL ASSESSMENT 13
6.1 Human Health Risk Assessment 13
6.2 Controlled Waters Risk Assessment 15
6.3 Disposal of Soil Arisings 18
6.4 Conclusions and Recommendations 18
7.0 GEOTECHNICAL ASSESSMENT 20
7.1 General 20
7.2 Foundation Design 20
7.3 Floor Slab and Gas Protection 21
7.4 Excavations 21
7.5 Pavement Design 22
7.6 Buried Concrete and Services 22
7.7 Conclusions and Recommendations 23

GENERAL NOTES
LIST OF REFERENCES

APPENDICES

APPENDIX A **DRAWINGS & FIGURES**

- Site Location Plan, Dwg No AG3187-20-01
- Exploratory Hole Location Plan, Dwg No AG3187-20-02
- Landscape Master Plan, AJM Landscape Architects, Dwg No. UC0030-AJM-EX-XX-DR-L-2211 Rev. P06
- SPT N value v depth

APPENDIX B **FACTUAL GI REPORT BY SOIL ENGINEERING**

APPENDIX C **EXPLORATORY HOLE LOGS**

APPENDIX D **FIELD MONITORING RESULTS**

APPENDIX E **LABORATORY TEST RESULTS & DATA SHEETS**

APPENDIX F **STANDARD FIELDWORK AND ASSESSMENT PROCEDURES**

1.0 INTRODUCTION

1.1 Objectives and Scope of Investigation

An area of land at Thomas Telford University Technical College (TT UTC) (the site) is being considered for development by the College, with the development to be undertaken by Morgan Sindall Construction & Infrastructure Ltd (the Contractor and Client for the purpose of this report). The proposals for the site comprise an extension to the existing TT UTC campus site to allow for the construction of a three-storey classroom block to the north of the existing TT UTC building, a separate single/two storey sports hall block to be located in the north east corner of the site, a new outdoor all-weather sports pitch and a new area of car parking.

A Desk Study, Phase I Geoenvironmental Risk Assessment has previously been produced by Applied Geology in February 2021 (Report Ref. AG3187-20-AL65) for the proposed development. Whilst the findings of this report have been taken into consideration in this current investigation, reference should be made to this report for full details of the desk study findings and conceptual site model.

A number or previous reports have been produced for the site and the wider site over various phases of proposed redevelopment. It is understood that the Client has obtained reliance on one of the most recent previous reports, *Report on Ground Investigation at HVA West Midlands UTC, Ref. TA8282-F01, date 22nd June 2020, by Soil Engineering Geoservices Ltd,* which is a factual ground investigation undertaken across the TT UTC extension site. The information contained within this report has therefore been reviewed and incorporated within this current report. A copy of this previous report in included in Appendix B.

Applied Geology was also instructed to undertake a supplementary Phase II geotechnical and geoenvironmental ground investigation to:

- further assess the potential for hazardous substances or conditions to exist at the site that might warrant mitigation or remediation appropriate to the intended end use proposed by the Client.
- further confirm geological conditions based on the findings of the previous reports.

The terms of reference/brief for the works were mutually developed between the Client and Applied Geology and are outlined in our proposal and estimate reference AG3187-20-01b dated 01st December 2020. A topographical survey (ref. 55003/1, dated January 2020 was also provided by the Client.

The scope of works undertaken by Applied Geology comprised:

- Ground investigation together with sampling, monitoring and a programme of laboratory testing;
- Assessment and reporting of the results of the works.

Underground service plans for the site were obtained by Applied Geology on 15th September 2020 and a Topographic and utilities survey undertaken on 28th February 2020 was provided by the Client.

1.2 Report Layout

This report presents a brief description of the site and the factual results of the intrusive investigations carried out. An interpretation of the ground conditions and a discussion/assessment of the findings is presented in the later report text sections. The main text of the report has been produced in a concise format, including the use of data tables to summarise key information where possible. The report should be read in conjunction with the general procedures detailed in Appendix F and General Notes given at the end of the main text, which provide details of investigation techniques, assessment methodology and standards, health & safety and limitations and exceptions of the report. Drawings and factual data including exploratory hole records and laboratory testing results are presented in the other Appendices.

2.0 SITE DESCRIPTION AND PROPOSALS

2.1 Site Description

The site is located at Thomas Telford University Technical College (TT UTC), Cambridge Street, Wolverhampton, approximately 900m northeast of Wolverhampton town centre. The Ordnance Survey grid reference for the centre of the site is 391892 299401 as shown on the Site Location Plan, Drawing No. AG3187-20-01, in Appendix A.

The site is irregular in plan shape with dimensions of approximately 145m by 115m (1.38ha). The area of the site including the car park, TTUTC buildings, soft landscaping and car parking is relatively flat topographically whereas the undeveloped land in the western third of the site slopes slightly from the western boundary down towards the edge of the car park. Elevations across the whole site ranges from c.133m AOD in the south western corner of the site to c.137m AOD on the western boundary of the site, as shown on the combined topographic and utility survey drawing, which has been utilised as the base plan for the Exploratory Hole Location Plan which is presented in Appendix A.

A site walkover survey was carried out by Applied Geology on the 8th December 2020 as part of the previous desk study report. No significant changes had occurred to the site since the previous walkover survey and reference should be made to the previous report for full details of the walkover survey.

2.2 Site Proposals

The proposals for the site comprise extension to the existing TT UTC campus site to allow for the construction of a three-storey classroom block to the north of the existing TT UTC building, a separate single/two storey sports hall block to be located in the north east corner of the site, a new outdoor all-weather sports pitch and a new area of car parking. The proposals are shown on the Landscape Master Plan, Dwg No. UC0030-AJM-EX-XX-DR-L-2211 Rev. P06, dated 17th January 2021, by AJM Landscape Architects. A copy of this is presented in Appendix A.

3.0 PURPOSE OF INVESTIGATION

The Desk Study/Phase 1 Geoenvironmental Risk Assessment identified a number of on-site sources of contamination, together with a number of potential on-site sources, of which their presence could not be discounted following a review of the available historical ground investigation and validation reports.

As a result of the desk study findings, a Phase II Ground Investigation was recommended to confirm the contamination status of the site and validate the findings and conclusion of the previous reports and the Conceptual Site Model (CSM). Any such, investigation would also be utilised to confirm the ground conditions beneath the site for geotechnical purposes and for the current proposed construction. The scope of works recommended in the desk study report included:

- A series of Driven Continuous Sampler borehole within the existing TT UTC boundary to enable samples to be collected for confirmatory contamination testing, check for the presence of obstructions and confirm the expected ground conditions. Ground gas and groundwater monitoring standpipes were also to be installed within selected boreholes.
- Trial pitting outside of the current TT UTC boundary to enable samples to be collected for confirmatory contamination testing, check for the presence of obstructions and confirm the expected ground conditions.
- Ground gas and groundwater level monitoring.
- Confirmatory contamination testing to include a suite of general common contaminants, as well as TPH and asbestos.
- Assessment and reporting of the results.

This report looks to cover the recommended ground investigation works detailed above.

4.0 GROUND INVESTIGATION WORKS

4.1 Fieldwork

The following scope of fieldwork was undertaken as part of this investigation:

- 5 No Driven Continuous Sampling boreholes (ref DCS1 to DCS5) to depths of between 0.50m and 5.45m below ground level (bgl);
- 6 No Machine Excavated Trial Pits (ref. TP1 to TP6) to depths of between 1.80m and 4.00m bgl;
- 4 No Shallow Machine Excavated trial pits (ref. AS1 to AS4) to depths of between 0.10m and 0.50m bgl.

The borehole and trial pit records together with the SPT calibration certificate are included in Appendix C of this report.

The locations of the exploratory holes were selected by the Client and set out on site by Applied Geology Limited. During the setting out of the exploratory hole positions, any locations constrained by the presence of underground services, were adjusted to the nearest cleared location. Access was also constrained to within the active TT UTC area, with works in this part of the site having to be stopped and all

equipment removed during lunch time break and the intrusive works in this area being restricted to boreholes only.

The sampling strategy for the exploratory hole locations was to enable investigation of the ground conditions beneath the proposed new buildings to confirm the findings of the previous reports, whilst also attempting to identify the presence of below ground obstructions. In addition to this, the locations were also positioned to obtain general site coverage for the collection of samples for chemical testing, to validate the contamination status of the site based of the data obtained from the previous reports and given the locations samples and tested as part of the recent Soil Engineering investigation works. Specifically, the DCS boreholes (DCS1 to DCS5) were targeted to within the footprint of the proposed three-storey classroom block to the north of the existing TT UTC building, trial pits TP1 to TP4 were targeted to beneath the footprint of the proposed single/two storey sports hall block and trial pits TP5 and TP6 and AS1 to AS4 were targeted to within the general location of the proposed outdoor all-weather sports pitch.

DCS drilling uses a method of percussive sampling to hammer a sampling tube into the ground with samples of the deposits encountered subsequently recovered in 1m long clear plastic liners, which were logged and sub-sampled on site by an Engineering Geologist. Descriptions based on samples obtained from DCS boreholes which only provide limited sample volume for description and can be prone to collapse of near surface material into the borehole at depth, therefore, it is not always feasible to give full engineering descriptions or assign strata names with certainty. During the drilling process, in-situ Standard Penetration Tests (SPTs) are also undertaken at 1m intervals to determine the relative density of coarse-grained deposits or an indication of the in-situ strength of fine grained deposits by comparison with published empirical data.

During drilling obstructions were encountered at shallow depths in exploratory locations DCS3 and DCS5. The obstruction in encountered in DCS5 was a combination of concrete and brick and was unable to be removed by hand to enable the borehole to be progressed. The obstruction encountered in DCS3 was concrete and when this was unable to be removed by hand, attempts were also made to remove this using the excavator, however, this was also unable to remove the obstruction and therefore the borehole was unable to progress.

It is noted that a number of former tanks were present on the former brewery site and that it cannot be fully determined whether these features were decommissioned and/or removed and validated during development of the site. An accurate location of these features cannot now be determined, however, from the review of the previous reports, an historical tank(s) and fuel pump were likely to have been in the region of the current area of soft landscaping located to the north of the TT UTC building, where BH101 (from the Soil Engineering investigation) and DCS4 (from this current investigation) were positioned. In addition, a former above ground diesel tank (which has obviously been removed) was likely to have been in the region of TP1 and TP2, a former well was likely to be in the region of TP3 and TP4 and a former fuel tank was likely to be in the region of TP102 and TP5. None of these features were encountered at these locations, nor were any signs of gross contamination.

Service plans were obtained by Applied Geology prior to the commencement of works and a service clearance exercise was undertaken by specialist contractor

(Rock Power Connections Limited) at each exploratory position prior to the commencement of drilling. The positions of the exploratory holes were also levelled and located by Rock Power Connections Limited during the site work, with the levels and coordinates for each position presented on the relevant exploratory hole record in Appendix B. The locations are presented on the Exploratory Hole Location Plan, Drawing No. AG3187-20-02 in Appendix A.

4.2 Instrumentation and Monitoring

On completion of boring, 50mm diameter standpipes were installed in selected boreholes as follows, with further details included in the relevant borehole logs in Appendix C:

- DCS1, response zone 0.5 to 1.2m bgl, in Made Ground;
- DCS2, response zone 0.5 to 1.9m bgl, in Made Ground.

Washed silica gravel (6-10mm) was used as the filter medium and each standpipe was fitted with a push-in bung and single gas tap and was finished with flush metal cover concreted in place.

Ground gas and groundwater monitoring visits were undertaken on 2 occasions from 17th December 2020 to 26th January 2021 during four periods of low and atmospheric pressure, of which two were also noted to be falling. Each monitoring well was monitored for concentrations of carbon dioxide, methane, oxygen, VOCs, flow rates and differential pressures and water level.

In additional to the standpipes installed during this investigation, one of the standpipes installed during the previous investigation undertaken by Soil Engineering (June 2020) was also monitored for both groundwater level and ground gas. This borehole was referenced BH101 and had a response zone installed at 1.00m to 5.00m bgl within the Made Ground and Glacial Till. The location of BH101 is shown on the Exploratory Hole Location Plan presented in the Soil Engineering report, reproduced in Appendix B.

The monitoring results are included in Appendix D.

4.3 Laboratory Testing

Geotechnical laboratory testing was undertaken as part of the previous ground investigation by Soil Engineering, for which the Client has obtained reliance upon. The results of this testing have therefore been incorporated within this report and, as such, no further geotechnical testing was required from this supplementary investigation.

Chemical testing was undertaken based upon the desk study, walkover and site observations during the fieldwork. Eight samples were analysed for the following suite of contaminants:

- Selected metals suite [arsenic, beryllium, boron, cadmium, chromium (total, trivalent and hexavalent), copper, mercury, nickel, lead, zinc, selenium, vanadium];
- Speciated (16 US EPA) Polycyclic Aromatic Hydrocarbons (PAH);

- Phenols (total);
- pH;
- Soluble sulphate;
- Organic matter.

Five of the above samples were also submitted for Total Petroleum Hydrocarbon Criteria Working Group (TPH CWG) testing including benzene, toluene, ethylbenzene and xylenes (BTEX) and methyl tertiary-butyl ether (MTBE). In addition, two of the five samples were submitted for Volatile Organic Compound (VOCs) testing. The samples selected for this testing were generally determined from the results of the headspace testing and from within the general location of potential historical sources of hydrocarbon contamination.

Due to the presence of asbestos recorded during previous investigations across the wider site, a total of fifteen samples were submitted for asbestos screening and ID.

At the request of the client, one sample of the natural Glacial Till was submitted for inert waste acceptance criteria (WAC) testing.

Two of the soil samples tested for the above suite, were also submitted for leachate testing and were analysed for the following suite of contaminants:

- Selected metals suite [arsenic, boron, beryllium, cadmium, chromium (total), copper, mercury, nickel, lead, vanadium, zinc, selenium];
- Speciated (16 US EPA) Polycyclic Aromatic Hydrocarbons (PAH);
- Total Organic Carbon (TOC);
- Phenols (total);
- pH and soluble sulphate.

Laboratory test results are included in Appendix D.

4.4 Soil Engineering Factual Ground Investigation

The fieldwork undertaken as part of the factual ground investigation by Soil Engineering, and which has been incorporated into the assessments below, comprised:

- 3No. 200-150mm diameter Cable Percussion (CP) boreholes (ref. BH101 to BH103) to depths of between 7.20m and 10.16m bgl;
- 2No. Rotary core follow on boreholes, continuing BH101 and BH102 to depths of 14.16m and 11.20m bgl, respectively;
- 2 No Machine excavated trial pits (ref. TP101 to TP102) to depths of 4.00m and 2.00m bgl respectively;
- 4 No shallow hand excavated trial pits (ref. HDP101 to HDP104) to depths of between 0.20m and 1.20m bgl;
- 1No. Trial pit soakaway test, undertaken with TP102.

Standpipes were installed within BH101 and BH102 for the purposed of ground gas and groundwater monitoring and sampling.

Return monitoring visits were undertaken on a weekly basis over a six-week period (six visits) between the 20th May and 24th June 2020, with the standpipes monitored

for carbon dioxide, methane, oxygen, carbon monoxide, hydrogen sulphide and flow rates on each occasion. Groundwater levels were also recorded.

A series of geotechnical and chemical laboratory testing was also undertaken as part of the factual report which was schedules by others.

Reference should be made to the full report, which is presented in Appendix B, for full details of the works undertaken.

5.0 GROUND CONDITIONS

5.1 Strata Encountered

Deep Made Ground was encountered across the site, up to a depth of 3.40m bgl, overlying Glacial Till which in turn overlies the Clent Formation and Enville Formation. Surface hardstanding was encountered in two locations and Topsoil/Made Ground encountered in one location. Full details of the strata encountered are given on the borehole records presented in Appendix C and within the Soil Engineering Report included in Appendix B. A generalised ground profile is presented below to summarise the information.

Stratum	Depth to Top of Strata (m bgl)	Thickness (range) (m)	Comments
Hardstanding	GL	0.05 – 0.3	Encountered in DCS1, DCS2, BH102, HDP101 and HDP102. Subbase type material was encountered beneath.
Topsoil/Made Ground	GL	0.20 - 0.25	Only encountered in DCS4 and BH101.
Made Ground	GL - 0.3	0.50 – 3.40	Encountered in all locations. The base was not proven in trial pits AS1 to AS4, DCS3, DCS5, TP6 and HDP1 to HDP4.
Glacial Till	1.00 – 3.40	0.30+ – 7.80	Encountered in DCS1, DCS2, DCS4 and TP1 to TP5. Base only proven in BH101 to BH103.
Clent Formation and Enville Formation	7.70 – 9.00	0.43+ - 5.16+	Only encountered in BH101 to BH103. Base not proven

5.2 Hardstanding and Subbase

Asphalt was encountered at ground level in exploratory locations DCS1, DCS2, BH102, HDP1 and HDP2 which were located within the active TT UTC area of the site. The asphalt was found to be 0.05m thick in DCS1 and 0.30m in DCS2.

Underlying the asphalt surfacing was a granular layer considered to represent subbase type material, which was proven to depths of between 0.20m and 0.50m bgl. In DCS1 the subbase type material comprised a layer of light grey gravel of concrete and asphalt overlying a layer of dark pinkish grey gravel of igneous stone. In DCS2 this material comprised dark grey brown slightly sandy slightly clayey gravel and cobbles of brick, concrete, asphalt and quartzite. In HDP1 and HDP2

this material was found to comprised grey sand slightly clayey gravel of limestone and in BH102 this material comprised grey very gravelly slightly clayey sand with gravel of sandstone.

5.3 Topsoil / Made Ground

Material deemed to represent Topsoil/Made Ground was encountered from ground level in DCS4 and BH101, which were both located in a small area of soft landscaping within the active TT UTC area of the site. This material was proven to a depth of 0.25m and 0.20m bgl respectively and comprised soft brown and dark brown slightly sandy slightly gravelly clay with rare cobbles and very gravelly very clayey sand. The gravel was fine to coarse subangular to subrounded sandstone, concrete, quartzite and wood and the cobbles were subangular to subrounded concrete. Frequent rootlets were also noted close to the surface. It is considered that this could represent a previously placed cover layer installed as part of the development of the TT UTC campus.

5.4 Made Ground

Made Ground was encountered in all exploratory hole locations from depths of between ground level to 0.20m bgl to depths of between 1.00m and 3.40m bgl, where the base was proven. The base of the Made Ground was however not proven within eleven of the exploratory holes with either the holes terminating on obstructions at shallow depths within the Made Ground (DCS3, DCS5, HDP103 and HDP104), terminating at shallow depths as they were for obtaining samples for chemical testing only (AS1 to AS4, HDP101 and HDP102) or due to the depth of the Made Ground and limitations on site (TP5).

Trial pits AS1 to AS4 and HDP101 to HDP104 were for shallow sampling only and therefore only penetrated to depths of between 0.10m and 1.20m bgl. The Made Ground at these locations was encountered from ground level and generally comprised dark brown and dark greyish brown gravelly to very gravelly occasionally clayey to very clayey medium to coarse sand, with gravel of fine to coarse angular to subrounded brick, chert, concrete and rare ceramics fragments.

At locations DCS3, DCS5, HDP103 and HDP104 obstructions were encountered at depths of between 0.20m and 0.60m bgl within the Made Ground. The obstructions were unable to be removed to enable the boreholes or hand dug pits to be progressed, with the obstruction in DCS3 also having been unable to be removed using an excavator. The obstructions were noted to comprised concrete in DCS3 and concrete and brick in DCS5. HDP103 and HDP104 were only noted to be terminated due to the presence of hard strata which was unable to be excavated. The presence of these obstructions highlights the potential for further obstructions to be present beneath the site associated with the former brewery.

Where fully investigated the Made Ground was noted to be predominantly granular in natural with localised area cohesive material. The granular Made Ground generally comprised dark pinkish grey and light to dark grey slightly sandy slightly clayey gravel with gravel of fine to coarse subangular to subrounded quartzite, concrete, igneous stone and rare brick and brown and dark greyish brown clayey gravel medium to coarse sand with rare to occasional cobbles and gravel of fine to coarse subangular to subrounded asphalt, quartzite, brick, concrete, charcoal and chert. The cobbles were angular to subrounded brick and concrete. Within the trial

pits (TP1 to TP5) occasional boulders of concrete were also noted to be present in the Made Ground at varying depths.

In DCS2 a layer of dark grey slightly gravelly fine to coarse sand, considered likely to be Pulverised Fuel Ash (PFA) was present between 0.50m and 1.80m bgl.

Cohesive Made Ground was encountered in DCS1, DCS4, TP2, BH102 and TP102 at varying depths and comprised soft to firm dark greyish black slight gravelly slightly sandy clay with rare cobbles, firm to stiff light greyish brown slightly sandy gravelly clay with rare to occasional cobbles and firm to stiff reddish brown sandy gravelly silty clay with frequent cobbles of concrete and brick. The gravel generally comprised fine to coarse subangular to subrounded brick, concrete, chert, quartzite, limestone, sandstone, charcoal and rare slate.

Eleven Particle Size Distribution (PSD) test was undertaken on the granular Made Ground from across the site and one was undertaken from the cohesive Made Ground encountered in TP102 at 0.80m to 1.00m bgl. The results are summarised in the table below:

Location	Depth (m bgl)	Sample Proportion (%)			
		Fines (Clay and Silt)	Sand	Gravel	Cobbles
BH101	0.05	21.2	54.2	24.6	0
BH101	0.20	7.8	23.9	54.5	13.8
BH101	1.20	16	29.7	40.8	13.5
BH102	0.50	14.1	26.8	59.1	0
BH103	1.00	6.3 (clay) 13.5 (silt)	53.6	26.6	0
BH103	1.20	15.4 (clay) 10 (silt)	60.9	13.7	0
HDP101	0.50	13.8	33.6	46.7	5.9
HDP101	1.00	25.9	45.4	12.7	16
HDP102	0.50	10.1	27	54.2	8.7
TP101	0.50	24.1	37.9	33.4	4.6
TP101	2.00	20.4	32.2	39.7	7.7
TP102	0.80	44.1	47.2	8.7	0

These results generally confirm the field descriptions of the Made Ground encountered.

Six Standard Penetration Tests (SPT) were undertaken in Made Ground at depths of between 1.20m and 2.00m bgl and recorded SPT ‘N’ values of between N=4 and N=46 (very loose to dense). In addition, one SPT test ‘refused’, with 50 blows for 245mm penetration (extrapolated to N=61), and another recorded an N value of N=46 which are both considered likely to be a result of a cobble or obstruction within the borehole. These results highlight the general variability of the Made Ground present beneath the site, together with the likely presence of obstructions.

5.5 Glacial Till

Strata deem to be Glacial Till was encountered in thirteen of the exploratory holes (DCS1, DCS2, DCS4, TP1 to TP5, BH101 to BH103, TP101 and TP102) from beneath the Made Ground to depths of between 2.10m and 9.00m bgl. Only three of the thirteen exploratory holes prove the base of the Glacial Till (BH101 to BH103), with the base depths recorded between 7.70m and 9.00m bgl.

The Glacial Till was encountered as both granular and cohesive deposits, with the granular material being limited to the northwest corner of the site within TP1, TP2 and TP101, and the cohesive material being encountered across the remainder of the site. The granular Glacial Till (TP1, TP2 and TP101) generally comprised orangish and reddish brown occasionally brownish grey clay/silty gravelly to very gravelly fine to coarse sand. In TP2 frequent gravel and cobble sized pockets of firm to stiff sandy gravelly clay were also noted. The gravel generally comprised fine to coarse subangular to subrounded quartzite, chert and sandstone.

The cohesive Glacial Till (DCS1, DCS2, DCS4, TP3 to TP5, BH101 to BH103 and TP102) comprised locally initially soft, generally firm, locally becoming stiff dark orangish brown and dark reddish brown occasionally mottled grey slightly gravelly to gravelly occasionally sandy clay. The gravel comprised fine to coarse subangular to subrounded quartzite, chert, sandstone and mudstone.

Eight Atterberg limit tests were carried out on samples of the cohesive Glacial Till from depths of between 1.00m and 6.90m bgl. The results indicate corrected plasticity index valves of 10% and 15%, indicating the materials to be of low shrinkability as defined by NHBC standards. Plastic limits of 12% and 22%, liquid limits of 25% and 36%. Natural moisture contents of 12% and 19.8% were also recorded. This suggests the material to be clay of low to intermediate plasticity.

Seven Particle Size Distribution (PSD) test was undertaken on the cohesive Glacial Till and two were undertaken on granular Glacial Till (BH102 at 6.50m bgl and TP101 at 3.50m bgl). The results are summarised in the table below:

Location	Depth (m bgl)	Sample Proportion (%)			
		Fines (Clay and Silt)	Sand	Gravel	Cobbles
BH101	3.00	16.6 (clay) 31.7 (silt)	44.9	6.8	0
BH101	8.00	53.3	41.1	5.6	0
BH102	3.00	18.5 (clay) 29.8 (silt)	38.2	13.5	0
BH102	5.00	22 (clay) 34.3 (silt)	36.8	6.9	0
BH102	6.50	11.1	85.1	3.8	0
BH103	3.00	22.2 (clay) 34.9 (silt)	36.8	6.1	0
BH103	5.00	22 (clay) 34.7 (silt)	39.4	3.9	0
TP101	3.50	9.7 (clay) 12.2 (silt)	46.4	31.7	0
TP102	1.30	15.6 (clay) 22.2 (silt)	47.9	14.3	0

These results generally confirm the field descriptions for this stratum.

Standard Penetration Tests were undertaken in cohesive Glacial Till at depths of between 2.00m and 5.00m bgl and recorded SPT 'N' values of between N=8 and N=32, indicating these materials to be of low/medium to high strength with approximate undrained shear strength of c.48 to 190kN/m^2, using Stroud's correlation and assuming a f_1 value of 6 based on a PI of between 10-15%. A SPT N value against depth plot is included in Appendix A and shows a general increasing trend with depth up to between 3-4m bgl, below which in DCS2 there is noted to be a slight decreasing trend.

5.6 Clent Formation and Enville Formation

Strata deem to be the Clent Formation and Enville Formation was encountered in three of the Soil Engineering exploratory holes (BH101 to BH103) from beneath the Glacial Till to depths of between 8.43m and 14.16m bgl, however, the base of this stratum was not proven with each of the three boreholes terminating at the scheduled depths.

Competent rock strength strata of the Clent Formation and Enville Formation was found to directly underlies the Glacial Till in each of the three boreholes with not initial weathered horizon having been identified. The competent rock strength strata comprised interbedded sandstones and mudstones with the strata typically initially being encountered as a very weak to weak becoming moderately strong orange brown and red brown fine to medium grained sandstone. Beneath the initial sandstone layer, the strata was noted to be interbedded with beds of weak reddish brown locally grey silty micaceous mudstone and moderately strong reddish brown locally light grey sandstone. Within the mudstone beds occasional thin (c. 100mm to 150mm) layers of firm and stiff clay and sandstone were noted.

A summary of the rock core detail is given in the table below and demonstrates the variability in core recovery within the boreholes. BH103 was not extended by rotary core follow on and therefore no rock core detail is available.

Borehole	Range of TCR (%)	Range of SCR (%)	Range of RQD (%)	Range of average If (mm)	Comments
BH101	70 - 100	0 - 76	0 - 76	60 to 300	A layer at 11.16m to 11.19m bgl was noted to be soft clay. Recovery between 11.72m to 12.06m bgl noted to be mudstone recovered as gravel. Multiple layers between 12.26m and 13.99m bgl are noted to be firm to stiff clay.
BH102	90 - 100	0 - 97	0 - 76	80 to 110	Multiple layers between 9.94m and 10.57m bgl are noted as firm clay. Zone of assumed core loss are noted at 8.15m to 8.20m bgl, 9.65m to 9.70m bgl and 11.15m to 11.20m bgl.

Key
TCR – Total Core Recovery
SCR – Solid Core Recovery
RQD – Rock Quality Designation
IF- Fracture Spacing

One Standard Penetration Test was undertaken in granular Glacial Till/Possible Clent Formation and Enville Formation in BH102 at a depth of 6.50m bgl and

recorded and SPT 'N' value of 100 indicating the material to be very dense or nearing rock strength.

SPT N values recorded in the weathered becoming rock strength strata ranged between N=27 and N>100.

5.7 Groundwater

Groundwater strikes were encountered during drilling/excavation within the following exploratory locations:

Exploratory Location	Depth of Water Strike (m bgl)	Stratum	Comments
DCS1	2.70	Glacial Till - Cohesive	-
DCS2	1.70	Made Ground - Granular	-
DCS4	3.10	Glacial Till - Cohesive	Rose to 2.10m bgl.
TP1	2.80	Glacial Till - Granular	Seepage.
TP2	2.00	Glacial Till - Granular	Seepage.
TP3	2.50	Glacial Till - Cohesive	Seepage.
TP4	3.00	Glacial Till - Cohesive	Seepage.
BH101	9.45	Clent Formation and Enville Formation - Granular	Rose to 7.50m bgl.
BH103	8.10	Clent Formation and Enville Formation - Granular	Rose to 6.40m bgl.
TP101	3.40	Glacial Till - Granular	-

Groundwater levels in borehole installations (DCS1, DCS2 and BH101) were recorded during the four subsequent monitoring visits undertaken between the 17th December 2020 and 26th January 2021. DCS1 installed at shallow depth within the Made Ground was recorded as dry on three of the four return visits, with a water level of 1.23m bgl having been recorded on the second visit. Water levels were recorded in DCS2 at greater depth within the Made Ground between 1.67m and 1.72m bgl, suggesting the presence of possible perched water within the Made Ground.

Groundwater level monitoring of the Soil Engineering standpipes, recorded groundwater levels of between 1.19m and 1.98m bgl in BH101 which was installed within both the Made Ground and bedrock and 5.88m and 6.17m bgl in BH102, which was installed within the bedrock only. The water levels recorded in BH101, seem to confirm the potential for perched water to be present within the Made Ground, whereas the groundwater measured in BH102 appears to be at a greater depth within the natural strata.

5.8 Contamination

No visual or olfactory evidence of any gross contamination was noted in any of the exploratory holes. However, deep Made Ground was recorded across the site which was noted to contain much anthropogenic material, including brick, concrete,

charcoal, rare china fragments, rare metal (rebar), rare plastic and rare glass. Frequent cobbles and boulders of concrete and brick were also recorded.

As part of the Applied Geology investigation, selected samples of Made Ground were screened using a photo ionisation detector (PID) to determine the presence of volatile organic compounds (VOC's). The screening typically returned results of between <0.1ppm (the limit of detection) to 0.7ppm, with one result from DCS2 at 1.00m bgl recording a concentration of 4.7ppm. These results are considered to be negligible and of limited significance.

5.9 Soil Gas

The results of the ground gas monitoring undertaken as part of this investigation and the Soil Engineering investigation, comprising a total of ten visits between the 20th May 2020 and the 26th January 2021, have recorded methane concentrations below the limit of detection (<0.1%) and carbon dioxide concentrations of between <0.1% (limit of detection) and 2.7%. Oxygen concentrations were recorded between 15.0% (slightly depleted) and 20.2% (near atmospheric).

As part of the ground gas monitoring undertaken by Applied Geology, average three-minute flow rates were recorded, with rates of <0.1l/hr (limit of detection) recorded during all of the return monitoring visits within all of the monitoring standpipes. Gas flow rates were also recorded as part of the Soil Engineering monitoring, however, it is not known whether these represent three-minute average flow rates or peak flow rates. The maximum flow rate recorded as part of the Soil Engineering monitoring was 0.5l/hr.

During the Applied Geology monitoring, standpipes were also screened using a PID to determine the presence of VOCs and recorded concentrations of between <0.1ppm (the limit of detection) and 0.7ppm, which are considered negligible.

Based on the highest average three-minute flow rate (taken as 0.1l/hr based on the Applied Geology monitoring data), combined with the maximum methane (taken as 0.1%) and carbon dioxide (2.7%), gas screening values (GSVs) have been calculated in accordance with CIRIA C665, as 0.0001l/hr for methane and 0.0027l/hr for carbon dioxide. In comparison, based on the maximum flow rate recorded as part of the Soil Engineering monitoring of 0.5l/hr and using the above maximum values, GSVs of 0.0005l/hr for methane and 0.0135l/hr for cardon dioxide has been calculated.

6.0 GEOENVIRONMENTAL ASSESSMENT

6.1 Human Health Risk Assessment

The results of the chemical testing on soils have been assessed as described in Appendix F, with specific details as follows:

- Proposed end-use – Extension to the existing college site area, to include a new classroom block, sports hall, all-weather sports pitches and car parking;
- Screening criteria – Public Open Space - Residential, assuming 2.5% SOM;
- Assuming a single dataset based on the size of the site, the site's history, current land-use and the proposed redevelopment.

The site is currently part of the wider TT UTC and will remain so on completion. Given that there are no generic published screening criteria for a college and the proposals for the site, conservative screening criteria for Public Open Space - Residential has been used to inform the assessment. To assess the indoor inhalation risk, volatile compounds have been compared to residential without plant uptake as an initial screen.

A spreadsheet summarising the laboratory results for soil testing and relevant screening values for the dataset are presented in Appendix E. For determinands that have been found to exceed screening values, the following table summarises the individual results, the corresponding screening values and the number of exceedances. In respect of benzo(a)pyrene and other genotoxic PAHs, various PAH ratios have been plotted and compared against data from the Culp et al study and found to be within the same range, therefore use of the surrogate marker approach is justified.

Contaminant	No of samples tested	Concentration Range (mg/kg)	Screening Value (mg/kg)	No. of exceedances
Arsenic	18	7.6 – 170	79	2
Asbestos	25	N/A	Detected	3

The table above identifies exceedances of Arsenic and asbestos, all of the remaining determinants were recorded below the relevant screening values, including all PAHs, TPH and VOCs.

Exceedances of arsenic were recorded in two of the 18 samples tested. These relate to a sample from DCS2 at 1.00m-1.10m bgl with a concentration of 130mg/kg and a sample from HDP101 at 1.00m bgl with a concentration of 170mg/kg, compared to a screening value of 79mg/kg. The sample from DCS2 was noted to be Made Ground possible pulverised fuel ash and HDP101 was noted to be granular (sand) Made Ground. Both of the samples where arsenic exceedances were recorded where noted to be within the active TT UTC section of the site, beneath the current sports court and car parking at depths which are unlikely to be come into contact with end users or generate dust. In addition, the screening values used in this assessment are likely to be conservative, and when compared to the screening value for commercial/industrial end use of 640mg/kg, these concentrations are noted to be well below this value.

Low level concentrations of TPH were detected within the Made Ground across the site, with total TPH concentrations ranging between below the limit of detection, in seven of the fifteen samples tested, up to 370mg/kg, which was recorded in a sample from TP102 at 0.80m bgl. Where low level concentration were recorded, these are all noted to be well below the relevant human health screening values for a residential without plant uptake scenario. The presence of these low-level concentrations are compatible with the known history of the site as having fuel storage on site, but suggests there to be no significant impact resulting from these historic features.

VOCs were tested for in a total of twelve samples. Of these samples all concentrations were noted to be well below the relevant screening values.

Asbestos screening of the twenty-five samples tested detected the presence of asbestos fibres in three samples. These were identified as TP3 at 1.50m bgl, TP4 at 0.40m bgl and TP6 at 0.60m bgl. In TP3 the asbestos was identified as chrysotile, in TP4 it was identified as amosite and in TP6 it was identified as both chrysotile and amosite. Quantification of the asbestos within each sample was recorded at <0.001% (below the limit of quantification), which can be considered representative of background concentration in urban environments. It is noted that locations TP3 and TP4 are likely to be beneath the proposed sports hall or surrounding hardstanding, however, location TP6 may be within the perimeter soft landscaping around the proposed all whether sports pitch.

Based on the results, together with the limited amount of soft landscaping within the proposed development, it is considered that the site generally presents a low risk to human health receptors. The only exception to this would be within the limited areas of proposed soft landscaping, where due to the presence of localised elevated arsenic and asbestos having been identified within the Made Ground soils during both this investigation and many of the past investigations, there is considered to be a medium risk to human health receptors. Therefore, within areas of proposed soft landscaping some basic remedial actions are considered to be necessary in order to break the pathway between the source (arsenic and asbestos) and future receptors. This ties in with the recommendations made within the previous reports for the use of cover layers in areas of soft landscaping, however, based on the two boreholes drilled within areas of existing soft landscaping around TT UTC site, only 200mm of topsoil type material was proven, which does not appear to comply with previous recommendations.

6.2 Controlled Waters Risk Assessment

The following Controlled Waters Receptors have been identified on or near the site:

- Groundwater within the Glacial Till (Secondary Undifferentiated Aquifer); and
- Groundwater within more permeable strata of the Clent Formation and Enville Formation (Secondary A Aquifer).

The potential for pollutant linkages associated with leaching and vertical migration from impacted soils has therefore been semi-quantitatively assessed using the results of the soil leachate and groundwater analysis detailed below:

Leachate Testing

Nine soil samples were analysed to examine their metal and PAH leaching potential, with seven also having been analysed for the leaching potential of TPH and VOCs. The results are compared directly to the Controlled Waters screening values based on the UK Drinking Water Standards 2010 (UK DWS). In the absence of a relevant UK DWS, Water Framework Directive Environmental Standards (WFD ES) or the laboratory limit of detection has been used. The results are tabulated and are presented in Appendix E. For determinands that have been found to exceed screening values, the following table summarises the individual results, the corresponding screening values and the number of exceedances.

Contaminant	No of samples tested	Concentration Range (µg/l)	Screening Value (µg/l)	No. of exceedances
Arsenic	9	2.3 - 22	10	3
Chromium (Hex)	9	20 - 29	20*	1
Selenium	9	1.1 - 14	10	1
Boron	9	21 - 2000	1000	4
Sulphate	9	13.3 - 970	250	4
Phenanthrene	9	0.01 -7.9	0.01*	1
Anthracene	9	0.01 – 0.9	0.01*	1
Fluoranthene	9	0.01 – 9.2	0.01*	1
Pyrene	9	0.01 – 9.6	0.01*	1

*Detection limit

The table above identifies a number of contaminants that have leached at concentration which exceed the relevant screening value. Three exceedances of arsenic have been detected which relate to soil samples collected from BH102 at 1.00m bgl with a concentration of 11µg/l, TP101 at 0.50m bgl with a concentration of 11µg/l and BH101 at 1.00m bgl with a concentration of 22µg/l. All of these are noted to be above the UK DWS of 10µg/l, however, the concentrations recorded in BH102 and TP101 are considered to be very marginal and therefore not of concern.

The exceedance of hexavalent chromium was recorded in a sample collected from TP101 at 1.50m bgl with a concentration of 29µg/l compared to a detection limit of 20µg/l. It is noted however, that within the same sample the total chromium was only recorded at 21µg/l and trivalent chromium was recorded at <20µg/l (below the limit of detection). This suggests a potential erroneous result for hexavalent chromium, with this result being unable to be queried with the reporting laboratory as the result is from the previous Soil Engineering investigation.

The exceedance of selenium was recorded in a sample collected from HDP102 at 0.5m bgl with a concentration of 14µg/l compared to a screening value of 10µg/l. This exceedance is considered to be marginal and therefore is not considered to warrant further action in the context of the proposed development as selenium is not considered to be hazardous.

Four exceedance of boron were recorded in samples collected from BH103 at 1.00m bgl with a concentration of 1400µg/l, BH102 at 1.00m bgl with a concentration of 1200µg/l, TP101 at 0.50m bgl with a concentration of 1800µg/l and TP101 at 1.50m bgl with a concentration of 2000µg/l, compared to a screening value of 1000µg/l.

Sulphate concentrations were found to exceed the screening value in four samples with the exceeding concentrations ranging between 290mg/l and 970mg/l, compared to a screening value of 250mg/l. However, sulphates are mainly considered to be a risk to buried concrete and not of significant concern to Controlled Water receptors.

The exceedances of the PAHs Phenanthrene, Anthracene, Fluoranthene and Pyrene were all detected within the same sample taken from BH101 at 1.00m bgl

with the exceedances ranging between 0.90µg/l and 9.6µg/l compared to the detection limit of 0.01µg/l.

All TPH and VOC concentrations were recorded below the limit of detection, these have therefore been omitted from the summary table for clarity.

Groundwater

Samples of groundwater were obtained from the boreholes BH101 and BH102 on two occasions and the testing has been compared directly to UK Drinking Water Standards 2010 (UK DWS). and. In the absence of a relevant standard, the Water Framework Directive Environmental Standards (WFD ES) or the laboratory limit of detection has been used. The results are tabulated and presented in Appendix E.

No exceedances were recorded in the groundwater samples tested with the exception of sulphate which recorded two elevated concentrations of 1200mg/l compared to the UK DWS of 250mg/l.

All of the determinants which recorded exceedances within the leachate testing, with the exception of the sulphate, have returned concentrations within the groundwater samples of less that the screening values. This is noted to include the hazardous determinants of arsenic and the PAHs.

All TPH and VOC concentrations were recorded below the limit of detection, these have therefore been omitted from the summary table for clarity.

Conclusion

Whilst localised areas of elevated arsenic were identified by the soil and leachate testing and elevated concentrations of Boron and PAHs were identified by the leachate testing, the testing undertake on samples of the groundwater collected from the Made Ground in BH101 and natural Clent Formation and Enville Formation in BH102 suggest that these determinants are not leaching into the underlying groundwater at concentrations of concern.

With regards to the elevated sulphates detected in the groundwater, it is considered that these are likely to be a result of both the Made Ground present at the site, as well as being regionally elevated due to the heavy industrial use of the area of Wolverhampton and/or as a function of natural background geology. The effect of high sulphate in the groundwater is predominantly an issue for buried concrete design and is discussed in more detail in Section 8.3.

In addition to the above, the site is not located within a principal aquifer or within a groundwater source protections zone. Also, in the context of the proposed development, it is considered very unlikely that infiltrating waters could in the future penetrate beneath much of the site, due to the presence of hardstanding across much of the site and only limited soft landscaping, such that they could pick up contaminants by leaching.

Based on the context of the site and the proposed redevelopment, there is considered to be a low risk to Controlled Waters and no further actions required.

6.3 Disposal of Soil Arisings

General comments regarding the procedures for the assessment of waste soil for off-site disposal purposes is included in Appendix F.

Made Ground soils would generally be classified as non-hazardous, however, soils containing low level concentrations of TPH and arsenic, for example soils in the vicinity of DCS2 and HDP101 have been identified on site. At the concentrations currently detected, these soils are unlikely to be determined as hazardous waste, however, the presence of these contaminants could indicate their presence in higher concentrations elsewhere across the site. It is therefore likely that additional testing of the actual waste stream (with regards to the Made Ground only) will be required by the receiving facility to confirm the materials classification. Should any soils be classified as hazardous waste, then Hazardous WAC testing would likely be required for disposal of these materials if sent to landfill. This would need to be discussed with the receiving landfill and the results of this investigation provided. Careful excavation and stockpiling of the Made Ground soils being disposed of at landfill could be undertaken prior to additional sampling in order to minimise offsite disposal costs.

Analysis confirmed that asbestos fibres were present within three of the twenty-five samples screened across the site (TP3, TP4 and TP6). However, the percentage of asbestos for all three samples was less than 0.1% by weight and therefore the waste can be disposed of within a non-hazardous waste landfill. However, there remains the potential for further, possibly elevated concentrations of asbestos fibres to be present within the Made Ground soils across the site, which could surpass the 0.1% threshold.

It is likely that the natural Glacial Till and underlying Clent Formation and Enville Formation would be classified as inert waste, if sent for disposal. Inert Waste Acceptance Criteria (WAC) testing was undertaken on a sample of the Glacial Till from TP2 at 2.00m bgl and the results indicate the material to be within inert waste limits. Further Inert WAC testing may be required in order to dispose of the natural soils.

No topsoil was encountered across the site. Therefore, it is assumed that a clean imported topsoil will be required for the limited areas of soft landscaping around the proposed development.

6.4 Conclusions and Recommendations

Concentrations of Arsenic above the conservative public open space (residential) screening criteria have been locally identified within the near surface, predominantly granular Made Ground soils during the investigation. However, these concentrations did not exceed the arguably more applicable (but less conservative) commercial/industrial screening values. Arsenic was also identified within the soil leachate testing. However, it should be noted that soil leachate testing can be relatively aggressive as compared to natural conditions and can over estimate the amount of leaching that will actually occur. Arsenic was not identified at elevated concentrations in the groundwater testing undertaken.

Loose fibres of amosite and chrysotile asbestos were identified locally across the site. Whilst the maximum identified concentration of free asbestos fibres (0.001%)

only has been recorded at the laboratory detection limit of 0.001%, there remains the potential for further elevated concentrations of asbestos fibres to be present in the Made Ground. Evidence for the potential for further elevated concentrations of asbestos fibres is also gained from the previous phases of ground investigation and remediation of the site and wider area, where asbestos fibres and asbestos containing materials were also identified to be present both at the site and within the Made Ground soils. The presence of asbestos fibres within the Made Ground soils would need to be included within any information provided to contractors to ensure appropriate measure and PPE are provided and in place.

Based on the above assessment, it is considered that the site generally presents a low risk to human health, especially given the proposed development plans with limited soft landscaping. It is considered that some remedial actions are warranted for this development with respect to human health in the areas of limited soft landscaping and that a 'Discover Strategy' should be in place during the groundworks element of the development to ensure that should any previously unidentified contamination be encountered it is appropriately dealt with.

Remedial actions would comprise the installation of a clean cover layer within the limited areas of soft landscaping being proposed as part of this development. This, together with the hardstanding across the remainder of the site, would break the pathway between identified contaminants within the Made Ground and future end users. The absence of any recorded topsoil on site, would also dictate the need to import 'clean' topsoil to site to be placed within areas of proposed soft landscaping. The thickness of any cover layer would need to be determined and formalised as part of the production of a Remedial Strategy/Verification Plan. Subsequent independent validation of the cover layers and a Validation Report would also need to be produced.

The site is known to have historically had above and below ground fuel tanks present. Whilst it is outlined in the previous reports that these features were to be removed and the works appropriately validated, from the review of the reports provided, it has not been possible to prove that these works were undertaken and there therefore remains the potential for remnant yet unidentified hydrocarbon contamination or below ground structures (tanks) to be present. It is confirmed from the development of the site and the site walkover that any above ground features (tanks) have been removed. A 'Discovery Strategy' is therefore recommended to be included within any Remedial Strategy/Verification Plan produced to outline the actions required should any previously unidentified contamination or below ground structures be encountered during the development.

With regards to controlled waters, unless any previously unidentified contamination is encountered during the development, it is considered that further assessment or remedial actions are not warranted for this redevelopment. Should any previously unidentified contamination be encountered then the advice of a specialist geoenvironmental consultant should be sort and further testing and assessment would likely be required.

Elevated sulphate has been recorded in the groundwater sampled from the site. These are considered likely to be associated with the heavy industrial background of the wider Wolverhampton area and as a result of background geology and not considered to be from an onsite source. This is not considered to pose a significant risk to end users or Controlled Waters.

Issues with respect to ground gas and hydrocarbon vapours and potential effects of contaminants on buried concrete and water supply pipework are included below.

7.0 GEOTECHNICAL ASSESSMENT

7.1 General

The proposals for the site comprise an extension to the existing TT UTC campus site to allow for the construction of a three-storey classroom block to the north of the existing TT UTC building, a separate single/two storey sports hall block to be located in the north east corner of the site, a new outdoor all-weather sports pitch and a new area of car parking. It is understood that the Client is looking at a piled foundation solution for the proposed development and that the existing TT UTC building is also piled.

The intrusive investigation identified a sequence of generally deep Made Ground was encountered across the site, up to a depth of 3.40m bgl, overlying Glacial Till which in turn overlies the Clent Formation and Enville Formation. Numerous underground obstructions and cobbles and boulders of concrete and brick were also noted to be present throughout the Made Ground.

During the return monitoring programme, groundwater was present at depths ranging from 1.19m and 1.98m bgl within the shallow standpipes and between 5.88m and 6.17m bgl within the deeper standpipe installed within BH102. A more detailed discussion of groundwater is presented in section 5.7.

7.2 Foundation Design

Based on the likely moderate to high column loads anticipated for the proposed structures, the presence of highly variable depths of Made Ground up to 3.40m deep, together with the presence of variable low to high strength Glacial Till, traditional spread foundations placed in the Glacial Till are not considered suitable at the site. It is therefore considered that a piled foundation solution will be necessary to support the proposed structures. Shallow foundations placed within natural strata where present at shallow depths may be feasible for any lightly loaded structures.

The use of bored or CFA piles are likely to prove suitable for the site, however, it is recommended that the advice of a specialist piling contractor is sought with regard to detailed design, including suitable pile diameters, capacities and confirmation of suitable pile types. An appropriately designed working platform will also need to be designed and constructed.

Allowances will need to be made for the appropriate management and disposal of any soil arisings associated with the construction of the piles through the Made Ground, Glacial Till and deeper Clent Formation and Enville Formation. There should be particular consideration for the disposal of the Made Ground soils due to the laboratory confirmation of fibres of asbestos within three of the samples tested and asbestos having been identified during the various other previous phases of investigation at the site. Piling operations should take into account loads imposed by piling plant on existing structures such as retaining walls/slopes to ensure that working loads do not exceed safe limits.

Some buried concrete obstructions were encountered across the site during the investigation, together with cobbles and boulders of concrete and brick (masonry). It is also noted from the online aerial imaginary and anecdotal evidence that the north western part of the site was part of an abandoned residential development and that a number of piles were formed across this area. It is likely that other relic foundations, slab structures and utilities may remain in-situ based on the site's historical uses. These will need to be taken into account within any pile design.

Foundations for any lightly loaded structures must be placed below any Made Ground and soft or loose natural materials and should be embedded within the in-situ firm or better clay/silt and medium dense granular Glacial Till. Conventional shallow strip foundation (up to 1m wide) or pad foundations (up to 2m by 2m) designed to the criteria above may adopt a net allowable bearing capacity of 100kN/m^2, based on a shear strength of 50kN/m^2 and traditional calculations as those set out in Tomlinson, whilst restricting settlements to within 25mm.

Reinforcement to shallow foundations should be allowed for to mitigate the potential tensional forces which may develop as a result of differential settlement between the cohesive and granular founding strata should foundations span these materials.

If conditions vary significantly to those described are encountered, specialist geotechnical advice should be sought to make appropriate assessment and recommendations.

7.3 Floor Slab and Gas Protection

Made Ground soils were encountered across the site to depths of between 1.00m and 3.40m bgl. A number of underground obstructions (concrete) and cobbles and boulders were also encountered within the Made Ground beneath the site. It is therefore recommended that suspended ground floor slabs are adopted for the proposed new buildings. Alternative consideration could be given to the removal of below ground obstructions and the use of ground improvement of the deep Made Ground and Glacial Till (such as vibro-stone columns) or the excavation and re-engineering of the Made Ground soils to an engineered specification. Should excavation and re-engineering of the Made Ground be adopted, further geotechnical testing (to confirm the material is suitable for re-use) and the production of an Earthworks Specification will be required. This will also depend to a degree on the level of reprofiling that is required as part of the development.

Based on the proposed development, the ground conditions encountered and the calculated GSVs (discussed in Section 5.9), the site can be characterised as Situation 1 (CIRIA C665). Therefore, ground gas protection measures are not deemed necessary for the proposed development. However, this should be agreed with the Local Authority prior to construction.

The site is not in a radon affected area and radon protection measures are also not required.

7.4 Excavations

In order to facilitate the installation of new services, excavations are envisaged to be in Made Ground. Due to the generally granular nature of the Made Ground these

materials may be prone to some short-term instability/spalling and will likely need to be graded back to a stable angle or trench support should be provided. Trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions. Typically, groundwater strikes were encountered at depths of between 2.00m and 3.00m bgl, in the Glacial Till, as such, significant groundwater ingress is not anticipated in shallow excavations. Some provision for obtaining sump pumping at shallow depths may be required for deeper excavations.

7.5 Pavement Design

Made Ground has been encountered between 1.00m and 3.40m bgl at the site.

Where Made Ground is encountered at formation, it is recommended that pavement design is based on an equilibrium CBR of <2%, subject to proof rolling and removal of soft/organic materials.

It is possible, depending on the level of reprofiling undertaken, that the underlying localised Glacial Till would be present a formation level. Should these be encountered a preliminary equilibrium CBR of value of 3% may be adopted.

Based on the visual descriptions and the laboratory testing, both the Made Ground and the Glacial Till are considered to be frost susceptible and therefore should not be present within 450mm of the pavement surface.

7.6 Buried Concrete and Services

As defined by BRE Special Digest 1, Concrete Aggressive Ground, 2005 the Design Sulphate Class and the Aggressive Chemical Environment for Concrete (ACEC) has been assessed for each of the strata encountered. Following the results of the geotechnical testing, the characteristic values for each stratum and groundwater have been determined and are detailed in the table below:

Strata	Soluble Sulphate (g/l)*1	Total Potential Sulphate (%)	pH	Design Sulphate Class	ACEC*2
Made Ground	0.62	-	8.5	DS-2	AC-1s
Glacial Till	0.63	0.6	8.4	DS-2	AC-2
Groundwater	1.2	-	8.2	DS-2	AC-2

*1: Characteristic values are rounded to the nearest 0.01g/l.
*2: Assumes static groundwater for shallow foundations and mobile groundwater at depth.
*3. In a data set less than 5 samples, the highest sulphate value and lowest pH is taken as the characteristic value. In a data set of between 5 and 9 the mean of the highest two sulphate test results has been taken as the characteristic value. In a data set in excess of 10, the mean of the highest 20% has been taken as the characteristic value.

Thirteen samples of Made Ground were tested for soluble sulphate and the mean of highest 20% of results have been taken as the characteristic value. The results indicate that a Design Classification of DS-2 AC-1s is required for concrete constructed within the Made Ground.

Four samples of Glacial Till were also tested and these recorded a highest soluble sulphate result of 0.63g/l and a pH of 8.4 indicating that a Design Classification of DS-2 and AC-2 is suitable for concrete constructed within these deposits.

Four groundwater samples, two obtained within the Glacial Till and two obtained within the Clent Formation and Enville Formation were tested and recorded soluble sulphates of up to 1.2g/l. In groundwater testing, the highest determined sulphate of samples is taken as the characteristic value, as such, the Design Sulphate Class is DS-2 and AC-2.

Further reference should be made to BRE Special Digest 1 for requirements in respect of types of cement and aggregate to be used and variations in type of concrete construction.

At the time of this investigation, the future routes of water supply pipes had not been established, hence the investigation and sampling strategy may not be fully compliant with UKWIR recommendations. Consequently, a targeted investigation and specific sampling/analytical strategy may be required at a later date once the route(s) of the supply pipe(s) are known. It is recommended that the relevant water supply company be contacted at an early stage to confirm its requirements for assessment.

7.7 Conclusions and Recommendations

Based on the likely moderate to high column loads anticipated for the proposed structures and the presence of significant variable thicknesses of Made Ground across the site, it is recommended that a piled foundation solution is adopted.

Based on the thickness of Made Ground encountered across the site (1.00m to 3.40m), it is recommended that suspended floor slabs are adopted for the proposed new buildings. Alternatively, consideration could be given to ground improvement or re-engineering of the Made Ground to support the ground floor slab. The presence of potential obstructions within the Made Ground would need to be taken into account within any of the alternative solutions mentioned.

No gas protection measures are considered necessary for the proposed development based on the most recent monitoring results. However, this should be agreed with the Local Authority prior to construction.

For foundations which come into contact with the Made Ground, Glacial Till and groundwater sulphate resisting concrete appropriate to DS-2 and AC-2 conditions will be required.

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GENERAL NOTES

A) The assessment made in this report is based on the site terrain and ground conditions revealed by the various field investigations undertaken and also any other relevant data for the site including previous site investigation reports (if available) and desk study data. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available. It must be recognised that many of the Environmental Searches obtained during the course of the desk study are often lengthy. Applied Geology have, where appropriate and in the interests of simplicity, only reproduced the summary of the searches within the report. A full copy of all the search data is held at the Applied Geology office and is available for inspection if required.

B) The services provided are defined within our proposal and are carried out in line with the terms of appointment between Applied Geology and the Client.

C) Where any data supplied by the Client or other external source, including that from previous site investigations, has been used it has been assumed that the information is correct. No responsibility can be accepted by Applied Geology for inaccuracies within this data.

D) Whilst the report may express an opinion on possible configurations of strata between or beyond the exploratory locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy.

E) Comments on groundwater (and landfill gas) conditions are based on observations made during the course of the present and past investigations or with reference to published data unless otherwise stated. It should be noted, however, that groundwater (and landfill gas) levels vary due to seasonal (or atmospheric conditions) or other effects.

F) The copyright of this report and other plans (and documents prepared by Applied Geology) is owned by Applied Geology and no such report, plan or document may be reproduced, published or adapted without the written consent of Applied Geology. Complete copies of the report may, however, be made and distributed by the Client as an expedient in dealing with matters related to its submission.

G) This report is prepared and written in the context of the proposals stated in the introduction to the report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Applied Geology for re-assessment and if necessary, re-appraisal.

H) The survey was conducted and this report was prepared for the sole internal use and reliance of the Client. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Applied Geology. If an unauthorised third party comes into possession of this report they rely on it at their peril and Applied Geology owes them no duty of care and skill.

I) Ground conditions should be monitored during the construction of the works and the recommendations of the report re-evaluated in the light of this data by the supervising geotechnical or geo-environmental engineers.

J) Unless specifically stated, the investigation has not taken into account the possible effects of mineral extraction.

K) The works performed are not a comprehensive site characterisation and should not be construed as being such.

L) The findings of the geo-environmental risk assessment are based on information obtained from a variety of sources which Applied Geology believe to be correct. Applied Geology cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

M) The report represents the findings and opinions of experienced geo-environmental consultants. Applied Geology does not provide legal advice and the advice of lawyers may be required.

N) Conditions at the site are subject to change from the time of the site inspection.

O) It is possible that researches carried out by Applied Geology, whilst fully appropriate for a phase 1 desk study, failed to indicate the existence of important information sources. Assuming such indicators actually exist, their information could not have been considered in the formulation of Applied Geology findings and opinions.

P) The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, depends on very many factors in addition to geotechnical considerations and hence its evaluation is outside the scope of this report.

Q) Applied Geology operates as a Consultancy and does not operate it's own laboratory for soil testing, this work being sub contracted to known and respected, generally UKAS accredited, laboratories. Applied Geology can therefore not be held responsible for the testing carried out.

LIST OF REFERENCES COMMONLY USED BY APPLIED GEOLOGY IN REPORTS

SECTION/TITLE	AUTHOR/PUBLICATION
LABORATORY TESTING	
BS 1377-1:2016 Method of Test for Soils for Civil Engineering Purposes	BSI
SITE WORK	
Guidelines for Combined Geoenvironmental and Geotechnical Investigations. Issue 2. March 2006.	AGS
BS 5930:2015. Code of Practice for Ground Investigations	BSI
BS 10175:2011 & A1:2013 Code of Practice for the Investigation of Potentially Contaminated Sites	BSI
FOUNDATION DESIGN	
BS EN 1997-1 Eurocode 7 – Geotechnical Design, Part 1. 2004.	BSI
BS EN 1997-2 Eurocode 7 – Geotechnical Design, Part 2. 2007.	BSI
Paper by M. A. Stroud 'The Standard Penetration Test – its Application and Interpretation' within Thomas Telford/ICE book 'Penetration Testing in the UK'. 1989.	Stroud
BRE Special Digest 1: 2005 Third Edition. Concrete in Aggressive Ground	BRE
NHBC Standards, Chapter 4.2: Building Near Trees. 2017.	National House Building Council
Engineering in Chalk (C574). 2002.	CIRIA
Engineering in Mercia Mudstone (C570). 2001.	CIRIA
Engineering in Glacial Till (C504). 1999.	CIRIA
GROUND GAS	
BRE 211 Protecting New Buildings from Radon. 2015.	BRE
BS 8485:2015 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.	BSI
Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present. 4th Ed, 2007	NHBC & RSK Group
Assessing Risks Posed by Hazardous Ground Gases to Buildings. C665. 2007.	CIRIA
Research Bulletin 17. 2012.	CLAIRE
BS 8576:2015 Guidance on Investigations for Ground Gas. Permanent Gases and Volatile Organic Compounds (VOCs)	BSI
Guidance on the Use of Plastic Membranes as VOC Vapour Barriers. C748. 2014.	CIRIA
Remediating and Mitigating Risks from Volatile Organic Compound (VOC) Vapours from Land Affected by Contamination. C716. 2012.	CIRIA
GROUNDWATER	
BRE DG 365: Soakaway Design. 2016.	BRE
BS EN ISO 22282-2:2012 Geotechnical Investigation and Testing – Geohydraulic Testing, Part 2. 2012.	BSI
CONTAMINATION ASPECTS (Soil & Groundwater)	
Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance. 2012.	DEFRA
Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination - SP1010. 2014.	DEFRA
HPA Contaminated Land Information Sheet – Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons. Version 3. 2010.	HPA
Cover Systems for Land Regeneration. Thickness of Cover Systems for Contaminated Land. 2004. BR465.	AGS/BRE
Development of Generic Assessment Criteria for Assessing Vapour Risk to Human Health from Volatile Contaminants in Groundwater. Version 1.0. February 2017.	SOBRA
BS 3882:2015 Specification for Topsoil	BSI
The LQM/CIEH S4ULs for Human Health Risk Assessment, 2015. S4UL3159.	Chartered Institute of Environmental Health. Land Quality Management.
Generic Assessment Criteria for Human Health Risk Assessment. 2009.	Chartered Institute of Environmental Health. Land Quality Management.
Model Procedures for the Management of Contaminated Land. Contaminated Land Report. 11 September 2004.	DEFRA / Environment Agency
The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. February 2005.	Environment Agency
The Environment Agency's Approach to Groundwater Protection, V1. 2017.	Environment Agency
Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination. 2006.	Environment Agency
Guidance for the Safe Development of Housing on Land Affected by Contamination	NHBC
Sampling Strategies for Contaminated Land. Contaminated Land Research Report no.4. 1994.	DoE
NHBC Standards, Chapter 4.1: Land Quality – Managing Ground Conditions. 2017.	National House Building Council
ATRISK^{soil} Soil Screening Values. 2017.	Atkins
CLEA Software (Version 1.071). 2015.	Environment Agency

The Water Supply (Water Quality) Regulations. 2016.	DWI
Prioritisation & Categorisation Procedure for Sites Which May Be Contaminated (CLR Report No6)	Department of the Environment, Contaminated Land Research Report
Code of Practice for the Investigation & Mitigation of Possible Petroleum-Based Land Contamination. 1993.	The Institute of Petroleum
Piling & Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. 2001.	Environment Agency
DISPOSAL OF SOIL	
Guidance on the Classification and Assessment of Waste. Technical Guidance WM3. 1st Ed. 2015.	SEPA, NIEA, Natural Resources Wales & Environment Agency
Waste Sampling and Testing for Disposal to Landfill. 2013.	Environment Agency
BURIED SERVICES	
Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites. (10/WM/03/21). 2011.	UK Water Industries Research
PAVEMENT DESIGN	
Interim Advice Note 73/06 Rev 1, 2009. Design Guidance for Road Pavement Foundations (Draft HD25)	Highways Agency
PLANNING	
DCLG:2012 National Planning Policy Framework and Practice Guidance	Department for Communities and Local Government
HEALTH & SAFETY ASPECTS	
A Guide for Safe Working on Contaminated Sites (Report 132)	CIRIA
Protection of Workers and the General Public During the Development of Contaminated Land (HSG66)	Health & Safety Executive
Construction (Design & Management) Regulations 2015 (CDM)	Health & Safety Executive
Control of Substances Hazardous to Health Regulations 2002	Health & Safety Executive
Workplace Exposure Limits. EH40/2005	Health & Safety Executive
Trenching Practice. Guidance on Groundwater Control (Report 97)	CIRIA
Control of Groundwater for Temporary Works (Report 113)	CIRIA
Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks. C733. 2014.	CIRIA

APPENDIX A

APPLiED GEOLOGY

Unit 23
Abbey Park
Stareton
Kenilworth
CV8 2LY

Tel: 02476 511822
email: admin@appliedgeology.co.uk

Client:
MORGAN SINDALL CONSTRUCTION & INFRASTRUCTURE LTD

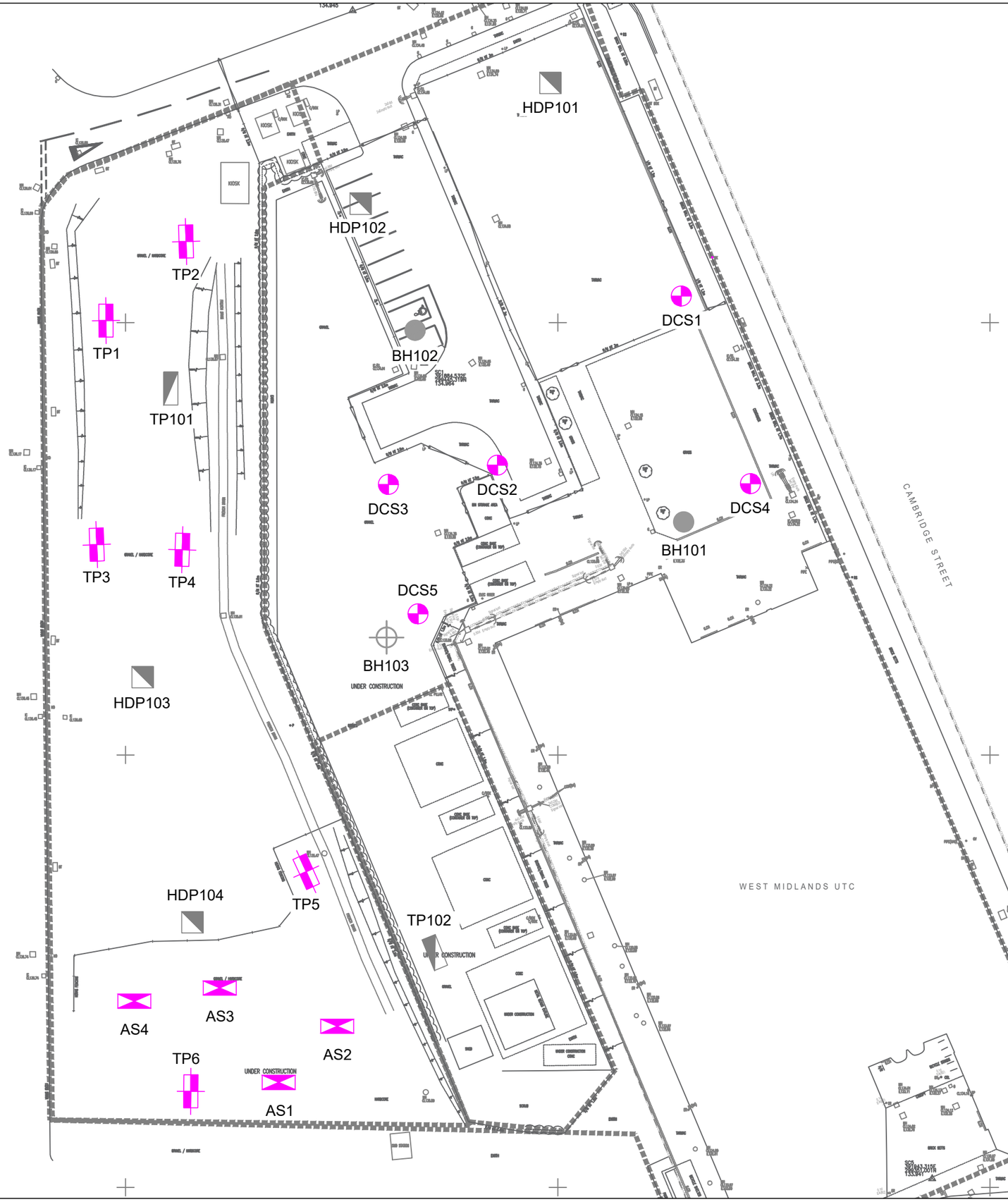
Project:
THOMAS TELFORD UTC, WOLVERHAMPTON

Drawn By:	Checked By:	Paper Size:
JS	GS	A4

Scale:	Date:	NGR:
NTS	02.02.2021	391892 299401

Drawing No:	Revision:
AG3187-20-01	0

Title:
SITE LOCATION PLAN



KEY:

TP1	Trial Pit
DCS2	Driven Continuous Sampling Borehole
AS1	Shallow Trial Pit for Asbestos Sampling
BH101	Cable Percussion Boreholes with Rotary Cored Follow-on (Soil Engineering- May 2020)
BH103	Cable Percussion Boreholes (Soil Engineering- May 2020)
TP101	Trial Pit (Soil Engineering May 2020)
HDP101	Hand Dug Pit (Soil Engineering May 2020)

Drawing based on Malcom Hughes, drawing No: 55003/UG dated 24/02/2020.

APPLIED GEOLOGY

Unit 23
Abbey Park
Stareton
Kenilworth
CV8 2LY

Tel: 02476 511822
email: admin@appliedgeology.co.uk

Client:
MORGAN SINDALL CONSTRUCTION & INFRASTRUCTURE LTD

Project:
THOMAS TELFORD UTC, WOLVERHAMPTON

Title:
EXPLORATORY HOLE LOCATION PLAN

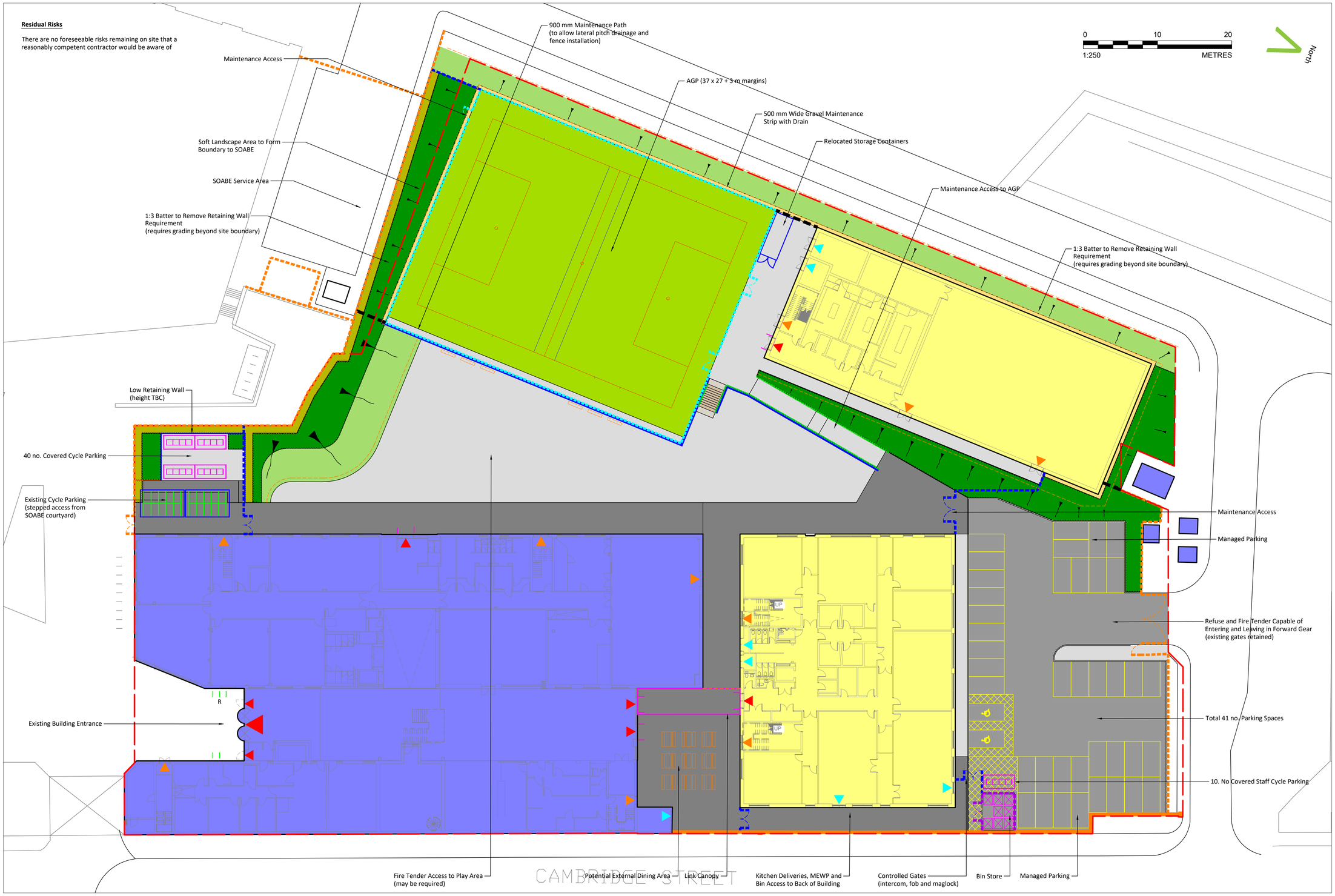
Drawn By:	Checked By:	Paper Size:
FD	GS	A3

Scale:	Date:
1:500	17.12.2020

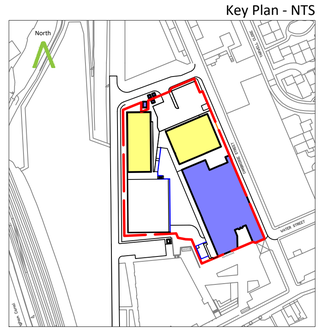
Drawing No:	Revision:
AG3187-20-02	0

Residual Risks

There are no foreseeable risks remaining on site that a reasonably competent contractor would be aware of



Key Plan - NTS



DO NOT CONSTRUCT FROM THIS DRAWING

Drawing References

All drawings prefixed with; UC0030-AJM-EX-XX

1. DR-L-1001 - Site Boundary
2. DR-L-2211 - Landscape Masterplan
3. DR-L-3111 - BB103 Areas - Proposed
4. DR-L-3211 - Security Zones
5. DR-L-3221 - Key Movement
6. DR-L-3231 - Vehicle and Cycle Parking Facilities
7. DR-L-3241 - Maintenance and Emergency Vehicle Access
8. DR-L-4011 - External Materials Samples Board
9. DR-L-4111 - Hard Landscape Layout
10. DR-L-4211 - Street Furniture and Fencing Layout
11. DR-L-5211 - Soft Landscape Layout
12. DR-L-6111 - Site Levels
13. DR-L-6211 - Site Sections
14. DR-L-7211 - Sports Court Layout

Developed Design Deliverable References

1.1a, 1.1b, 1.1d, 2.5a, 2.5e

Drawing Notes

1. Site boundary identified on this drawing is provided by third parties and is interpolated between Ordnance Survey data and topographical survey data.
2. Drawing provided for illustrative purposes only to identify design intent only and is subject to change.
3. Extent of slopes, retaining wall, steps and ramps to be confirmed in line with detailed resolution of site levels and cut and fill balance requirements.
4. Fire tender access requirements to the existing and proposed buildings to be confirmed in line with Building Regulations.

General Notes

1. This drawing is based upon information provided by third parties and as such the accuracy and content cannot be guaranteed.
2. Site boundaries depicted on this drawing reflects the topographical survey and is to be confirmed by the Contracting Authority.
3. Do not scale from this drawing. Use figured dimensions only.

Notes Under CDM

1. The information presented on this drawing has been prepared with regards to the role of the Designer.
2. Where possible the design has taken care to eliminate hazards and reduce risk.
3. This drawing is to be read in conjunction with the Health and Safety File.

Rev.	Description:	Drawn:	Ckd:	Date:
P06	Proposed cycle parking amended; existing fencing updated; existing cycle parking identified	AJM	AM	17.01.21
P05	Trees to SOABE removed	AJM	AM	07.01.21
P04	Trees removed to west; maintenance path to east of AGP; fire doors relocated to north; fence adjusted	AJM	AM	21.12.20
P03	Updated GFP; boundary fence, tree and shrub planting adjusted	AJM	AM	08.12.20
P02	Updated link canopy and fence lines	AJM	AM	01.20.20
P01	First issue for information	AJM	AM	01.12.20

Client:
Morgan Sindall

Project Name:
Thomas Telford UTC

Description:
Landscape Masterplan

Project Number:	Creator:	Date:	Scale @ A1:
20010	AJM	01.12.20	1:250

AJM LANDSCAPE ARCHITECTS
A: Morwick Holl
Mortec Park
York Road
Leeds LS15 4TA
T: 0113 4931446
E: hello@ajmlandscape.uk
W: www.ajmlandscape.uk

Status:	Suitability:	Revision:
FOR INFORMATION	S2	P06

Drawing Title: (UPRN) (Originator) (Zone) (Level) (Type) (Role) Number:
UC0030-AJM-EX-XX-DR-L-2211

Legend

Red Line Boundary

Buildings and Structures

- Retained Buildings
- Proposed Buildings
- Principal/ Secondary Building Access and Egress
- Service Vehicle/ Kitchen and Plant/ Maintenance Access and Egress
- Fire Escape

Hard Landscape Elements

- Proposed Concrete Asphalt Vehicular Grade/ Car Park Grade
- Proposed Concrete Asphalt MEWP Grade / Concrete Bin Store
- Proposed Concrete Asphalt Pedestrian
- Proposed Steps
- Proposed Hazard Warning Paving (corduroy to steps)
- Proposed Artificial Grass
- Proposed Gravel Maintenance Strip

Street Furniture and Equipment

- Existing Cycle Canopy/ External Storage
- Proposed Cycle Shelter
- Existing Site Furniture (R = Relocation/ Provision TBC)
- Proposed Site Furniture (min. provision to meet building regulations)
- Potential Site Furniture (Provision TBC in line with cost plan)

Fences

- Existing Fencing
- Proposed Welded Mesh Boundary Fence (2.4 m high/ combined with wall)
- Proposed Welded Mesh Separation Fence (1.8 m high)
- Proposed Welded Mesh Sports Court Fence (4 m high)
- Proposed Timber Hit and Miss Fence (1.8 m high)

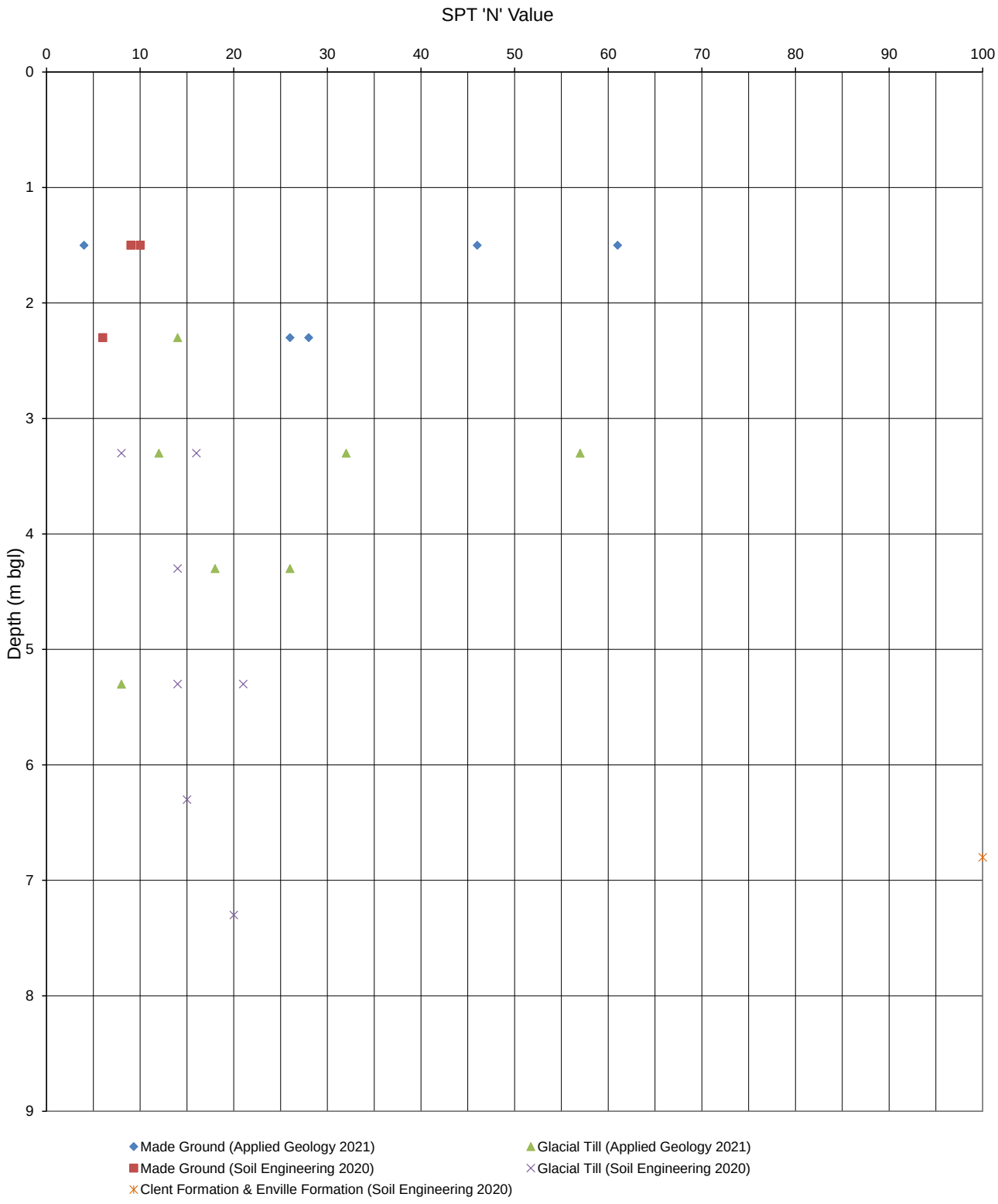
Soft Landscape Elements

- Proposed Ornamental Hedge Planting
- Proposed Ornamental Shrub Planting
- Proposed Amenity Grass

Site Levels

- Existing Retaining Wall
- Proposed Retaining / Bondary Walls
- Proposed Embankments (max. 1:3 gradient)
- Proposed Top/ Bottom of Slope

Uncorrected SPT 'N' Value versus depth



Notes: 1. Uncorrected N values plotted.

2. SPT N vlaues >100 omitted for clarity

Client:	Morgan Sindall Construction & Infrastructure Ltd
Project:	Thomas Telford UTC, Wolverhampton
Project No.	AG3187-20

APPLiED GEOLOGY
Unit 23 Abbey Park, Stareton, Kenilworth, Warwickshire. CV8 2LY
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APPENDIX B

Link to Soil Engineering Report dated June 2020

https://appgeo-my.sharepoint.com/:b:/g/personal/jill_bloxham_appliedgeology_co_uk/EfAKmhoDPsVMvs5o3nv1k_EBe_qkQ4zok6B3Rx9DrDGkBg?e=cTfhhe

APPENDIX C

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS1

Project	Thomas Telford UTC, Wolverhampton			**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd			**Sheet**	1 of 1
Start	08/12/2020	**Coordinates**	E 391914.29 N 299453.06	**Scale**	1:25
End	08/12/2020	**Ground Level**	134.29m AOD	**Total Depth**	3.45m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
				134.24	(0.05)	Asphalt.			
				134.16	0.05	(MADE GROUND)			
				134.04	(0.08)	Light grey GRAVEL of subangular to subrounded concrete and asphalt.			
ES	0.30				0.13	(MADE GROUND - SUBBASE)			
PID	0.30	PID = 0.0			(0.12)	Dark pinkish grey GRAVEL. Gravel is fine to coarse angular to subrounded igneous stone.			
D	0.50				0.25	(MADE GROUND - SUBBASE)			
B	0.70				(1.03)	Dark pinkish grey slightly sandy slightly clayey GRAVEL with rare cobbles. Gravel is fine to coarse subangular to subrounded quartzite, concrete, igneous stone and rare brick. Cobbles are angular to subrounded concrete and quartzite. (MADE GROUND)			
ES	1.10								
PID	1.10	PID = 0.2							
C	1.20	N = 4		133.01	1.28	Soft to firm dark greyish black slightly gravelly slightly sandy CLAY with rare cobbles. Gravel is fine to coarse subangular to subrounded quartzite, brick and concrete. Cobbles are subangular to subrounded concrete and brick. (MADE GROUND)			
D	1.50		116mm /80%						
					(1.07)				
C	2.00	N = 26							
				131.94	2.35	Firm to stiff dark orangish brown slightly mottled grey slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded quartzite. (GLACIAL TILL) *At 2.60m to 3.00m bgl: no recovery due to brick preventing sample collection.*			
D	2.40		101mm /100%						
B	2.80				(1.10)				
S	3.00	N = 12							
				130.84	3.45	End of Borehole at 3.45m			

Installation: 50mm diameter standpipe installed to 1.20m bgl.

Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole terminated at 3.45m due to collapse from 3.45m to 1.70m bgl, unable to proceed further.

Groundwater Strikes

Depth Strike	Rose to	Remarks	Cased	Sealed
2.70	2.70			

Drilled: DH

Logged: KM

Checked: AS

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS2

Project	Thomas Telford UTC, Wolverhampton			**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd			**Sheet**	1 of 2
Start	08/12/2020	**Coordinates**	E 391893.02 N 299433.51	**Scale**	1:25
End	08/12/2020	**Ground Level**	134.54m AOD	**Total Depth**	5.45m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata
					(0.30)	Asphalt. (MADE GROUND)
D	0.20			134.24	0.30	
B	0.40				(0.20)	Dark greyish brown slightly sandy slightly clayey GRAVEL with rare to occasional cobbles. Gravel is fine to coarse subangular to subrounded asphalt, quartzite, brick and concrete. Cobbles are angular to subrounded brick and concrete. (MADE GROUND - SUBBASE)
ES	0.40			134.04	0.50	
PID	0.40	PID = 0.0				
D	0.60					Dark grey slightly gravelly SAND. Sand is fine to coarse. Gravel is fine brick and charcoal fragments. (Possible Pulverised Fuel Ash) (MADE GROUND)
ES	1.00					
PID	1.00	PID = 4.7				
S	1.20	N >50	101mm /80%		(1.30)	
D	1.80			132.74	1.80	
				132.64	(0.10)	Reddish brown slightly sandy clayey GRAVEL. Gravel is fine to coarse subangular to subrounded brick, concrete and sandstone. (MADE GROUND)
S	2.00	N = 14			1.90	Firm to stiff dark reddish brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded quartzite. (GLACIAL TILL) *Below 2.10m bgl: no grey mottling only dark reddish brown.*
D	2.50		92mm /100%			
B	2.70					
S	3.00	N = 32				
D	3.70		79mm /100%		(3.55)	
S	4.00	N = 26				*Below 4.00m bgl: no recovery.*
S	5.00	N = 8	70mm /0%			

Continued next sheet

Installation: 50mm diameter standpipe installed to 1.90m bgl.

Remarks: Hand dug service inspection pit excavated to 1.20m bgl.

Groundwater Strikes

Depth Strike	Rose to	Remarks	Cased	Sealed
1.70	1.70			

Drilled: DH

Logged: KM

Checked: AS

APPLiED GEOLOGY

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS2

Project	Thomas Telford UTC, Wolverhampton			**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd			**Sheet**	2 of 2
Start	08/12/2020	**Coordinates**	E 391893.02 N 299433.51	**Scale**	1:25
End	08/12/2020	**Ground Level**	134.54m AOD	**Total Depth**	5.45m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
						Firm to stiff dark reddish brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded quartzite. (GLACIAL TILL)			
				129.09	5.45	End of Borehole at 5.45m			

Installation: 50mm diameter standpipe installed to 1.90m bgl.

Remarks: Hand dug service inspection pit excavated to 1.20m bgl.

Groundwater Strikes

Depth Strike	Rose to	Remarks	Cased	Sealed
1.70	1.70			

Drilled: DH

Logged: KM

Checked: AS

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS3

Project	Thomas Telford UTC, Wolverhampton			**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd			**Sheet**	1 of 1
Start	08/12/2020	**Coordinates**	E 391880.42 N 299431.28	**Scale**	1:25
End	08/12/2020	**Ground Level**	134.65m AOD	**Total Depth**	0.50m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
B ES PID	0.20 0.30 0.30	PID = 0.1			(0.50)	Dark greyish brown slightly sandy slightly clayey GRAVEL with occasional to frequent cobbles. Gravel is fine to coarse angular to subrounded concrete, brick and quartzite. Cobbles are subangular to subrounded brick and concrete. (MADE GROUND) *At 0.50m bgl: Concrete obstruction, unable to remove by hand or with excavator. Borehole terminated.*			
				134.15	0.50	End of Borehole at 0.50m			

Installation:

Remarks: Attempted to excavate service pit using backhoe excavator. Refused at 0.50m bgl due to hardstanding/ concrete. Morgan Sindall observed and recorded. Unable to excavated deeper and drill. Pit backfilled with arisings.

Groundwater Strikes

Depth Strike	Rose to	Remarks	Cased	Sealed

Drilled: DH

Logged: KM

Checked: AS

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS4

Project	Thomas Telford UTC, Wolverhampton			**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd			**Sheet**	1 of 1
Start	08/12/2020	**Coordinates**	E 391922.30 N 299431.36	**Scale**	1:25
End	08/12/2020	**Ground Level**	134.12m AOD	**Total Depth**	4.45m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
ES	0.15				(0.25)	Dark brown slightly sandy slightly gravelly CLAY with rare cobbles. Gravel is fine to coarse subangular to subrounded concrete and quartzite. Cobbles are subangular to subrounded concrete. Frequent rootlets near surface. (TOPSOIL/MADE GROUND)			
PID	0.15	PID = 0.2		133.87	0.25				
B	0.25								
D	0.50					Light to dark grey slightly sandy clayey GRAVEL with occasional cobbles. Gravel is fine to coarse subangular to subrounded concrete, rare brick and quartzite. Cobbles are subangular to subrounded concrete and brick. Rare pieces of translucent and blue fabric. (MADE GROUND)			
ES	0.80								
PID	0.80	PID = 0.4							
					(1.60)				
C	1.20	N = 46							
B	1.50		116mm /80%						
D	1.80			132.27	1.85				
C	2.00	N = 28				Firm to stiff light greyish brown slightly sandy gravelly CLAY with rare to occasional cobbles. Gravel is fine to coarse subangular to subrounded brick, concrete, quartzite, black organic charcoal and rare slate. Cobbles are subangular to subrounded concrete and brick. (MADE GROUND) *From 2.00m to 2.55m bgl: no recovery.*			
					(0.70)				
			101mm /80%	131.57	2.55	Dark brown slightly sandy clayey GRAVEL with frequent cobbles. Gravel is fine to coarse subangular to subrounded brick and concrete. (MADE GROUND)			
					(0.37)				
D	2.92			131.20	2.92	Soft dark orangish brown slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded quartzite. (GLACIAL TILL) *Between 3.00m and 3.50m bgl: no recovery.*			
S	3.00	N = 57							
					(0.58)				
B	3.50		92mm /100%	130.62	3.50	Firm to stiff dark orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded quartzite. (GLACIAL TILL)			
D	3.90								
C	4.00	N = 18			(0.95)				
				129.67	4.45	End of Borehole at 4.45m			

Installation:

Remarks: Hand dug service inspection pit excavated to 1.20m bgl. Borehole terminated at 4.45m bgl due to collapse to 2.10m bgl. Borehole backfilled with arisings on completion.

Groundwater Strikes

Depth Strike	Rose to	Remarks	Cased	Sealed
3.10	2.10			

Drilled: DH

Logged: KM

Checked: AS

Exploratory hole logs to be read in conjunction with key sheet

APPLiED GEOLOGY

BOREHOLE LOG - DRIVEN CONTINUOUS SAMPLING

DCS5

Project	Thomas Telford UTC, Wolverhampton			**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd			**Sheet**	1 of 1
Start	08/12/2020	**Coordinates**	E 391883.83 N 299416.31	**Scale**	1:25
End	08/12/2020	**Ground Level**	134.40m AOD	**Total Depth**	0.60m

Sample / Test Type	Depth (m)	Result	Dia./ Rec.	Level (mAoD)	Strata Depth (thickness) (m)	Description of Strata	Legend	GW	Install
ES PID B	0.20 0.20 0.40	PID = 0.7			(0.60)	Dark greyish brown slightly sandy slightly clayey GRAVEL with occasional to frequent cobbles. Gravel is fine to coarse angular to subrounded concrete, brick and quartzite. Cobbles are subangular to subrounded brick and concrete. (MADE GROUND) *At 0.60m bgl: Concrete and brick obstruction encountered, unable to remove. Borehole terminated.*			
				133.80	0.60	End of Borehole at 0.60m			

Installation:
Remarks: Refused at 0.60m bgl due to concrete and brick. Morgan Sindall observed and recorded. Unable to excavate deeper and drill. Pit backfilled with arisings.

Groundwater Strikes

Depth Strike	Rose to	Remarks	Cased	Sealed

Drilled: DH

Logged: KM

Checked: AS

Exploratory hole logs to be read in conjunction with key sheet

APPLiED GEOLOGY

SPT SUMMARY SHEET

Project: Thomas Telford UTC, Wolverhampton
Client: Morgan Sindall Construction & Infrastructure Ltd
Project No: AG3187-20

Borehole No.	Borehole depth (m)	Bottom depth (m)	Casing depth (m)	Water Level (m)	Equipment ref.	Seating Drive				Test Drive									Test Type	N Value
						Blows		Pen (mm)		Blows				Pen (mm)				Total Pen (mm)		
DCS1	1.20	1.65			110.119	4	2	75	75	1	1	1	1	75	75	75	75	300	C	4
DCS1	2.00	2.45			110.119	1	4	75	75	7	6	6	7	75	75	75	75	300	C	26
DCS1	3.00	3.45			110.119	2	2	75	75	3	3	2	4	75	75	75	75	300	S	12
DCS2	1.20	1.60			110.119	5	8	75	75	12	15	15	8	75	75	75	20	245	S	>50
DCS2	2.00	2.45			110.119	2	2	75	75	3	3	4	4	75	75	75	75	300	S	14
DCS2	3.00	3.45			110.119	3	6	75	75	7	8	8	9	75	75	75	75	300	S	32
DCS2	4.00	4.45			110.119	3	4	75	75	6	6	7	7	75	75	75	75	300	S	26
DCS2	5.00	5.45			110.119	2	2	75	75	2	2	2	2	75	75	75	75	300	S	8
DCS4	1.20	1.64			110.119	14	11	75	60	10	12	12	12	75	75	75	75	300	C	46
DCS4	2.00	2.41			110.119	16	9	75	30	15	6	4	3	75	75	75	75	300	C	28
DCS4	3.00	3.45			110.119	3	4	75	75	4	45	4	4	75	75	75	75	300	S	57
DCS4	4.00	4.45			110.119	1	2	75	75	3	4	5	6	75	75	75	75	300	C	18

Notes:
1. Test carried out in general accordance with BS EN ISO 22476-3:2005
2. N values have not been subjected to any correction.
3. Test carried out using split spoon S, or solid cone C.

APPLiED GEOLOGY

Driven Continuous Sampling

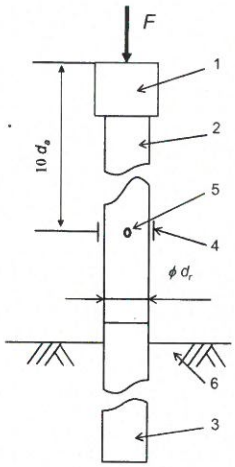
SPT Calibration Report

Hammer Energy Measurement Report

Type of Hammer	PREMIER COMPACT
Test No	EQU2556
Client	APPLIED GEOLOGY
Test Depth (m)	9.20
Mass of hammer	m = 63.5kg
Falling height	h = 0.76m
E_{theor} =	$m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of instrumented rod	0.558 m
Area	A = 11.61 cm²
Modulus	E_a = 206843 MPa



Key

1 Anvil
2 Part of instrumented rod
3 Drive Rod
4 Strain Gauge
5 Accelerometer
6 Ground

F Force
d_r Diameter of rod

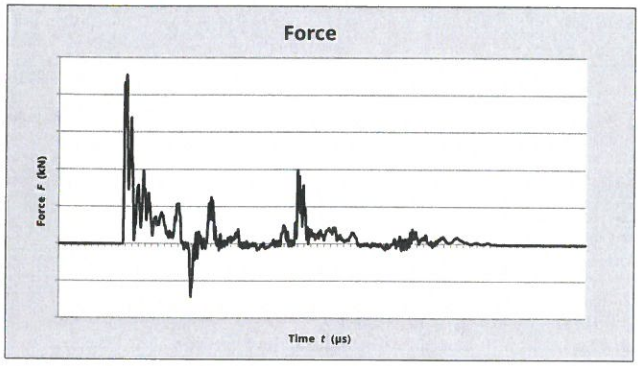
Fig. B.1 and B.2
BS EN ISO 22476-3 : 2005 + A1 : 2011

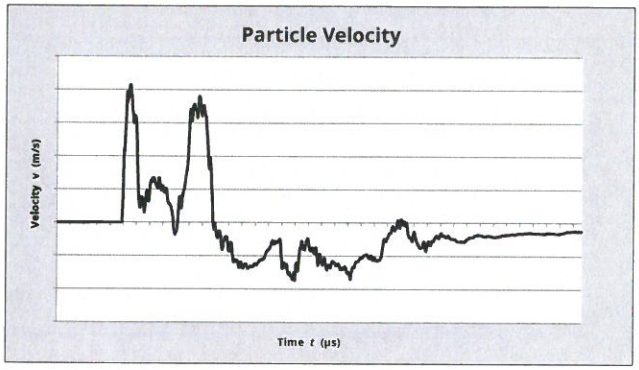
DATE OF TEST	VALID UNTIL	HAMMER ID
30/03/2020	30/03/2021	PREMIER 110/119

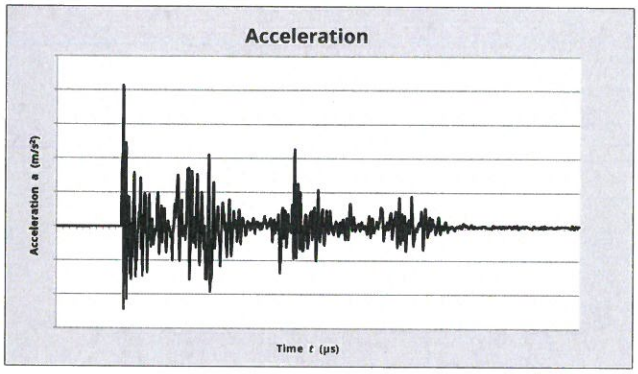
E_{meas} = **0.381** kN-m

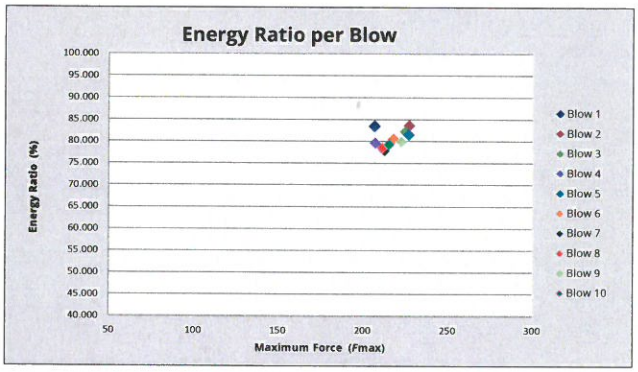
E_{theor} = **0.473** kN-m

Comments









Energy Ratio (Er) = $\frac{E_{meas}}{E_{theor}}$ **80.64%**

Equipe SPT Analyzer Operator	Certificate prepared by	Certificate checked by	Certificate date
KS			17/04/2020

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

TRIAL PIT LOG

TP1

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.51m AOD **Coordinates** E 391847.73 N 299450.22	**Total Depth**	4.00m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
				(0.60)		Dark brownish grey slightly clayey gravelly medium to coarse SAND with frequent cobbles. Gravel is fine to coarse angular to subrounded brick, concrete, chert and rare slag. Cobbles are brick and concrete. (MADE GROUND)		
B	0.50							
ES	0.50		135.91	0.60				
PID	0.50	PID = 0.0				Brown, dark brown and grey clayey gravelly medium to coarse SAND with frequent cobbles and frequent gravel and cobble sized pockets of firm to stiff brown and greyish brown sandy gravelly clay. Gravel is fine to coarse subangular to subrounded charcoal, brick, concrete and chert. Cobbles are brick, concrete and plastic. (MADE GROUND) *At 1.00m bgl: occasional boulders of concrete (approximately 600mm x 800mm x 300mm).*		
D	0.80							
B	1.20							
ES	1.20							
PID	1.20	PID = 0.1				*Below 1.30m bgl: gravel includes limestone with rare ceramic, fabric fragments and rare metal pipe fragments.*		
				(2.20)				
D	1.80							
B	2.50							
ES	2.50							
PID	2.50	PID = 0.0						
			133.71	2.80		Orangish and reddish brown silty gravelly medium to coarse SAND. Gravel is fine to coarse subangular to subrounded quartzite and sandstone. (GLACIAL TILL)		
B	3.00							
				(1.20)				
D	3.70							
			132.51	4.00		End of Trial Pit at 4.00m		

Method: Wheeled Backhoe Excavator.

Groundwater: Groundwater seepage at 2.8m bgl.

Stability: Unstable, minor collapses of sidewalls below 2.80m bgl.

Remarks: Trial pit backfilled with arisings on completion.

Length:	2.60m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

TP2

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	135.93m AOD **Coordinates** E 391857.00 N 299459.36	**Total Depth**	2.50m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
				(0.60)		Dark brownish grey clayey gravelly medium to coarse SAND with frequent cobbles and frequent gravel and cobble sized pockets of firm to stiff sandy gravelly clay. Gravel is fine to coarse angular to subrounded brick, concrete, chert, limestone and sandstone. Cobbles are brick and concrete. (MADE GROUND)		
B	0.40							
ES	0.40					*At 0.50m bgl: 1 piece of rebar.*		
PID	0.40	PID = 0.0	135.33	0.60		Firm to stiff reddish brown sandy gravelly silty CLAY with frequent cobbles. Gravel is fine to coarse subangular to subrounded brick, concrete, chert, rare slate, limestone and sandstone. Cobbles are concrete and brick. (MADE GROUND) *From 0.60m to 1.30m bgl: frequent boulders (approximately 600mm x 800mm x 300mm) and cobbles with dark grey clayey gravelly medium to coarse sand.*		
D	1.10							
ES	1.10							
PID	1.10	PID = 0.0		(1.35)				
			133.98	1.95				
B	2.00					Brown, reddish-orangish brown and occasionally brownish grey gravelly clayey silty medium to coarse SAND with frequent gravel and cobble sized pockets of firm to stiff sandy gravelly clay. Gravel is fine to coarse subangular to subrounded chert and sandstone. (GLACIAL TILL)		
ES	2.00							
PID	2.00	PID = 0.0		(0.55)				
			133.43	2.50		End of Trial Pit at 2.50m		

Method: Wheeled Backhoe Excavator

Groundwater: Groundwater seepage at 2.0m bgl.

Stability: Unstable, sidewalls collapsed.

Remarks: Trial pit backfilled with arisings on completion.

Length:	2.50m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

TP3

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.28m AOD **Coordinates** E 391846.66 N 299424.32	**Total Depth**	3.90m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
B ES PID	0.30 0.30 0.30	PID = 0.0		(0.60)		Dark brownish grey very gravelly medium to coarse SAND with frequent cobbles and occasional plastic fragments. Gravel is fine to coarse angular to subrounded brick, concrete, limestone, sandstone, chert and rare clinker. Cobbles are brick and concrete. (MADE GROUND)		
			135.68	0.60				
D	0.80					Dark grey gravelly slightly clayey fine to medium SAND with frequent gravel sized pockets of soft sandy clay, frequent cobbles and rare plastic fragments. Gravel is fine to coarse angular to subrounded brick, chert and rare quartzite and charcoal. Cobbles are brick and occasional concrete. (MADE GROUND)		
B ES PID	1.50 1.50 1.50	PID = 0.1		(1.85)		*At 1.70m bgl: boulder of concrete in southwest of pit (approximately 300mm x 200mm x 300mm).*		
			133.83	2.45				▼
D HV	2.50 2.50	Cu = 32				Soft becoming firm reddish brown frequently orangish brown with occasional black staining sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded chert and sandstone. (GLACIAL TILL) *Below 2.50m bgl: frequent cobble and boulder sized pockets of clayey gravelly medium to coarse sand.*		
B	3.00			(1.45)		*Below 3.00m bgl: soft to firm and gravel includes fine to medium angular to subangular extremely weak sandstone lithorelicts.* *Below 3.00m bgl: occasionally light grey.*		
D HV	3.50 3.50	Cu = 51				*Below 3.50m bgl: Firm.*		
			132.38	3.90		End of Trial Pit at 3.90m		

Method: Wheeled Backhoe Excavator

Groundwater: Groundwater seepage at 2.5m bgl.

Stability: Stable.

Remarks: Trial pit backfilled with arisings on completion.

Length:	2.90m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

TP4

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.13m AOD **Coordinates** E 391856.56 N 299423.73	**Total Depth**	3.00m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
						Dark brown very clayey gravelly fine to medium SAND with occasional rootlets, frequent cobbles and rare ceramic fragments. Gravel is fine to coarse angular to subrounded brick, concrete, chert and metal. Cobbles are brick. (MADE GROUND)		
B	0.40							
ES	0.40							
PID	0.40	PID = 0.0				*Below 0.50m bgl: slightly clayey and cobbles and gravel includes siltstone.*		
						At 0.80m to 1.60m bgl: frequent cobble and boulder sized pockets of firm sandy gravelly clay.		
D	1.00			(2.05)				
						At 1.50m bgl: frequent concrete boulders (approximately 400mm x 300mm x 300mm).		
B	1.60							
ES	1.60							
PID	1.60	PID = 0.0						
			134.08	2.05		*Below 2.00m bgl: greyish brown.*		
D	2.20					Soft to firm reddish brown sandy gravelly CLAY. Gravel is fine to coarse subangular to subrounded quartzite, chert and sandstone. (GLACIAL TILL)		
				(0.95)				
B	2.80							
ES	2.80							
PID	2.80	PID = 0.0	133.13	3.00				
						End of Trial Pit at 3.00m		

Method: Wheeled Backhoe Excavator

Groundwater: Groundwater seepage at 3.0m bgl.

Stability: Unstable, sidewalls collapsed.

Remarks: Trial pit backfilled with arisings on completion.

Length:	2.60m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

TP5

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	135.64m AOD **Coordinates** E 391870.90 N 299386.51	**Total Depth**	2.10m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
ES	0.10			(0.20)		Brown slightly clayey SAND and GRAVEL with rare cobbles and rare ceramic fragments. Gravel is fine to coarse angular to subrounded brick, quartzite, concrete and chert. Cobbles are brick. (MADE GROUND)		
PID	0.10	PID = 0.0	135.44	0.20				
				(0.50)		Greyish brown very gravelly medium to coarse SAND with frequent cobbles and frequent gravel and cobble sized pockets of sandy gravelly clay. Gravel is fine to coarse angular to subrounded quartzite, brick, chert and rare glass fragments. Cobbles are concrete. (MADE GROUND) *At 0.40m bgl: rebar fragment. At 0.50m bgl: metal fragments, cobbles of brick and concrete boulder (approximately 1000mm x 500mm x 400mm).*		
B	0.60							
ES	0.60		134.94	0.70				
PID	0.60	PID = 0.1						
				(0.80)		Dark brown clayey gravelly fine to medium SAND with frequent cobbles, gravel and boulder sized pockets of firm sandy gravelly clay with occasional black staining and occasional rootlets. Gravel is fine to coarse angular to subrounded chert, brick and concrete. Cobbles are concrete. (MADE GROUND) *At 1.00m bgl: rebar fragment.*		
D	1.20							
ES	1.20							
PID	1.20	PID = 0.0						
			134.14	1.50		Dark blackish brown silty fine to medium SAND with possible organic odour. (MADE GROUND)		
ES	1.60							
PID	1.60	PID = 0.1		(0.30)				
			133.84	1.80		Firm reddish and orangish brown sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded quartzite and sandstone. (GLACIAL TILL)		
				(0.30)				
ES	2.00							
PID	2.00	PID = 0.2	133.54	2.10		End of Trial Pit at 2.10m		

Method: Wheeled Backhoe Excavator

Groundwater: Groundwater not encountered.

Stability: Stable.

Remarks: Trial pit backfilled with arisings on completion.

Length:	2.20m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

TP6

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.95m AOD **Coordinates** E 391857.60 N 299361.11	**Total Depth**	1.80m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
ES PID	0.10 0.10	PID = 0.0				Dark brown very gravelly medium to coarse SAND with rare rootlets and rare ceramic fragments. Gravel is fine to coarse angular to subrounded brick, concrete, quartzite and chert. (MADE GROUND) *Below 0.20m bgl: brown and gravel includes occasional ceramic and ceramic tile fragments (white) and frequent cobbles. Cobbles are brick and concrete.*		
ES PID	0.60 0.60	PID = 0.0		(1.80)		*At 0.90m to 1.20m bgl: light brown, no cobbles.*		
ES PID	1.20 1.20	PID = 0.0				*Below 1.20m bgl: cobbles include brick and concrete. Occasional metal fragments.*		
ES PID	1.80 1.80	PID = 0.2	135.15	1.80		End of Trial Pit at 1.80m		

Method: Wheeled Backhoe Excavator

Groundwater: Groundwater not encountered.

Stability: Stable.

Remarks: Trial pit backfilled with arisings on completion.

Length:	2.20m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

AS1

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.73m AOD **Coordinates** E 391867.71 N 299362.14	**Total Depth**	0.50m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
				(0.50)		Dark brown very gravelly medium to coarse SAND. Gravel is fine to coarse angular to subrounded brick, chert, concrete and rare ceramic fragments. (MADE GROUND)		
ES	0.50		136.23	0.50		End of Trial Pit at 0.50m		

Method: Wheeled Backhoe Excavator.
Groundwater: Groundwater not encountered.
Stability: Stable
Remarks: Trial pit backfilled with arisings on completion.

Length:	0.50m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

AS2

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.17m AOD **Coordinates** E 391874.48 N 299368.63	**Total Depth**	0.30m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
				(0.30)		Dark brown very gravelly medium to coarse SAND. Gravel is fine to coarse angular to subrounded brick, chert, concrete and rare ceramic fragments. (MADE GROUND)		
ES	0.30		135.87	0.30		End of Trial Pit at 0.30m		

Method: Wheeled Backhoe Excavator.

Groundwater: Groundwater not encountered.

Stability: Stable

Remarks: Trial pit backfilled with arisings on completion.

Length:	0.50m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

AS3

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.31m AOD **Coordinates** E 391860.90 N 299373.06	**Total Depth**	0.40m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
				(0.40)		Dark brown very gravelly medium to coarse SAND. Gravel is fine to coarse angular to subrounded brick, chert, concrete and rare ceramic fragments. (MADE GROUND)		
ES	0.40		135.91	0.40		End of Trial Pit at 0.40m		

Method: Wheeled Backhoe Excavator.

Groundwater: Groundwater not encountered.

Stability: Stable

Remarks: Trial pit backfilled with arisings on completion.

Length:	0.50m
Width:	0.70m
Logged:	GS
Checked:	AS

TRIAL PIT LOG

AS4

Project	Thomas Telford UTC, Wolverhampton	**Project No.**	AG3187-20
Client	Morgan Sindall Construction & Infrastructure Ltd	**Sheet**	1 of 1
Date	08/12/2020	**Scale**	1:25
Ground Level	136.64m AOD **Coordinates** E 391851.01 N 299371.53	**Total Depth**	0.10m

Sample / Test Type	Depth (m)	Result	Level (mAoD)	Strata Depth (thickness) (m)	Ease of Dig	Description of Strata	Legend	GW
ES	0.10		136.54	(0.10) 0.10		Dark brown very gravelly medium to coarse SAND. Gravel is fine to coarse angular to subrounded brick, chert, concrete and rare ceramic fragments. (MADE GROUND) End of Trial Pit at 0.10m		

Method: Wheeled Backhoe Excavator.

Groundwater: Groundwater not encountered.

Stability: Stable

Remarks: Trial pit backfilled with arisings on completion.

Length:	0.50m
Width:	0.70m
Logged:	GS
Checked:	AS

Exploratory Hole Log Key Sheet

Sample Notation

D	Small Disturbed sample
B	Bulk Disturbed sample
ES	Environmental sample
U	Undisturbed U100 sample
UT	Undisturbed UT100 sample
C	Core sample
W	Water sample

In Situ Test Notation

S	Standard Penetration Test
S (C)	Standard Penetration Test (cone)
HV	Hand Shear Vane Test
PID	Photoionization Detector Test
MEXE	Mexecone Cone Penetrometer Test
PP	Pocket Penetrometer Test
K	Permeability Test

Results Notation

Cu	Shear Strength	kN/m^2
N	SPT N Value	-
PID	VOC Concentration	ppm
( )	U/UT Blow Count	-

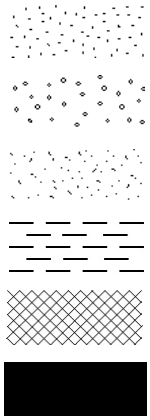
Rotary Core Notation

TCR	Total Core Recovery
SCR	Solid Core Recovery
RQD	Rock Quality Designation
FI	Fracture Index
If	Fracture Spacing
NI	Non Intact
NR	No Recovery
NA	Not Applicable

Ease of Dig

VE	Very Easy
E	Easy
M	Moderate
H	Hard
VH	Very Hard

Backfill Symbols



Sand

Gravel

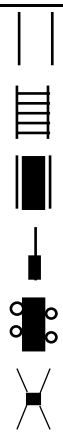
Concrete

Bentonite

Arisings

Grout

Installation Symbols



Plain Standpipe

Slotted Standpipe

Piezometer

Vibrating Wire Piezometer

Inclinometer

Extensometer
(with magnet locations)

Groundwater (GW)

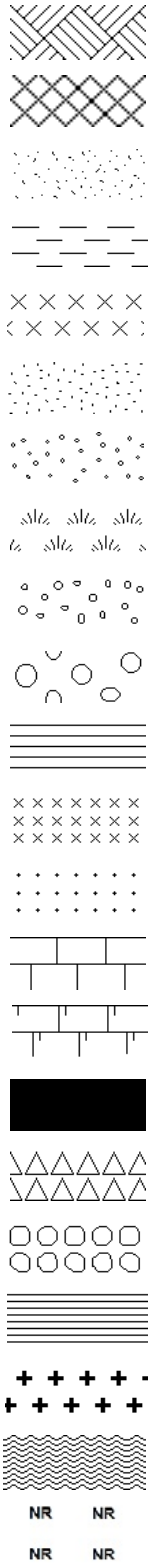
Rise

Groundwater Strike -
with Recorded Rise

Strike

Groundwater Strike -
No Recorded Rise

Legend Symbols



Topsoil

Made Ground

Concrete

Clay

Silt

Sand

Gravel

Peat

Cobbles

Boulders

Mudstone

Siltstone

Sandstone

Limestone

Chalk

Coal

Breccia

Conglomerate

Shale

Igenous Rock

Metamorphic Rock

NR NR
NR NR

No Recovery

Note: Most soils comprise a mixture of particle sizes. The soil type is graphically represented on the log and may be a combination of these symbols.

General Notes

1. Details of the standpipe/piezometer are given on the log. The 'Install' column shows a graphical representation of the installed including depth of instruments including slotted section or piezometer depth, and backfill details.

2. Standard Penetration Test is defined in BS EN ISO 17892. Total N value is shown on the logs, full details of the test increments, equipment references, water and casing levels shown on the SPT Summary Sheet.

APPLiED GEOLOGY

APPENDIX D

Ground Gas Monitoring and Flow Results

Project Number: AG3187-20

Project Name: Thomas Telford UTC, Wolverhampton

Date and Time of Monitoring: 17/12/2020 12.00

Phase of Monitoring: 1 of 4

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS1	<0.1	<0.1	<0.1	-0.02	<0.1	<0.1	<0.1	<0.1	19.1	19.1	50	Dry
DCS2	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	0.1	<0.1	19.5	19.5	50	1.72
BH101	<0.1	<0.1	<0.1	0.02	<0.1	<0.1	0.8	0.8	15.2	15.2	50	1.81

Additional gases (if required)

BH No.	VOCs (ppm)			
DCS1	<0.1			
DCS2	0.7			
BH101	0.1			

Borehole specific comments/observations
BH102 (historical): concrete/tarmac preventing entry. Will attempt next visit with tools
BH103 (historical): Backfilled.

Meterological Data

Atmospheric Pressure (mb)	Start:	997
Atmospheric Pressure (mb)	Finish:	997
Pressure Rising or Falling	Rising	
Weather Conditions	Sunny	
Atmospheric Oxygen (% vol)	21.4	
Wind Speed & Direction	light breeze	
Ambient Air Temperature (°C)	10.0	

Site Data

Monitoring Personnel	Malcolm McGlone
GPS Instrument	
Gasmeter Serial Number	G505737
PID Serial Number	108606
Ground Conditions (vegetation stress, visual contamination):	

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

APPLiED GEOLOGY

Ground Gas Monitoring and Flow Results

Project Number: AG3187-20

Project Name: Thomas Telford UTC, Wolverhampton

Date and Time of Monitoring: 22/12/2020 10.00

Phase of Monitoring: 2 of 4

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS1	<0.1	<0.1	<0.1	0.05	<0.1	<0.1	0.1	<0.1	19.4	19.4	50	1.23
DCS2	<0.1	<0.1	<0.1	-0.02	<0.1	<0.1	0.1	<0.1	18.8	18.8	50	1.69
BH101	<0.1	<0.1	<0.1	-0.03	<0.1	<0.1	0.1	0.1	20.0	20.0	50	1.76

Additional gases (if required)

BH No.	VOCs (ppm)			
DCS1	<0.1			
DCS2	0.5			
BH101	0.1			

Borehole specific comments/observations
BH102 (historical): concrete/tarmac preventing entry.
BH103 (historical): Backfilled.

Meterological Data

Atmospheric Pressure (mb)	Start: 997
Atmospheric Pressure (mb)	Finish: 997
Pressure Rising or Falling	Rising
Weather Conditions	Light cloud
Atmospheric Oxygen (% vol)	21.1
Wind Speed & Direction	light breeze S/Sw
Ambient Air Temperature (°C)	5.0

Site Data

Monitoring Personnel	Malcolm McGlone
GPS Instrument	
Gasmeter Serial Number	G505737
PID Serial Number	109598

Ground Conditions (vegetation stress, visual contamination):

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

APPLiED GEOLOGY

Ground Gas Monitoring and Flow Results

Project Number: AG3187-20

Project Name: Thomas Telford UTC, Wolverhampton

Date and Time of Monitoring: 19/01/2021 13.20

Phase of Monitoring: 3 of 4

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS1	<0.1	<0.1	<0.1	0.03	<0.1	<0.1	0.1	0.1	18.8	18.8	50.0	Dry
DCS2	<0.1	-0.8	<0.1	-3.49	<0.1	<0.1	0.2	0.1	17.9	17.9	50.0	1.67
BH101	<0.1	<0.1	<0.1	0.07	<0.1	<0.1	0.6	0.6	15.5	15.5	50.0	1.83

Additional gases (if required)

BH No.	VOCs (ppm)			
DCS1	<0.1			
DCS2	<0.1			
BH101	<0.1			

Borehole specific comments/observations
BH102 (historical): concrete/tarmac preventing entry.
BH103 (historical): Backfilled.

Meterological Data

Atmospheric Pressure (mb)	Start: 984
Atmospheric Pressure (mb)	Finish: 984
Pressure Rising or Falling	Falling
Weather Conditions	Raining
Atmospheric Oxygen (% vol)	20.8
Wind Speed & Direction	Fresh Breeze NW
Ambient Air Temperature (°C)	11.0

Site Data

Monitoring Personnel	Malcolm McGlone
GPS Instrument	
Gasmeter Serial Number	G506760
PID Serial Number	108308
Ground Conditions (vegetation stress, visual contamination):	

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

APPLiED GEOLOGY

Ground Gas Monitoring and Flow Results

Project Number: AG3187-20

Project Name: Thomas Telford UTC, Wolverhampton

Date and Time of Monitoring: 26/01/2021 11.00

Phase of Monitoring: 4 of 4

BH No.	Flow Range (litres/hr over 3 mins)			Differential Pressure (mb)	Methane % v/v		Carbon dioxide % v/v		Oxygen % v/v		Diameter of installation (mm)	Water level (m bgl)
	Max	Min	Avg		Peak	Steady	Peak	Steady	Min	Steady		
DCS1	<0.1	<0.1	<0.1	0.21	<0.1	<0.1	0.1	0.1	19.3	19.3	50.0	Dry
DCS2	<0.1	-0.6	<0.1	-1.39	<0.1	<0.1	0.1	0.1	18.0	18.0	50.0	1.71
BH101	<0.1	<0.1	<0.1	0.03	<0.1	<0.1	0.6	0.6	16.2	16.2	50.0	1.19

Additional gases (if required)

BH No.	VOCs (ppm)			
DCS1	<0.1			
DCS2	<0.1			
BH101	<0.1			

Borehole specific comments/observations
BH102 (historical): concrete/tarmac preventing entry.
BH103 (historical): Backfilled.

Meterological Data

Atmospheric Pressure (mb)	Start: 999
Atmospheric Pressure (mb)	Finish: 999
Pressure Rising or Falling	Falling
Weather Conditions	Cloudy/drizzle
Atmospheric Oxygen (% vol)	20.9
Wind Speed & Direction	Calm
Ambient Air Temperature (°C)	4.0

Site Data

Monitoring Personnel	Malcolm McGlone
GPS Instrument	
Gasmeter Serial Number	G506760
PID Serial Number	108308

Ground Conditions (vegetation stress, visual contamination): **SNOW ON THE GROUND**

General Notes:

1. Instrument specification data and calibration information provided on a separate sheet

APPLiED GEOLOGY

Gas Monitoring Equipment Specification and Accuracy Details

Instrument Specifications

Instrument	Atmospheric Pressure Range	Temperature Range	Flow Range	Flow Resolution	Borehole Pressure Range
GA5000	500-1500 mb +/- 5 mb	-10°C to + 50°C	0-20 lt/hr +/- 0.3 l/hr	0.1l/hr	.+500/-500 mbar +/- 4 mbar
Phocheck Tiger	-	-20 to + 60°C (Certified to -15 to + 45°C)	-	-	-

Instrument Accuracy

Instrument		Methane	Lower Explosive Limit	Carbon Dioxide	Oxygen	Volatile Organic Compounds	Hydrogen Sulphide	Carbon Monoxide
GA5000	Detection Range	0-100%	-	0 -100%	0-25%	NA	0 -50ppm response <30 secs	0 - 1000ppm response <30 Secs
	Detection Accuracy	.+/- 0.5% @ 0 to 70%, +/-1.5% @ 70 to 100% Response < 10 secs	N/A	.+/- 0.5% @ 0 to 60%, +/-1.5% @ 60 to 100% Response < 10 secs	.+/- 1.0% @ 0 to 25%, Response < 20 secs	NA	.+/- 1.5% FS	.+/- 2% of FS
Phocheck Tiger	Detection Range	N/A	N/A	N/A	N/A	1 ppb - 10,000 ppm	N/A	N/A
	Detection Accuracy	N/A	N/A	N/A	N/A	+/- 1ppb +- 5% of actual displayed accuracy +/- One digit Response < 2sec	N/A	N/A

Calibration Frequency

Instruments are calibrated annually.

Details of the instrument calibration certificates and service records are available if required.

Equipment Serial Numbers

GA5000 (G503948, G505383, G505737)

Phocheck Tiger - (T-108308, T-109597, T-109598, T-110423)

APPLiED GEOLOGY

APPENDIX E

SOIL CHEMICAL RESULTS COMPARED AGAINST SCREENING VALUES FOR HUMAN HEALTH

Site: Thomas Telford UTC, Wolverhampton
Job No: AG3187-20

Land Use: Public Open Space (Residential)
Dataset: All results
Soil Organic Matter (%) 2.5 **%**

		Applied Geology - February 2021																Soil Engineering - June 2020												
Exploratory Hole Reference		DCS1	DCS2	DCS4	TP1	TP3	TP5	TP5	TP6	DCS3	DCS5	TP2	TP4	AS1	AS2	AS3	AS4	BH103	TP102	BH102	TP101	TP101	HDP101	HDP102	BH102	BH101	BH101	**No. of samples (n)**	**Commercial / Industrial**	**Public Open Space (Residential)**	**Source/Justification**
Depth (m)		0.30-0.40	1.00-1.10	0.15-0.25	0.50	1.50	1.60	0.6	0.6	0.30-0.50	0.20-0.30	1.10	0.40	0.5	0.3	0.4	0.1	1.0	0.8	1.0	0.5	1.5	1.0	0.5	2.0	0.2	1.0				
Strata		MG	MG	TS/MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	GT	MG	MG				
	Units																														
Organic Matter (%)	%	2.5	0.3	2.9	1.7	3.4	6.4	1.3	1.3																			8			
pH		10.6	9.6	8.7	9	8.8	7.7	9.3	9.8									8.0	10.5	9.0	9.5	10.2	9.1	9.4	8.8	8.4	9.4	18			
Arsenic	mg/kg	12	130	9.3	12	15	12	45	7.6									6	13	25	24	45	170	20	9.8	6.9	14	18	640	79	LQM/CIEH S4UL (2015)
Boron	mg/kg	20	320	9	17	20	17	62	17									4.1	2.0	4.4	4.9	12	4.2	2.7	1.7	0.61	2.7	18	240000	21000	LQM/CIEH S4UL (2015)
Cadmium	mg/kg	0.5	**0.2**	2.5	0.5	2.3	0.7	**0.2**	0.4									0.41	0.31	0.41	0.6	0.76	0.44	0.74	0.21	2.4	0.5	18	190	120	LQM/CIEH S4UL (2015)
Chromium	mg/kg	28	67	78	19	30	18	32	21									14	22	20	31	43	25	22	24	80	24	18	8600	1500	LQM/CIEH S4UL (2015)
Chromium (Hexavalent)	mg/kg	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**									**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	18	33	7.7	LQM/CIEH S4UL (2015)
Copper	mg/kg	180	100	78	71	330	140	66	35									34	40	57	68	70	55	78	31	69	110	18	68000	12000	LQM/CIEH S4UL (2015)
Lead	mg/kg	100	92	80	270	270	110	100	73									43	61	64	100	89	68	160	38	63	140	18	2330	630	C4SL (2014)
Mercury	mg/kg	**0.3**	**0.3**	**0.3**	**0.3**	1.1	3.4	**0.3**	**0.3**									0.28	0.24	0.31	0.35	0.29	3.1	0.47	0.39	0.59	7.5	18	1100	120	LQM/CIEH S4UL (2015)
Nickel	mg/kg	23	98	31	21	37	22	46	16									15	23	32	42	53	29	42	31	31	30	18	980	230	LQM/CIEH S4UL (2015)
Selenium	mg/kg	1	3.4	**1**	**1**	**1**	**1**	1.1	**1**									0.39	**0.20**	**0.20**	0.81	1.6	5.2	0.48	0.23	0.34	0.33	18	12000	1100	LQM/CIEH S4UL (2015)
Vanadium	mg/kg	48	180	26	34	37	33	73	35									23	38	38	52	94	38	61	30	22	45	18		2000	LQM/CIEH S4UL (2015)
Zinc	mg/kg	180	410	440	270	540	190	230	110									80	92	160	150	160	130	180	68	420	170	18	730000	81000	LQM/CIEH S4UL (2015)
Naphthalene	mg/kg	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**									**0.10**	**0.10**	**0.10**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.26	18	460	4900	LQM/CIEH S4UL (2015)
Acenaphthylene	mg/kg	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**									**0.10**	0.13	**0.10**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.14	18	97000	15000	LQM/CIEH S4UL (2015)
Acenaphthene	mg/kg	**0.05**	**0.05**	**0.05**	**0.05**	1.4	**0.05**	**0.05**	**0.05**									**0.10**	0.19	**0.10**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.59	18	97000	15000	LQM/CIEH S4UL (2015)
Fluorene	mg/kg	**0.05**	**0.05**	**0.05**	**0.05**	1.3	**0.05**	**0.05**	**0.05**									**0.10**	0.12	**0.10**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.53	18	68000	9900	LQM/CIEH S4UL (2015)
Phenanthrene	mg/kg	1.9	**0.05**	0.54	1.6	13	**0.05**	0.55	0.85									**0.10**	0.66	0.39	0.91	1.2	0.24	0.78	**0.1**	**0.1**	3.9	18	22000	3100	LQM/CIEH S4UL (2015)
Anthracene	mg/kg	0.23	**0.05**	**0.05**	0.2	2	**0.05**	**0.05**	**0.05**									**0.10**	**0.10**	0.26	0.24	0.28	**0.1**	0.15	**0.1**	**0.1**	0.71	18	540000	74000	LQM/CIEH S4UL (2015)
Fluoranthene	mg/kg	2.2	**0.05**	0.81	1.8	11	**0.05**	0.6	1.5									**0.10**	0.79	1.40	1.7	0.99	0.34	0.84	**0.1**	0.28	4.8	18	23000	3100	LQM/CIEH S4UL (2015)
Pyrene	mg/kg	2.3	**0.05**	0.81	1.7	9.1	**0.05**	0.68	1.6									**0.10**	1.10	1.60	1.7	1.2	0.33	0.85	**0.1**	0.38	4.5	18	54000	7400	LQM/CIEH S4UL (2015)
Benzo[a]anthracene	mg/kg	1.1	**0.05**	0.43	0.93	4.3	**0.05**	0.29	0.74									**0.10**	0.43	2.00	0.77	0.42	**0.1**	0.38	**0.1**	**0.1**	1.7	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Chrysene	mg/kg	1.3	**0.05**	0.37	0.77	3.5	**0.05**	0.32	0.71									**0.10**	0.49	2.20	0.88	0.79	**0.1**	0.79	**0.1**	**0.1**	2.2	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Benzo[b]fluoranthene	mg/kg	1.3	**0.05**	0.36	0.6	3.8	**0.05**	**0.05**	0.61									**0.10**	0.33	2.20	1.1	0.51	**0.1**	0.52	**0.1**	**0.1**	1.9	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Benzo[k]fluoranthene	mg/kg	0.36	**0.05**	0.27	0.68	1.5	**0.05**	**0.05**	0.49									**0.10**	0.27	1.60	0.5	0.39	**0.1**	0.33	**0.1**	**0.1**	1.1	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Benzo[a]pyrene	mg/kg	1.1	**0.05**	0.34	0.68	3.2	**0.05**	**0.05**	0.58									**0.10**	0.31	2.40	0.68	0.46	**0.1**	0.31	**0.1**	**0.1**	1.8	18	76	10	C4SL (2014)
Dibenzo[a,h]anthracene	mg/kg	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**									**0.10**	0.13	0.67	0.25	0.11	**0.1**	**0.1**	**0.1**	**0.1**	0.26	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Indeno[1,2,3-cd]pyrene	mg/kg	0.63	**0.05**	**0.05**	0.36	2.1	**0.05**	**0.05**	0.33									**0.10**	0.35	1.30	0.5	0.29	**0.1**	0.22	**0.1**	**0.1**	0.87	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Benzo[g,h,i]perylene	mg/kg	0.9	**0.05**	**0.05**	0.61	2.6	**0.05**	**0.05**	0.45									**0.10**	0.90	1.30	0.57	0.36	**0.1**	0.24	**0.1**	**0.1**	0.85	18	*	*	Genotoxic PAH see Benzo(a)pyrene
Total of 16 PAHs	mg/kg																	**2**	6.20	17	9.8	7	**2**	5.4	**2**	**2**	26	10	-	-	-
Phenols (Total)	mg/kg	13.3	**0.8**	3.93	9.91	58.9	**0.8**	2.44	7.89									**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	18	690	690	LQM/CIEH S4UL (2015)
Benzene	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	15	-	0.7^	LQM/CIEH S4UL (2015)
Toluene	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	15	-	1900^	LQM/CIEH S4UL (2015)
Ethylbenzene	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	15	-	190^	LQM/CIEH S4UL (2015)
m&p Xylene	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	15	-	180^	LQM/CIEH S4UL (2015)
o-Xylene	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	15	-	210^	LQM/CIEH S4UL (2015)
MTBE (Methyl Tertiary Butyl Ether)	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	15	-	0.001	Detection limit
Aliphatic TPH >C5-C6	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	78^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C6-C8	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	230^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C8-C10	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	65^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C10-C12	mg/kg		**1**	**1**	**1**		**1**		**1**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	330^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C12-C16	mg/kg		**2**	**2**	**2**		**2**		**2**									**1**	10	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	2400^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C16-C21	mg/kg		**8**	**8**	**8**		**8**		**8**									**1**	35	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	92000^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C21-C35	mg/kg		**8**	**8**	**8**		**8**		**8**									**1**	130	**1**	83	67	**1**	**1**	**1**	**1**	**1**	15	-	92000^	LQM/CIEH S4UL (2015)
Aliphatic TPH >C35-C44	mg/kg		**8.4**	**8.4**	**8.4**		**8.4**		**8.4**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	92000^	LQM/CIEH S4UL (2015)
Total Aliphatic Hydrocarbons	mg/kg		**10**	**10**	**10**		**10**		**10**									**5**	180	**5**	83	67	**1**	**1**	**1**	**5**	**5**	15	-	-	-
Aromatic TPH >C5-C7	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	690^	LQM/CIEH S4UL (2015)
Aromatic TPH >C7-C8	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	1800^	LQM/CIEH S4UL (2015)
Aromatic TPH >C8-C10	mg/kg		**0.001**	**0.001**	**0.001**		**0.001**		**0.001**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	110^	LQM/CIEH S4UL (2015)
Aromatic TPH >C10-C12	mg/kg		**1**	**1**	**1**		**1**		**1**									**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	590^	LQM/CIEH S4UL (2015)
Aromatic TPH >C12-C16	mg/kg		**2**	**2**	**2**		**2**		5.6									**1**	7.80	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	15	-	2300^	LQM/CIEH S4UL (2015)
Aromatic TPH >C16-C21	mg/kg		**10**	**10**	13		11		35									**1**	7.20	**1**	1.4	1.4	**1**	**1**	**1**	**1**	**1**	15	-	1900^	LQM/CIEH S4UL (2015)
Aromatic TPH >C21-C35	mg/kg		30	24	30		28		40									**1**	180	**1**	83	130	**1**	**1**	**1**	**1**	**1**	15	-	1900^	LQM/CIEH S4UL (2015)
Aromatic TPH >C35-C44	mg/kg		**8.4**	**8.4**	**8.4**		**8.4**		21									**1**	**1**	**1**	1	**1**	**1**	**1**	**1**	**1**	**1**	15	-	1900^	LQM/CIEH S4UL (2015)
Total Aromatic Hydrocarbons	mg/kg		38	31	43		39		100									**5**	190	**5**	85	130	**5**	**5**	**5**	**5**	**5**	15	-	-	-
Total Petroleum Hydrocarbons	mg/kg		38	31	43		39		100									**10**	370	**10**	170	200	**10**	**10**	**10**	**10**	**10**	15	-	-	-
VOCs	µg/kg		**				**											**	**	**	**	**	**	**	**	**	**	12	-	-	-
Trichloroethene	µg/kg																										0.0027	1	-	0.036^	LQM/CIEH S4UL (2015)
Tetrachloroethene	µg/kg																										0.003	1	-	0.4^	LQM/CIEH S4UL (2015)
Asbestos Screen and ID		Not-detected	Not-detected	Not-detected	Not-detected	Detected		Not-detected	Detected	Not-detected	Not-detected	Not-detected	Detected	Not-detected	Not-detected	Not-detected	Not-detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected	25	-	Detected	Detection limit
Asbestos ID						Chrysotile			Amosite				Chrysotile & Amosite															3	-	-	-
Asbestos Quantification	%					< 0.001			< 0.001				< 0.001															3	-	-	-

Key -
Value within sample set exceeds screening value
TS/MG - Topsoil/Made Ground
MG - Made Ground
GT - Glacial Till
** All VOCs recorded below the limit of detection and therefore have been omitted for clarity. Where concentration have been found above the limit of detection, these have been listed separately.
^ Residential without plant uptake screening values used to account for indoor inhalation pathway.
LQM/CIEH S4UL Reference No. S4UL3159 (2015)
Values in **bold** are reported at the laboratory limit of detection
Benzo(a)pyrene has been used as a 'surrogate marker for genotoxic PAH' as discussed in Appendix E of CL:AIRE SP1010 'Development of C4SL for Assessment of Land Affected by Contamination', December 2013.
This allows assessment of the combined carcinogenic risk associated with genotoxic PAH using only b(a)p. Genotoxic PAHs include Benz(a)pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(ah)anthracene, Indeno(123cd)pyrene, Benzo(ghi)perylene and have been marked with a * on the table.

APPLiED GEOLOGY

SUMMARY OF LEACHATE & GROUNDWATER TEST RESULTS

Site Thomas Telford UTC, Wolverhampton
Job Number AG3187-20
Type of Water Leachate & Groundwater

				AG February 2021		Soil Engineering June 2020													
Determinand	**Limit of Detection**	**Hazardous or Non-Hazardous^**	**Sample Identity Depth Sampled Date**	TP3 1.5 08/12/2020 Leachate	TP6 0.6 08/12/2020 Leachate	BH103 1 04/05/2020 Leachate	BH102 1 04/05/2020 Leachate	TP101 0.5 06/05/2020 Leachate	TP101 1.5 06/05/2020 Leachate	HDP102 0.5 06/05/2020 Leachate	BH102 2 06/05/2020 Leachate	BH101 1 07/05/2020 Leachate	BH101 4.5 20/05/2020 Water	BH102 9 20/05/2020 Water	BH101 1.93 20/05/2020 Water	BH102 6 20/05/2020 Water	**No. of samples (n)**	**Waters Screening Value**	**Source & Justification**
Hardness		-	mg l-1										300	1100			2	-	-
pH		-	-	7.7	9.4	7.9	8.1	8.7	10	10.7	8.6	8.8	8.3	8.2	8.3	8.2	13	-	-
TOC	0.1	-	mg l-1	8.59	6.13												2	-	-
Arsenic	1	**Haz**	µg l-1	2.8	3	2.3	11	11	5.8	5.6	1.1	22	3.8	1.8	3.8	1.8	13	10	UK Drinking Water Standards (2010)
Cadmium	0.08	**Non Haz**	µg l-1	**0.08**	**0.08**	**0.08**	0.5	0.71	0.58	0.22	**0.08**	0.088	**0.08**	**0.08**	**0.08**	**0.08**	13	5	UK Drinking Water Standards (2010)
Chromium (Total)	1	*Non Haz*	µg l-1	1.3	1.7	**1**	**1**	9.8	21	7.1	**1**	12	**1**	**1**	**1**	**1**	13	50	UK Drinking Water Standards (2010)
Chromium (III)	1 / 20	*Non Haz*	µg l-1	1.3	1.7	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	13	20	Detection Limit
Chromium (VI)	5 / 20	**Haz**	µg l-1	**5**	**5**	**20**	**20**	**20**	29	**20**	**20**	**20**	**20**	**20**	**20**	**20**	13	20	Detection Limit
Copper	0.7	**Non Haz**	µg l-1	28	22	7.4	2.3	3.6	15	14	1.2	6.6	2.3	1.3	2.3	1.3	13	2000	UK Drinking Water Standards (2010)
Lead	1	**Haz**	µg l-1	8.9	3.5	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	13	10	UK Drinking Water Standards (2010)
Mercury	0.5	**Haz**	µg l-1	**0.5**	**0.5**	**0.01**	**0.01**	0.026	0.042	0.033	**0.01**	0.02	**0.01**	**0.01**	**0.01**	**0.01**	13	1	UK Drinking Water Standards (2010)
Nickel	0.3	**Non Haz**	µg l-1	0.7	0.9	1.8	1.2	1.2	3	2.4	**1**	1.6	2.5	7.7	2.5	7.7	13	20	UK Drinking Water Standards (2010)
Selenium	4	**Non Haz**	µg l-1	**4**	**4**	1.3	7.7	8.3	10	14	1.1	8.4	1.6	6.9	1.9	6.9	13	10	UK Drinking Water Standards (2010)
Zinc	0.4	**Non Haz**	µg l-1	16	9.2	31	12	13	13	9.8	5.4	33	8.4	40	8.4	40	13	5000	UK Drinking Water Standards (2010)
Boron	10	*Non Haz*	µg l-1	88	21	1400	1200	1800	2000	320	290	510	180	470	180	470	13	1000	UK Drinking Water Standards (2010)
Beryllium	0.2 / 1	*Non Haz*	µg l-1	0.2	**0.2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	13	12	UK Drinking Water Standards (2010)
Vanadium	1	*Non Haz*	µg l-1	14	4.9	2.5	42	8.4	86	70	**1**	25	**1**	**1**	**1**	**1**	13	-	Not of health concern at the levels found in drinking water
Sulphate	0.1	*Non Haz*	mg l-1	13.3	970	460	150	370	290	190	53	60	240	1200	240	1200	13	250	UK Drinking Water Standards (2010)
Phenol	1 / 0.005	**Non Haz**	µg l-1	1.9	2.5	0.021	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	**0.005**	13	7.7	WFD Environmental Standard, 2010
Naphthalene	0.01	**Non Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Acenaphthylene	0.01	*Haz*	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Acenaphthene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Fluorene	0.01	*Haz*	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Phenanthrene	0.01	*Haz*	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	7.9	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Anthracene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.9	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Fluoranthene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	9.2	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Pyrene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	9.6	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Benzo[a]anthracene	0.01	*Haz*	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Chrysene	0.01	*Haz*	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Benzo[b]fluoranthene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Benzo[k]fluoranthene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Benzo[a]pyrene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Dibenz(a,h)Anthracene	0.01	*Haz*	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Indeno(1,2,3-c,d)Pyrene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
Benzo[g,h,i]perylene	0.01	**Haz**	µg l-1	**0.01**	**0.01**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.01**	**0.01**	**0.01**	**0.01**	13	-	Detection limit
TPH						**	**	**	**	**	**	**	**	**	**	**	11		
VOCs						**	**	**	**	**	**	**	**	**	**	**	11		

Key-

Result exceeds test Detection Limit (for Haz determinands)

Result exceeds Screening Value (for Non Haz determinands)

** TPH and VOCs all recorded below the limit of detection and therefore omitted for clarity.

Values in bold at the limit of detection

^ Note: Hazardous and non-hazardous substances determined by JAGDAG (Jan 2017) and published at http://www.wfduk.org/sites/default/files/Media/170116%20Substance%20Determinationsfinal.pdf. These are marked in bold.
For substances not assessed by JAGDAG, Applied Geology has assumed a determination based on our understanding of the behaviour of the chemical. These determinations are highlighted in yellow.

APPLiED GEOLOGY

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Analytical Report Number : 20-47754

Project / Site name:	Thomas Telford UTC	**Samples received on:**	15/12/2020
Your job number:	AG3187 20	**Samples instructed on/ Analysis started on:**	15/12/2020
Your order number:	16302	**Analysis completed by:**	23/12/2020
Report Issue Number:	1	**Report issued on:**	23/12/2020
Samples Analysed:	2 leachate samples - 16 soil samples		

Signed: Karolina Marek

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719750	1719751	1719752	1719753	1719754
Sample Reference				DCS1	DCS2	DCS3	DCS4	DCS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	1.00-1.10	0.30-0.50	0.15-0.25	0.20-0.30
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	-	< 0.1	-
Moisture Content	%	0.01	NONE	8.1	21	-	12	-
Total mass of sample received	kg	0.001	NONE	1	1	-	1	-
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	10.6	9.6	-	8.7	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	530	810	-	310	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.26	0.4	-	0.16	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	264	403	-	156	-
Organic Matter	%	0.1	MCERTS	2.5	0.3	-	2.9	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	1.9	< 0.05	-	0.54	-
Anthracene	mg/kg	0.05	MCERTS	0.23	< 0.05	-	< 0.05	-
Fluoranthene	mg/kg	0.05	MCERTS	2.2	< 0.05	-	0.81	-
Pyrene	mg/kg	0.05	MCERTS	2.3	< 0.05	-	0.81	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.1	< 0.05	-	0.43	-
Chrysene	mg/kg	0.05	MCERTS	1.3	< 0.05	-	0.37	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.3	< 0.05	-	0.36	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.36	< 0.05	-	0.27	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.1	< 0.05	-	0.34	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.63	< 0.05	-	< 0.05	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.9	< 0.05	-	< 0.05	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	13.3	< 0.80	-	3.93	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719750	1719751	1719752	1719753	1719754
Sample Reference				DCS1	DCS2	DCS3	DCS4	DCS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	1.00-1.10	0.30-0.50	0.15-0.25	0.20-0.30
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	130	-	9.3	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	7.9	-	0.69	-
Boron (total)	mg/kg	1	MCERTS	20	320	-	9	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	< 0.2	-	2.5	-
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	< 4.0	-
Chromium (III)	mg/kg	1	NONE	28	67	-	77	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	67	-	78	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	180	100	-	78	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	92	-	80	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	98	-	31	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	3.4	-	< 1.0	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	48	180	-	26	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	180	410	-	440	-
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0	-	9.1	-
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	< 2.0	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	-	< 8.0	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	< 8.0	-	< 8.0	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	-	< 8.4	-	< 8.4	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	-	< 10	-
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	-	< 10	-	< 10	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	< 0.001	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	< 2.0	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	< 10	-	< 10	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	30	-	24	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	-	< 8.4	-	< 8.4	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	38	-	31	-
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	-	38	-	31	-
TPHCWG - Total C5 - C44 Aliphatic & Aromatic	mg/kg	10	NONE	-	38	-	31	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719750	1719751	1719752	1719753	1719754
Sample Reference				DCS1	DCS2	DCS3	DCS4	DCS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	1.00-1.10	0.30-0.50	0.15-0.25	0.20-0.30
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chloroethane	µg/kg	1	NONE	-	< 1.0	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	< 1.0	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	< 1.0	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tribromomethane	µg/kg	1	NONE	-	< 1.0	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719750	1719751	1719752	1719753	1719754
Sample Reference				DCS1	DCS2	DCS3	DCS4	DCS5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	1.00-1.10	0.30-0.50	0.15-0.25	0.20-0.30
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	< 1.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	< 1.0	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719755	1719756	1719757	1719758	1719759
Sample Reference				TP1	TP2	TP3	TP4	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.10	1.50	0.40	1.60
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	-	< 0.1	-	< 0.1
Moisture Content	%	0.01	NONE	11	-	14	-	19
Total mass of sample received	kg	0.001	NONE	1	-	1	-	1
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	Chrysotile	Chrysotile & Amosite	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Detected	Detected	-
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	< 0.001	< 0.001	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	< 0.001	< 0.001	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9	-	8.8	-	7.7
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1000	-	440	-	1100
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.5	-	0.22	-	0.53
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	500	-	221	-	526
Organic Matter	%	0.1	MCERTS	1.7	-	3.4	-	6.4
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	1.4	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	1.3	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.6	-	13	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.2	-	2.0	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.8	-	11	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	1.7	-	9.1	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.93	-	4.3	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.77	-	3.5	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.6	-	3.8	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.68	-	1.5	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.68	-	3.2	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.36	-	2.1	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.61	-	2.6	-	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	9.91	-	58.9	-	< 0.80

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719755	1719756	1719757	1719758	1719759
Sample Reference				TP1	TP2	TP3	TP4	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.10	1.50	0.40	1.60
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	12	-	15	-	12
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	-	1.5	-	1.4
Boron (total)	mg/kg	1	MCERTS	17	-	20	-	17
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.5	-	2.3	-	0.7
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	-	< 4.0	-	< 4.0
Chromium (III)	mg/kg	1	NONE	18	-	29	-	17
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	19	-	30	-	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	71	-	330	-	140
Lead (aqua regia extractable)	mg/kg	1	MCERTS	270	-	270	-	110
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	1.1	-	3.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21	-	37	-	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	34	-	37	-	33
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	270	-	540	-	190
Magnesium (water soluble)	mg/kg	5	NONE	12	-	8.2	-	20
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	-	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	-	-	-	< 8.0
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	-	-	-	< 8.4
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	-	-	< 10
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	< 10	-	-	-	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	-	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	-	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	-	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	-	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	-	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	13	-	-	-	11
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	30	-	-	-	28
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	< 8.4	-	-	-	< 8.4
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	43	-	-	-	39
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	43	-	-	-	39
TPHCWG - Total C5 - C44 Aliphatic & Aromatic	mg/kg	10	NONE	43	-	-	-	39

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719755	1719756	1719757	1719758	1719759
Sample Reference				TP1	TP2	TP3	TP4	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.10	1.50	0.40	1.60
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Chloroethane	µg/kg	1	NONE	-	-	-	-	< 1.0
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	< 1.0
Benzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Styrene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Tribromomethane	µg/kg	1	NONE	-	-	-	-	< 1.0
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719755	1719756	1719757	1719758	1719759
Sample Reference				TP1	TP2	TP3	TP4	TP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.10	1.50	0.40	1.60
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719760	1719761	1719762	1719763	1719764
Sample Reference				TP5	TP6	AS1	AS2	AS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	0.60	0.50	0.30	0.40
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	-	-	-
Moisture Content	%	0.01	NONE	13	11	-	-	-
Total mass of sample received	kg	0.001	NONE	1	1	-	-	-
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Amosite	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	< 0.001	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	< 0.001	-	-	-
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	9.3	9.8	-	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	1500	3000	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.73	1.5	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	731	1490	-	-	-
Organic Matter	%	0.1	MCERTS	1.3	1.3	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	-
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	0.55	0.85	-	-	-
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	0.6	1.5	-	-	-
Pyrene	mg/kg	0.05	MCERTS	0.68	1.6	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.29	0.74	-	-	-
Chrysene	mg/kg	0.05	MCERTS	0.32	0.71	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.61	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.49	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.58	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.33	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.45	-	-	-
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	2.44	7.89	-	-	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719760	1719761	1719762	1719763	1719764
Sample Reference				TP5	TP6	AS1	AS2	AS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	0.60	0.50	0.30	0.40
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	45	7.6	-	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.8	0.85	-	-	-
Boron (total)	mg/kg	1	MCERTS	62	17	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.4	-	-	-
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	-	-
Chromium (III)	mg/kg	1	NONE	31	21	-	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	32	21	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	66	35	-	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	100	73	-	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	46	16	-	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	1.1	< 1.0	-	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	73	35	-	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	230	110	-	-	-
Magnesium (water soluble)	mg/kg	5	NONE	7.5	< 5.0	-	-	-
Monoaromatics & Oxygenates								
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	< 8.0	-	-	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	-	< 8.4	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	< 10	-	-	-
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	-	< 10	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	< 0.001	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	5.6	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	35	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	40	-	-	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	-	21	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	81	-	-	-
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	-	100	-	-	-
TPHCWG - Total C5 - C44 Aliphatic & Aromatic	mg/kg	10	NONE	-	100	-	-	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719760	1719761	1719762	1719763	1719764
Sample Reference				TP5	TP6	AS1	AS2	AS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	0.60	0.50	0.30	0.40
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chloroethane	µg/kg	1	NONE	-	-	-	-	-
Bromomethane	µg/kg	1	ISO 17025	-	-	-	-	-
Vinyl Chloride	µg/kg	1	NONE	-	-	-	-	-
Trichlorofluoromethane	µg/kg	1	NONE	-	-	-	-	-
1,1-Dichloroethene	µg/kg	1	NONE	-	-	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-	-	-	-	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-	-	-	-	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-	-	-	-	-
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Tetrachloromethane	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-	-	-	-	-
Trichloroethene	µg/kg	1	MCERTS	-	-	-	-	-
Dibromomethane	µg/kg	1	MCERTS	-	-	-	-	-
Bromodichloromethane	µg/kg	1	MCERTS	-	-	-	-	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
Dibromochloromethane	µg/kg	1	ISO 17025	-	-	-	-	-
Tetrachloroethene	µg/kg	1	NONE	-	-	-	-	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-	-	-	-	-
Chlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
Styrene	µg/kg	1	MCERTS	-	-	-	-	-
Tribromomethane	µg/kg	1	NONE	-	-	-	-	-
o-Xylene	µg/kg	1	MCERTS	-	-	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-	-	-	-	-
Isopropylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
Bromobenzene	µg/kg	1	MCERTS	-	-	-	-	-
n-Propylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
2-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
4-Chlorotoluene	µg/kg	1	MCERTS	-	-	-	-	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
tert-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-	-	-	-	-
sec-Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-	-	-	-	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719760	1719761	1719762	1719763	1719764
Sample Reference				TP5	TP6	AS1	AS2	AS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.60	0.60	0.50	0.30	0.40
Date Sampled				08/12/2020	08/12/2020	08/12/2020	08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Butylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-	-	-	-	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-	-	-	-	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-	-	-	-	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719765
Sample Reference				AS4
Sample Number				None Supplied
Depth (m)				0.10
Date Sampled				08/12/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	-
Moisture Content	%	0.01	NONE	-
Total mass of sample received	kg	0.001	NONE	-

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-
Asbestos Quantification Total	%	0.001	ISO 17025	-

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-
Organic Matter	%	0.1	MCERTS	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	-

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-
Acenaphthylene	mg/kg	0.05	MCERTS	-
Acenaphthene	mg/kg	0.05	MCERTS	-
Fluorene	mg/kg	0.05	MCERTS	-
Phenanthrene	mg/kg	0.05	MCERTS	-
Anthracene	mg/kg	0.05	MCERTS	-
Fluoranthene	mg/kg	0.05	MCERTS	-
Pyrene	mg/kg	0.05	MCERTS	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-
Chrysene	mg/kg	0.05	MCERTS	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719765
Sample Reference				AS4
Sample Number				None Supplied
Depth (m)				0.10
Date Sampled				08/12/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-
Boron (total)	mg/kg	1	MCERTS	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-
Chromium (hexavalent)	mg/kg	4	MCERTS	-
Chromium (III)	mg/kg	1	NONE	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-
Magnesium (water soluble)	mg/kg	5	NONE	-
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	MCERTS	-
Toluene	µg/kg	1	MCERTS	-
Ethylbenzene	µg/kg	1	MCERTS	-
p & m-xylene	µg/kg	1	MCERTS	-
o-xylene	µg/kg	1	MCERTS	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-
Petroleum Hydrocarbons				
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	-
TPHCWG - Total C5 - C44 Aliphatic & Aromatic	mg/kg	10	NONE	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719765
Sample Reference				AS4
Sample Number				None Supplied
Depth (m)				0.10
Date Sampled				08/12/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
VOCs				
Chloromethane	µg/kg	1	ISO 17025	-
Chloroethane	µg/kg	1	NONE	-
Bromomethane	µg/kg	1	ISO 17025	-
Vinyl Chloride	µg/kg	1	NONE	-
Trichlorofluoromethane	µg/kg	1	NONE	-
1,1-Dichloroethene	µg/kg	1	NONE	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-
1,1-Dichloroethane	µg/kg	1	MCERTS	-
2,2-Dichloropropane	µg/kg	1	MCERTS	-
Trichloromethane	µg/kg	1	MCERTS	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	-
1,2-Dichloroethane	µg/kg	1	MCERTS	-
1,1-Dichloropropene	µg/kg	1	MCERTS	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	-
Benzene	µg/kg	1	MCERTS	-
Tetrachloromethane	µg/kg	1	MCERTS	-
1,2-Dichloropropane	µg/kg	1	MCERTS	-
Trichloroethene	µg/kg	1	MCERTS	-
Dibromomethane	µg/kg	1	MCERTS	-
Bromodichloromethane	µg/kg	1	MCERTS	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	-
Toluene	µg/kg	1	MCERTS	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	-
Dibromochloromethane	µg/kg	1	ISO 17025	-
Tetrachloroethene	µg/kg	1	NONE	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	-
Chlorobenzene	µg/kg	1	MCERTS	-
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	-
Ethylbenzene	µg/kg	1	MCERTS	-
p & m-Xylene	µg/kg	1	MCERTS	-
Styrene	µg/kg	1	MCERTS	-
Tribromomethane	µg/kg	1	NONE	-
o-Xylene	µg/kg	1	MCERTS	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	-
Isopropylbenzene	µg/kg	1	MCERTS	-
Bromobenzene	µg/kg	1	MCERTS	-
n-Propylbenzene	µg/kg	1	ISO 17025	-
2-Chlorotoluene	µg/kg	1	MCERTS	-
4-Chlorotoluene	µg/kg	1	MCERTS	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	-
tert-Butylbenzene	µg/kg	1	MCERTS	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	-
sec-Butylbenzene	µg/kg	1	MCERTS	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	-

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Lab Sample Number				1719765
Sample Reference				AS4
Sample Number				None Supplied
Depth (m)				0.10
Date Sampled				08/12/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
1,2-Dichlorobenzene	µg/kg	1	MCERTS	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	-
Butylbenzene	µg/kg	1	MCERTS	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	-
Hexachlorobutadiene	µg/kg	1	MCERTS	-
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC
Your Order No: 16302

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1719757	TP3	1.50	131	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**
1719758	TP4	0.40	125	Loose Fibres	**Chrysotile & Amosite**	< 0.001	**< 0.001**
1719761	TP6	0.60	132	Loose Fibres	**Amosite**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number: 20-47754
Project / Site name: Thomas Telford UTC

Your Order No: 16302

Lab Sample Number				1719766	1719767
Sample Reference				TP3	TP6
Sample Number				None Supplied	None Supplied
Depth (m)				1.50	0.60
Date Sampled				08/12/2020	08/12/2020
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
General Inorganics					
pH	pH Units	N/A	ISO 17025	7.7	9.4
Sulphate as SO4	mg/l	0.1	ISO 17025	13.3	970
Total Organic Carbon (TOC)	mg/l	0.1	NONE	8.59	6.13
Total Phenols					
Total Phenols (monohydric)	µg/l	1	ISO 17025	1.9	2.5
Speciated PAHs					
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01
Total PAH					
Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2
Heavy Metals / Metalloids					
Arsenic (dissolved)	µg/l	1	ISO 17025	2.8	3
Beryllium (dissolved)	µg/l	0.2	ISO 17025	0.2	< 0.2
Boron (dissolved)	µg/l	10	ISO 17025	88	21
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	1.3	1.7
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.3	1.7
Copper (dissolved)	µg/l	0.7	ISO 17025	28	22
Lead (dissolved)	µg/l	1	ISO 17025	8.9	3.5
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.7	0.9
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0
Vanadium (dissolved)	µg/l	1.7	ISO 17025	14	4.9
Zinc (dissolved)	µg/l	0.4	ISO 17025	16	9.2
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.59	0.41

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-47754
Project / Site name: Thomas Telford UTC

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1719750	DCS1	None Supplied	0.30-0.40	Brown sand with rubble and tar.
1719751	DCS2	None Supplied	1.00-1.10	Grey sandy clay.
1719753	DCS4	None Supplied	0.15-0.25	Brown loam and sand with vegetation and gravel.
1719755	TP1	None Supplied	0.5	Brown loam and sand with vegetation and gravel.
1719757	TP3	None Supplied	1.5	Brown loam and sand with brick and gravel
1719759	TP5	None Supplied	1.6	Brown clay and sand with gravel and vegetation.
1719760	TP5	None Supplied	0.6	Grey clay and sand with gravel and brick.
1719761	TP6	None Supplied	0.6	Brown clay and sand with gravel.

Analytical Report Number : 20-47754
Project / Site name: Thomas Telford UTC

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In house method.	L005-PL	W	ISO 17025

Analytical Report Number : 20-47754
Project / Site name: Thomas Telford UTC

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon in leachate	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Cr (III) in leachate	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG Ali Aro Sum	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

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Analytical Report Number : 20-47757

Project / Site name:	Thomas Telford UTC	**Samples received on:**	15/12/2020
Your job number:	AG3187 20	**Samples instructed on/ Analysis started on:**	15/12/2020
Your order number:	16302	**Analysis completed by:**	24/12/2020
Report Issue Number:	1	**Report issued on:**	24/12/2020
Samples Analysed:	10:1 WAC sample		

Signed: Karolina Marek

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Waste Acceptance Criteria Analytical Results

Report No:	**20-47757**						
					Client:	**APPLIEDGEO**	
Location	**Thomas Telford UTC**						
Lab Reference (Sample Number)	1719785 / 1719786				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	08/12/2020				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP2						
Depth (m)	2.00						
Solid Waste Analysis							
TOC (%)**	1.5				3%	5%	6%
Loss on Ignition (%) **	-				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg)	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	20.4				100	--	--
pH (units)**	-				--	>6	--
Acid Neutralisation Capacity (mol / kg)	-				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	0.0044			0.0374	0.5	2	25
Barium *	0.0147			0.125	20	100	300
Cadmium *	< 0.0001			< 0.0008	0.04	1	5
Chromium *	0.0005			0.0046	0.5	10	70
Copper *	0.0034			0.029	2	50	100
Mercury *	< 0.0005			< 0.0050	0.01	0.2	2
Molybdenum *	0.0058			0.0490	0.5	10	30
Nickel *	0.0005			0.0043	0.4	10	40
Lead *	0.0023			0.020	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.0032			0.027	4	50	200
Chloride *	0.63			5.3	800	15000	25000
Fluoride	0.31			2.6	10	150	500
Sulphate *	16			140	1000	20000	50000
TDS*	55			470	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	4.79			40.5	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2.0						
Dry Matter (%)	87						
Moisture (%)	13						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.
*= UKAS accredited (liquid eluate analysis only)
Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation
** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Analytical Report Number : 20-47757
Project / Site name: Thomas Telford UTC

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1719785	TP2	None Supplied	2	Brown clay and sand with gravel.

Analytical Report Number : 20-47757
Project / Site name: Thomas Telford UTC

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270. MCERTS accredited except Coronene.	L064-PL	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073-PL	W	MCERTS
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

Analytical Report Number : 20-47757
Project / Site name: Thomas Telford UTC

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX F

APPENDIX F

STANDARD FIELDWORK AND ASSESSMENT PROCEDURES

Scope of Work

The scope of work undertaken is defined in Section 1 of the Report. It should be noted that Applied Geology Limited does not provide arboricultural surveys, specialist surveys for the detection of invasive plant species (such as Japanese Knotweed) or protected species of wildlife. Information from environmental and ecological datasets is included from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website, however, if a full assessment of Environmental or Ecological aspects is required, it is recommended that other specialists are consulted. Similarly, information on flood risk is included; obtained from the Environment Agency Web site and the GroundSure report; but this is not intended to be a full hydrological study and, if a flood risk assessment is needed, additional analysis by others is recommended to confirm this aspect of the development. Also, whilst our field staff have undergone asbestos awareness training, Applied Geology does not undertake asbestos surveys or provide specific advice relating to asbestos-containing materials. Any suspected asbestos-containing materials observed by our field staff will be mentioned in the report but further assessment by others may be required.

Fieldwork

Fieldwork is generally carried out in accordance with BS5930 (2015) “Code of Practice for Site Investigations” and BS10175 (2011) Investigation of Potentially Contaminated Sites, unless otherwise stated.

Prior to commencement on site, statutory services plans are generally obtained and verbal enquiries are also made regarding the positions of private or statutory services on site. Prior to excavation or drilling, locations are scanned with a cable avoidance tool (CAT) and service pits are generally excavated at borehole positions, where possible.

Descriptions and depths of the various strata recovered are presented on the exploratory hole records, reproduced in the report appendices, together with sample depths, the results of in-situ testing, comments on groundwater inflows, and any other pertinent information. The strata descriptions are in general accordance with BS5930:2015. Disturbed plastic pot and glass amber jar samples are recovered from the various strata and stored and transported in cool boxes, where relevant, for possible future laboratory testing.

Light cable percussion boreholes are generally drilled using a Pilcon Wayfarer or Dando rig and are advanced using equipment to bore 200/150mm diameter boreholes. Disturbed plastic pot samples are recovered from all deposits encountered to allow examination and laboratory testing. Certain strata are cased off due to their tendency to collapse, particularly in the presence of groundwater inflows and/or to reduce the risk of cross contamination. In situ Standard Penetration Tests, using Split Spoon (SPT) and Cone (CPT) are undertaken in the boreholes to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT “N” value results. Within the fine grained (cohesive) deposits, “undisturbed” 100mm driven open tube samples were recovered from the various deposits to provide samples for examination and laboratory testing. On encountering groundwater, boring is usually suspended for 20 minutes while any rise in water level is recorded. Full details of the groundwater observations and monitoring results during boring operations are included on the borehole records. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion, unless otherwise stated on the individual logs.

Unless otherwise stated on the relevant logs, trial pits are excavated using a wheeled backhoe excavator, usually with a 0.6m wide bucket. The excavations are logged from the ground surface by an Engineering Geologist / Geo-environmental Engineer and relevant field testing, appropriate to the soils encountered, is carried out on samples brought to the surface. Representative disturbed soil

samples are collected from selected horizons for subsequent laboratory testing. The trial pits are usually unshored and where reasonable, left open for a period of time to allow observations of pit stability and depth and inflow rate of any groundwater ingress. The excavations are backfilled with arisings prior to moving on to the next position. Any trial pits carried out as part of this or previous investigations may represent soft spots and conduits/sumps for groundwater or surface water. In excavations, such materials may also be loose and unstable.

Driven Continuous Sampling (DCS) boreholes are drilled using a track mounted Global mini-rig or similar using sampling tubes of varying diameter (decreasing with depth). Samples of the deposits encountered are recovered in 1m long clear plastic liners, which are logged and sub-sampled on site by an Engineering Geologist. Generally for geotechnical investigations, during the drilling process in-situ Standard Penetration Tests (SPTs) are undertaken at selected depths to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT “N” value results. Groundwater seepages are noted during drilling if encountered. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion.

Unless specifically stated in the report, exploratory hole locations should be regarded as approximate. Consideration should be given to accurate location of the exploratory holes where it is considered they may impact on proposed development.

It should be noted that groundwater levels at any particular site may fluctuate due to rainfall, seasonal variations etc and, therefore, levels may be different to those measured during the course of the fieldwork and monitoring period.

Laboratory Testing

The geotechnical testing was carried out in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes and was undertaken by a UKAS accredited specialist laboratory. Chemical testing was undertaken by a UKAS accredited specialist chemical testing laboratory and MCERTS accredited methods, in accordance with Environment Agency recommendations, were specified where available.

Contamination Assessment – Human Health

Applied Geology Limited has followed the guidance given in the CLR 11 publication and other available guidance to assess the contaminant concentrations. Details of the methodology followed are briefly outlined below.

The available chemical data is sorted into appropriate datasets depending on sampling regime and ground conditions. An initial generic quantitative risk assessment is undertaken on this data using statistical tests, where appropriate, and relevant screening values. Risk to human health has been initially assessed by comparing soil results against various published screening criteria. These have been sourced from the following, in order of preference:

- DEFRA. Category 4 Screening Levels (C4SL), March 2014;
- LQM/CIEH S4UL for Human Health Risk Assessment (S4UL), 2015*;
- Environment Agency/DEFRA, Soil Guideline Values (SGV) published in 2009;
- EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (GAC), 2010.

Except for lead and benzo(a)pyrene, the assessments will be carried out by comparing results against the LQM/CIEH S4UL in the first instance, where these values are exceeded, then reference will be made to the C4SLs where such exist. Lead will only be compared to the C4SL because no S4UL exists for lead. For Benzo(a)pyrene, Applied Geology has chosen to adopt the approach presented by the C4SL committee rather than the approach proposed by LQM/CIEH. Further discussion on this is presented below.

It is our view, and the view of others in the industry, that the C4SL were derived for use in both the Part IIA system and through the planning system, as they allow identification of those sites that fall within Category 4 (not contaminated) and are therefore able to be developed with no further remedial action. The C4SLs are considered to represent a contamination level that is 'low' from a toxicological view point, which we therefore consider to be 'acceptable' under planning.

Historically, the level of contamination has been assessed with reference to SGV values which were derived to represent a 'minimal' level of contamination. The SGVs are still valid and can be used alongside C4SL, however both screening values are only intended to provide guidance as to the level of contamination and, where concentrations fall below these screening values, the site is not contaminated (and is within Category 4). Exceedance of a SGV/S4UL/C4SL does not automatically indicate that an 'unacceptable' risk exists at a site; simply that further consideration of that particular contaminant is required.

At this time, there are two toxicological methodologies that can be used in the derivation of screening criteria for PAHs; Relative Potency Factor (RPFs) or the Surrogate Marker approach. Applied Geology has chosen (based on the latest guidance from the Health Protection Agency (HPA) to use the surrogate marker approach proposed in the C4SL methodology, whereby benzo(a)pyrene can be used as a surrogate marker for all 'genotoxic' (gene damaging) PAHs. The surrogate marker approach estimates the toxicity of a mixture of PAHs in an environmental matrix by using data from toxicity studies in which a PAH mixture of known composition was tested. Exposure to the surrogate marker benzo(a)pyrene is assumed to represent exposure to all the PAHs in the environmental matrix. Thus, the level of toxicity ascribed to the surrogate represents the toxicity of the PAH mixture. This allows an assessment of the combined carcinogenic risk associated with genotoxic PAHs using only benzo(a)pyrene. In order to confirm that the mixture of genotoxic PAH in the soil is similar to the coal tar mixture used in the toxicological study, various PAH ratios are plotted and checked to see that they fall within the limits set in HPA, 2010.

Contamination Assessment – Water Quality

Risks to water quality has been assessed by following the Environment Agency guidance on groundwater protection (previously known as GP3), updated on their website in March 2017, see https://www.gov.uk/government/policies/water-quality and 'The Environment Agency's approach to groundwater protection' (March 2017 Version 1.0).

For hazardous substances, which should be prevented from entering groundwater, the screening criteria are initially set as the limit of detection, however, if groundwater has already been impacted, an appropriate environmental standard will then be used. For hazardous substances, background quality may also be taken into account.

For non-hazardous compounds, their release should not result in any pollution or significant risk of pollution in the future, as such comparison with UK DWS or EQS standards will allow determination of whether pollution could occur. Typically screening criteria will be sourced from the following:

- Environmental Standards (ES), which are defined in European legislation such as the Water Framework Directive (WFD) (2000/60/EC) and the Priority Substances Directive (PSD) (2008/105/EC) a daughter directive of the WFD.
- The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Direction, 2010.
- UK Water Supply (Water Quality) Regulations, 2010.
- UK quality standards for water to be used for direct abstraction to potable supply e.g. Surface Water (Abstraction for Drinking Water) (Classification) Regulations, 1996.
- World Health Organisation (WHO) Guidelines for Drinking Water Quality.

Re-use of Soils and Waste Soil Disposal

It is noted that if any excavated material is to be reused on site, a Waste Management Plan (WMP) and / or a Materials Management Plan (MMP) will probably be required. Any such materials must be suitable for re-use without further treatment, and only the quantity necessary for the specified works should be used. Any materials not within these definitions may need to be considered as waste whereby a Waste Management Licence Exemption may also be required.

A specific categorisation and assessment of potential waste soils arising from the proposed development has not been undertaken as part of the investigation, unless otherwise detailed in the report text. However, generic comments and advice are made below for the reader.

All waste soils should be sorted to prevent mixtures of waste types. Where possible, any waste soil should be recycled and the volume of soil to be disposed of should be minimised. Any excavated soil material and excess spoil disposed of off-site should be treated as Waste and classified as Inert, Non-hazardous or Hazardous, prior to removal from site, as required by the “Duty of Care” (Environmental Protection Act, 1990) legislation together with Annex II of Directive 1999/31/EC (“Landfill Directive”). Initially, Basic Characterisation of the waste is required whereby the material should be described and its source of origin recorded (a site plan, exploratory hole records and the certificates of chemical analysis in this report should be included). This should also include data on its composition and leaching behaviour, its European Waste Catalogue (EWC) code, and where relevant any hazardous properties according to Annex III of Directive 91/689/EEC. This information should be provided to the licensed waste contractor.

Soils excavated on many sites would generally fall under the EWC description “Soil and Stones”, EWC code 17 05 04. Waste Acceptance Criteria (WAC) testing is required for many Inert wastes and generally for all Hazardous Waste but not for non-hazardous waste. There are certain restrictions for inert wastes regarding topsoil and peat. Any asbestos must be disposed of by suitably licensed contractors to a suitably licensed facility.

Health & Safety Aspects

As outlined within the HSE publication ‘Successful Health and Safety Management - HSG65’, this report should inform your development of safe systems of work and information as an input into the safety management system.

When developing risk control systems we suggest making reference to the CIRIA report 132 "A guide for safe working on contaminated sites" and the HSE document "Protection of workers and the general public during the development of contaminated land – HSG66". All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.

The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations.

Where excavations are undertaken on site, trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions. Care should be taken when digging excavations to prevent undermining or causing loss of support to the foundations of the nearby adjoining structures. Surcharging such as from spoil or vehicle movements close to excavation sides should be avoided. Practical guidance on trench excavation is given in CIRIA Report 97 Trenching Practice. Guidance on groundwater control is given in CIRIA Report 113 Control of groundwater for temporary works. Temporary works should be designed by a suitably qualified engineer or a competent person particularly where personnel access is necessary, in accordance with the requirements of the Construction (Design and Management) (CDM) Regulations.