RIDGE

PROPERTY & CONSTRUCTION CONSULTANTS

GROUND CONDITION ASSESSMENT

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5005462-RDG-XX-ST-DOC-C-0001

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Prepared for

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1. INTRODUCTION

1.1. Introduction

Ridge and Partners LLP (Ridge) was commissioned by EP Barrus Ltd. in January 2018 to undertake a Ground Condition Assessment in relation to a proposed new office development at Anniversary Avenue, Bicester, OX26 6HF (hereafter referred to as "the site"). A site location plan is included as Figure 1.

The investigation follows the submission of a Desk Top Study (preliminary risk assessment) in May 2018 (Ref: 5005462-RDG-XX-ST-DOC-C-0101), which should be read in conjunction with this report.

Ridge were briefed to undertake a ground investigation to determine ground conditions and likely load capacity in the specific development areas. Intrusive investigative works comprised diamond coring, dynamic sampler boreholes, trial pits, and Dynamic Cone Penetrometer tests for conversion to California Bearing Ratio.

This report provides a detailed assessment of the materials present beneath the development site and present characteristic parameters that should be used in design of geotechnical facets of the proposed development. Following on from the outcomes of the Desk Top Study, and utilising data obtained during intrusive works, a contaminant assessment has been carried out.

This report is prepared in line with the agreed brief and is subject to the report conditions shown in Appendix 1.

1.2. Methodology

The investigation was carried out in accordance with statutory guidance including BS5930:1999 *Code of Practice for Site Investigations (Amendment 3: 2015)* and BS10175:2011+A1:2013 *Investigation of Potentially Contaminated Sites: Code of Practice.*

1.3. Proposed Use

Development proposals indicate the provision of one office building with associated service utilities, access roads, and pedestrian walkways. Further to this, re-use of existing buildings and highway improvement works. It is likely that the development will include limited areas of soft landscaping. Further details are provided within Figure 2.

A commercial end use scenario has been adopted for development of the conceptual site model.

1.4. Sources of Information

The information and documents received and reviewed to provide some background information for the preparation of this report are given below:

- British Geological Survey website

1.5. Report Scope and Limitation

This report is based upon a review of the Desk Top Study and the recent site investigation data detailed herein. The report presents an interpretation of boreholes and laboratory data provided by the Ridge site investigation undertaken on 16th and 17th April 2018.

This information has been collated, processed and used to provide an interpretation of the ground conditions.

The recommendations and opinions expressed in this report are based on the strata observed in the exploratory holes, the results of the site and laboratory tests, and information obtained or provided by others. Ridge takes no responsibility for conditions that have not been revealed by the exploratory holes, or which occur between them.

Whilst efforts have been made to interpret the conditions between investigation locations, such information is only indicative and liability cannot be accepted for its accuracy. Information provided from other sources is taken in good faith and Ridge cannot guarantee its accuracy. It should also be acknowledged that the findings of the investigation may be more widespread than identified by the investigation.

The information contained in this report is intended for the use of E P Barrus Ltd. and Ridge can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

2. SITE CONDITIONS

The site measures approximately 7.40ha and is currently used for storage and warehousing of a variety of products as part of a Ministry of Defence (MOD) facility known as Bicester Garrison.

2.1. Site Location and Description

Table 2.1: Site Details

Site Address	Anniversary Avenue, Bicester, OX26 6HF
National Grid Reference	459046, 219805
Site Area	7.40ha
Site Occupier	Ministry of Defence
Site Access	Anniversary Avenue to the north, via guarded gates to the east
Site Boundaries	North – Anniversary Avenue
	East – Open boundary
	South – Train line
	West – Wooded areas
Ground Cover	Approximately 60% hardstanding inclusive of building footprint. 40% softstanding.
Site Topography and Elevation	Approximately between 70 and 65mAOD, sloping downhill to the south.

Two brick and steel clad warehouses (90 x 120m) are located in the northern and western parts of the site. The northern warehouse is known as D1, while the western warehouse is known as D4.

At the time of the walkover, D1 was used to store various materials such as razor wire, helmets, Kevlar body armour, sandbags, and plastic storage containers. Fork lift charging points were also noted. Train wells are situated on the eastern elevation at the northern and southern extents. An above ground fuel storage tank (AST) was noted to the external of the north-eastern elevation. According to information obtained on site, the AST was used for intermittent heating of the warehouse. Munition storage huts were noted approximately 15m east of warehouse.

D4 is used for the storage of ration packs only (approximately one million at the time of the walkover). A train well is situated at the north-eastern elevation. An AST was identified approximately 20m north of the northern elevation, apparently used for warehouse heating.

The remainder of the site primarily comprises hardstanding areas inclusive of pallet storage, grassed softstanding, access roads and relict train lines. The south-eastern portion of the site is made up of a concrete-surfaced storage area measuring approximately 75 x 60m. This area is used to store sea containers and temporary roll-out steel road surface, amongst other items.

2.2. Surroundings

MOD land surrounds the site boundary to the north, east and west. A network rail railway line bounds the site to the immediate south with a solar farm beyond.

The surrounding area is primarily rural comprising a mixture of pastoral and arable farmland. The centre of Bicester is situated approximately 3km north.

3. PHYSICAL SETTING

3.1. Published Geology

The following observations are taken from the British Geological Survey (BGS) Geology of Britain Viewer (2018).

The British Geological Survey (BGS) Geology of Britain Viewer (2018) indicates that the site is directly underlain by Bedrock Geology of the Peterborough Member. There are no records of Superficial Deposits directly below the site, although it should be noted that there is the possibility of Alluvium (Clay, Silt, Sand and Gravel) directly south of the site boundary.

- Alluvium – Soft to firm consolidated, compressible silty Clay, but can contain layers of silt, sand, peat and basal gravel. A stronger desiccated surface zone may be present.
- Peterborough Member – Brownish grey, fissile, organic-rich (bituminous) mudstones; shelly fauna dominated by crushed aragonitic ammonites and bivalves, including nuculoid and meleagrinella shell beds. Subordinate beds of pale medium grey, blocky mudstone. Several bands of cementstone nodules/ concretions. Basal beds commonly silty, with gryphaea-rich shell beds.

3.1.1. Artificial Ground

According to records the entire site area has been subject to landscaped ground.

3.2. Historical Boreholes

A historical borehole drilled 230m north-east within the Bicester Garrison (Ref: SP52SE72 – 459300, 220100) identified Made Ground comprising topsoil with ash and cinders to 0.10mbgl. Soft orangish brown and greyish brown silty Clay was observed from 0.10 to 2.40mbgl. Soft to firm greyish brown silty Clay with sand, calcareous nodules and occasional fossils was identified from 2.40 to 2.90mbgl. Stiff fissured sometimes friable dark brownish grey silty Clay with some gypsum dust was noted from 2.90mbgl to the maximum drill depth of 3.00mbgl.

Water entry was noted at 2.40mbgl. No further details are provided.

3.3. Hydrogeology and Hydrology

Aquifer within Superficial Deposits (adjacent south): Secondary (A) – Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

Aquifer within Bedrock Geology: Unproductive – Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base blow.

Groundwater Vulnerability and Soil Leaching Potential: Superficial Deposits to the immediate south are classified as H1 in terms of Soil Vulnerability – soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.

Source Protection Zones: There are no Source Protection Zones (SPZ) within 500m of the study site.

Surface Water Features: The nearest surface water feature is 35m south, considered to be an agricultural drainage channel. The closest Detailed River Network feature (tertiary) is 300m south-east.

4. PREVIOUS REPORTS

4.1. Desk Top Study

A Desk Top Study (Preliminary Risk Assessment) was issued by Ridge in May 2018 (Ref: 5005462-RDG-XX-ST-DOC-C-0101), which should be read in conjunction with this report. The purpose of the Desk Top Study is to use development information provided in an environmental database search relating to the site, a and walkover survey, to assess and report on the findings with respect to potential ground contamination. This enables the development of a Preliminary Conceptual Site Model (CSM) and risk assessment.

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach the receptor and hence whether it is of major or minor significance.

4.1.1. Receptors

The Desk Top Study identified the following receptors:

- Site Operatives (as part of day to day operations)
- Construction Workers (during development)
- Any future Maintenance Workers
- Underlying Secondary (A) Superficial Aquifer
- Surface Water Feature 35m south

4.1.2. Sources

Following site reconnaissance, review of historical maps, and information on public record, potential sources of contamination have been identified as follows:

- Potential petroleum hydrocarbon related contamination associated with on site diesel incident in April 2003 and Above Ground Storage Tank (AST) situated 20m north of the northern elevation of D4 (southern warehouse).

- Potential for petroleum hydrocarbon related contamination associated with on site AST situated adjacent to north-east elevation of D1 (northern warehouse).

- Development/ levelling of site and general usage as storage facility inclusive of railway line use. Possible contaminants of concern include asbestos heavy metals, solvents, petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Additional potential for ground gas based on in filling of land.

- Development and activities associated with surrounding land use, inclusive of railway line 5m south. Possible contaminants of concern include asbestos, heavy metals, solvents, petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Additional potential for ground gas based on in filling of land.

4.1.3. Contaminants in Soil

The study identified potential for contaminants within Made Ground and shallow natural soils. Although it is assumed that the development includes limited areas of soft landscaping, it is acknowledged that the majority of the development comprises areas of build footprint, hardstanding, roadways and pavements. Further to this, hardstanding and buildings act as a barrier between soil contamination in the soil and human site end users.

Due to the nature of site preparation and groundworks, there is potential for construction workers to come into contact with exposed shallow soils during development, thereby creating a viable pathway.

4.1.4. Ground Gas and Soil Vapour

Due to the unknown composition of Made Ground fill materials on site, there is some potential for ground gas producing soils. Nevertheless, it is acknowledged that there are no records of landfill or waste treatment site within 500m of the site boundary.

Based on the identification of 2no. ASTs, and an on site diesel incident in 2003, there is some potential for risk from hydrocarbon related sources. It is acknowledged that diesel specific impact to soil is unlikely to produce soil vapours, but lighter -end carbon chain soil impact cannot be ruled out.

4.1.5. Preliminary Risk Rating

Following the compilation of a Conceptual Site Model, the risk of impact to receptors from identified potential sources was considered to be **Very Low** to **Low**.

4.1.6. Recommendations

It was recommended that as part of the commissioned Geotechnical Ground Investigation, a contamination screen of Made Ground and shallow natural soils should be conducted. Screening should involve physical and chemical characterisation of soils within the development area specifically.

The requirement for characterisation of the ground gas and soil vapour regime is dependent on observations made during site works and subsequent laboratory analysis.

Further details of recommendations can be viewed within the issued report. Full details of fieldworks conducted are detailed in Section 5.0 of this report.

5. FIELDWORKS

5.1. Site Management and Preparation

Suitably experienced Ridge staff supervised the investigation which was undertaken on 16th and 17th April 2018. Methods employed during the investigation were carried out in accordance with statutory guidance including BS5930:1999 *Code of Practice for Site Investigations (Amendment 3: 2015)* and BS10175:2011+A1:2013 *Investigation of Potentially Contaminated Sites: Code of Practice*.

An Underground Utility Drawing (Ref: 20338) produced by MK Surveys, was made available prior to works, and intrusive positions were located in cleared areas. As an additional check while on site, manhole covers were lifted and a Cable Avoidance Tool (CAT) was used to check for any underground metallic or electrical services. Furthermore, starter pits were excavated to 1.20mbgl to clear test locations prior to any intrusive works, where possible.

Engineering Logs are presented in Appendix 2. Photographs relating to the Ground Investigation are presented in Appendix 3.

5.2. Rationale and Summary of Scope

The scope and rationale of the ground investigation undertaken is presented below.

- 7no. diamond core positions advanced in areas of hardstanding to allow collection of concrete cores or asphalt, to establish thickness and for testing;
- 16no. Dynamic Cone Penetrometer (DCP) tests to allow subsequent conversion to California Bearing Ratio (CBR) value;
- 8no. windowless sample boreholes (BH02-BH09) advanced with a Competitor 130 rig to a maximum depth of 4.45mbgl;
- 2no. hand advanced trial pits; and
- Collection of disturbed and environmental samples to allow geotechnical and chemical laboratory testing

Table 4.1: Exploratory Hole Location Rationale

Location ID	Rationale	Max Depth (mbgl)
T01-DCP	Area to the north-west of D4 proposed as new road/ turning area	0.908
T02-DCP	Area to the north-west of D1 proposed as new road/ turning area	0.906
T03-DCP	South-west of D1 proposed as new road/ turning area	0.912
T04-DCP	East of D4 – proposed as turning area	0.959
T05-DCP	East of D4 – proposed as turning area	0.962
T06-DCP	East of D4 – proposed as turning area	0.971
T07-DCP	South-east of D4 – proposed walkway/ pavement	0.926
T08-DCP	Eastern area of site – proposed walkway/ pavement	0.905
T09-DCP	Eastern area of site – proposed walkway/ pavement	0.905
T10-DCP	Eastern area of site – proposed parking	0.605 (refusal)
T11-DCP	Eastern area of site – proposed parking	0.905
C01-DCP	North-west of D1 – proposed road/ turning area	0.915
C02-DCP	North-east of D1 – proposed road	0.363 (refusal)
C03-DCP	South-east of D1 – proposed road	0.920
C04-DCP	North-west of D4 – proposed road/ turning area	0.800 (refusal)
C05-DCP	North-east of D4 - proposed road/ turning area	0.366 (refusal)
BH02	East of D4 – proposed as turning area	4.450
BH03	Centre of site – proposed office	4.450
BH04	Centre of site – proposed office	3.000
BH05	South-east of site – proposed temporary building	4.450
BH06	East of D1 – proposed roadway/ turning area	4.450
BH07	East of D1 – proposed roadway/ turning area	4.450
BH08	North-east of site – proposed roadway	4.450
BH09	West of D1 – proposed road	4.450
HP01	North of D4 – located to assess Above Ground Storage Tank (AST)	0.550
HP02	North of D1 – located to assess Above Ground Storage Tank (AST)	0.550

BH01 was not completed due to access restrictions. The layout of the exploratory positions is presented in Figure 3.

On completion, three of the boreholes (BH04, BH08 and BH09) were installed as dual purpose gas and groundwater monitoring wells constructed with 50mm internal diameter HDPE plain and slotted pipe. The response zone of the wells was firstly designed to target any groundwater underlying the site, and secondly to target possible Ground Gas producing Made ground.

A filter pack of washed gravel was placed in the well annulus to just above the screen sections, the annulus was sealed to the surface with bentonite. The monitoring wells were finished with flush-to-ground-level traffic-rated steel covers.

All remaining test positions were backfilled with arisings and finished at the surface with concrete.

5.3. Soil Sampling

All intrusive locations were logged and visual or olfactory evidence of contamination noted in accordance with current protocol.

Samples were handled using a fresh pair of nitrile gloves. Equipment was cleaned between use at different test locations and different sampling depths to prevent cross-contamination.

Selected samples were placed in sealable bags, sealed glass jars or plastic tubs (dependent on the exact laboratory requirement and analysis to be undertaken) and stored in a temperature controlled environment before transit.

Analytical test results are discussed in Sections 7.0 and 10.0.

5.4. Gas and Groundwater Monitoring

Gas and groundwater monitoring was not conducted due to access restrictions. Details will be issued under a separate cover.

6. GROUND CONDITIONS ENCOUNTERED

6.1. Soil

Ground conditions encountered during the ground investigation were consistent with those identified in the published literature and in summary comprised Made Ground or topsoil over the Peterborough Member. Superficial Alluvium Deposits were not identified.

A summary of ground conditions and any variations in strata thicknesses are summarised in Table 6.1 below. Engineering logs are presented in Appendix 2.

Table 6.1: Summary of encountered ground conditions

Strata	Depth Encountered (mbgl)		Typical Description/ Details
	Top	Bottom	
Topsoil	0.00	0.20 - 0.30	Identified in the majority of test positions in soft standing, and generally 200 to 300mm thickness. Comprised dark brown grey slightly gravelly silty Clay.
Made Ground	0.00	0.30 - 1.00	Identified in all positions with the exception of BH04. In areas of hardstanding Made Ground comprised Concrete over limestone hardcore sub base. In areas of softstanding, Made Ground generally comprised firm to stiff dark yellow brown slightly gravelly silty CLAY with anthropogenic materials such as: brick and charcoal fragments, bitumen and chert. Rare cloth was identified in Made Ground within BH08 only. Wood fragments were noted in BH03. Anthropogenic materials within HP01 comprised glass bottles, asphalt, brick clinker and brick fragments.
Clay	0.30 - 1.00	0.60 - 1.60	Firm to stiff grey yellow brown gravelly Clay was identified in all test locations. Gravel comprised angular and sub angular chert and limestone
Laminated Clay	0.60 - 2.10	4.45 (max. drill depth)	Stiff to very stiff dark grey brown thinly laminated silty Clay. Abundant compressed fossils on bedding surfaces within BH03 and BH05-BH09.

6.1.1. Additional Observations

Made Ground was identified in all test positions with the exception of BH04, thus supporting the fact that the majority of the site was subject to landscape profiling historically (refer to Section 3.1.1).

Weak yellow brown argillaceous fine medium Sandstone was identified within BH09 only, at 2.90-3.00mbgl.

A summary of the cores removed is provided in the table below. Cores were removed by way of a mobile diamond coring unit.

Table 6.2: Core Descriptions

Location ID	Description	Depth Base (mbgl)
C1	Bituminous Macadam (Wearing Course) Bituminous Macadam Concrete – limestone aggregate (no rebar)	0.045 0.105 0.340
C2	Bituminous Macadam (Wearing Course) Bituminous Macadam	0.030 0.220
C3	Bituminous Macadam Limestone capping material (unbound)	0.060 0.290
C4	Bituminous Macadam (Wearing Course) Bituminous Macadam Concrete – limestone aggregate (no rebar)	0.045 0.190 0.350
C5	Bituminous Macadam	0.090
C6	Bituminous Macadam Concrete – flint chert aggregate (no rebar) (Unable to prove base of concrete – limit of core barrel)	0.070 >0.450 (no sample)
BH05	Concrete – quartzite aggregate rebar at 0.1m & base, membrane below	0.165
BH09	Concrete – quartzite & limestone aggregate rebar at 0.1m, membrane below	0.165
T10	Concrete – quartzite aggregate rebar at 0.09m & base, membrane below	0.170

6.2. Groundwater

Details of groundwater strikes and subsequent rest water levels observed during the intrusive works are provided in the table below.

Table 6.3: Groundwater

Location ID	Water Strike (mbgl)	Water Level after 20 minutes (mbgl)	Comments
BH02	4.00	3.90 (in Clay)	Slow seepage
BH03	2.00	1.00 (Made Ground)	Slow seepage
BH04	2.00	1.20 (Clay)	Moderate flow
BH05	0.20 (in sub base)	0.20 (sub base)	Slow seepage
BH06	DRY	n/a	n/a
BH07	3.00	0.70 (Clay)	Rapid flow
BH08	4.00	3.20 (Clay)	Slow seepage
BH09	3.00	2.30 (Clay)	Moderate flow
HP01	DRY	n/a	n/a
HP02	DRY	n/a	n/a

With reference to the table above, there is much variation in observed groundwater levels, and this is perhaps indicative of the impermeable nature of identified strata, and the inherent variable nature of Made Ground.

It is recommended that a groundwater monitoring program is completed to determine more reliable equilibrium groundwater levels.

6.3. Visual/Olfactory Evidence of Contamination

Other than the anthropogenic constituents described above, there was no visual or olfactory evidence of contamination identified.

6.4. Roots

Occasional (grass) rootlets were identified in topsoil only.

7. SOIL CONTAMINATION ASSESSMENT

7.1. Assessment Methodology

It was recommended within the Desk Top Study that a contamination screen of Made Ground and shallow natural soils should be conducted.

Screening involved both physical and chemical characterisation of soils within the development area specifically.

Further to this, as an addition to on site logging and inspection, a laboratory screen of common contaminants was carried out on Made Ground fill materials and shallow natural soils.

Ridge have undertaken a screen of the soil laboratory results using generic assessment criteria. Generic assessment criteria (GAC) are conservative contaminant concentration values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information.

In order to assess the soil analyses results with regard to potential human health risks, Ridge has adopted published guidance criteria widely referred to by professionals within the industry, which include the following:

- Suitable 4 Use Levels (S4ULs) Generic Assessment Criteria (GAC) developed by the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management Ltd. (LQM);
- Category 4 Screening Levels (C4SL) for lead, produced by CL:AIRE (2014); and
- The UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols, produced by the EA and Department of Environment, Food and Rural Affairs (2009).

Comparisons have been made against the ‘commercial’ land use setting based on the continued use of the site. Results were compared to the conservative 1.00% soil organic matter value unless otherwise stated.

With regard to human health, the CLEA model states that, 'the contamination is assumed to be at or within 1m of the surface' (CLR10 pg10). It is considered that at depths greater than 1m, the probability of human exposure via the direct contact pathways are significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway. Therefore, for the purposes of statistical analysis, data from the top 1.0 to 1.5m is used for assessment of risks to human health via direct contact pathways in accordance with the CLEA model, dependant on proposed future site levels.

7.2. Soil Results

7.2.1. General

Nine soil samples collected during the site investigation were submitted to a UKAS and MCERTS accredited laboratory testing facility. Analytical suites were chosen to represent common contaminants of concern and included; an asbestos screen, heavy metals, and hydrocarbons including speciated Total Petroleum Hydrocarbons (TPH CWH aromatic/ aliphatic split), BTEX, MTBE and speciated Polycyclic Aromatic Hydrocarbons (PAH).

Specific samples were chosen for analysis to provide an indication of typical Made Ground and shallow natural soil conditions. The range of potentially hazardous contaminants present on a site can be wide and varied and the suite has been chosen to reflect commonly found contaminants and others indicated by research to have a significant chance of being present. It is, however, possible that others may exist for which analyses have not been carried out or which were outside the scope of completed exploratory holes.

Chemical Test Certificates are included in Appendix 4.

7.2.2. Asbestos

Off the nine samples tested, asbestos was identified in just one of the samples at HP01-0.40m. The laboratory identified the asbestos as microscopic chrysotile within soil.

Subsequent asbestos quantification (% asbestos by weight) of the sample HP01-0.40m returned 0.013% with a laboratory limit of detection of 0.001%.

Currently, there is no Soil Guideline Value for asbestos, although based on a study performed by the Institute of Occupational Medicine (Ref: TM/88/14 1988), any result over 0.001% is considered a risk. The study utilised the 'dustiness' test, where air is blown through a dried soil, and any fibres are trapped and measured.

7.2.3. Heavy metals

There were no exceedances of the applicable GAC. Furthermore, all results for mercury, selenium and phenols were below the laboratory limit of detection (LOD).

There was some elevation of chromium and lead within the sample collected from BH07 at 0.30m within Made ground. Analysis of a deeper sample within natural soils at 0.50m depth returned results below LOD for these determinands, and the majority of other determinands were also below LOD.

7.2.4. Polycyclic Aromatic Hydrocarbons (PAHs)

All tested determinands were below LOD for all samples with the exception of BH03-0.50-0.75m, BH06-0.40m, HP01-0.40m. Nevertheless, there were no exceedances of the GAC.

7.2.5. Petroleum Hydrocarbons

All tested determinands were below LOD for all samples with the exception of HP01-0.40m. There were slight elevations of aromatic >C16-C35, although there were no exceedances of the GAC.

7.2.6. BTEX and MTBE

All tested determinands were below LOD for all samples. There were no exceedances of the GAC.

7.2.7. Inorganics

The concentrations of free cyanide fell below LOD in both soil samples analysed.

7.2.8. Soil Waste Removal

Based on the results of the laboratory testing the made ground from B08 and natural ground from HP02 would be classified as inert.

Nine core samples of macadam were tested for speciated PAH. All of the samples had Benzo-a-pyrene concentrations <50mg/kg which is the threshold in WM3 above which macadam is classified as hazardous.

8. GROUNDWATER CONTAMINATION ASSESSMENT

8.1. Assessment Methodology

The requirement for assessment of groundwater is dependent on observations made during intrusive site works and subsequent analysis of soil samples.

In the absence of dedicated UK groundwater standards, groundwater analytical results would be screened against the conservative Water Framework Directive (WFD) 2015 Environmental Quality Standards (EQS), UK Drinking Water Standards (DWS) as taken from the Water Supply Regulations (2000), the New Dutch List (Dutch Target and Intervention Values, 2000) and the US EPA Drinking Water Standards (and Health Advisories) 2012.

Where a number of standards are available for a particular compound, the standard selected for screening purposes is based on the most relevant standard for the receptor, in the first instance. Thereafter, statutory standards are prioritised over non-statutory standards.

8.2. Requirement for Assessment

It was concluded that assessment of contamination to groundwater was not required. This conclusion was based on the following:

- The aquifer within Superficial Deposits is classified as Secondary (A) – in terms of sensitivity, this is considered **Low**
- The Bedrock aquifer is classified as Unproductive – in terms of sensitivity, this is considered as **Very Low**
- Risk to surface water is considered to be **Low** based on distance to the nearest feature (35m), an agricultural drainage channel, which is unlikely to be in connection with controlled water resources
- There are no Source Protection Zones (SPZ) within 500m of the study site
- Soil analysis has returned no exceedances of the GAC, and only minor elevations of heavy metals, PAHs and hydrocarbons above background levels. Analysis of natural samples returned results predominantly below laboratory limit of detection. The cohesive nature of natural Clay soils, means it is unlikely that contaminants have impacted underlying groundwater.

9. GROUND GAS AND SOIL VAPOUR ASSESSMENT

9.1. Design of Gas Monitoring Program

In accordance with BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds*, the extent of monitoring deemed necessary to assess the ground gas and vapour regime is determined by the generation potential of the source, i.e. what is the risk that large volumes of gas can be generated and can plausibly migrate to pose a credible hazard to the identified receptors.

Points detailed in the table below were pertinent in the design of the gas monitoring program. Information detailed in the table has either been taken from the Desk Top Study or interpreted from the intrusive investigation.

Table 9.1: Factors Influencing Design of Gas Monitoring Program

Factor	More Monitoring Required	Less Monitoring Required
Landfills and Waste Facilities	-	There are no landfills within 1km, and no waste treatment sites within 500m.
Mine Workings	-	There are no records of Mine Working in the vicinity of the site.
Artificial Ground	The Groundsure Report used within the Desk Top Study identified landscaped ground across the entire site. The Ground Investigation identified Made Ground in all locations with the exception of BH04.	-
Made Ground Organic Content	Rare cloth and wood fragments noted in Made Ground during Ground Investigation.	Nevertheless, in general a low content of degradable organic material. Following laboratory analysis Total Organic Carbon (TOC) ranged from 0.35 to 2.67%, with an average of 1.72%.
Natural Soils Organic Content	-	There was no evidence of degradable organic material in logged soils. TOC in natural soils was 1.22%, although it should be noted there was only one sample from Natural Soils.
Volatiles	-	Investigation of areas in the immediate vicinity of possible hydrocarbon sources (HP01 and HP02) confirmed the absence of VOCs. There was no visual or olfactory evidence of hydrocarbons, and subsequent laboratory analysis did not return significantly elevated TPH results.

9.1.1. Generation Potential of Source

Based on the information within Table 9.1, the generation potential is considered to be **Very Low**. According to guidance, a **Very Low** potential equates to – 'gas monitoring might not be necessary'

Nevertheless, it is acknowledged that rare wood and rag was noted within Made Ground that was present across much of the site, and therefore a screening is deemed appropriate.

9.1.2. Monitoring Program

Two to three monitoring visits are required to confirm the generation potential level considered above. Mobilisation for gas and soil vapour monitoring is to be combined with groundwater monitoring that is required for geotechnical purposes.

9.2. Report Addendum

Gas and groundwater monitoring was not carried out due to access restrictions. Details will be issued under a separate cover.

10. GEOTECHNICAL ASSESSMENT

10.1. Introduction

This geotechnical assessment and the subsequent foundation design recommendations will use the findings of the ground investigation and the results of the in-situ and laboratory geotechnical testing carried out in the boreholes and on representative samples of the materials encountered across the site.

10.2. Geotechnical Tests

Geotechnical laboratory testing was carried out on representative samples collected from the strata encountered during the ground investigation. Details of the specific procedure used in each case are shown below in Table 10.1 and the geotechnical test certificates are presented in Appendix 5.

Table 10.1: Summary of Geotechnical Testing

Test	Standard (BS1377:1990) unless otherwise indicated	No.
Chemical Tests		
pH value	Part 3, Clause 9.0	6
Sulphate content	Part 3, Clause 5.3	6
Natural Moisture Content	BS 1377 : Part 2 : 3.2	5
Liquid & Plastic Limits	Part 2, Clauses 4.3, 5.3 & 5.4	5
Compressive strength	BS EN 12504-1:2009	1

10.3. Geotechnical and Geological Parameters

This section discusses the key geotechnical characteristics of each encountered stratum as determined from field observations, in-situ and laboratory geotechnical testing. The stratigraphy revealed during the ground investigation comprised Made Ground or Topsoil over the Peterborough Member which forms the basal unit revealed. Each of these strata will be discussed separately in the following Sections.

10.3.1. Made Ground

The Ground Investigation identified Made Ground in seven of the eight boreholes to depths between 0.30m (BH09) and 1.00m (BH03). No Made Ground was present in BH04.

The Made Ground comprised reinforced concrete in each location with 10mm diameter rebar noted.

Concrete was present at ground level in BH05 and BH09. Sub-base 150mm thick was present beneath the slab in each location.

TRL DCP tests were carried out in 16 locations. This test provides a CBR value (%) but is not a CBR test. Results certificates are included as Appendix 2. The test results are varied depending upon depth and test material.

10.4. Concrete

The compressive strength of the concrete core from BH05 0.000-0.165m was 35.5N/mm^2. The core sample had no reinforcement present on the tested specimen. However the borehole log notes rebar at 0.10m.

10.4.1. Topsoil

Encountered in six of the eight boreholes to depths between 0.20 and 0.30m.

10.4.2. Peterborough Member

The bedrock of Peterborough Member was encountered underlying the Made Ground or Topsoil in each of the boreholes and was proved to a maximum depth of 4.45m.

In – Situ Testing

Standard Penetration Testing was carried out through the Peterborough Member and gave SPT 'N' values of between 7 and 9 at 1.00m and between 7 and 12 at 2.00m depth.

The distribution of SPT N-Values for is shown in Table 10.2. Borehole logs showing the full test results are included in Appendix 2. Graphical representation is included as Figure 4.

Table 10.2: Distribution of Equivalent SPT N Values in the Peterborough Member

BH No.	Depth (mbgl)	SPT N Value	Main Constituent
BH02	1.00	7	CLAY
	2.00	7	CLAY
	3.00	10	CLAY
	4.00	16	CLAY
BH03	1.00	8	CLAY
	2.00	10	CLAY
	3.00	13	CLAY
	4.00	31	CLAY

BH No.	Depth (mbgl)	SPT N Value	Main Constituent
BH04	1.00	7	CLAY
	2.00	9	CLAY
	3.00	>50	CLAY
BH05	1.00	9	CLAY
	2.00	8	CLAY
	3.00	14	CLAY
	4.00	16	CLAY
BH06	1.00	9	CLAY
	2.00	9	CLAY
	3.00	17	CLAY
	4.00	39	CLAY
BH07	1.00	8	CLAY
	2.00	12	CLAY
	3.00	24	CLAY
	4.00	33	CLAY
BH08	1.00	7	CLAY
	2.00	9	CLAY
	3.00	9	CLAY
	4.00	24	CLAY
BH09	1.00	9	CLAY
	2.00	9	CLAY
	3.00	34	CLAY
	4.00	18	CLAY

Classification Testing

Consistency Limits

Five representative samples of the Peterborough Member underwent Atterberg limits testing to determine the consistency limits.

Table 10.3: Consistency Limits

Location	Depth (mbgl)	Natural Water Content, w (%)	Liquid Limit w_L (%)	Plastic Limit w_P (%)	Plasticity Index I_P (%)	Corrected Plasticity Index (%)
BH02	1.30-1.50	32	70	27	43	43
BH03	1.50-1.70	35	76	29	47	47
BH03	2.80-3.00	35	68	31	37	37
BH04	0.80-1.00	39	76	29	47	47
BH04	1.80-2.00	38	74	31	43	43

NP = non- plastic

The Atterberg limits testing returned plasticity indices in the range 37-47% which are indicative of an intermediate to high plasticity. No correction is required to account for >425µm content (all 100% passing 425µm sieve). Therefore the tested samples have a medium to high volume change potential.

Undrained shear strengths derived from the results of the standard penetration testing using the recognised empirical relationship:

$$c_{uk} = N \times f_1$$

where f_1 is a correlation factor based on the characteristic plasticity index

Using a correlation factor of 5.5 all the undrained shear strength data ranges from c_{uk} from 38.5-49.5kN/m^2 at 1m depth to 38.5-66kN/m^2 at 2.00m.

Drained (Effective) Shear Strength

The widely accepted relationship between drained shear strength and plasticity index for remoulded clays has been used to determine the effective shear strength parameters. In terms of effective stress, the shear strength of a fine-grained soil can be considered as frictional, such that c'_k = 0kN/m^2.

Taking the characteristic plasticity index of 43% will give a characteristic effective angle of shearing resistance (ϕ'_k) of 23˚.

Modulus of Deformation (E_K)

Marslland (1975) gives a E_{uk}/c_{uk} ratio of 348 for glacial till giving a E_{uk} of 13.4MN/m^2 at 1.00mbgl rising to 22.9MN/m^2 at 17.00mbgl. CIRIA R 143 suggests that the drained modulus (E'_K) should be taken as 0.75E_{uk}. Therefore an E'_k of 10MN/m^2 should be ascribed to the Peterborough Member at 1.00mbgl rising to 17MN/m^2 at 2.00mbgl

Coefficient of Volume Compressibility

The coefficient of volume compressibility (m_v) has been determined from the empirical relationship with the SPT N and published data for similar materials giving an m_{vk} of 0.06m²/MN which is indicative of a material of low compressibility.

10.5. Aggressive Ground Soil Chemistry

Chemical testing was carried out on eleven samples of the encountered materials in accordance with Box C10, BRE Special Digest 1. The results are summarised in Tables 8.13 and 8.14.

Table 10.4: Summary of the Results of Chemical Testing for Concrete Classification

Test	BH02	BH03	BH04	BH04	BH04	BH05
	1.30m	2.80m	0.80m	1.80	2.80	1.80m
	PM	PM	PM	PM	PM	PM
pH	6.88	6.99	6.94	6.87	6.94	7.10
Soluble Sulphate (g/l)	0.4	0.46	0.32	0.54	0.61	0.66

Based on the maximum determined sulphate content Table C1 of BRE SD1 (natural ground locations) gives a Design Sulphate Classification of DS-2 and an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-2 assuming mobile groundwater conditions.

10.6. Characteristic Geotechnical Parameters

Based on the laboratory test results, in-situ testing and subsequent analysis a range of characteristic geotechnical parameters, which should be used in the subsequent geotechnical and foundation design calculations are presented in Table 7.3.

Table 10.5: Characteristic Geotechnical Parameters

Stratum	Parameter		Source	Value
Made Ground & Topsoil	Not used in foundation design			
Peterborough Member	Unit Weight γ_k (kN/m^3)		BS8002	18kN/m^3
	Undrained Shear Strength	c_{uk} (kN/m^2)	Emperical relationship with SPT	38.5kN/m^2 to 66kN/m^2
		ϕ_{uk} (˚)		0˚
	Drained Shear Strength	c'_k (kN/m^2)	Published values for organic Clays	0kN/m^2
		ϕ'_k (˚)		23˚
	Undrained Modulus of Deformation	E_{uk} (MN/m^2)	Marsland (1975)	13.4MN/m^2 to 22.9MN/m^2.
	Drained Modulus of Deformation	E'_k (MN/m^2)	CIRIA R 143	10MN/m2 to 17MN/m^2
	Coefficient of Volume Compressibility	m_{vk} (m^2/MN)	Relationship with I_{pk}	0.06m^2/MN

11. FOUNDATION AND GROUND ENGINEERING

11.1. Introduction

The geotechnical assessment below relates to the details of the proposed development. It is understood that a two storey office building is to be located at the site (BH03 & BH04). A RUBB (fabrick building) is to be erected on the existing concrete slab (BH05). At the time of writing no site specific structural loads had been made available; therefore this section of the Report will take a more generic approach.

The ground investigation has shown that the site is underlain by Made Ground or Topsoil which in BH03 extends to 1.00m. The natural strata comprises the Peterborough Member (clay) extending to a maximum investigation depth of 4.45m.

Various groundwater inflows were recorded during the investigatory works. The depths and inflow rates were variable and as noted in Section 6.2.

11.2. Shallow Foundations

11.2.1. New Office Building

The indigenous Clay is considered to be a suitable bearing stratum for traditional foundations for the proposed building. An allowable bearing capacity of 100kPa is considered appropriate for a strip foundations up to 1m wide and for pad foundations up to 2 x 2m in plan for foundations extending into the firm-to-stiff or stiffer Clay.

Foundations will need to extend through the made ground and extend at least 150mm in to the indigenous Clay that has been identified in in all borehole locations. The formation should be inspected by a suitably qualified Geotechnical Engineer to ensure that consistent materials are encountered across the footprint. Hand shear vane tests can be carried out on arisings from foundation excavations to confirm the expected founding materials.

It is recommended that foundations are located in materials with similar engineering properties. Foundations should be nominally reinforced if they cross materials with different engineering properties.

The clay has been found to be of medium and high shrinkage potential. As a conservative approach all of the clay should be assumed to be of high shrinkage potential. Foundation depths, new tree planting and ground floor slab design should take this shrinkage potential into account.

Some groundwater inflow was recorded in BH02 and BH04 and therefore allowance for some minor de-watering should be taken into account for excavations in this part of the site. It should be acknowledged that groundwater levels may vary seasonally.

11.2.2. RUBB

The compressive strength of the concrete sample from BH05 is as expected and 35.5N/mm^2. The concrete is 165mm thick. The concrete is underlain by a granular sub-base to 0.30m and made ground extending to 0.70m.

Assessment of the suitability of this concrete for the RUBB is subject to exact loadings and structural engineers calculations.

11.3. Other Geotechnical Considerations

11.3.1. CBR Values / Road Modifications

Due to the variation of construction thicknesses and CBR results it is not possible to provide recommendations for all areas. Bespoke designs for the individual areas should be progressed using the various results, taking proposed levels into account.

It may be necessary for in situ CBR tests to be undertaken at formation, following reduction in levels.

11.3.2. Waste Classification

The results of the WAC tests should be provided to hauliers and the associated landfill sites. It would be prudent for Made Ground / Inert materials to be segregated during excavations where possible.

Further testing should be commissioned if variable materials are identified during the course of groundworks.

11.3.3. Further Investigation

No further investigation is considered necessary at this time.

12. CONCEPTUAL SITE MODEL

12.1. Sources

Following interpretation of ground investigation data, potential sources of contamination have been identified:

- Potential Asbestos Containing Materials (ACMs) within Made Ground across the site. Although asbestos was only identified in one soil sample (HP01-0.40m);
- Impacted Made Ground soils across the site, inclusive of heavy metals, PAHs and hydrocarbons. Note, there were no exceedances of the GAC; and,
- Currently, unquantified risk from ground gas.

Made Ground was identified to a maximum depth of 1.00mbgl.

12.2. Pathways

The key environmental pathways and exposure routes by which potentially toxic substances can reach the identified potential receptors are considered to be:

12.2.1. Direct

- Inhalation of contaminated dust;
- Ingestion; and,
- Dermal contact.

12.3. Receptors

Receptors that may be affected by the potential contamination are considered to be:

12.3.1. Human

- Future (commercial) site users
- Construction workers

12.3.2. Environmental

- None, based on the justification as laid out in Section 8.2. There is not considered to be a viable source-pathway-receptor pollutant linkage associated with environmental receptors.

13. CONTAMINATION RISK ASSESSMENT

13.1. Risk Assessment Procedure

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been undertaken with reference to BS 10175:2011+A1:2013 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential magnitude of the hazard and the sensitivity of the target, based on the categories given below.

Table 13.1: Sensitivity of receptor

Category	Examples
High	Residential with gardens/Groundwater Source Protection Zone
Medium	Residential without gardens/Principal (Major) Aquifer/sensitive watercourse
Low	Commercial and industrial use/Secondary (Minor) Aquifer
Very Low	Construction and maintenance workers/non-sensitive watercourse

Table 13.2: Magnitude of impact

Category	Examples
Gross Impact	Heavily contaminated gasworks or industrial Site, hazardous waste landfill
Moderate Impact	Major leaks and spills from fuel infrastructure (e.g. petrol stations), domestic waste landfills
Slight Impact	Minor leaks and spills from fuel infrastructure, 'inert' waste landfills

Table 13.3: Level of severity of potential hazard

Magnitude of impact	Sensitivity of receptor			
	High	Medium	Low	Very Low
Gross Impact	Severe	Medium	Mild	Minor
Moderate Impact	Medium	Mild	Minor	Minor
Slight Impact	Mild	Minor	Minor	Minor

The likelihood of an event (probability) takes into account both the presence of the hazard and target and the integrity of the pathway and has been assessed based on the categories given below.

Table 13.4: Probability of risk definition

Category	Examples
High likelihood	Pollutant linkage may be present, and risk is almost certain to occur in long term, or there is evidence of harm to the receptor
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term
Low likelihood	Pollutant linkage may be present, and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable

The potential severity of the risk and the probability of the risk occurring have been combined in accordance with the following matrix in order to give a level of risk for each potential hazard.

Table 13.5: Level of risk for potential hazard definition

	Sensitivity of receptor			
Probability of risk	**Severe/ High**	**Medium**	**Mild/ Low**	**Minor/ V. Low**
High likelihood	Very High	High	Moderate	Low/Moderate
Likely	High	Moderate	Low/Moderate	Low
Low likelihood	Moderate	Low/Moderate	Low	Very Low
Unlikely	Low/Moderate	Low	Very Low	Very Low

The assessment is discussed below in terms of plausible pollutant linkages. A complete assessment of the pollutant linkages is presented in Table 13.6.

A description of these risk classifications and likely action required are given in CIRIA 552 as:

Very high risk – High probability that severe harm could arise to a designated receptor from an identified hazard OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in substantial liability. Urgent investigation and remediation are likely to be required.

High risk – Harm is likely to arise to a designated receptor from an identified hazard. This risk, if realised, is likely to result in substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the long term.

Moderate risk – It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.

Low risk – It is possible that harm could arise to a designated receptor from an identified hazard but it is likely that this harm, if realised, would at worst normally be mild.

Very low risk – It is a low possibility that harm could arise to a designated receptor. In the event of such harm being realised it is not likely to be severe.

13.2. Pollutant Linkage Assessment

Table 13.6: Pollutant linkage assessment

Source	Pathway	Receptor	Severity	Likelihood	Risk Level
Asbestos containing materials in soil	Inhalation	Future site (commercial) users	Minor	Unlikely	**Very Low**
		Construction workers	Minor	Likely	**Low**
Heavy metals, PAHs and hydrocarbons within Made Ground across the site.	Direct contact Ingestion Inhalation	Future site (commercial) users	Minor	Unlikely	**Very Low**
		Construction workers	Minor	Likely	**Low**
Possible risk from Ground Gas	Migration through the underlying geology	Future site (commercial) users	Low	Currently undefined – **gas monitoring required**	
		Construction workers	Very Low		

13.2.1. Asbestos in Made Ground

It is acknowledged that asbestos was identified in just one of the test positions, although there is potential it is more widespread.

Commercial end users working at the site during day-to-day operations are unlikely to come into contact with Made Ground materials. Interaction with areas of soft landscaping are likely to be recreational (tea breaks, smoking etc.) as opposed to operational.

A veneer of topsoil was identified at the majority of locations above the underlying Made Ground creating a 'protective' layer above potential asbestos containing Made Ground. Much of the site is covered with hardstanding or buildings thus breaking the contaminant pathway.

During site development and in particular groundworks, there is potential to expose asbestos containing Made Ground soils. The risks to development construction workers from asbestos are only likely to be significant if there is very dry weather during the development that results in dust generation from the soil. It is recommended that the risk of asbestos fibres becoming airborne should be managed by the contractor throughout the proposed development. Further details are provided in Section 14.0

13.2.2. Impacted Made Ground

Although impacted soils were localised, due to the variable character of Made Ground, heavy metals, PAHs and hydrocarbons may well be present across the site.

Commercial end users working at the site during day-to-day operations are unlikely to come into contact with Made Ground materials. Interaction with areas of soft landscaping are likely to be recreational (tea breaks, smoking etc.) as opposed to operational. Much of the site is covered with hardstanding or buildings thus breaking the contaminant pathway. Furthermore, a veneer of topsoil was identified at the majority of locations above the underlying Made Ground.

During site development and in particular groundworks, there is some potential to expose impacted Made Ground soils although implementation of simple measures will enable mitigation of risks. Further details are provided in Section 14.0.

14. CONCLUSIONS AND RECOMMENDATIONS

14.1. Contamination

Risks to site end users is currently considered to be **Very Low**.

Risks to construction workers is currently considered to be **Low**. A number of simple mitigation measures should be implemented during development construction works.

Mitigation measures are detailed below.

14.1.1. Gas Monitoring

Gas monitoring was not carried out due to access restrictions.

As stated in Section 9.0, two to three gas monitoring visits are required to confirm the ground gas regime. Potential risks from ground gas is currently considered to be **Very Low.**

Mobilisation for gas and soil vapour monitoring can be combined with groundwater monitoring that is required for geotechnical purposes.

14.1.2. Knowledge Share

Tool Box Talks and site meetings should be conducted to make all visitors and operators aware of potential risks based on site data collected to date.

14.1.3. Watching Brief

Appraisal of exposed soils during groundworks should be made by the on-site manager or developers nominated person. If any material is noted to show visual and/ or olfactory signs of contamination, this material should be stockpiled separately and tested. A suitably qualified geo-environmental specialist should be contacted to advise what further work is required.

14.1.4. Asbestos Specific Mitigation

To be managed by the contractor but mitigation may include wetting of soil during excavation, and segregation of soils. Adequate wash and mess facilities should be made available.

14.1.5. Personal Protective Equipment (PPE)

Although acknowledged as the last line of defence, PPE should be worn to reduce residual risks. Appropriate equipment may include long-sleeved shirts and nitrile gloves.

14.2. Geotechnical

The ground investigation revealed Topsoil and / or Made Ground in all borehole locations. The Made Ground was fairly limited in thickness, extending to 1.00m in WS03. Indigenous Clay was found to underlie the Made Ground or Topsoil in all locations and was proved to a maximum depth of 4.45m. The strength of the Icy was found to typically increase with depth.

The indigenous Clay is considered to be a suitable stratum for the use of traditional strip or pad foundations for the proposed two storey building. The clay has been found to be of high shrinkage potential and subsequent foundation and floor slab designs should take this shrinkability into account.

The materials encountered are not considered suitable for the use of soakaway drains for surface water disposal. It is recommended that the existing drainage network is investigated and capacity assessed to establish if surface water from the proposed building can be accommodated.

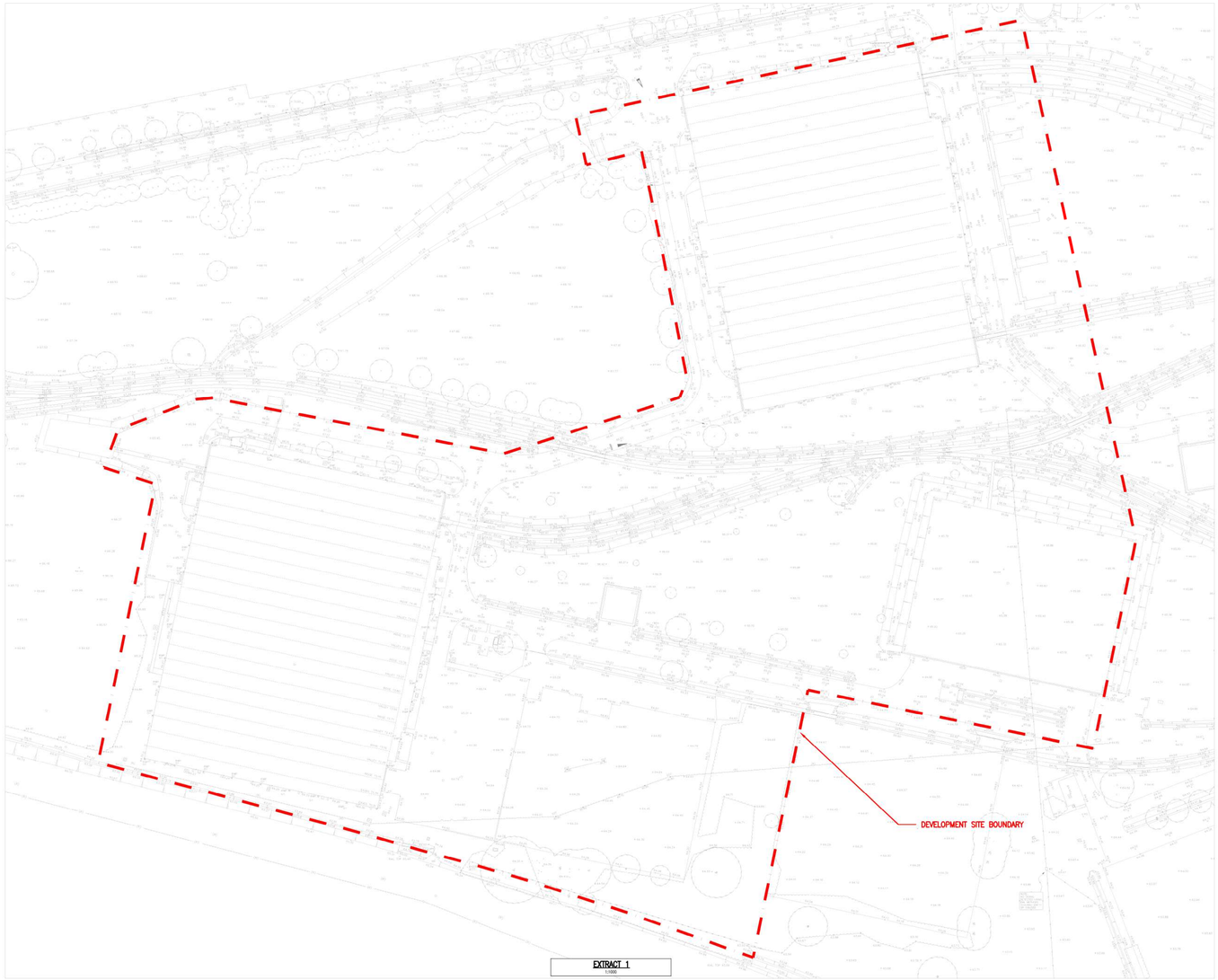
New road design should take the results of the TRL DCP and core profiles into account.

The existing external concrete slab is considered sufficient to accommodate the new RUBB fabric building, subject to Structural Engineers calculations.

Groundwater was encountered during the ground investigation appropriate mitigation should be allowed during excavations for foundations, drainage etc.

WAC testing has proved both indigenous and Made Ground to be inert. The presence of asbestos in HP01 should be further investigated should materials for disposal off site be generated from this part of the site.

FIGURE 1 – SITE LOCATION PLAN



EXTRACT 1
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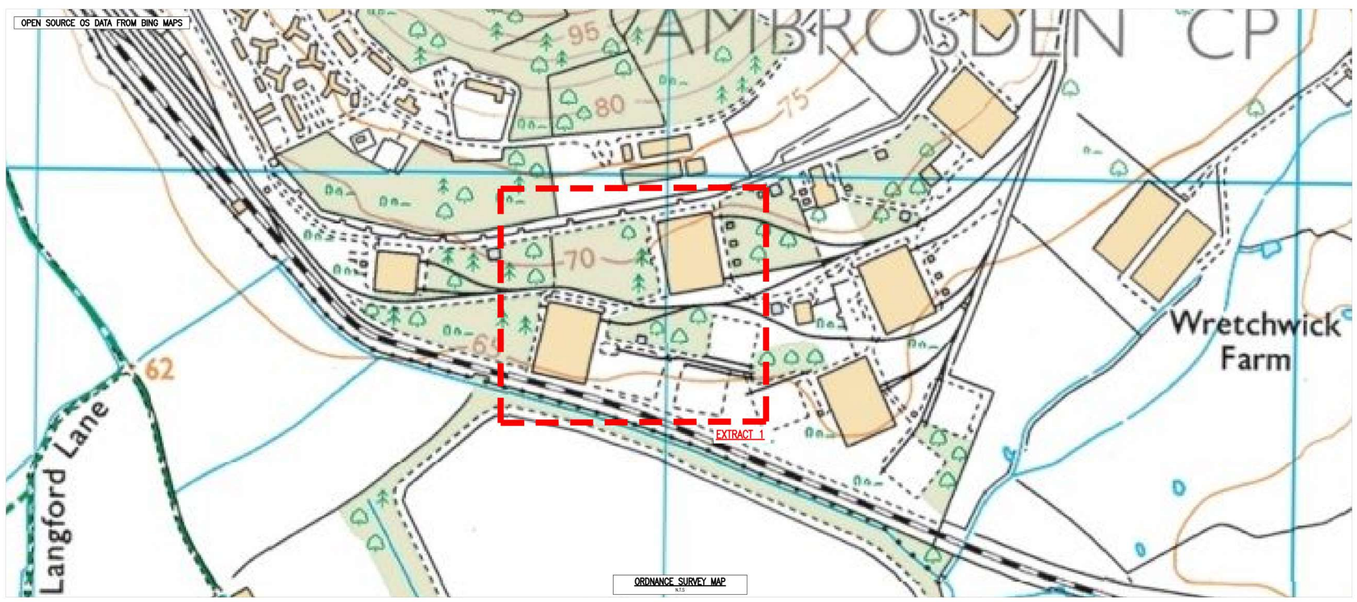

ORDNANCE SURVEY MAP
N.T.S

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REV	DRN	DATE	DESCRIPTION	CSE	ICSE
A	CL	06/02/19	SITE BOUNDARY AMENDED		
-	CLL	04/05/18	PRELIMINARY ISSUE		

ORIGINATOR:

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PROJECT:
GRAVEN HILL
UNITS D1 & D4

TITLE:
SITE LOCATION PLAN

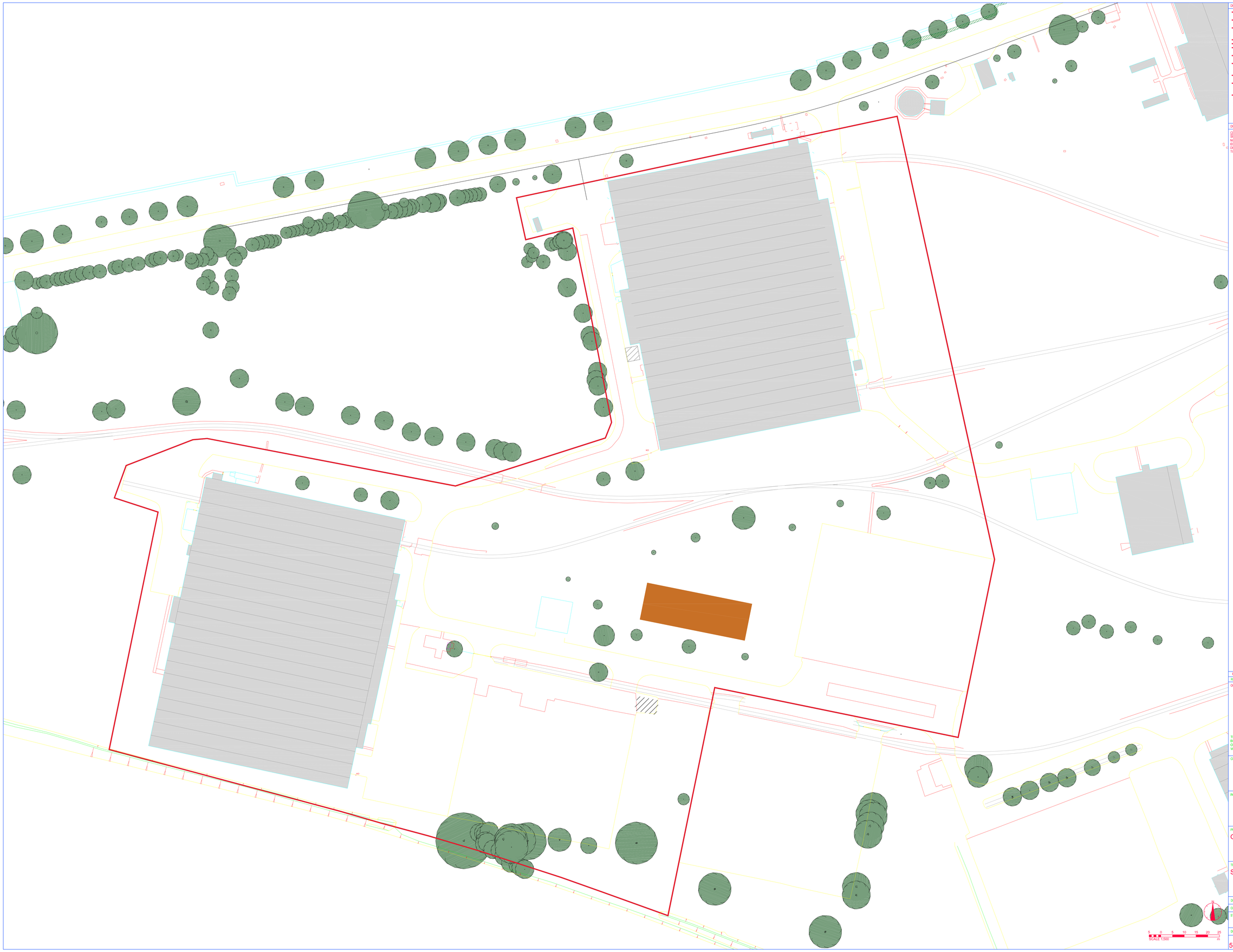
ENG:	CSE:	ICSE:	SCALE: VARIES @ A1
DF			INITIAL ISSUE: 04.05.2018

STATUS:
PRELIMINARY

DRAWING No:

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5005462	RDG	XX	ST	PL	C	0001	A

FIGURE 2 – DEVELOPMENT PLANS



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ORIGINATOR:

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TEL: 01993 815000
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CLIENT:

BARRUS
Est. 1917

IN ASSOCIATION WITH:

PROJECT:
GRAVEN HILL - UNITS D1 & D4

TITLE:
SITE LOCATION PLAN

DRAWN BY:	DS	SCALE: 1:500	@ A0
CHECKED BY:	AG	DATE: 15/11/2018	

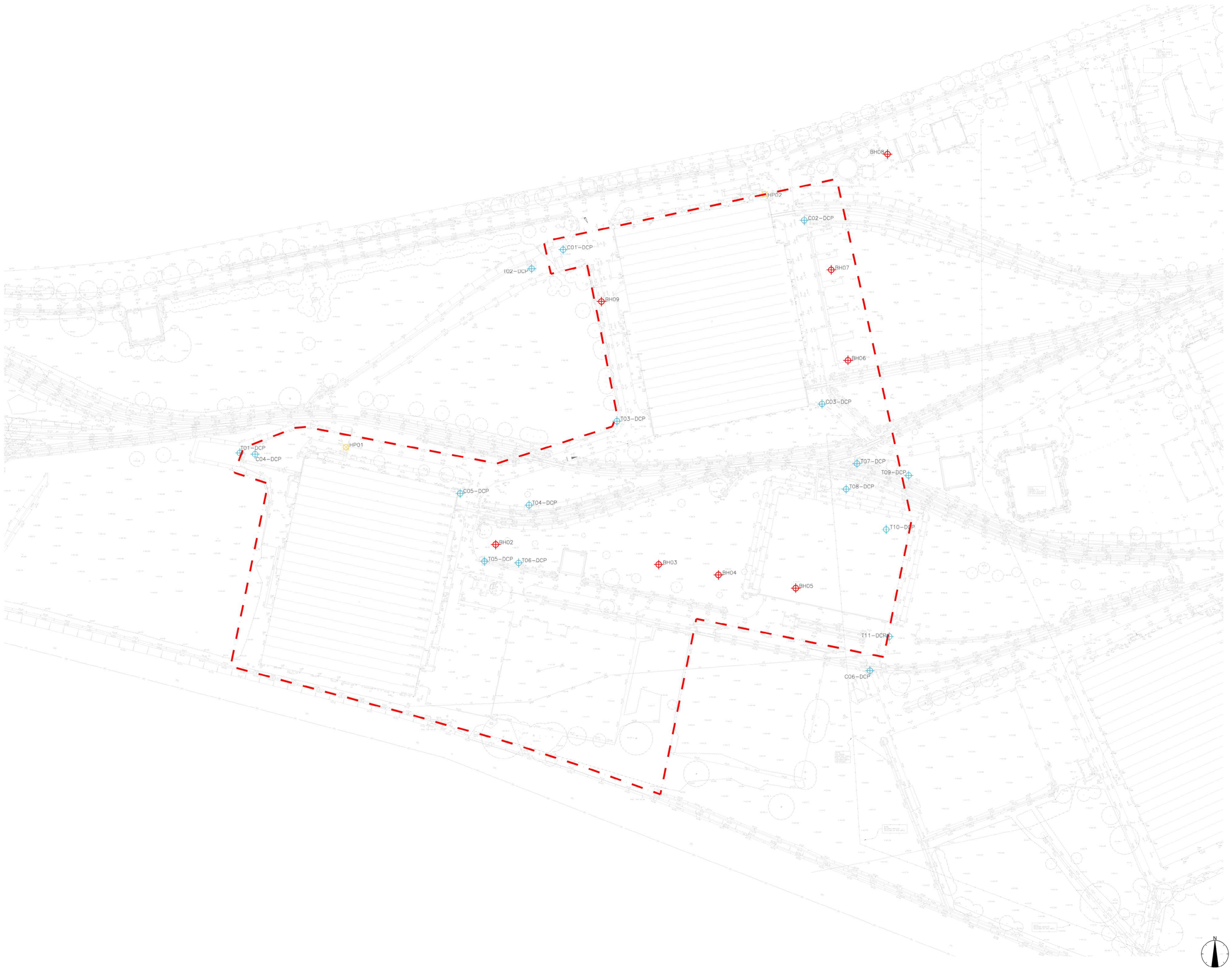
STATUS:
PLANNING

DRAWING No:

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5005462	RDG	XX	ST	PL	B	0100	B

5 0 5 10 15 20 25 m
SCALE 1:500

FIGURE 3: TEST LOCATION PLAN



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LEGEND

- BOREHOLE
- HAND-DUG TRIAL PIT
- DYNAMIC CONE PENETROMETER (DCP)
- PROPOSED SITE BOUNDARY

REV	DRN	DATE	DESCRIPTION	CSE	ICSE
A	CL	06/02/19	SITE BOUNDARY UPDATED		
-	CLL	04/05/18	PRELIMINARY ISSUE		

ORIGINATOR:

RIDGE
PROPERTY & CONSTRUCTION CONSULTANTS

PARTNERSHIP HOUSE
MOORSIDE ROAD
WINCHESTER
SO23 7RX

TEL: 01962 834400

WWW.RIDGE.CO.UK

CLIENT:
E P BARRUS

IN ASSOCIATION WITH:

PROJECT:
GRAVEN HILL
UNITS D1 & D4

TITLE:
TEST LOCATION PLAN

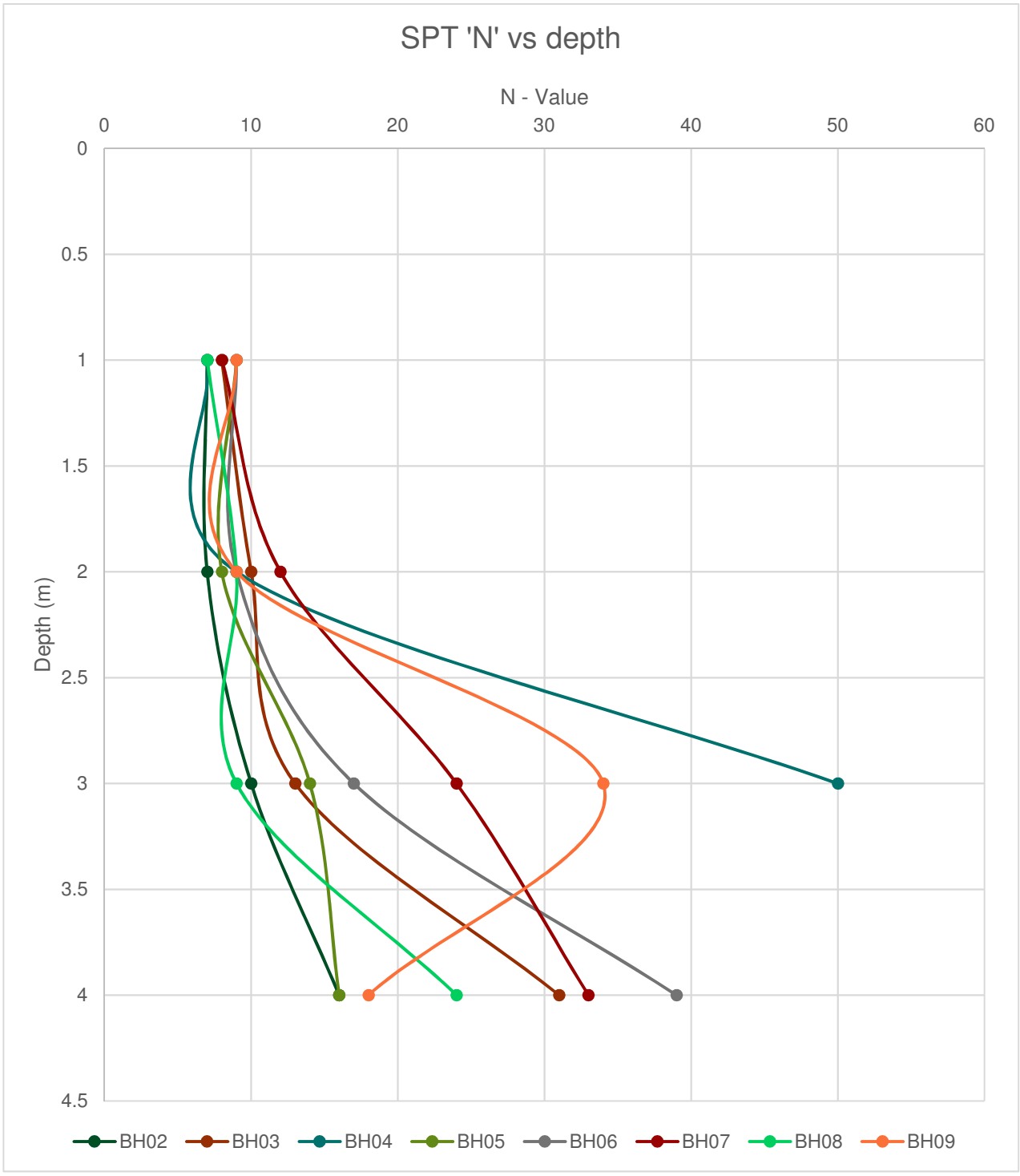
ENG:	CSE:	ICSE:	SCALE: 1:1000 @ A1
DF			INITIAL ISSUE: 04.05.2018

STATUS:
PRELIMINARY

DRAWING No:

PROJECT:	ORG:	ZONE:	LEVEL:	TYPE:	ROLE:	NUMBER:	REV:
5005462	RDG	XX	ST	PL	C	0002	A

FIGURE 4: SPT 'N' V DEPTH GRAPH


SPT 'N' vs depth
N - Value
0
10
20
30
40
50
60
Depth (m)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
BH02
BH03
BH04
BH05
BH06
BH07
BH08
BH09

APPENDIX 1 – REPORT CONDITIONS

This report is produced solely for the benefit of **EP Barrus Ltd.** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

This report is based on a visual site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categoric assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ridge and Partners LLP. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the site and adjacent sites. The report concentrates on the site as defined in the report and provides an opinion on surrounding sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off site intrusive investigations and monitoring.

APPENDIX 2 – ENGINEERING LOGS

ADVANCED INVESTIGATION SYSTEMS LTD
Tel: 07970 460 427
Email: enquiries@windowsampling.com
Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH02

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		458926.00	219756.00	17/04/2018	16/04/2018	1:50

GROUND WATER			SAMPLING & IN SITU TESTING			STRATA RECORD			
Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
			0.5 ES						Turf over TOPSOIL: dark brown grey slightly gravelly silty CLAY.
			0.8 ES						MADE GROUND: firm to stiff dark yellow brown slightly gravelly silty CLAY with chert limestone occasional brick carbonaceous fragments., bitumen, brick clinker.
				N=7 (1,1/2,1,2,2)	Hand dug	1	-1.0		Firm to stiff yellow brown gravelly silty CLAY. Gravel is angular to sub angular chert & limestone.
			1.30 - 1.50						Stiff light grey / yellow brown mottled CLAY.
				N=7 (1,2/2,1,2,2)	101mm WLS: 80%	2	-2.0		Stiff yellow brown gravelly silty sandy CLAY. Gravel is angular to sub angular chert & limestone.
			2.80 - 3.00	N=10 (2,1/2,2,3,3)	92mm WLS: 90%	3	-3.0		Stiff with lithorelic development grading to thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
Slow Seepage		3.85 4.00	3.80 - 4.00	N=16 (3,3/3,4,4,5)	79mm WLS: 100%	4	-4.0		Stiff to very stiff dark grey brown thinly laminated silty CLAY locally weathered to orange brown.
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

Backfilled with arisings.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

ADVANCED INVESTIGATION SYSTEMS LTD
Tel: 07970 460 427
Email: enquiries@windowsampling.com
Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH03

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		459005.00	219749.00	17/04/2018	16/04/2018	1:50

GROUND WATER | **SAMPLING & IN SITU TESTING** | **STRATA RECORD** | Sheet 1 of 1

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
			0.50 - 0.75 ES						Turf over TOPSOIL: dark brown grey slightly gravelly silty CLAY. MADE GROUND: firm to stiff dark yellow brown / grey variegated cobbly gravelly silty CLAY with chert limestone (boulder) occasional brick carbonaceous fragments iron wood fragments asphalt, clinker.
Slow Seepage				N=8 (1,2/2,1,2,3)	Hand dug	1	-1.0		
			1.2 ES 1.50 - 1.70						Firm to stiff yellow brown gravelly silty CLAY. Gravel is angular to sub angular chert & limestone. Stiff with lithorelic development grading to thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
		1.02 2.00		N=10 (2,2/2,2,3,3)	79mm WLS: 80%	2	-2.0		Very stiff dark grey thinly laminated silty CLAY with abundant compressed fossils on bedding surfaces.
			2.80 - 3.00	N=13 (2,2/3,3,3,4)	70mm WLS: 90%	3	-3.0		
				N=31 (3,4/5,7,9,10)	70mm WLS: 100%	4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

Backfilled with arisings.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

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BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH04

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		459040.00	219745.00	16/04/2018	16/04/2018	1:50

GROUND WATER | **SAMPLING & IN SITU TESTING** | **STRATA RECORD** | Sheet 1 of 1

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
			0.4 ES						Turf over TOPSOIL: dark brown grey slightly gravelly silty CLAY.
			0.9 0.80 - 1.00 ES	N=7 (1,1/2,1,2,2)	Hand dug	1	-1.0		Firm to stiff yellow brown gravelly silty CLAY. Gravel is angular to sub angular chert & limestone.
Moderate Flow		1.25							Firm to stiff light grey / yellow brown mottled CLAY.
		2.00	1.80 - 2.00	N=9 (1,2/2,2,2,3)	101mm WLS: 90%	2	-2.0		Stiff dark grey brown thinly laminated silty CLAY locally weathered to orange brown.
			2.80 - 3.00	0 (20 for 30mm/0 for 0mm)	83mm WS: 80%	3	-3.0		Stiff thinly laminated grey / dark brown variegated with white powdery dusting on some bedding surfaces (Jarosite?) silty CLAY. Sudden refusal at base.
						4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

3.03m BGL: refusal. 50mm ID slotted well screen installed to 3.0m BGL.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

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Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH05

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		459088.00	219737.00	17/04/2018	16/04/2018	1:50

GROUND WATER | **SAMPLING & IN SITU TESTING** | **STRATA RECORD** | Sheet 1 of 1

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
~~Slow~~ Seepage		0.17	0.3 ES		150mm core				CONCRETE rebar at 0.10m BGL. Membrane at base.
		0.20							FILL: cream limestone SUB BASE.
									MADE GROUND: (loose) dark grey very silty SAND & GRAVEL of flint chert limestone brick clinker. Geotextile at base.
			0.9 0.80 - 1.00 ES	N=9 (1,2/2,2,2,3)	101mm WLS: 100%	1	-1.0		Stiff grey mottled dark brown CLAY.
									Firm to stiff with lithorelic development grading to disrupted thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
			1.80 - 2.00	N=8 (1,2/1,2,2,3)	92mm WLS: 80%	2	-2.0		Stiff dark grey brown thinly laminated silty CLAY locally sandy & weathered to orange brown. Occasional lignite fragments.
				N=14 (3,3/3,3,4,4)	79mm WLS: 100%	3	-3.0		Very stiff dark grey thinly laminated silty CLAY with abundant compressed fossils on bedding surfaces.
			3.80 - 4.00	N=16 (2,3/3,4,4,5)	70mm WLS: 100%	4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

Backfilled with arisings & reinstated.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

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Email: enquiries@windowsampling.com
Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH06

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		459116.00	219863.00	17/04/2018	17/04/2018	1:50

GROUND WATER | **SAMPLING & IN SITU TESTING** | **STRATA RECORD** | Sheet 1 of 1

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
			0.4 ES						Turf over TOPSOIL: dark brown grey slightly gravelly silty CLAY.
			0.9 ES						MADE GROUND: firm to stiff yellow brown locally gravelly silty CLAY. Gravel is angular to sub angular chert limestone concrete brick & charcoal.
				N=9 (2,1/2,2,2,3)	Hand dug	1	-1.0		Firm to stiff yellow brown locally gravelly silty CLAY. Gravel is angular to sub angular chert & limestone.
			1.20 - 1.40						Stiff with lithorelic development grading to thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
				N=9 (2,2/2,2,2,3)	101mm WLS: 90%	2	-2.0		
			2.80 - 3.00	N=17 (2,2/3,4,5,5)	92mm WLS: 90%	3	-3.0		Very stiff dark brown becoming dark grey thinly laminated silty CLAY with abundant compressed fossils on bedding surfaces.
				N=39 (4,6/8,9,10,12)	79mm WLS: 100%	4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

Dry hole. Backfilled with arisings.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

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Email: enquiries@windowsampling.com
Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH07

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		459104.00	219921.00	17/04/2018	17/04/2018	1:50

GROUND WATER | **SAMPLING & IN SITU TESTING** | **STRATA RECORD** | Sheet 1 of 1

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
Rapid Flow			0.3 0.30 - 0.50 ES 0.5 ES						Turf over TOPSOIL: dark brown grey slightly gravelly silty CLAY.
				N=8 (2,1/2,2,2,2)		1	-1.0		MADE GROUND: firm to stiff yellow brown gravelly silty CLAY. Gravel is angular to sub angular chert limestone brick charcoal fragments
			1.20 - 1.40						Firm to stiff yellow brown gravelly silty CLAY. Gravel is angular to sub angular chert & limestone.
									Firm to stiff light grey / yellow brown mottled CLAY.
				N=12 (2,3/2,3,3,4)		2	-2.0		Stiff with lithorelic development grading to thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
		0.65 3.00		N=24 (2,3/4,4,7,9)		3	-3.0		Very stiff dark brown becoming dark grey thinly laminated silty CLAY with abundant compressed fossils on bedding surfaces.
				N=33 (5,6/6,7,9,11)		4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

Backfilled with arisings.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

ADVANCED INVESTIGATION SYSTEMS LTD
Tel: 07970 460 427
Email: enquiries@windowsampling.com
Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH08

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		459134.00	219971.00	17/04/2018	17/04/2018	1:50

GROUND WATER | SAMPLING & IN SITU TESTING | STRATA RECORD

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
			0.3 ES 0.5 ES 0.9 0.80 - 1.00 ES	N=7 (1,1/2,1,2,2)	Hand dug	1	-1.0		Turf over TOPSOIL: dark brown grey slightly gravelly silty CLAY. MADE GROUND: firm to stiff dark yellow brown locally grey variegated cobbly bouldery gravelly silty CLAY with chert limestone (boulder) brick cloth charcoal fragments. Firm to stiff light grey / yellow brown mottled CLAY.
			1.80 - 2.00	N=9 (2,1/2,2,2,3)	101mm WLS: 100%	2	-2.0		Stiff with lithorelic development grading to disrupted thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
Slow Seepage			2.80 - 3.00	N=9 (2,1/2,2,3,2)	92mm WLS: 100%	3	-3.0		Firm to stiff dark grey thinly laminated silty CLAY with abundant compressed fossils on bedding surfaces.
		3.20 4.00		N=24 (4,3/4,5,7,8)	70mm WLS: 90%	4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

50mm ID slotted well screen installed to 4.0m BGL.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

ADVANCED INVESTIGATION SYSTEMS LTD
Tel: 07970 460 427
Email: enquiries@windowsampling.com
Web: www.windowsampling.com

BOREHOLE RECORD
(Window Sampling)

Borehole Number
BH09

Site:	Engineer:	Drilling Equipment:
Barrus, Graven Hill, Bicester	Ridge & Partners Ltd	Competitor 130

Client:	Elevation mAOD:	Easting:	Northing:	Start:	Finish:	Scale:
		458980.00	219889.00	17/04/2018	17/04/2018	1:50

GROUND WATER | **SAMPLING & IN SITU TESTING** | **STRATA RECORD** | Sheet 1 of 1

Strike	Well	Depth (m)	Depth/Type (m)	Standard Penetration Testing	Sampler / Recovery	Depth mBGL	Depth mAOD	Key	Description
					150mm core Hand dug				CONCRETE. Membrane at base.
									FILL: grey over cream limestone SUB BASE.
									Firm light grey / yellow brown mottled CLAY.
			0.40 - 0.90 0.8 ES						Stiff with lithorelic development grading to disrupted thinly laminated fabric grey with white powdery patches & dusting on some bedding surfaces (Jarosite?) silty CLAY.
				N=9 (2,2/2,2,2,3)	70mm WLS: 100%	1	-1.0		
			1.50 - 1.70						
				N=9 (2,1/2,2,2,3)	92mm WLS: 90%	2	-2.0		
Moderate Flow									
		2.28		N=34 (4,4/5,8,9,12)	79mm WLS: 100%	3	-3.0		Weak yellow brown argillaceous fine medium SANDSTONE.
		3.00	3.50 - 3.80						Very stiff dark brown becoming dark grey thinly laminated silty CLAY with abundant compressed fossils on bedding surfaces.
				N=18 (3,3/3,4,4,7)	70mm WLS: 90%	4	-4.0		
						5	-5.0		
						6	-6.0		
						7	-7.0		
						8	-8.0		
						9	-9.0		
						10	-10.0		

Remarks / Well Installation / Casing Details

50mm ID slotted well screen installed to 4.0m BGL.

AGS

ES ES Sample
● □ Disturbed Sample
W Water Sample
Φ Bulk Sample
U Undisturbed Sample

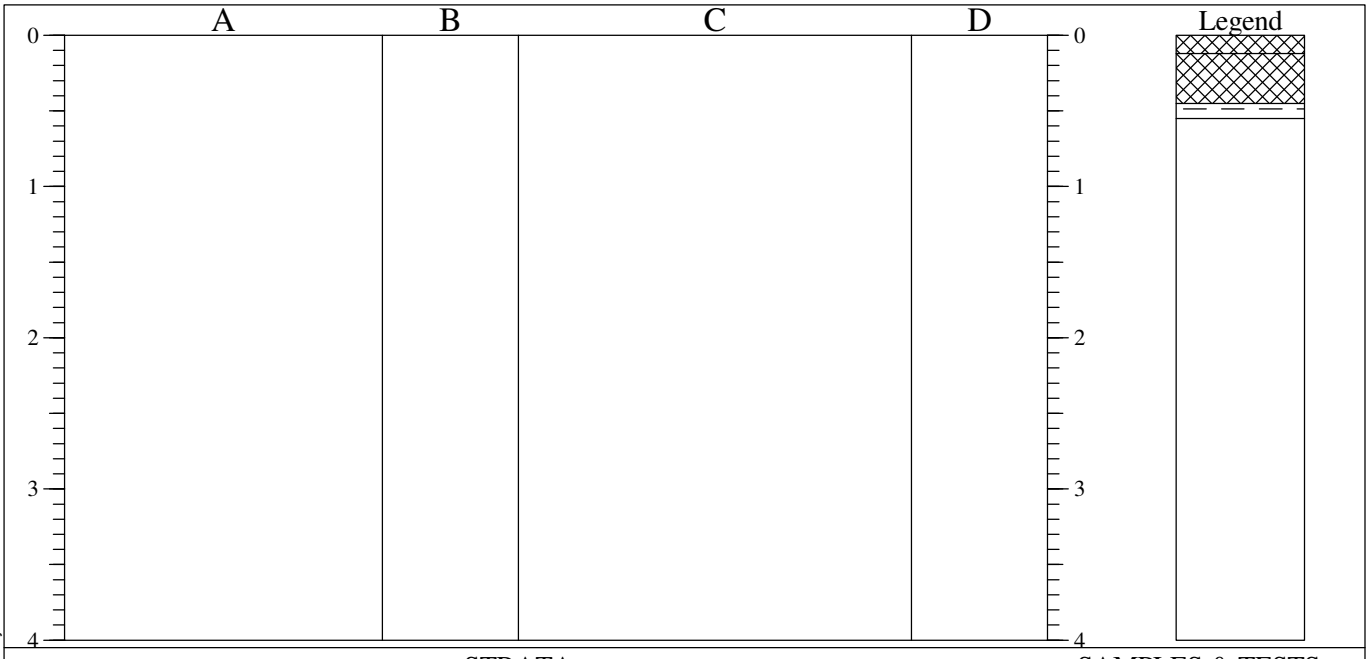
WLS Windowless Sampler
WS Window Sampler
▽ Depth to water strike
▼ Standing water depth

Job No. X0212

Ridge & Partners LLP
Moorside Road
SO23 7RX

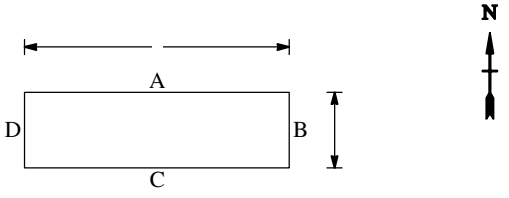
TRIAL PIT LOG

Project				TRIAL PIT No
E P Barrus - Graven Hill, Units D1 and D4				**HP01**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5005462-815	17-04-18 17-04-18			
Contractor				Sheet
AIS				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.12		MADE GROUND: Grass over topsoil inclusive of rounded chert gravel fill.			
0.12-0.45		MADE GROUND: Clay inclusive of glass bottles, asphalt, brick clinker and brick fragments.			
0.45-0.55		Firm to stiff light brownish grey CLAY.	0.40 0.50	ES ES	

Shoring/Support:
Stability:



GENERAL REMARKS

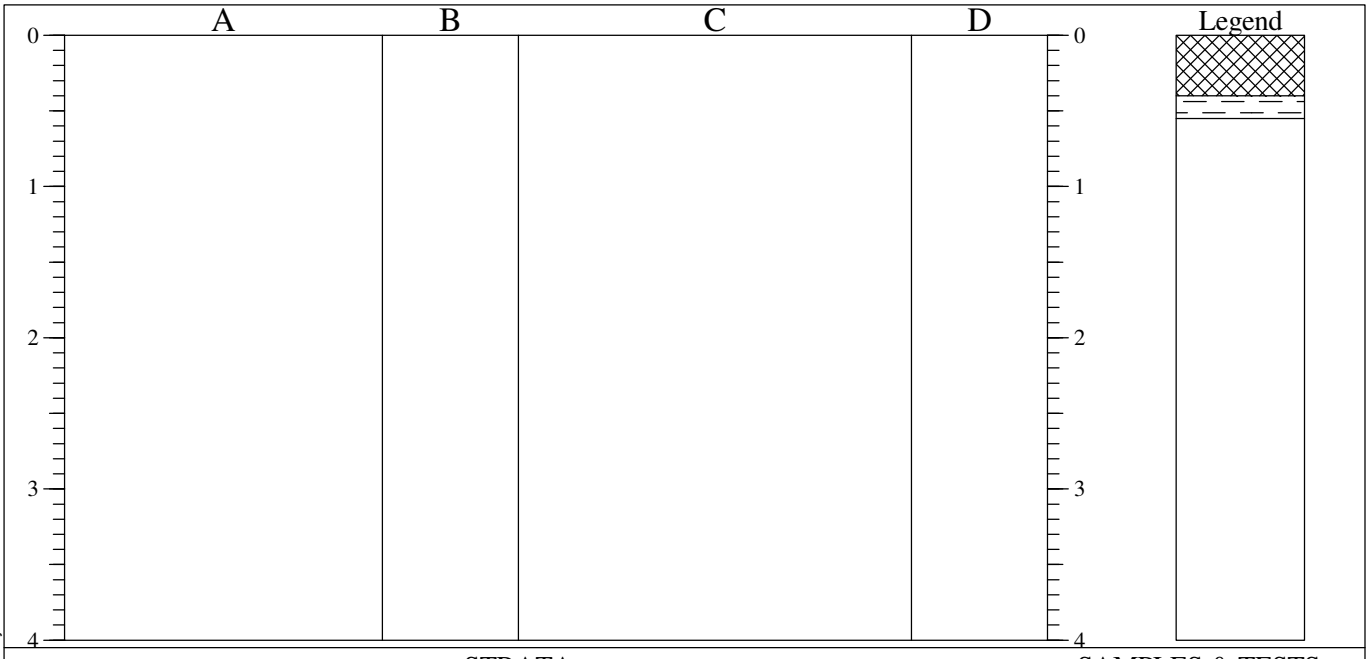
Trial pit advanced with hand digging equipment to 0.55m depth. Located downgradient of AST. Groundwater not encountered. Moisture noted above Clay. Backfilled with arisings on completion.

All dimensions in metres Scale 1:50	Client E P Barrrus	Method/ Plant Used Hand Tools	Logged By MS

Ridge & Partners LLP
Moorside Road
SO23 7RX

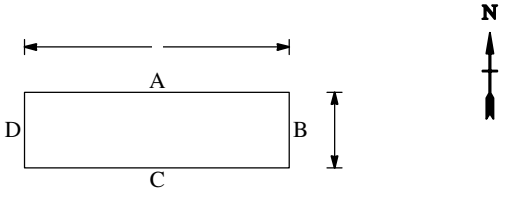
TRIAL PIT LOG

Project				TRIAL PIT No
E P Barrus - Graven Hill, Units D1 and D4				**HP02**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
5005462-815	17-04-18 17-04-18			
Contractor				Sheet
AIS				1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.40		MADE GROUND: Grass over topsoil inclusive of rounded chert gravel fill. Frequent concrete fragments.			
0.40-0.55		Soft to firm light brownish grey CLAY.	0.45	ES	

Shoring/Support:
Stability:



GENERAL REMARKS

Trial pit advanced with hand digging equipment to 0.55m depth. Located downgradient of AST. Groundwater not encountered. Moisture noted above Clay. Backfilled with arisings on completion.

All dimensions in metres Scale 1:50	Client E P Barrrus	Method/ Plant Used Hand Tools	Logged By MS

SITE DCP Testing

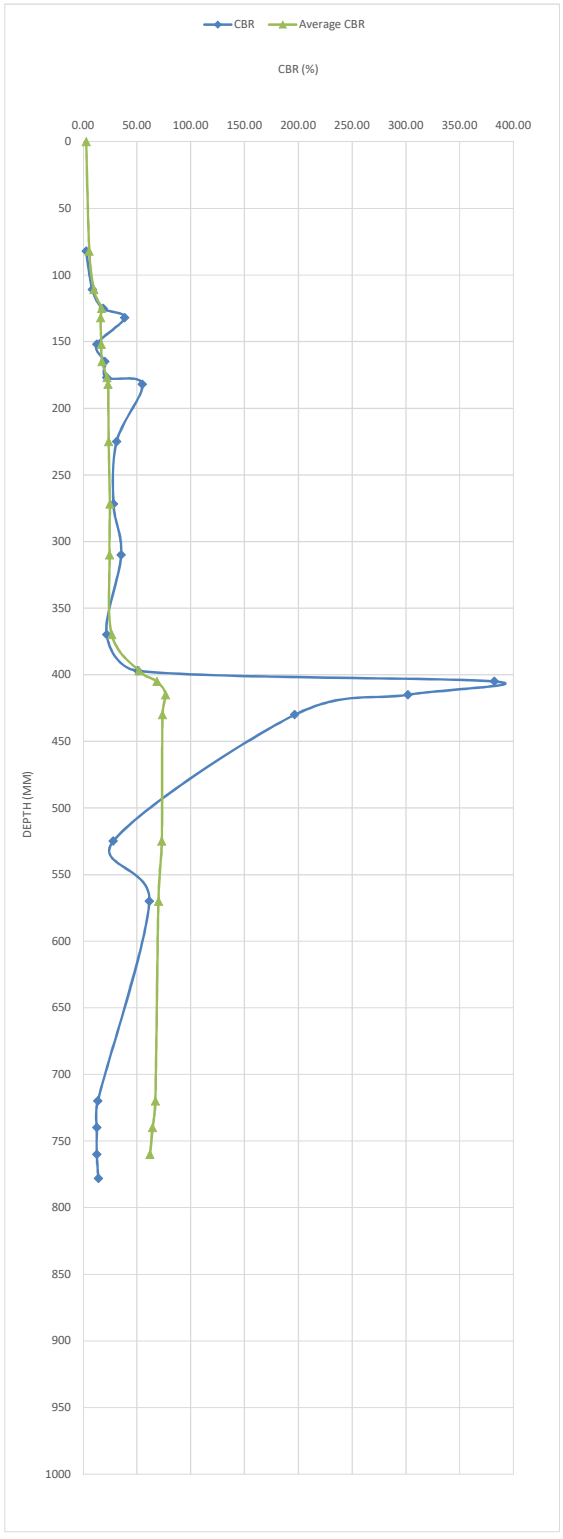
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T01 - DCP
Location	E P Barrus, Graven Hill
	NW of D4
Date	17/04/2018
Material:	Rough softstanding
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
	zero	130			0				
1	1	212			82	82	0.4570988	2.9	2.9
1	2	241			111	29	0.9342453	8.6	5.7
1	3	255			125	14	1.2685427	18.6	10.0
1	4	262			132	7	1.5867314	38.6	17.2
1	5	282			152	20	1.1048113	12.7	16.3
1	6	295			165	13	1.3025619	20.1	16.9
1	7	307			177	12	1.3393054	21.8	17.6
1	8	312			182	5	1.7411887	55.1	22.3
5	13	355			225	8.6	1.4922351	31.1	23.3
5	18	402			272	9.4	1.4514039	28.3	23.8
5	23	440			310	7.6	1.54898	35.4	24.8
5	28	500			370	12	1.3393054	21.8	24.6
5	33	527			397	5.4	1.7058598	50.8	26.6
10	43	535			405	0.8	2.5824339	382.3	52.0
10	53	545			415	1	2.48	302.0	68.7
10	63	560			430	1.5	2.2938715	196.7	76.7
10	73	655			525	9.5	1.4465461	28.0	73.8
10	83	700			570	4.5	1.7895544	61.6	73.1
8	91	850			720	18.75	1.1344377	13.6	70.0
1	92	870			740	20	1.1048113	12.7	67.1
1	93	890			760	20	1.1048113	12.7	64.5
1	94	908			778	18	1.153177	14.2	62.3

Remarks

TEST T01 - DCP



SITE DCP Testing

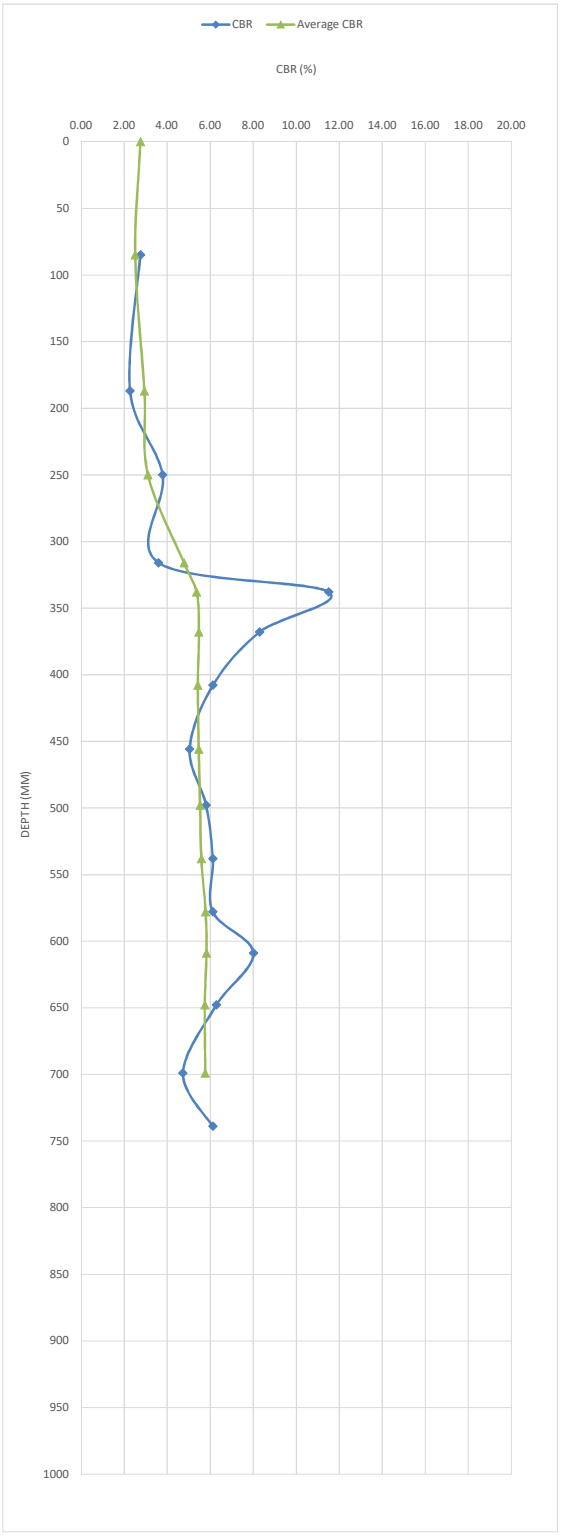
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T02 - DCP
Location	E P Barrus, Graven Hill
	NW of D1
Date	17/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		167			0				
1	1	252			85	85	0.4406042	2.8	2.8
1	2	354			187	102	0.3569096	2.3	2.5
1	3	417			250	63	0.578097	3.8	2.9
1	4	483			316	66	0.5567421	3.6	3.1
1	5	505			338	22	1.0610592	11.5	4.8
1	6	535			368	30	0.9186828	8.3	5.4
1	7	575			408	40	0.7866226	6.1	5.5
1	8	623			456	48	0.702928	5.0	5.4
1	9	665			498	42	0.7642255	5.8	5.5
1	10	705			538	40	0.7866226	6.1	5.5
1	11	745			578	40	0.7866226	6.1	5.6
1	12	776			609	31	0.9036307	8.0	5.8
1	13	815			648	39	0.7982447	6.3	5.8
1	14	866			699	51	0.6750983	4.7	5.7
1	15	906			739	40	0.7866226	6.1	5.8

Remarks

TEST T02 - DCP



SITE DCP Testing

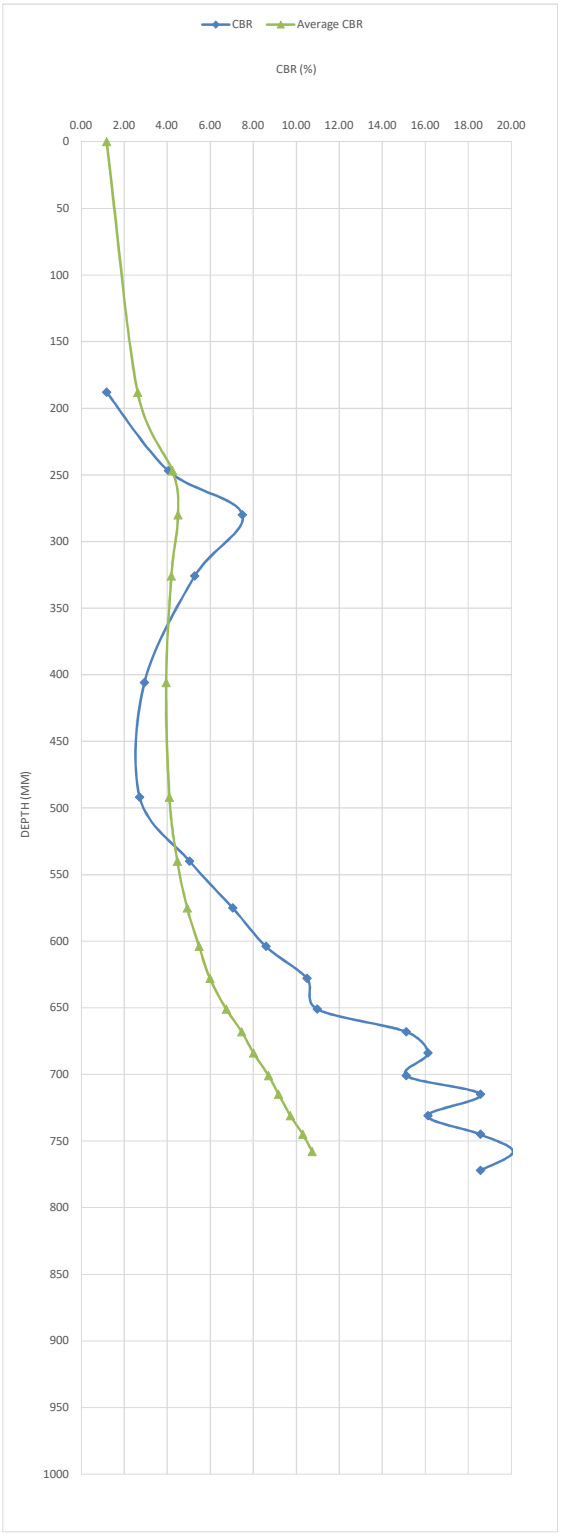
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T03 - DCP
Location	E P Barrus, Graven Hill
	SW of D1
Date	17/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		140			0				
1	1	328			188	188	0.0762152	1.2	1.2
1	2	387			247	59	0.6082094	4.1	2.6
1	3	420			280	33	0.8749308	7.5	4.2
1	4	466			326	46	0.722465	5.3	4.5
1	5	546			406	80	0.4684339	2.9	4.2
1	6	632			492	86	0.4352351	2.7	3.9
1	7	680			540	48	0.702928	5.0	4.1
1	8	715			575	35	0.8479201	7.0	4.5
1	9	744			604	29	0.9342453	8.6	4.9
1	10	768			628	24	1.0211167	10.5	5.5
1	11	791			651	23	1.0406537	11.0	6.0
1	12	808			668	17	1.1794155	15.1	6.7
1	13	824			684	16	1.2072452	16.1	7.5
1	14	841			701	17	1.1794155	15.1	8.0
1	15	855			715	14	1.2685427	18.6	8.7
1	16	871			731	16	1.2072452	16.1	9.2
1	17	885			745	14	1.2685427	18.6	9.7
1	18	898			758	13	1.3025619	20.1	10.3
1	19	912			772	14	1.2685427	18.6	10.7

Remarks

TEST T03 - DCP



SITE DCP Testing

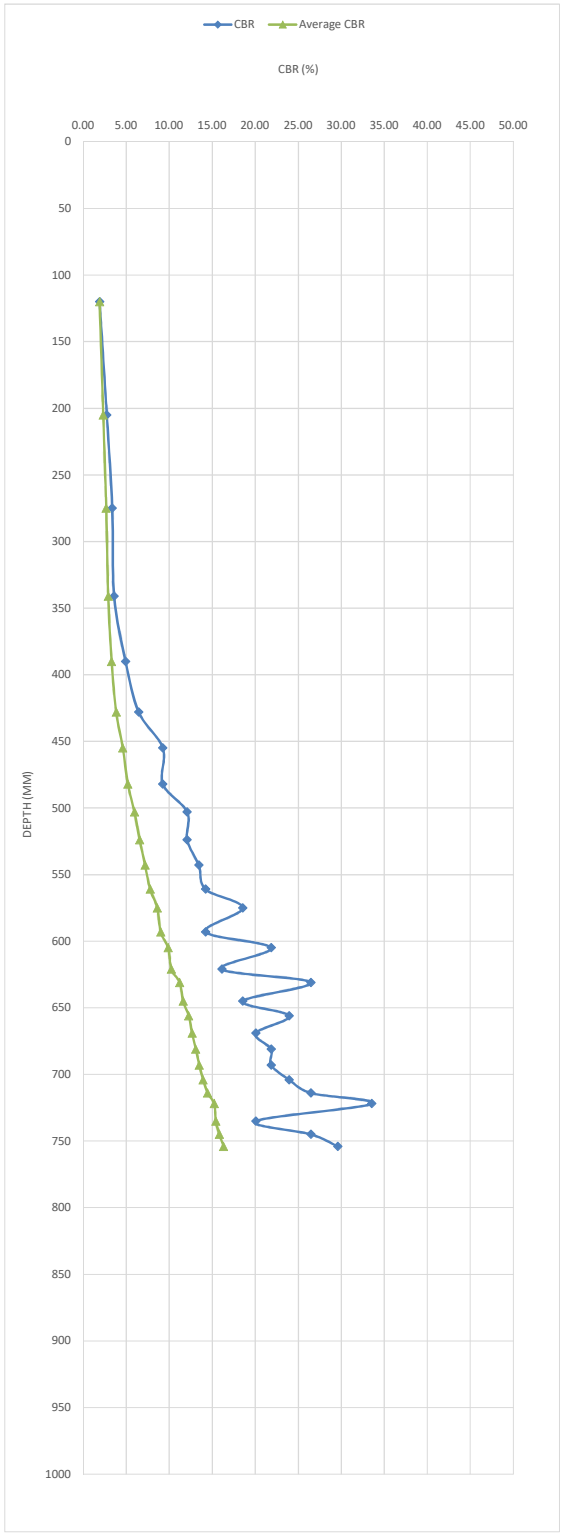
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T04 - DCP
Location	E P Barrus, Graven Hill
	East of D4
Date	16/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		150			0				
1	1	270			120	120	0.2823054	1.9	1.9
1	2	355			205	85	0.4406042	2.8	2.3
1	3	425			275	70	0.5297314	3.4	2.7
1	4	491			341	66	0.5567421	3.6	2.9
1	5	540			390	49	0.6934627	4.9	3.3
1	6	578			428	38	0.8101687	6.5	3.8
1	7	605			455	27	0.9670485	9.3	4.6
1	8	632			482	27	0.9670485	9.3	5.2
1	9	653			503	21	1.0824142	12.1	6.0
1	10	674			524	21	1.0824142	12.1	6.6
1	11	693			543	19	1.1283574	13.4	7.2
1	12	711			561	18	1.153177	14.2	7.8
1	13	725			575	14	1.2685427	18.6	8.6
1	14	743			593	18	1.153177	14.2	9.0
1	15	755			605	12	1.3393054	21.8	9.9
1	16	771			621	16	1.2072452	16.1	10.3
1	17	781			631	10	1.423	26.5	11.2
1	18	795			645	14	1.2685427	18.6	11.6
1	19	806			656	11	1.3792479	23.9	12.3
1	20	819			669	13	1.3025619	20.1	12.7
1	21	831			681	12	1.3393054	21.8	13.1
1	22	843			693	12	1.3393054	21.8	13.5
1	23	854			704	11	1.3792479	23.9	14.0
1	24	864			714	10	1.423	26.5	14.5
1	25	872			722	8	1.5254339	33.5	15.2
1	26	885			735	13	1.3025619	20.1	15.4
1	27	895			745	10	1.423	26.5	15.8
1	28	904			754	9	1.4713657	29.6	16.3
1	29	913			763	9	1.4713657	29.6	16.8
1	30	923			773	10	1.423	26.5	17.1
1	31	932			782	9	1.4713657	29.6	17.5
1	32	943			793	11	1.3792479	23.9	17.7
1	33	953			803	10	1.423	26.5	18.0
1	34	959			809	6	1.6574941	45.4	18.8

Remarks

TEST T04 - DCP



SITE DCP Testing

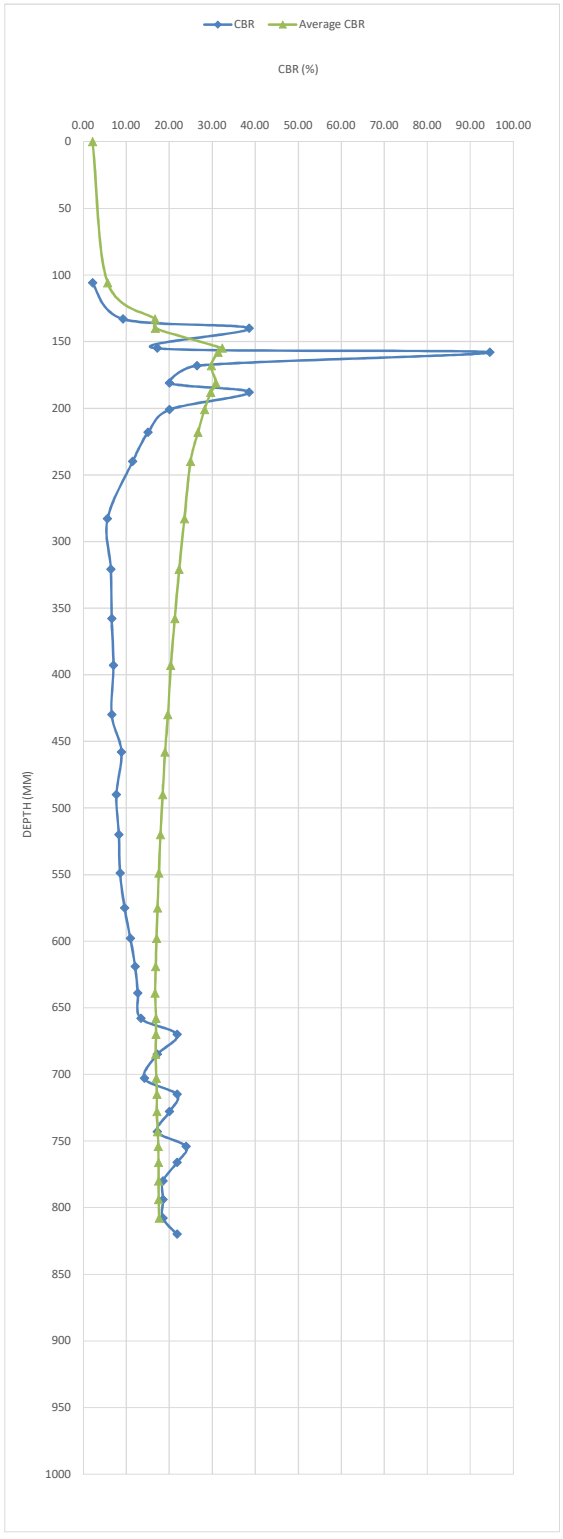
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T05 - DCP
Location	E P Barrus, Graven Hill
	East of D4
Date	16/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		142			0				
1	1	248			106	106	0.3392517	2.2	2.2
1	2	275			133	27	0.9670485	9.3	5.7
1	3	282			140	7	1.5867314	38.6	16.7
1	4	297			155	15	1.2368715	17.3	16.8
1	5	300			158	3	1.9756828	94.6	32.4
1	6	310			168	10	1.423	26.5	31.4
1	7	323			181	13	1.3025619	20.1	29.8
1	8	330			188	7	1.5867314	38.6	30.9
1	9	343			201	13	1.3025619	20.1	29.7
1	10	360			218	17	1.1794155	15.1	28.2
1	11	382			240	22	1.0610592	11.5	26.7
1	12	425			283	43	0.7534238	5.7	25.0
1	13	463			321	38	0.8101687	6.5	23.5
1	14	500			358	37	0.8224108	6.6	22.3
1	15	535			393	35	0.8479201	7.0	21.3
1	16	572			430	37	0.8224108	6.6	20.4
1	17	600			458	28	0.950354	8.9	19.7
1	18	632			490	32	0.8890565	7.7	19.0
1	19	662			520	30	0.9186828	8.3	18.5
1	20	691			549	29	0.9342453	8.6	18.0
1	21	717			575	26	0.9843732	9.6	17.6
1	22	740			598	23	1.0406537	11.0	17.3
1	23	761			619	21	1.0824142	12.1	17.1
1	24	781			639	20	1.1048113	12.7	16.9
1	25	800			658	19	1.1283574	13.4	16.7
1	26	812			670	12	1.3393054	21.8	16.9
1	27	827			685	15	1.2368715	17.3	17.0
1	28	845			703	18	1.153177	14.2	16.9
1	29	857			715	12	1.3393054	21.8	17.0
1	30	870			728	13	1.3025619	20.1	17.1
1	31	885			743	15	1.2368715	17.3	17.1
1	32	896			754	11	1.3792479	23.9	17.3
1	33	908			766	12	1.3393054	21.8	17.5
1	34	922			780	14	1.2685427	18.6	17.5
1	35	936			794	14	1.2685427	18.6	17.5
1	36	950			808	14	1.2685427	18.6	17.6
1	37	962			820	12	1.3393054	21.8	17.7

Remarks

TEST T05 - DCP



SITE DCP Testing

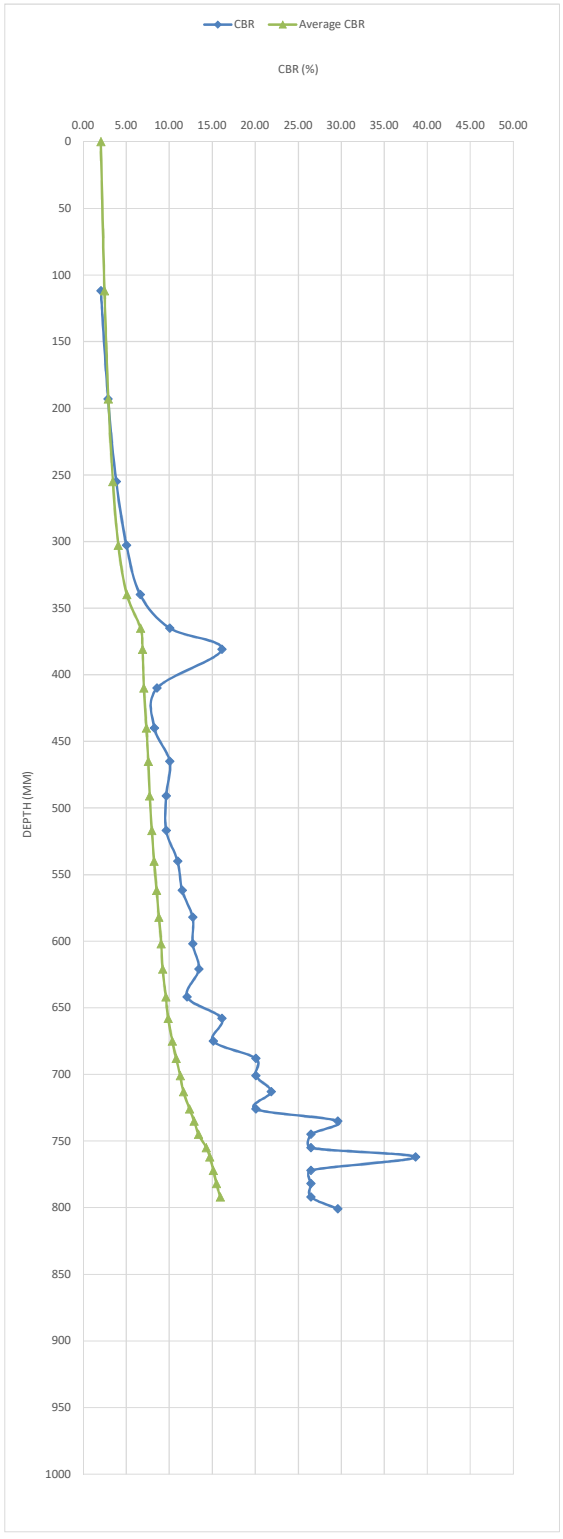
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T06 - DCP
Location	E P Barrus, Graven Hill
	East of D4
Date	16/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		170			0				
1	1	282			112	112	0.3139766	2.1	2.1
1	2	363			193	81	0.4627313	2.9	2.5
1	3	425			255	62	0.585442	3.8	2.9
1	4	473			303	48	0.702928	5.0	3.5
1	5	510			340	37	0.8224108	6.6	4.1
1	6	535			365	25	1.0023774	10.1	5.1
1	7	551			381	16	1.2072452	16.1	6.7
1	8	580			410	29	0.9342453	8.6	6.9
1	9	610			440	30	0.9186828	8.3	7.1
1	10	635			465	25	1.0023774	10.1	7.4
1	11	661			491	26	0.9843732	9.6	7.6
1	12	687			517	26	0.9843732	9.6	7.7
1	13	710			540	23	1.0406537	11.0	8.0
1	14	732			562	22	1.0610592	11.5	8.2
1	15	752			582	20	1.1048113	12.7	8.5
1	16	772			602	20	1.1048113	12.7	8.8
1	17	791			621	19	1.1283574	13.4	9.1
1	18	812			642	21	1.0824142	12.1	9.2
1	19	828			658	16	1.2072452	16.1	9.6
1	20	845			675	17	1.1794155	15.1	9.9
1	21	858			688	13	1.3025619	20.1	10.4
1	22	871			701	13	1.3025619	20.1	10.8
1	23	883			713	12	1.3393054	21.8	11.3
1	24	896			726	13	1.3025619	20.1	11.7
1	25	905			735	9	1.4713657	29.6	12.4
1	26	915			745	10	1.423	26.5	12.9
1	27	925			755	10	1.423	26.5	13.4
1	28	932			762	7	1.5867314	38.6	14.3
1	29	942			772	10	1.423	26.5	14.7
1	30	952			782	10	1.423	26.5	15.1
1	31	962			792	10	1.423	26.5	15.5
1	32	971			801	9	1.4713657	29.6	15.9

Remarks

TEST T06 - DCP



SITE DCP Testing

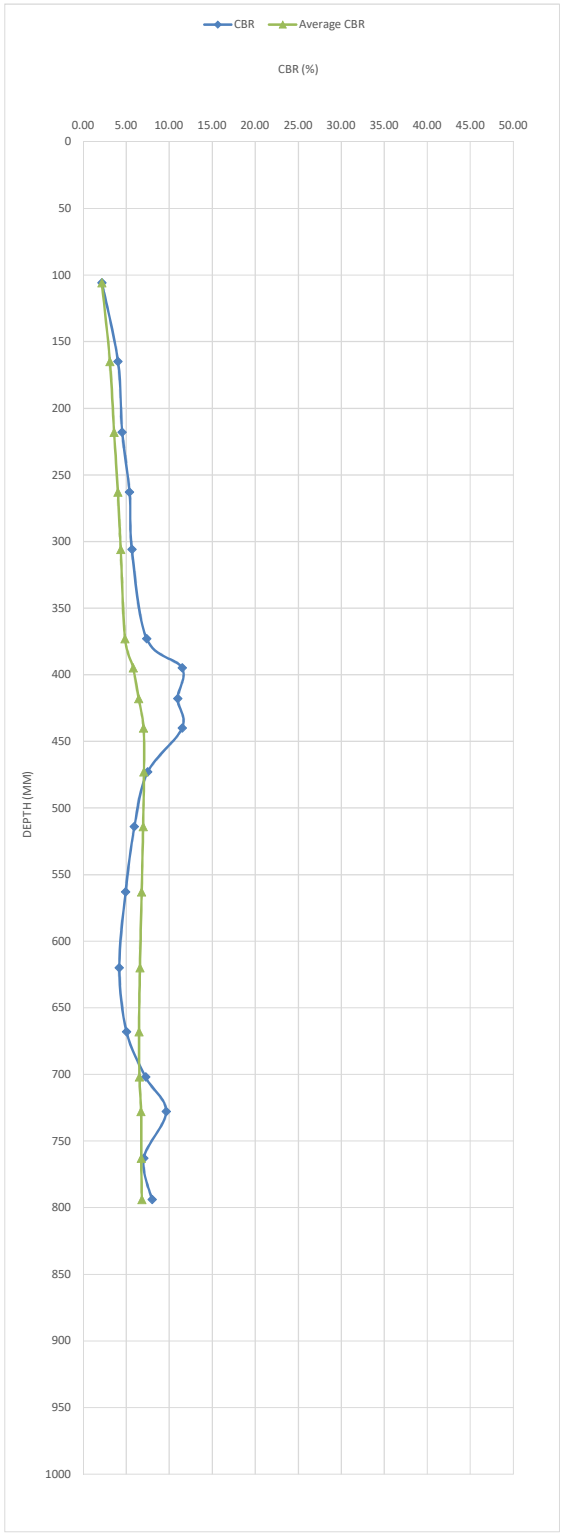
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T07 - DCP
Location	E P Barrus, Graven Hill
	Eastern area of site
Date	16/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		132			0				
1	1	238			106	106	0.3392517	2.2	2.2
1	2	297			165	59	0.6082094	4.1	3.1
1	3	350			218	53	0.6574404	4.5	3.6
1	4	395			263	45	0.7325544	5.4	4.0
1	5	438			306	43	0.7534238	5.7	4.4
2	7	505			373	33.5	0.8680276	7.4	4.9
1	8	527			395	22	1.0610592	11.5	5.8
1	9	550			418	23	1.0406537	11.0	6.5
1	10	572			440	22	1.0610592	11.5	7.0
1	11	605			473	33	0.8749308	7.5	7.1
1	12	646			514	41	0.7752875	6.0	7.0
1	13	695			563	49	0.6934627	4.9	6.8
1	14	752			620	57	0.6240403	4.2	6.6
1	15	800			668	48	0.702928	5.0	6.5
1	16	834			702	34	0.8612268	7.3	6.5
1	17	860			728	26	0.9843732	9.6	6.7
1	18	895			763	35	0.8479201	7.0	6.8
1	19	926			794	31	0.9036307	8.0	6.8

Remarks

TEST T07 - DCP



SITE DCP Testing

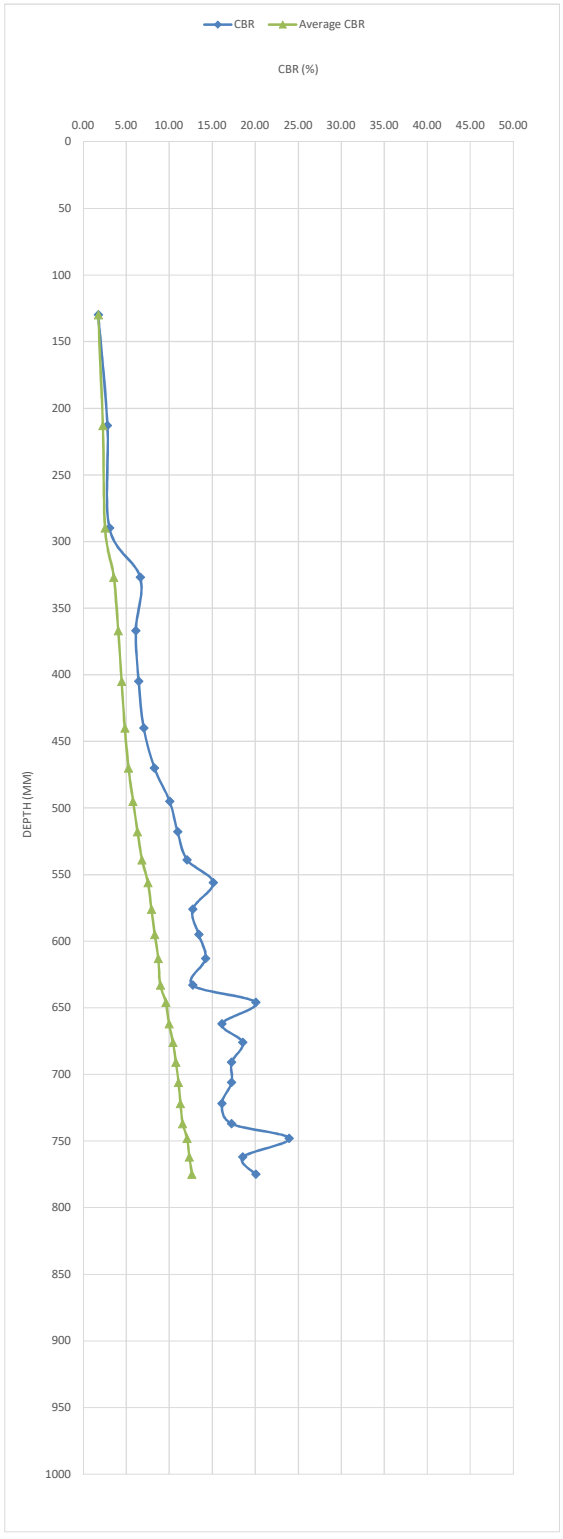
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T08 - DCP
Location	E P Barrus, Graven Hill
	Eastern area of site
Date	16/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		130			0				
1	1	260			130	130	0.2455619	1.8	1.8
1	2	343			213	83	0.4515345	2.8	2.3
1	3	420			290	77	0.4859793	3.1	2.6
1	4	457			327	37	0.8224108	6.6	3.6
1	5	497			367	40	0.7866226	6.1	4.1
1	6	535			405	38	0.8101687	6.5	4.5
1	7	570			440	35	0.8479201	7.0	4.8
1	8	600			470	30	0.9186828	8.3	5.3
1	9	625			495	25	1.0023774	10.1	5.8
1	10	648			518	23	1.0406537	11.0	6.3
1	11	669			539	21	1.0824142	12.1	6.8
1	12	686			556	17	1.1794155	15.1	7.5
1	13	706			576	20	1.1048113	12.7	7.9
1	14	725			595	19	1.1283574	13.4	8.3
1	15	743			613	18	1.153177	14.2	8.7
1	16	763			633	20	1.1048113	12.7	9.0
1	17	776			646	13	1.3025619	20.1	9.6
1	18	792			662	16	1.2072452	16.1	10.0
1	19	806			676	14	1.2685427	18.6	10.4
1	20	821			691	15	1.2368715	17.3	10.8
1	21	836			706	15	1.2368715	17.3	11.1
1	22	852			722	16	1.2072452	16.1	11.3
1	23	867			737	15	1.2368715	17.3	11.6
1	24	878			748	11	1.3792479	23.9	12.1
1	25	892			762	14	1.2685427	18.6	12.3
1	26	905			775	13	1.3025619	20.1	12.6

Remarks

TEST T08 - DCP



SITE DCP Testing

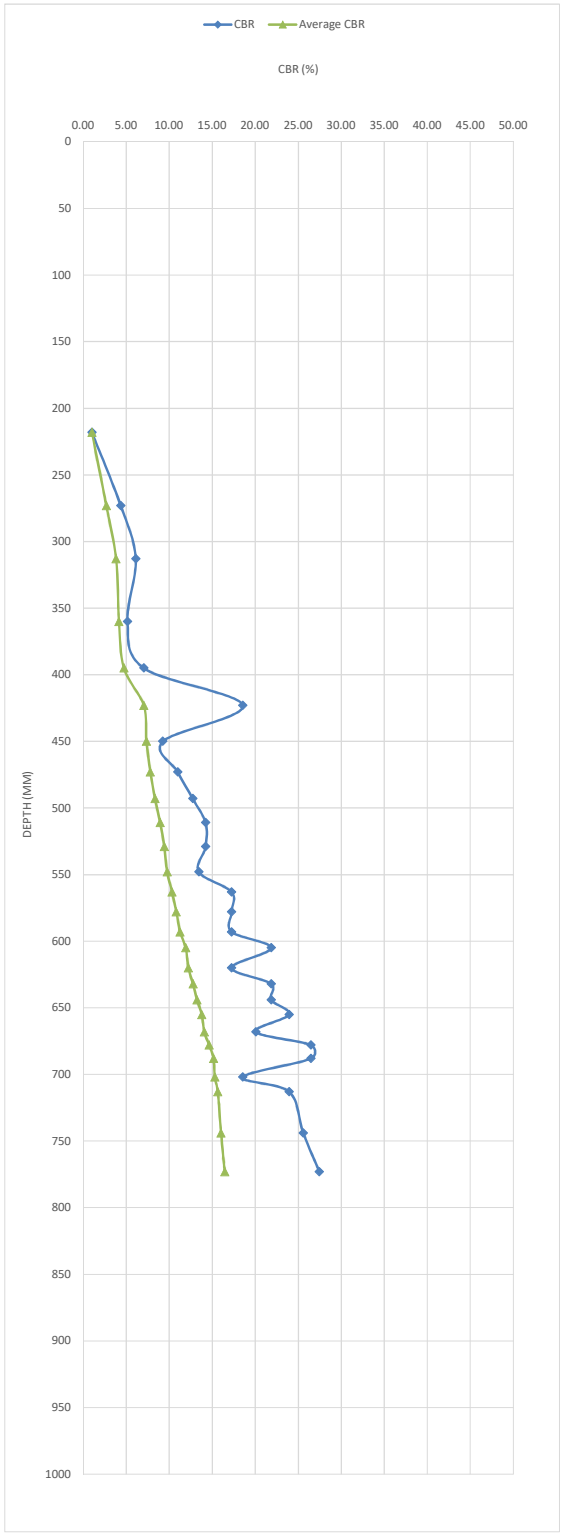
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T09 - DCP
Location	E P Barrus, Graven Hill
	Eastern area of site
Date	16/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		132			0				
1	1	350			218	218	0.0082515	1.0	1.0
1	2	405			273	55	0.6404366	4.4	2.7
1	3	445			313	40	0.7866226	6.1	3.8
1	4	492			360	47	0.7125926	5.2	4.2
1	5	527			395	35	0.8479201	7.0	4.7
2	7	555			423	14	1.2685427	18.6	7.0
1	8	582			450	27	0.9670485	9.3	7.4
1	9	605			473	23	1.0406537	11.0	7.8
1	10	625			493	20	1.1048113	12.7	8.4
1	11	643			511	18	1.153177	14.2	8.9
1	12	661			529	18	1.153177	14.2	9.4
1	13	680			548	19	1.1283574	13.4	9.8
1	14	695			563	15	1.2368715	17.3	10.3
1	15	710			578	15	1.2368715	17.3	10.8
1	16	725			593	15	1.2368715	17.3	11.3
1	17	737			605	12	1.3393054	21.8	11.9
1	18	752			620	15	1.2368715	17.3	12.2
1	19	764			632	12	1.3393054	21.8	12.8
1	20	776			644	12	1.3393054	21.8	13.2
1	21	787			655	11	1.3792479	23.9	13.8
1	22	800			668	13	1.3025619	20.1	14.1
1	23	810			678	10	1.423	26.5	14.6
1	24	820			688	10	1.423	26.5	15.2
1	25	834			702	14	1.2685427	18.6	15.3
1	26	845			713	11	1.3792479	23.9	15.6
3	29	876			744	10.33333	1.4079479	25.6	16.0
3	32	905			773	9.666667	1.4385625	27.5	16.5

Remarks

TEST T09 - DCP



SITE DCP Testing

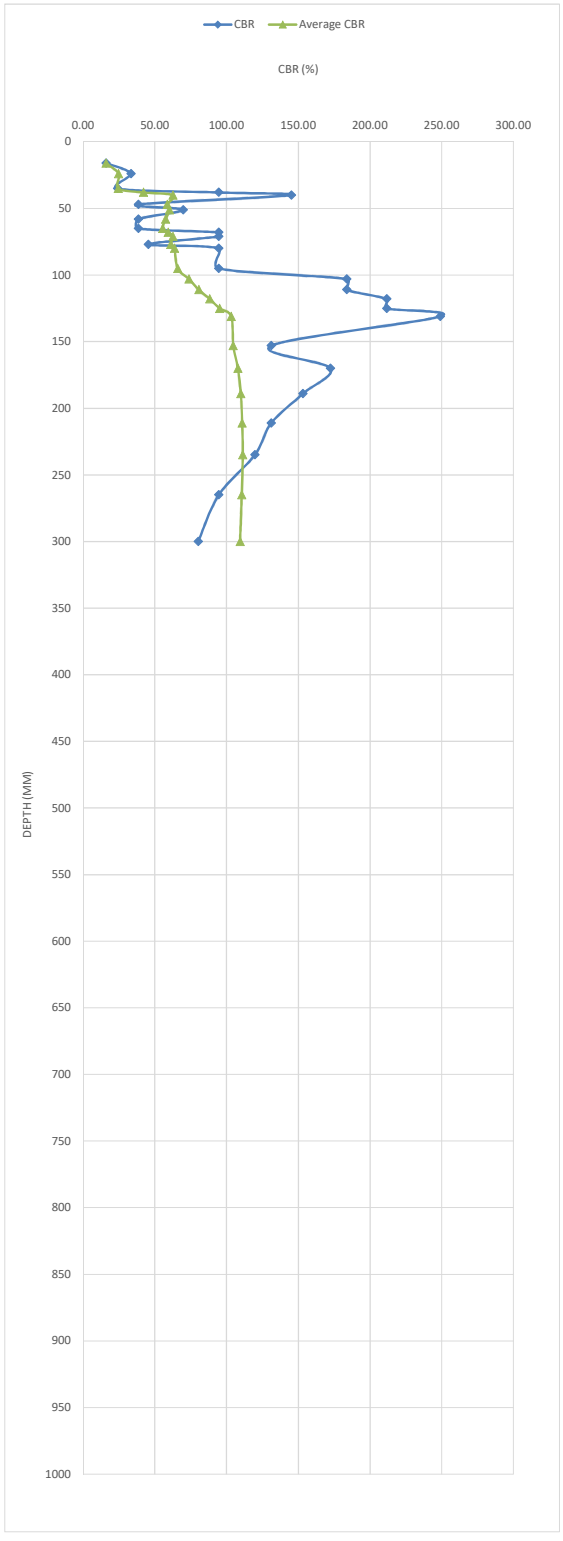
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T10 - DCP
Location	E P Barrus, Graven Hill
	SE corner of site, compound
Date	16/04/2018
Material:	Type 1
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		305			0				
1	1	321			16	16	1.2072452	16.1	16.1
1	2	329			24	8	1.5254339	33.5	24.8
1	3	340			35	11	1.3792479	23.9	24.5
1	4	343			38	3	1.9756828	94.6	42.0
1	5	345			40	2	2.1618113	145.1	62.7
1	6	352			47	7	1.5867314	38.6	58.7
1	7	356			51	4	1.8436226	69.8	60.2
1	8	363			58	7	1.5867314	38.6	57.5
1	9	370			65	7	1.5867314	38.6	55.4
1	10	373			68	3	1.9756828	94.6	59.3
1	11	376			71	3	1.9756828	94.6	62.5
1	12	382			77	6	1.6574941	45.4	61.1
1	13	385			80	3	1.9756828	94.6	63.7
5	18	400			95	3	1.9756828	94.6	65.9
5	23	408			103	1.6	2.2642452	183.8	73.8
5	28	416			111	1.6	2.2642452	183.8	80.6
5	33	423			118	1.4	2.3255427	211.6	88.3
5	38	430			125	1.4	2.3255427	211.6	95.2
5	43	436			131	1.2	2.3963054	249.1	103.3
10	53	458			153	2.2	2.1180592	131.2	104.7
10	63	475			170	1.7	2.2364155	172.4	107.9
10	73	494			189	1.9	2.1853574	153.2	110.0
10	83	516			211	2.2	2.1180592	131.2	110.9
10	93	540			235	2.4	2.0781167	119.7	111.3
10	103	570			265	3	1.9756828	94.6	110.6
10	113	605			300	3.5	1.9049201	80.3	109.4

Remarks
Refusal at base

TEST T10 - DCP



SITE DCP Testing

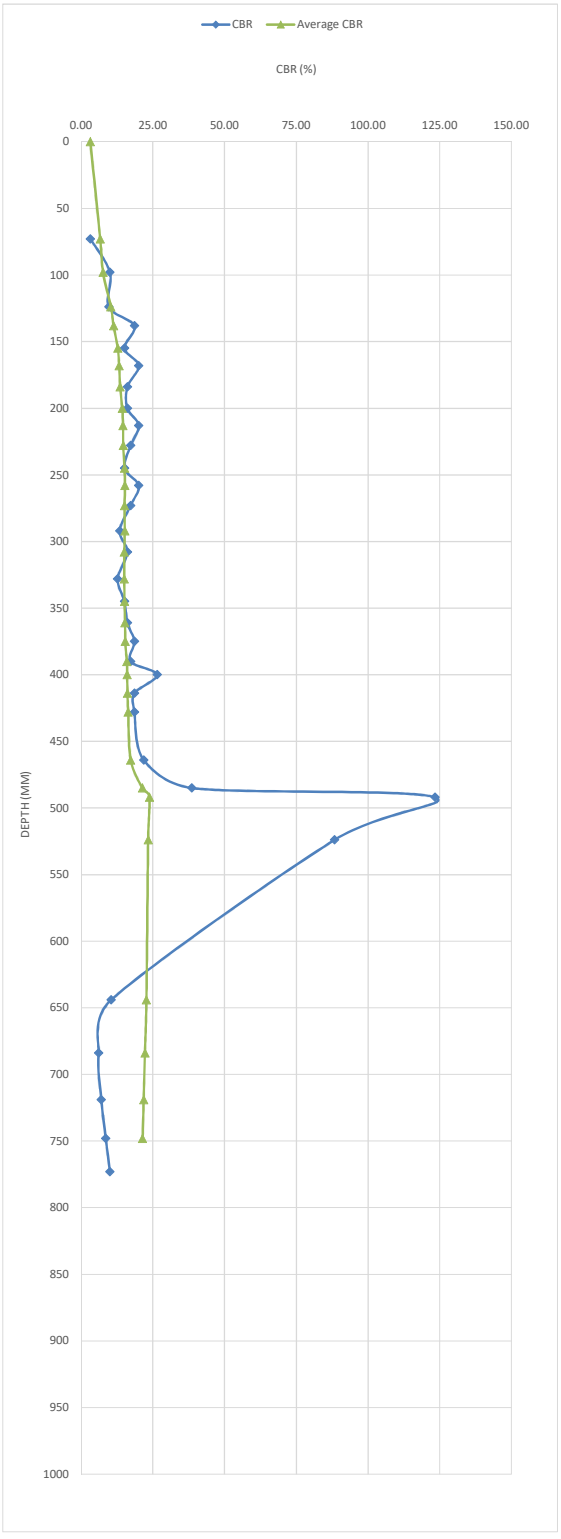
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	T11 - DCP
Location	E P Barrus, Graven Hill
	SE corner of site, compound
Date	17/04/2018
Material:	Grass
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		132			0				
1	1	205			73	73	0.5104677	3.2	3.2
1	2	230			98	25	1.0023774	10.1	6.6
1	3	256			124	26	0.9843732	9.6	7.6
1	4	270			138	14	1.2685427	18.6	10.4
1	5	287			155	17	1.1794155	15.1	11.3
1	6	300			168	13	1.3025619	20.1	12.8
1	7	316			184	16	1.2072452	16.1	13.3
1	8	332			200	16	1.2072452	16.1	13.6
1	9	345			213	13	1.3025619	20.1	14.3
1	10	360			228	15	1.2368715	17.3	14.6
1	11	377			245	17	1.1794155	15.1	14.7
1	12	390			258	13	1.3025619	20.1	15.1
1	13	405			273	15	1.2368715	17.3	15.3
1	14	424			292	19	1.1283574	13.4	15.2
1	15	440			308	16	1.2072452	16.1	15.2
1	16	460			328	20	1.1048113	12.7	15.1
1	17	477			345	17	1.1794155	15.1	15.1
1	18	493			361	16	1.2072452	16.1	15.1
1	19	507			375	14	1.2685427	18.6	15.3
1	20	522			390	15	1.2368715	17.3	15.4
1	21	532			400	10	1.423	26.5	15.9
1	22	546			414	14	1.2685427	18.6	16.0
1	23	560			428	14	1.2685427	18.6	16.2
3	26	596			464	12	1.3393054	21.8	16.4
3	29	617			485	7	1.5867314	38.6	17.3
3	32	624			492	2.333333	2.0910485	123.3	21.4
10	42	656			524	3.2	1.9460565	88.3	23.8
5	47	776			644	24	1.0211167	10.5	23.4
1	48	816			684	40	0.7866226	6.1	22.8
1	49	851			719	35	0.8479201	7.0	22.2
1	50	880			748	29	0.9342453	8.6	21.8
1	51	905			773	25	1.0023774	10.1	21.4

Remarks

TEST T11 - DCP



SITE DCP Testing

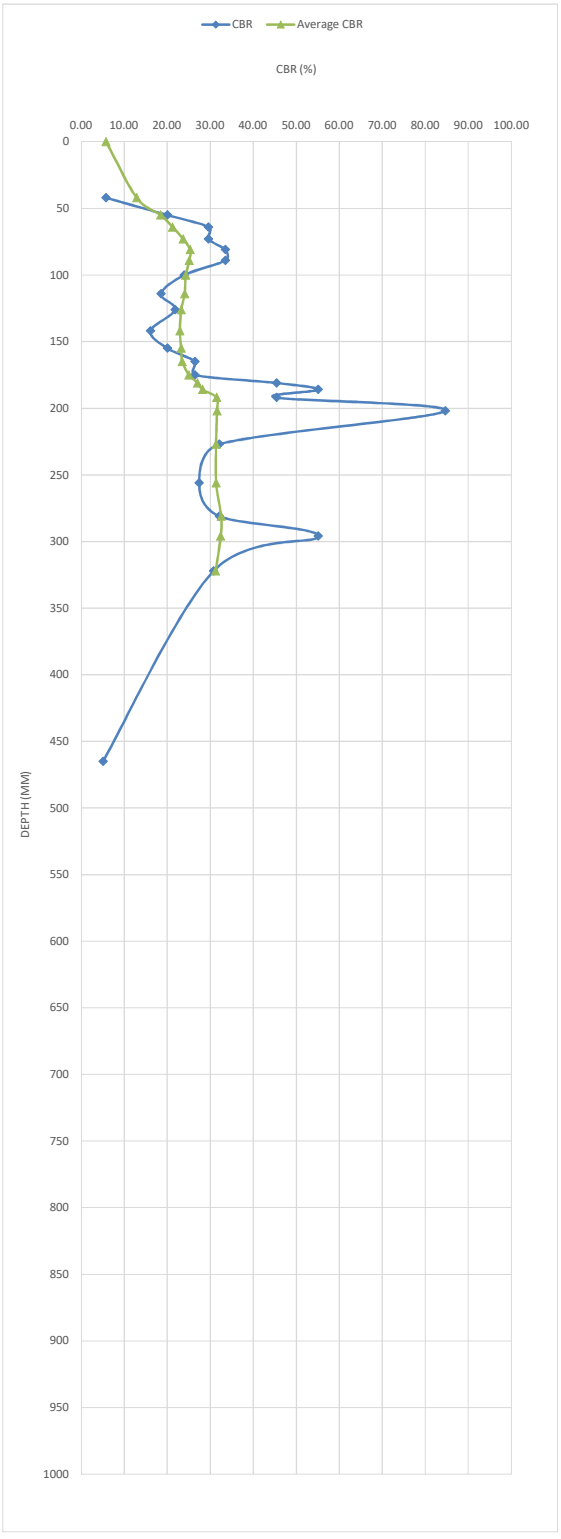
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	C01 - DCP
Location	E P Barrus, Graven Hill
	NW of D1
Date	17/04/2018
Material:	Type 1
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		450			0				
1	1	492			42	42	0.7642255	5.8	5.8
1	2	505			55	13	1.3025619	20.1	12.9
1	3	514			64	9	1.4713657	29.6	18.5
1	4	523			73	9	1.4713657	29.6	21.3
1	5	531			81	8	1.5254339	33.5	23.7
1	6	539			89	8	1.5254339	33.5	25.4
1	7	550			100	11	1.3792479	23.9	25.2
1	8	564			114	14	1.2685427	18.6	24.3
1	9	576			126	12	1.3393054	21.8	24.1
1	10	592			142	16	1.2072452	16.1	23.3
1	11	605			155	13	1.3025619	20.1	23.0
1	12	615			165	10	1.423	26.5	23.3
1	13	625			175	10	1.423	26.5	23.5
1	14	631			181	6	1.6574941	45.4	25.1
1	15	636			186	5	1.7411887	55.1	27.1
1	16	642			192	6	1.6574941	45.4	28.2
3	19	652			202	3.333333	1.9273172	84.6	31.5
3	22	677			227	8.333333	1.5066946	32.1	31.6
3	25	706			256	9.666667	1.4385625	27.5	31.4
3	28	731			281	8.333333	1.5066946	32.1	31.4
3	31	746			296	5	1.7411887	55.1	32.5
3	34	772			322	8.666667	1.4886903	30.8	32.4
3	37	915			465	47.66667	0.706127	5.1	31.3

Remarks
Flooded to 0.10m below ground level

TEST C01 - DCP



SITE DCP Testing

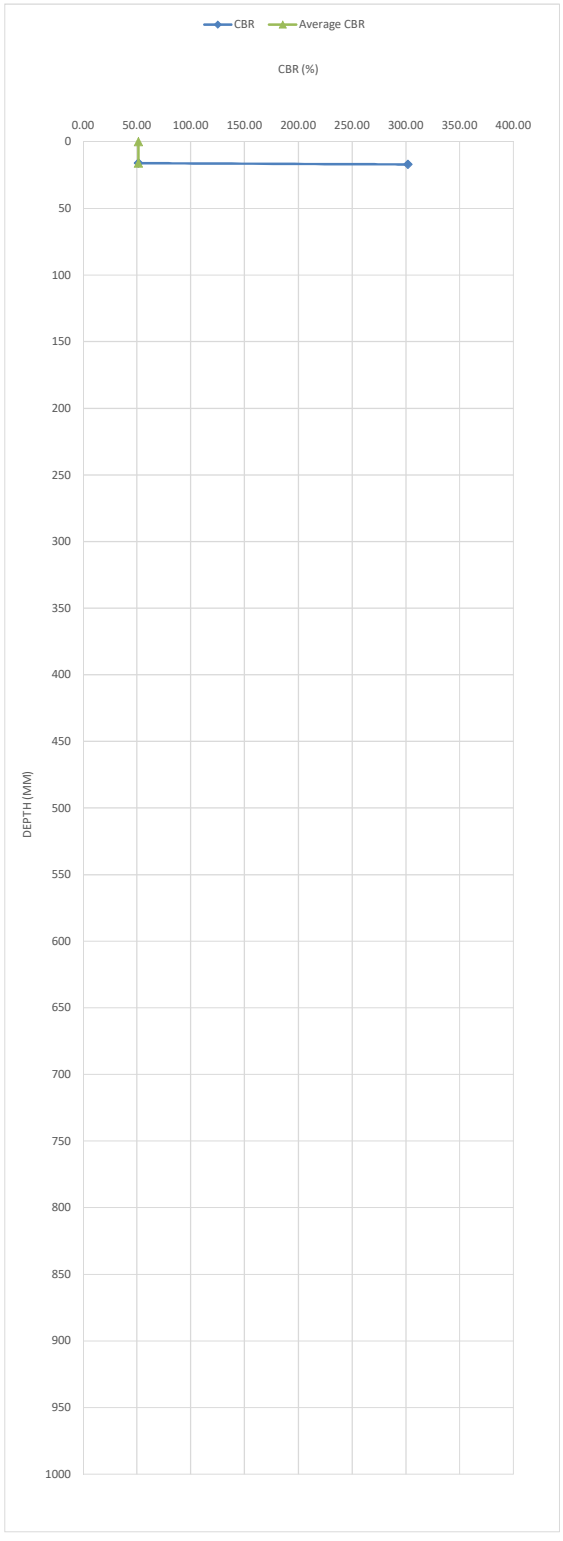
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	C02 - DCP
Location	E P Barrus, Graven Hill
	East of D1
Date	17/04/2018
Material:	Type 1
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
	zero	337			0				
3	3	353			16	5.333333	1.7115623	51.5	51.5
10	13	363			17	1	2.48	302.0	51.5

Remarks
Refusal, possibly on second concrete layer

TEST C02 - DCP



SITE DCP Testing

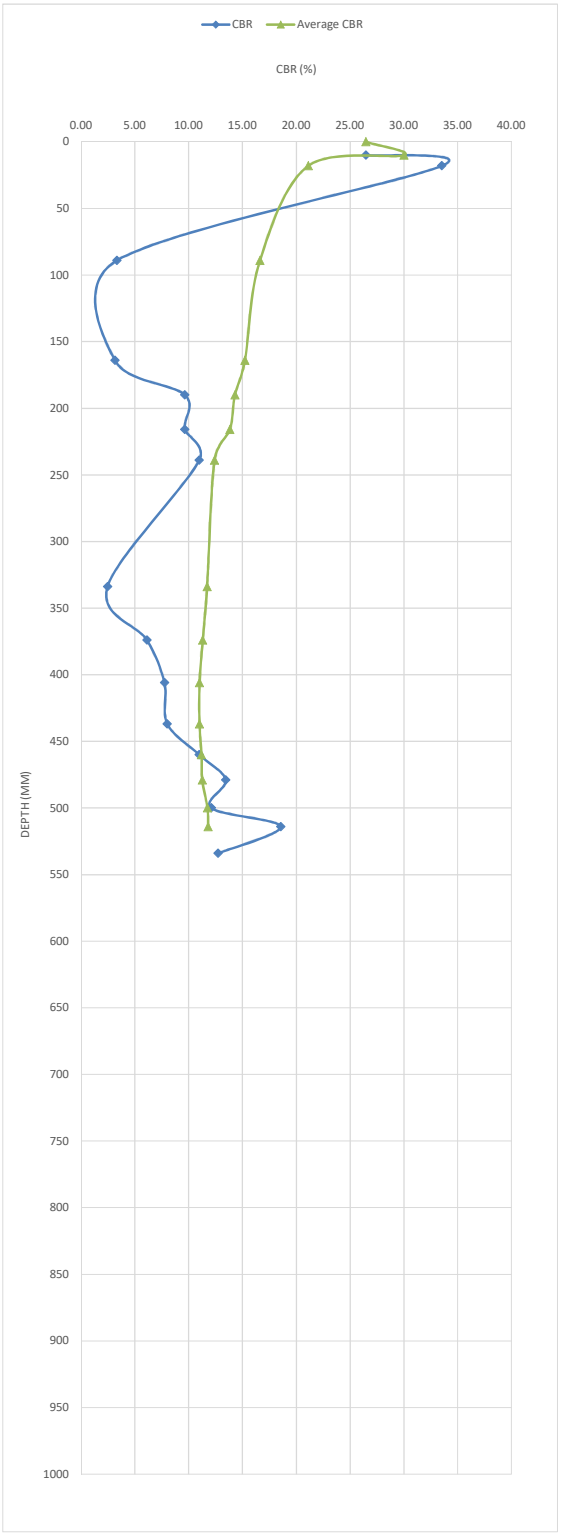
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	C03 - DCP
Location	E P Barrus, Graven Hill
	SE of D1
Date	17/04/2018
Material:	Type 1
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		386			0				
1	1	396			10	10	1.423	26.5	26.5
1	2	404			18	8	1.5254339	33.5	30.0
1	3	475			89	71	0.5232199	3.3	21.1
1	4	550			164	75	0.4980602	3.1	16.6
1	5	576			190	26	0.9843732	9.6	15.2
1	6	602			216	26	0.9843732	9.6	14.3
1	7	625			239	23	1.0406537	11.0	13.8
1	8	720			334	95	0.3895461	2.5	12.4
1	9	760			374	40	0.7866226	6.1	11.7
1	10	792			406	32	0.8890565	7.7	11.3
1	11	823			437	31	0.9036307	8.0	11.0
1	12	846			460	23	1.0406537	11.0	11.0
1	13	865			479	19	1.1283574	13.4	11.2
1	14	886			500	21	1.0824142	12.1	11.3
1	15	900			514	14	1.2685427	18.6	11.7
1	16	920			534	20	1.1048113	12.7	11.8

Remarks

TEST C03 - DCP



SITE DCP Testing

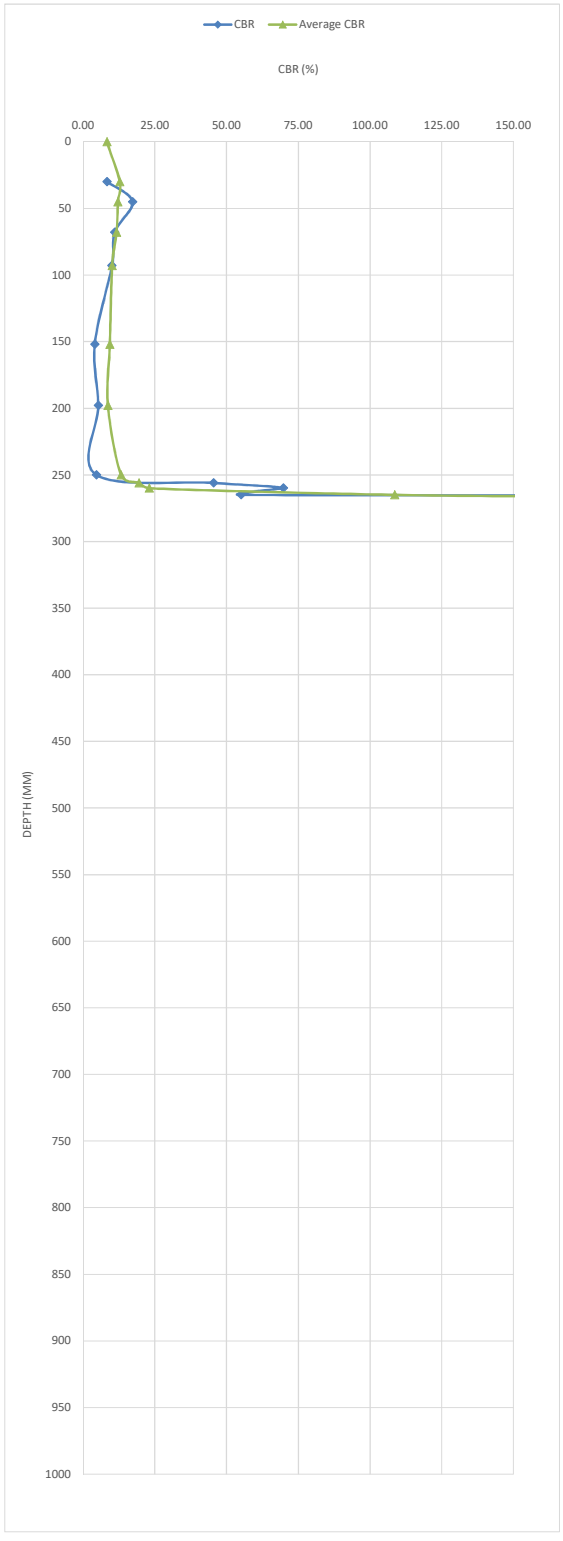
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	C04 - DCP
Location	E P Barrus, Graven Hill
	NW of D4
Date	17/04/2018
Material:	Type 1
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		530			0				
1	1	560			30	30	0.9186828	8.3	8.3
1	2	575			45	15	1.2368715	17.3	12.8
1	3	598			68	23	1.0406537	11.0	12.2
1	4	623			93	25	1.0023774	10.1	11.6
1	5	682			152	59	0.6082094	4.1	10.1
1	6	728			198	46	0.722465	5.3	9.3
1	7	780			250	52	0.6661845	4.6	8.7
1	8	786			256	6	1.6574941	45.4	13.2
1	9	790			260	4	1.8436226	69.8	19.5
1	10	795			265	5	1.7411887	55.1	23.1
3	13	796			266	0.333333	2.9843172	964.5	108.7
10	23	800			270	0.4	2.9006226	795.5	165.9

Remarks
Refusal

TEST C04 - DCP



SITE DCP Testing

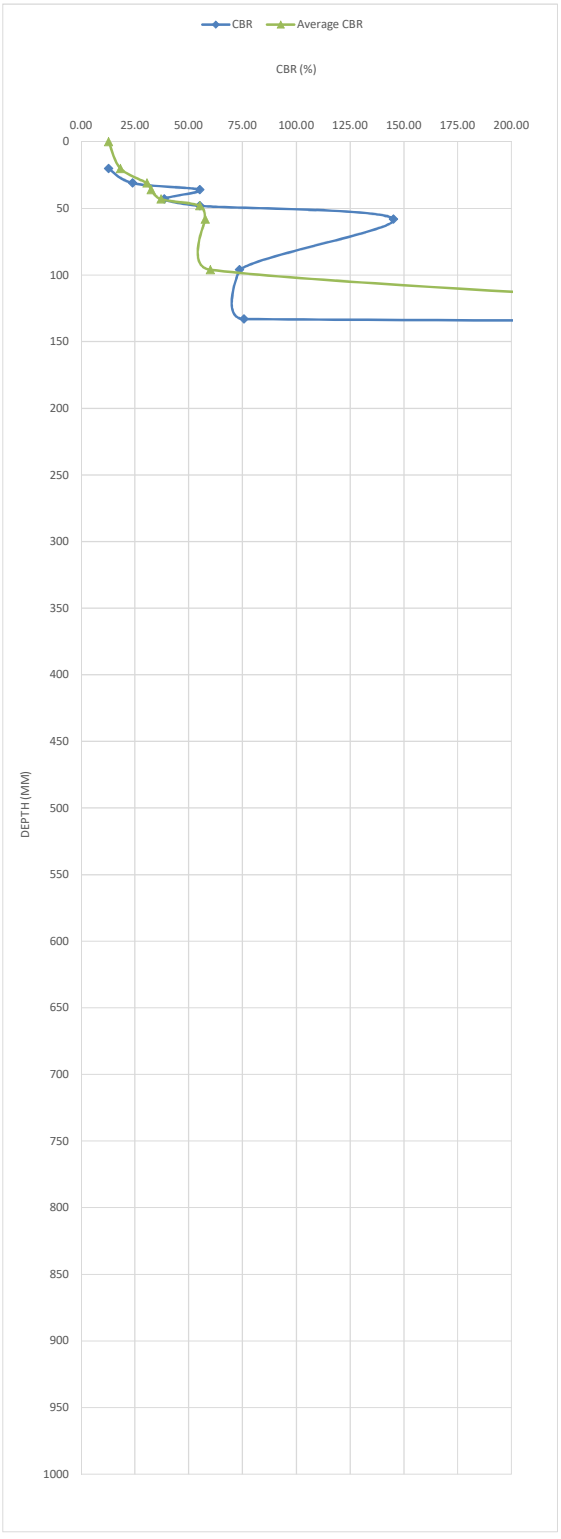
Determination of Penetration Value of Unbound Soil using Dynamic Cone Penetrometer (DCP)

Test Ref.	C05 - DCP
Location	E P Barrus, Graven Hill
	NE of D4
Date	17/04/2018
Material:	Type 1
Level	GL

Number of Blows	Total Blows	Rod 1 Reading (mm)	Rod 2 Reading (mm)		Total Depth	mm/Blow (5)		CBR (%)	Average CBR (%)
START POSITION:									
zero		232			0				
1	1	252			20	20	1.1048113	12.7	12.7
1	2	263			31	11	1.3792479	23.9	18.3
1	3	268			36	5	1.7411887	55.1	30.6
1	4	275			43	7	1.5867314	38.6	32.6
1	5	280			48	5	1.7411887	55.1	37.1
5	10	290			58	2	2.1618113	145.1	55.1
10	20	328			96	3.8	1.8671687	73.6	57.8
10	30	365			133	3.7	1.8794108	75.8	60.0
10	40	366			134	0.1	3.537	3443.5	436.0

Remarks
Refusal

TEST C05 - DCP



Hole ID	Depth (base) m BGL	Description
C1	0.045 0.105 0.340	Bituminous Macadam (Wearing Course) Bituminous Macadam Concrete – limestone aggregate (no rebar)
C2	0.030 0.220	Bituminous Macadam (Wearing Course) Bituminous Macadam
C3	0.060 0.290	Bituminous Macadam Limestone capping material (unbound)
C4	0.045 0.190 0.350	Bituminous Macadam (Wearing Course) Bituminous Macadam Concrete – limestone aggregate (no rebar)
C5	0.090	Bituminous Macadam
C6	0.070 >0.45 (No sample)	Bituminous Macadam Concrete – flint chert aggregate (no rebar) (Unable to prove base of concrete – limit of core barrel)
BH05 (Core)	0.165	Concrete – quartzite aggregate rebar at 0.1m & base, membrane below
BH09 (Core)	0.165	Concrete – quartzite & limestone aggregate rebar at 0.1m, membrane below
T10 (Core)	0.170	Concrete – quartzite aggregate rebar at 0.09m & base, membrane below

GRAVEN HILL BICESTER – CORE SUMMARY

AIS Job No. X0212

APPENDIX 3 – PHOTOGRAPHS

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 1. Location of BH02

Plate 2. BH02 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 3. BH02 arisings

Plate 4. BH05 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 5. BH05 arisings - 3.50m

Plate 6. Location of HP01

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 7. Location of HP01

Plate 8. HP01

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 9. Location of HP02

Plate 10. HP02 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 11. HP02

Plate 12. BH06 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 13. BH06 arisings

Plate 14. Arisings from BH06

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 15. BH06 arisings

Plate 16. BH06 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 17. Location of BH06

Plate 18. Location of BH07

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 19. BH07 arisings

Plate 20. BH07 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 21. Location of BH08

Plate 22. BH08 arisings

SITE INVESTIGATION PHOTOGRAPHS - 5005462

Plate 23. BH08 arisings

Plate 24. Reinstatement at BH05

Plate 25. BH08 installation

Plate 26. BH08 installation

Plate 27. BH09 installation

Plate 28. BH09 installation

APPENDIX 4 – CHEMICAL TEST CERTIFICATES

Max Smeeth
Ridge
Partnership House
Moorside Road
Winchester
SO23 7RX

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410
russell.jarvis@qtsenvironmental.com

DETS Report No: 18-73985

Site Reference:	Bicester
Project / Job Ref:	5005462
Order No:	5005462-815
Sample Receipt Date:	19/04/2018
Sample Scheduled Date:	19/04/2018
Report Issue Number:	1
Reporting Date:	25/04/2018

Authorised by:

[redacted]

Russell Jarvis
Associate Director of Client Services

Authorised by:

[redacted]

Dave Ashworth
Deputy Quality Manager

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 18-73985	**Date Sampled**	16/04/18	16/04/18	16/04/18	17/04/18	17/04/18
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bicester	**TP / BH No**	BH02	BH03	BH05	BH06	BH07
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5005462-815	**Depth (m)**	0.50	0.50 - 0.75	0.30	0.40	0.30
Reporting Date: 25/04/2018	**QTSE Sample No**	329166	329167	329168	329169	329170

Determinand	Unit	RL	Accreditation	(n)				
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
Sample Matrix (S)	Material Type	N/a	NONE					
Asbestos Type (S)	PLM Result	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	8.0	8.0	11.2	8.3	7.8
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Organic Matter	%	< 0.1	MCERTS	2.1	3.7	0.6	3.8	4.6
Arsenic (As)	mg/kg	< 2	MCERTS	13	10	7	8	10
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.5	0.4	< 0.2	0.4	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	31	29	14	29	186
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	11.9
Copper (Cu)	mg/kg	< 4	MCERTS	29	26	16	23	18
Lead (Pb)	mg/kg	< 3	MCERTS	19	27	9	25	701
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	43	34	9	35	25
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3	< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	117	121	27	109	96
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Subcontracted analysis (S)
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Soil Analysis Certificate						
DETS Report No: 18-73985	**Date Sampled**	17/04/18	17/04/18	17/04/18		
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Bicester	**TP / BH No**	BH08	BH09	HP01		
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: 5005462-815	**Depth (m)**	0.50	0.80	0.40		
Reporting Date: 25/04/2018	**QTSE Sample No**	329172	329173	329174		

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	**ISO17025**	Not Detected	Not Detected	Detected		
Sample Matrix (S)	Material Type	N/a	NONE			Microscopic bitumen in soil		
Asbestos Type (S)	PLM Result	N/a	**ISO17025**			Chrysotile		
pH	pH Units	N/a	**MCERTS**	8.1	7.6	8.1		
Total Cyanide	mg/kg	< 2	NONE	< 2	< 2	< 2		
Organic Matter	%	< 0.1	**MCERTS**	1.9	2.9	3.4		
Arsenic (As)	mg/kg	< 2	**MCERTS**	9	4	10		
Cadmium (Cd)	mg/kg	< 0.2	**MCERTS**	< 0.2	0.3	0.3		
Chromium (Cr)	mg/kg	< 2	**MCERTS**	32	26	28		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	**MCERTS**	16	22	37		
Lead (Pb)	mg/kg	< 3	**MCERTS**	19	12	37		
Mercury (Hg)	mg/kg	< 1	NONE	< 1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	**MCERTS**	31	31	34		
Selenium (Se)	mg/kg	< 3	NONE	< 3	< 3	< 3		
Zinc (Zn)	mg/kg	< 3	**MCERTS**	81	79	118		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 18-73985	**Date Sampled**	16/04/18	16/04/18	16/04/18	17/04/18	17/04/18
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bicester	**TP / BH No**	BH02	BH03	BH05	BH06	BH07
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5005462-815	**Depth (m)**	0.50	0.50 - 0.75	0.30	0.40	0.30
Reporting Date: 25/04/2018	**QTSE Sample No**	329166	329167	329168	329169	329170

Determinand	Unit	RL	Accreditation	(n)				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	0.14	< 0.1	0.22	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	0.18	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 18-73985	**Date Sampled**	17/04/18	17/04/18	17/04/18		
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Bicester	**TP / BH No**	BH08	BH09	HP01		
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: 5005462-815	**Depth (m)**	0.50	0.80	0.40		
Reporting Date: 25/04/2018	**QTSE Sample No**	329172	329173	329174		

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.70		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.39		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.31		
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	4.95		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.78		
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	9.68		
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	8.07		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	2.99		
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	3.53		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	3.90		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	1.23		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	2.64		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	1.53		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.23		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	1.31		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	42.2		

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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 18-73985	**Date Sampled**	16/04/18	16/04/18	16/04/18	17/04/18	17/04/18
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bicester	**TP / BH No**	BH02	BH03	BH05	BH06	BH07
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5005462-815	**Depth (m)**	0.50	0.50 - 0.75	0.30	0.40	0.30
Reporting Date: 25/04/2018	**QTSE Sample No**	329166	329167	329168	329169	329170

Determinand	Unit	RL	Accreditation			(n)		
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	< 21
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3	< 3	< 3
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	< 21	< 21	< 21
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	< 42	< 42	< 42

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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 18-73985	**Date Sampled**	17/04/18	17/04/18	17/04/18		
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Bicester	**TP / BH No**	BH08	BH09	HP01		
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: 5005462-815	**Depth (m)**	0.50	0.80	0.40		
Reporting Date: 25/04/2018	**QTSE Sample No**	329172	329173	329174		

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	< 3		
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10	< 10	< 10		
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21	< 21	< 21		
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01	< 0.01	< 0.01		
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3	< 3	30		
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10	< 10	50		
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21	< 21	80		
Total >C5 - C35	mg/kg	< 42	NONE	< 42	< 42	80		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{o}C

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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 18-73985	**Date Sampled**	16/04/18	16/04/18	16/04/18	17/04/18	17/04/18
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bicester	**TP / BH No**	BH02	BH03	BH05	BH06	BH07
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5005462-815	**Depth (m)**	0.50	0.50 - 0.75	0.30	0.40	0.30
Reporting Date: 25/04/2018	**QTSE Sample No**	329166	329167	329168	329169	329170

Determinand	Unit	RL	Accreditation	(n)				
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5	< 5	< 5

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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 18-73985	**Date Sampled**	17/04/18	17/04/18	17/04/18		
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Bicester	**TP / BH No**	BH08	BH09	HP01		
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: 5005462-815	**Depth (m)**	0.50	0.80	0.40		
Reporting Date: 25/04/2018	**QTSE Sample No**	329172	329173	329174		

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
Toluene	ug/kg	< 5	MCERTS	< 5	< 5	< 5		
Ethylbenzene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
p & m-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
o-xylene	ug/kg	< 2	MCERTS	< 2	< 2	< 2		
MTBE	ug/kg	< 5	MCERTS	< 5	< 5	< 5		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{o}C

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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 18-73985	**Date Sampled**	17/04/18	
Ridge	**Time Sampled**	None Supplied	
Site Reference: Bicester	**TP / BH No**	BH08	
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	
Order No: 5005462-815	**Depth (m)**	0.30	
Reporting Date: 25/04/2018	**QTSE Sample No**	329171	

Determinand	**Unit**	**MDL**		**Landfill Waste Acceptance Criteria Limits**		
				Inert Waste Landfill	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
TOC[MU]	%	< 0.1	1.1	3%	5%	6%
Loss on Ignition	%	< 0.01	4.50	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1	1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10	500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7	100	--	--
pH[MU]	pH Units	N/a	8.5	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	2	--	To be evaluated	To be evaluated

Eluate Analysis	**10:1 mg/l**	**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01	< 0.1	0.5	2	25
Barium[U]	< 0.02	< 0.2	20	100	300
Cadmium[U]	< 0.0005	< 0.005	0.04	1	5
Chromium[U]	< 0.005	< 0.05	0.5	10	70
Copper[U]	< 0.01	< 0.1	2	50	100
Mercury[U]	< 0.0005	< 0.01	0.01	0.2	2
Molybdenum[U]	0.002	0.02	0.5	10	30
Nickel[U]	< 0.007	< 0.07	0.4	10	40
Lead[U]	< 0.005	< 0.05	0.5	10	50
Antimony[U]	< 0.005	< 0.05	0.06	0.7	5
Selenium[U]	< 0.005	< 0.05	0.1	0.5	7
Zinc[U]	< 0.005	< 0.05	4	50	200
Chloride[U]	< 1	< 10	800	15000	25000
Fluoride[U]	0.5	5	10	150	500
Sulphate[U]	2	20	1000	20000	50000
TDS	86	860	4000	60000	100000
Phenol Index	< 0.01	< 0.1	1	-	-
DOC	5.1	50.8	500	800	1000
Leach Test Information					
Sample Mass (kg)	0.11				
Dry Matter (%)	82.5				
Moisture (%)	21.2				
Stage 1					
Volume Eluate L10 (litres)	0.88				

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

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Waste Acceptance Criteria Analytical Certificate - BS EN 12457/2

DETS Report No: 18-73985	**Date Sampled**	17/04/18	
Ridge	**Time Sampled**	None Supplied	
Site Reference: Bicester	**TP / BH No**	HP02	
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	
Order No: 5005462-815	**Depth (m)**	0.45	
Reporting Date: 25/04/2018	**QTSE Sample No**	329175	

Determinand	**Unit**	**MDL**		**Landfill Waste Acceptance Criteria Limits**		
				Inert Waste Landfill	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
TOC[MU]	%	< 0.1	1.7	3%	5%	6%
Loss on Ignition	%	< 0.01	4.90	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1	1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10	500	--	--
Total PAH[MU]	mg/kg	< 1.7	9.1	100	--	--
pH[MU]	pH Units	N/a	8.0	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	2.1	--	To be evaluated	To be evaluated

Eluate Analysis	**10:1 mg/l**			**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01			< 0.1	0.5	2	25
Barium[U]	< 0.02			< 0.2	20	100	300
Cadmium[U]	< 0.0005			< 0.005	0.04	1	5
Chromium[U]	< 0.005			< 0.05	0.5	10	70
Copper[U]	< 0.01			< 0.1	2	50	100
Mercury[U]	< 0.0005			< 0.01	0.01	0.2	2
Molybdenum[U]	0.002			0.02	0.5	10	30
Nickel[U]	< 0.007			< 0.07	0.4	10	40
Lead[U]	< 0.005			< 0.05	0.5	10	50
Antimony[U]	< 0.005			< 0.05	0.06	0.7	5
Selenium[U]	< 0.005			< 0.05	0.1	0.5	7
Zinc[U]	< 0.005			< 0.05	4	50	200
Chloride[U]	< 1			< 10	800	15000	25000
Fluoride[U]	0.8			8	10	150	500
Sulphate[U]	27			266	1000	20000	50000
TDS	115			1149	4000	60000	100000
Phenol Index	< 0.01			< 0.1	1	-	-
DOC	7.1			70.7	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.11						
Dry Matter (%)	80.7						
Moisture (%)	24						
Stage 1							
Volume Eluate L10 (litres)	0.88						

Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and QTS Environmental cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

DETS Ltd
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Soil Analysis Certificate - Sample Descriptions
DETS Report No: 18-73985
Ridge
Site Reference: Bicester
Project / Job Ref: 5005462
Order No: 5005462-815
Reporting Date: 25/04/2018

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
329166	BH02	None Supplied	0.50	17.4	Brown sandy clay
329167	BH03	None Supplied	0.50 - 0.75	21.4	Brown sandy clay
329168	BH05	None Supplied	0.30	2.9	Brown concrete
329169	BH06	None Supplied	0.40	21.8	Brown sandy clay with vegetation
329170	BH07	None Supplied	0.30	26.2	Brown sandy clay with vegetation
329171	BH08	None Supplied	0.30	17.5	Brown sandy clay
329172	BH08	None Supplied	0.50	18.1	Brown sandy clay with vegetation
329173	BH09	None Supplied	0.80	19.3	Brown sandy clay
329174	HP01	None Supplied	0.40	21.5	Brown sandy clay
329175	HP02	None Supplied	0.45	19.3	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

Max Smeeth
Ridge
Partnership House
Moorside Road
Winchester
SO23 7RX

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russell.jarvis@qtsenvironmental.com

DETS Report No: 18-74358

Site Reference:	Bicester
Project / Job Ref:	5005462
Order No:	5005462-815
Sample Receipt Date:	19/04/2018
Sample Scheduled Date:	26/04/2018
Report Issue Number:	1
Reporting Date:	02/05/2018

Authorised by:

[redacted]

Russell Jarvis
Associate Director of Client Services

Authorised by:

[redacted]

Dave Ashworth
Deputy Quality Manager

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4480

Soil Analysis Certificate						
DETS Report No: 18-74358	**Date Sampled**	17/04/18				
Ridge	**Time Sampled**	None Supplied				
Site Reference: Bicester	**TP / BH No**	BH07				
Project / Job Ref: 5005462	**Additional Refs**	None Supplied				
Order No: 5005462-815	**Depth (m)**	0.50				
Reporting Date: 02/05/2018	**QTSE Sample No**	330498				

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected				
pH	pH Units	N/a	MCERTS	8.2				
Total Cyanide	mg/kg	< 2	NONE	< 2				
Organic Matter	%	< 0.1	MCERTS	2.1				
Arsenic (As)	mg/kg	< 2	MCERTS	10				
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2				
Chromium (Cr)	mg/kg	< 2	MCERTS	38				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	MCERTS	18				
Lead (Pb)	mg/kg	< 3	MCERTS	14				
Mercury (Hg)	mg/kg	< 1	NONE	< 1				
Nickel (Ni)	mg/kg	< 3	MCERTS	37				
Selenium (Se)	mg/kg	< 3	NONE	< 3				
Zinc (Zn)	mg/kg	< 3	MCERTS	72				
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 18-74358	**Date Sampled**	17/04/18				
Ridge	**Time Sampled**	None Supplied				
Site Reference: Bicester	**TP / BH No**	BH07				
Project / Job Ref: 5005462	**Additional Refs**	None Supplied				
Order No: 5005462-815	**Depth (m)**	0.50				
Reporting Date: 02/05/2018	**QTSE Sample No**	330498				

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1				
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1				
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1				
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 18-74358	**Date Sampled**	17/04/18				
Ridge	**Time Sampled**	None Supplied				
Site Reference: Bicester	**TP / BH No**	BH07				
Project / Job Ref: 5005462	**Additional Refs**	None Supplied				
Order No: 5005462-815	**Depth (m)**	0.50				
Reporting Date: 02/05/2018	**QTSE Sample No**	330498				

Determinand	Unit	RL	Accreditation					
Aliphatic >C5 - C6	mg/kg	< 0.01	NONE	< 0.01				
Aliphatic >C6 - C8	mg/kg	< 0.05	NONE	< 0.05				
Aliphatic >C8 - C10	mg/kg	< 2	MCERTS	< 2				
Aliphatic >C10 - C12	mg/kg	< 2	MCERTS	< 2				
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3				
Aliphatic >C16 - C21	mg/kg	< 3	MCERTS	< 3				
Aliphatic >C21 - C34	mg/kg	< 10	MCERTS	< 10				
Aliphatic (C5 - C34)	mg/kg	< 21	NONE	< 21				
Aromatic >C5 - C7	mg/kg	< 0.01	NONE	< 0.01				
Aromatic >C7 - C8	mg/kg	< 0.05	NONE	< 0.05				
Aromatic >C8 - C10	mg/kg	< 2	MCERTS	< 2				
Aromatic >C10 - C12	mg/kg	< 2	MCERTS	< 2				
Aromatic >C12 - C16	mg/kg	< 2	MCERTS	< 2				
Aromatic >C16 - C21	mg/kg	< 3	MCERTS	< 3				
Aromatic >C21 - C35	mg/kg	< 10	MCERTS	< 10				
Aromatic (C5 - C35)	mg/kg	< 21	NONE	< 21				
Total >C5 - C35	mg/kg	< 42	NONE	< 42				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{o}C

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Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 18-74358	**Date Sampled**	17/04/18				
Ridge	**Time Sampled**	None Supplied				
Site Reference: Bicester	**TP / BH No**	BH07				
Project / Job Ref: 5005462	**Additional Refs**	None Supplied				
Order No: 5005462-815	**Depth (m)**	0.50				
Reporting Date: 02/05/2018	**QTSE Sample No**	330498				

Determinand	Unit	RL	Accreditation					
Benzene	ug/kg	< 2	MCERTS	< 2				
Toluene	ug/kg	< 5	MCERTS	< 5				
Ethylbenzene	ug/kg	< 2	MCERTS	< 2				
p & m-xylene	ug/kg	< 2	MCERTS	< 2				
o-xylene	ug/kg	< 2	MCERTS	< 2				
MTBE	ug/kg	< 5	MCERTS	< 5				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{o}C

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Soil Analysis Certificate - Sample Descriptions
DETS Report No: 18-74358
Ridge
Site Reference: Bicester
Project / Job Ref: 5005462
Order No: 5005462-815
Reporting Date: 02/05/2018

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
330498	BH07	None Supplied	0.50	13.7	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 18-74358

Ridge

Site Reference: Bicester

Project / Job Ref: 5005462

Order No: 5005462-815

Reporting Date: 02/05/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Max Smeeth
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DETS Report No: 18-75087

Site Reference:	Bicester
Project / Job Ref:	5005462
Order No:	5005462-815
Sample Receipt Date:	19/04/2018
Sample Scheduled Date:	11/05/2018
Report Issue Number:	1
Reporting Date:	16/05/2018

Authorised by:

[redacted]

Russell Jarvis
Associate Director of Client Services

[redacted]

Dave Ashworth
Deputy Quality Manager

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Tel : 01622 850410

UKAS TESTING
4480

Soil Analysis Certificate							
DETS Report No: 18-75087	**Date Sampled**	17/04/18					
Ridge	**Time Sampled**	None Supplied					
Site Reference: Bicester	**TP / BH No**	HP01					
Project / Job Ref: 5005462	**Additional Refs**	None Supplied					
Order No: 5005462-815	**Depth (m)**	0.40					
Reporting Date: 16/05/2018	**QTSE Sample No**	333428					

Determinand	Unit	RL	Accreditation					
Asbestos Quantification (S)	%	< 0.001	ISO17025	0.013				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
Subcontracted analysis (S)

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 18-75087
Ridge
Site Reference: Bicester
Project / Job Ref: 5005462
Order No: 5005462-815
Reporting Date: 16/05/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10 C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Max Smeeth
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DETS Report No: 18-74272

Site Reference:	Bicester
Project / Job Ref:	5005462
Order No:	5005462-815
Sample Receipt Date:	25/04/2018
Sample Scheduled Date:	25/04/2018
Report Issue Number:	1
Reporting Date:	30/04/2018

Authorised by:

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Russell Jarvis
Associate Director of Client Services

Authorised by:

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Dave Ashworth
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UKAS TESTING
4480

Core Analysis Certificate - Speciated PAHs							
DETS Report No: 18-74272	**Date Sampled**	16/04/18	16/04/18	16/04/18	16/04/18	16/04/18
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bicester	**TP / BH No**	C1	C1	C2	C2	C3
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 5005462-815	**Depth (m)**	GL - 0.045	0.045 - 0.105	GL - 0.03	0.03 - 0.22	GL - 0.06
Reporting Date: 30/04/2018	**QTSE Sample No**	330163	330164	330165	330166	330167

Determinand	**Unit**	**RL**	**Accreditation**	(n)	(n)	(n)	(n)	(n)
Naphthalene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	< 1
Acenaphthylene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	< 1
Acenaphthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	< 1
Fluorene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	< 1
Phenanthrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	8.07
Anthracene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	3.05
Fluoranthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	56.70
Pyrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	47.40
Benzo(a)anthracene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	31.30
Chrysene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	27.90
Benzo(b)fluoranthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	39.50
Benzo(k)fluoranthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	11.60
Benzo(a)pyrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	24.50
Indeno(1,2,3-cd)pyrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	18.10
Dibenz(a,h)anthracene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	2.43
Benzo(ghi)perylene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	12.90
Coronene	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Total Oily Waste PAHs	mg/kg	< 10	**ISO17025**	< 10	< 10	< 10	< 10	155
Total Dutch 10 PAHs	mg/kg	< 10	**ISO17025**	< 10	< 10	< 10	< 10	194
Total EPA-16 PAHs	mg/kg	< 16	**ISO17025**	< 16	< 16	< 16	< 16	283
Total WAC-17 PAHs	mg/kg	< 17	NONE	< 17	< 17	< 17	< 17	283

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C
(n) Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation

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UKAS TESTING
4480

Core Analysis Certificate - Speciated PAHs							
DETS Report No: 18-74272	**Date Sampled**	16/04/18	16/04/18	16/04/18	16/04/18	
Ridge	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	
Site Reference: Bicester	**TP / BH No**	C4	C4	C5	C6	
Project / Job Ref: 5005462	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	
Order No: 5005462-815	**Depth (m)**	GL - 0.045	0.045 - 0.19	GL - 0.09	GL - 0.07	
Reporting Date: 30/04/2018	**QTSE Sample No**	330168	330169	330170	330171	

Determinand	**Unit**	**RL**	**Accreditation**	(n)	(n)	(n)	(n)	
Naphthalene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Acenaphthylene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Acenaphthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Fluorene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Phenanthrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Anthracene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Fluoranthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Pyrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Benzo(a)anthracene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Chrysene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Benzo(b)fluoranthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Benzo(k)fluoranthene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Benzo(a)pyrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Dibenz(a,h)anthracene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Benzo(ghi)perylene	mg/kg	< 1	**ISO17025**	< 1	< 1	< 1	< 1	
Coronene	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	
Total Oily Waste PAHs	mg/kg	< 10	**ISO17025**	< 10	< 10	< 10	< 10	
Total Dutch 10 PAHs	mg/kg	< 10	**ISO17025**	< 10	< 10	< 10	< 10	
Total EPA-16 PAHs	mg/kg	< 16	**ISO17025**	< 16	< 16	< 16	< 16	
Total WAC-17 PAHs	mg/kg	< 17	NONE	< 17	< 17	< 17	< 17	

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30^{O}C

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Tel : 01622 850410

Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 18-74272	
Ridge	
Site Reference: Bicester	
Project / Job Ref: 5005462	
Order No: 5005462-815	
Reporting Date: 30/04/2018	

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
& 330163	C1	None Supplied	GL - 0.045	0.1	Black tar
& 330164	C1	None Supplied	0.045 - 0.105	0.8	Black tar
& 330165	C2	None Supplied	GL - 0.03	0.4	Black tar
& 330166	C2	None Supplied	0.03 - 0.22	1.4	Black tar
& 330167	C3	None Supplied	GL - 0.06	< 0.1	Black tar
& 330168	C4	None Supplied	GL - 0.045	< 0.1	Black tar
& 330169	C4	None Supplied	0.045 - 0.19	0.3	Black tar
& 330170	C5	None Supplied	GL - 0.09	0.3	Black tar
& 330171	C6	None Supplied	GL - 0.07	0.3	Black tar

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample $^{I/S}$

& samples received in inappropriate containers for hydrocarbon analysis

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 18-74272
Ridge
Site Reference: Bicester
Project / Job Ref: 5005462
Order No: 5005462-815
Reporting Date: 30/04/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 18-73985
Ridge
Site Reference: Bicester
Project / Job Ref: 5005462
Order No: 5005462-815
Reporting Date: 25/04/2018

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

APPENDIX 5 – GEOTECHNICAL TEST CERTIFICATES

Laboratory Report

UKAS TESTING
2788

GSTL
GEO Site & Testing Services Ltd

Contract Number: 38990

Client Ref: **5005462**
Client PO:

Report Date: **09-05-2018**

Client **Advanced Investigation Systems Ltd**
Stout Hill Cottage, Stout hill
Henley
Langport
Somerset
TA10 9BJ

Contract Title: **Barrus, Graven Hill, Bicester**
For the attention of: **Paul Kings**

Date Received: **24-04-2018**
Date Commenced: **24-04-2018**
Date Completed: **09-05-2018**

Test Description	Qty
Moisture Content BS 1377 : Part 2 : 3.2 - * UKAS	5
4 Point Liquid & Plastic Limit (LL/PL) BS 1377 Part 2 : 4.3 & 5.3 - * UKAS	5
Water Soluble Sulphate 2:1 extract 1377 : 1990 Part 3 : 5 - @ Non Accredited Test	6
pH Value of Soil. 1377 : 1990 Part 3 : 9 - @ Non Accredited Test	6
Cored specimens **- testing in compression BS EN 12504-1:2009** BS EN 12504-1:2009 - * UKAS	1
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Alex Wynn (Associate Director) - Ben Sharp (Contracts Manager) - Emma Sharp (Office Manager)
Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager) - Sean Penn (Administrative/Quality Assistant)
Wayne Honey (Administrative/Quality Assistant)

GEO Site & Testing Services Ltd
Unit 3-4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5) DESCRIPTIONS	
Contract Number	**38990**	
Site Name	**Barrus, Graven Hill, Bicester**	

Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
BH02	1	D	1.30	-	1.50	Brown silty CLAY.
BH03	1	D	1.50	-	1.70	Brown silty CLAY.
BH03	2	D	2.80	-	3.00	Brown silty CLAY.
BH04	1	D	0.80	-	1.00	Brown silty CLAY.
BH04	2	D	1.80	-	2.00	Brown silty CLAY.
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				-		
				-		
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				-		
				-		
				-		
				-		

Operators	Checked	08-05-18	Emma Sharp	[redacted]
RO/MH	Approved	09-05-18	Paul Evans	

UKAS TESTING 2788

GSTL	LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377 : Part 2 : 1990 Method 5)	
Contract Number	38990	
Site Name	Barrus, Graven Hill, Bicester	

Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing .425mm %	Remarks
BH02	1	D	1.30	-	1.50	32	70	27	43	100	CH/V High/HighPlasticity
BH03	1	D	1.50	-	1.70	35	76	29	47	100	CV Very High Plasticity
BH03	2	D	2.80	-	3.00	35	68	31	37	100	CH High Plasticity
BH04	2	D	0.80	-	1.00	39	76	29	47	100	CV Very High Plasticity
BH04	2	D	1.80	-	2.00	38	74	31	43	100	CV Very High Plasticity
				-							
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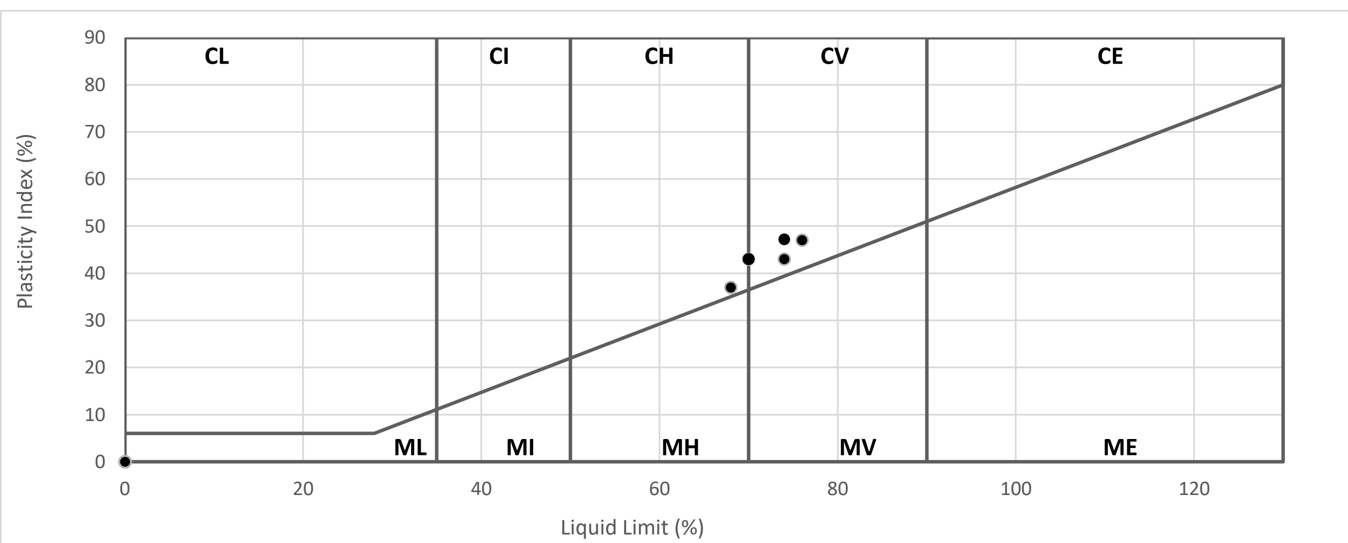
Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:1999+A2:2010



Operators	Checked	08-05-18	Emma Sharp	[redacted]
DB	Approved	09-05-18	Paul Evans	

GSTL	Certificate of Chemical Analysis onsuling	Contract Number	38990
		Client Reference	5005462
Client	Advanced Investigation System	**Date Received**	
Site Name	Barrus, Graven Hill, Bicester	**Date Started**	01-05-18
		Date Completed	09-05-18
		No. of Samples	6

Hole Number	Sample Number	Sample Type	Depth (m)			Acid Soluble Sulphate	Aqueous Extract Sulphate	Water Soluble Chloride	PH Value	Organic Matter Content	Acid Soluble Chloride	Loss On Ignition
BH02	1	D	1.30	-	1.50		0.40		6.88			
BH03	2	D	2.80	-	3.00		0.46		6.99			
BH04	1	D	0.80	-	1.00		0.32		6.94			
BH04	2	D	1.80	-	2.00		0.54		6.87			
BH04	3	D	2.80	-	3.00		0.61		6.94			
BH05	2	D	1.80	-	2.00		0.66		7.10			
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Key	**Reported As**	**Clause**
Acid Soluble Sulphate	% SO_3	Clause 5.2 & 5.5
Aqueous Extract Sulphate	g/l SO_3	Clause 5.3 & 5.5
2/1 Chloride	%	Clause 7.2
PH Value	@ 25°	Clause 9.5
Organic	%	Clause 3
Redox Mv	Mv	Clause 4
LOI	%	Clause 4

Remarks

NCP = No Chloride Present

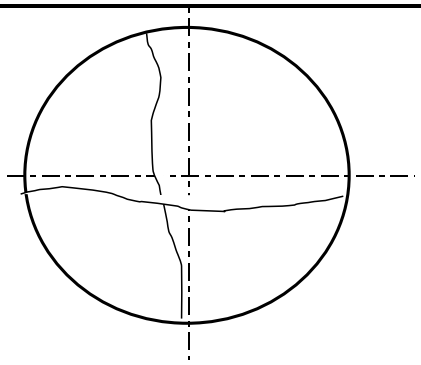
Test Operator	Checked and Authorised by		Ben Sharp	[redacted]
Darren Bourne	Date	09-05-18		

Test Report: **Testing concrete in structures. Cored specimens. Taking, examining and testing in compression BS EN 12504-1:2009 & BS EN 12390-3: 2009**

Client:	**AIS**
Location:	**Barrus, Graven Hill, Bicester**
Client Ref:	**5005462**
Contract Number:	**38990**

Core Description	**BH05@0.00-0.165**
Estimated Maximum aggregate Size (mm)	**16**
Date of Coring	**unknown**
Date of Receipt	**23-04-18**
Date of Test	**08-05-18**
Method used for Preparation	**Cutting**
Condition On Test *	**Surface Wet**

* Surface Wet, Dry

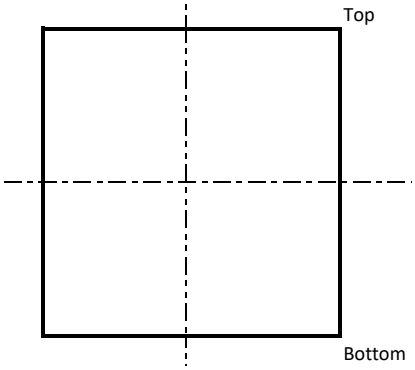


Vertical re-bar
From Centre (mm) na
Horizontal Rebar
From Top (mm) na
From Centre (mm) na
Re-bar Diameter (mm) na

Measurement Dimensions: BS EN 12390-1: 2012

Size of sample Received in Lab (mm) Diameter	**141.1**
Size of sample Received in Lab (mm) Length	**136**
Cut Length of specimen tested (mm)	**136.7**
Length Diameter ratio of prepared specimen:	**1.01**
Density (kg/m^3)	**2176**

RE-BAR NOT PRESENT



Compression: BS EN 12390-3:2009

Compressive Strength N/mm^2	**35.5**
Estimated in-situ cube strength N/mm^2	**35.5**
Appearance of concrete and Type of Fracture	**Satisfactory**
Compaction of concrete, classification of void %	**0.5**
Any Deviations from the standard Method of Testing [1]	**n/a**

Remarks:

[1] All the testing was carried out in accordance with BS EN 12390-3: 2009 except as detailed

Technician Responsible
Matthew Havard

For and behalf of GEO Site & Testing Services Ltd

Vaughan Edwards (Managing Director) [redacted]

Date Checked and Approved: 9.5.18

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