

GEOTECHNICAL AND GEO-ENVIRONMENTAL ASSESSMENT

Client: Blue Cedar Homes

Land off Clifton Road, Deddington

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Version 1



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Executive Summary

South West Geotechnical Ltd (SWG) was instructed by Blue Cedar Homes (the Client) to undertake a geotechnical and geo-environmental assessment to assist with the proposed development of the land off Clifton Road, Deddington, Oxfordshire.

At the time of the investigation, development proposals included the construction of residential properties, with associated gardens and access roads.

This geotechnical and geo-environmental assessment was carried out to determine the ground conditions for foundation and pavement design. In addition, an assessment was required from a geo-environmental perspective to include recommendations for any contamination remediation that may be required.

Desk Study

A Stage One study was undertaken on the site by RSK in 2018 which surmised that contaminant linkages appeared to be absent, the potential for ground gas and lateral migration of gases was low. The report suggests that due to the limited scope a more comprehensive investigation was recommended in order to identify whether any contamination is present.

Ground Conditions

The investigation generally encountered topsoil overlying cohesive soils then granular soils derived from the weathering of the Marlstone Rock Formation. Extremely weak, siltstone of the Dyrham Formation was found at the base of TP03.

Groundwater was not encountered during the investigation.

Geo-environmental

Although naturally occurring arsenic concentrations are elevated above the S4UL values for residential land use with plant uptake, a maximum bio-accessible arsenic concentration of 0.5% was recorded using the BARGE method bio-accessible testing. Using CLEA software a Site Specific Assessment Criteria (SSAC) value of 161 mg/kg has been calculated based on the maximum bio-accessible arsenic concentration. Therefore, all

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concentrations are below this value, and so the soils are considered suitable for use, and no further works are necessary in this regard.

Full radon protection measures are required.

No other gas protection measures are required.

Standard potable, water pipes are expected to be suitable.

Should any obviously contaminated soils be encountered during the construction phase of the works, advice should be sought from a suitably experienced Geo-environmental Engineer.

The results of the Waste Acceptance Criteria testing indicate the determinands would suggest the natural soil materials would be classified as inert.

Geotechnical

In order to ensure a consistent bearing stratum as possible, it is recommended that foundations for the proposed units are taken down to the upper levels of the granular materials associated with the Marlstone Rock Formation. These materials were encountered at between 0.8 and 2.0m below ground level. A serviceable limit state (allowable) bearing capacity of 150 kN/m² is considered appropriate for foundation design.

A combination of traditional strip and shallow trench fill foundations will be appropriate with foundation depths largely dependent on proposed reductions in ground level.

Given the volume change potential of the soils, suspended floors will be required.

Concrete should be designed to a Design Sulphate Class of DS-1, and ACEC Class AC-1.

Based on the plasticity of near surface cohesive soils, a CBR value of 3% is expected to be appropriate for pavement design.

1 INTRODUCTION

1.1 General

South West Geotechnical Ltd (SWG) was instructed by Blue Cedar Homes (the Client) to undertake a geotechnical and geo-environmental assessment to assist with the proposed development of the land off Clifton Road, Deddington, Oxfordshire.

At the time of the investigation, development proposals included the construction of residential properties, with associated gardens and access roads.

This geotechnical and geo-environmental assessment was carried out to determine the ground conditions for foundation and pavement design. In addition, an assessment was required from a geo-environmental perspective to include recommendations for any contamination remediation that may be required.

The investigation comprised a walkover survey, intrusive investigation, geotechnical and geo-environmental laboratory testing and reporting.

1.2 Site Description

The site is situated in south of Clifton Road, Deddington, Oxfordshire, OX15 0TH. It is centred on National Grid Reference 447115, 231706, as shown in the Site Location Plan, Appendix A.

The site is set within a predominantly rural area south of Banbury. The site is an approximately rectangular shaped plot of level open field bordered by Clifton Road to the north, residential properties to the east and west, and further fields to the south. Large (10m+) trees are present along the north and south boundaries and smaller trees and bushes to the west. Access is gained from the north western corner, via Clifton Road.

Ground surface conditions encountered across the site were consistently firm underfoot.

Topographically, the site is level.

2 DESK STUDY

2.1 General

A Stage One study was undertaken on the site by RSK in 2018 which surmised that contaminant linkages appeared to be absent, the potential for ground gas and lateral migration of gases was low. The report suggests that due to the limited scope a more comprehensive investigation was recommended in order to identify whether any contamination is present.

It should be noted that a historic gas works is present 10m north of the site which although disused since the 1920s, may still be a source of contaminants.

2.2 Geology

The British Geological Survey (BGS) map for the area (218 Chipping Norton) indicates the bedrock geology beneath the site comprises the Marlstone Rock Formation. Typically this comprises sandy, shelly and ooidal ferruginous limestone, sandstone and subordinate mudstone.

Beneath the Marlstone Rock Formation, the Dyrham Formation is present. This comprises a weakly cemented, interbedded siltstone and mudstone.

No Superficial (Recent) soils are shown to overlie the bedrock.

No made ground is mapped.

Borehole records available on the British Geological Survey GeoIndex website indicates the Marlstone Rock is approximately 9m thick.

3 GROUND INVESTIGATION

3.1 Fieldwork

An intrusive investigation was carried out on the 18th of August 2021. The exploratory hole location plan, exploratory hole logs, in-situ test data / results and associated photographs are contained in Appendices B and C respectively.

The fieldwork was carried out following the guidelines of BS 5930 (2015): Code of Practice for Ground Investigation; British Standard BS10175 (2011): Investigation of Potentially Contaminated Sites – Code of Practice and BS EN 1997-2:2007 (Eurocode 7) – Geotechnical Design – Part 2: Ground investigation and testing).

The fieldwork consisted of:

- Eight (8 no) Trial Pits
- Six (6 no) TRL DCP Probes

The trial pits were positioned to give good representative coverage of the site from both a geotechnical and geo-environmental perspective.

3.2 Trial Pits

Eight (8 no) trial pits were excavated with a 3 tonne tracked excavator.

The pits are logged from the surface by a qualified SWG Engineering Geologist as work progressed. Representative samples were taken from each stratum, and the pit photographed on completion. A photograph was also taken of the respective spoil heap.

3.3 TRL DCP Probes

Six (6 no) UKAS accredited TRL DCP probes were undertaken around the site. The TRL DCP apparatus is designed for determining soil and material strengths in a continuous profile. The probe uses an 8kg hammer dropping through a height of 575mm and a 60 degree cone with a diameter of 20mm (TRL Project Report PR/INT/277/04). CBR values

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were calculated using the formula given in Advice Note 73/06 Revision 1 (2009) Design Guidance for Road Pavement Foundations (Draft HD25).

The individual DCP probe plots are included as Appendix G.

4 LABORATORY TESTING

4.1 Geotechnical Laboratory Testing

All geotechnical testing was carried out in the SWG UKAS accredited laboratory in accordance with BS 1377; 1990, Methods of tests for soils for civil engineering purposes. Table 1 summarises geotechnical testing undertaken. The geotechnical laboratory test results are enclosed as Appendix D.

Table 1: Geotechnical Testing

Test	No. Tests
Moisture Content	5
Atterberg Limits	5

Three soil samples were tested for the BRE SD1 sulphate suite.

4.2 Geo-environmental testing

Five soil samples were tested for the following suite of determinands:

- pH, organic matter, total organic carbon, sulphate (water soluble).
- Metals: Arsenic, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc and cyanide
- Speciated Polyaromatic Hydrocarbons (PAH): Acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene.
- Total Phenols
- Total Petroleum Hydrocarbons (TPH)
- Speciated Total Petroleum Hydrocarbons (TPH), aliphatic >C5-C6, aliphatic >C6-C8, aliphatic >C8-C10, aliphatic >C10-C12, aliphatic >C12-C16, aliphatic >C16-C21, aliphatic >C21-C35, aromatic >C5-C7, aromatic >C7-C8, aromatic >C8-C10, aromatic >C10-C12, aromatic >C12-C16, aromatic >C16-C21, aromatic >C21-C35.
- Benzene, toluene, ethylbenzene, p & m-xylene and o-xylene
- Asbestos Screen

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A single soil sample was tested for additional speciated PAH and TPH.

One soil sample was selected for Waste Acceptance Criteria (WAC) analysis.

Due to the presence of elevated arsenic concentrations in the natural soils on site, Bio-Accessibilitiy Research Group of Europe (BARGE) method bio-accessible arsenic testing was undertaken on two samples near surface soils recovered from the site.

5 GROUND CONDITIONS

5.1 General

The investigation generally encountered topsoil overlying cohesive soils then granular soils derived from the weathering of the Marlstone Rock Formation. Extremely weak, siltstone of the Dyrham Formation was found at the base of TP03.

The ground conditions have been summarised in Table 2.

Table 2: Stratum summary

Stratum	Depth to base of stratum (m BGL)							
	TP01	TP02	TP03	TP04	TP05	TP06	TP07	TP08
Topsoil	0.3	0.3	0.3	0.3	0.4	0.2	0.3	0.3
Cohesive Residual Soil	0.8	0.9	0.9	1.0	1.1	1.5	2.0	1.3
Marlstone Rock Formation	>1.9	>1.7	2.3	>2.7	>2.75	>2.1	>3.0	>2.1
Dyrham Formation	-	-	>3.3	-	-	-	-	-
Groundwater	-	-	-	-	-	-	-	-

5.2 Cohesive Residual Soil

Cohesive deposits derived from the weathering of the Marlstone Rock Formation were encountered in all trial pits. These deposits comprised firm consistency orange brown gravelly sandy CLAY with low cobble content. Gravel and cobbles were of ironstone and fossiliferous limestone.

Liquid and Plastic (Atterberg) Limit testing undertaken on the cohesive materials indicate the soils are of high plasticity (CH) and generally low volume change potential in accordance with NHBC (2021).

Based on correlations between plasticity index and friction angle, a friction angle of 25° has been determined for the soils.

5.3 Marlstone Rock Formation

Granular deposits derived from weathering of the Marlstone Rock Formation were encountered in all trial pits extending to depths of 1.7 to 3.0m below ground level. The materials generally comprise orange brown cobbly sandy clayey GRAVEL with low boulder content. Gravel and cobbles of ironstone and fossiliferous limestone with boulders of fossiliferous limestone.

A friction angle of 37° is considered appropriate the Marlstone Rock materials.

5.4 Dyrham Formation

A unit of extremely weak laminated micaceous grey SILTSTONE was encountered below 2.3m below ground level in TP03. These materials have been interpreted as the Dyrham Formation.

5.5 Groundwater

Groundwater was not encountered during the investigation. It is expected to be seasonally perched at the base of the Marlstone Rock Formation, at the contact with the low permeability Dyrham Formation beneath.

5.6 Geo-environmental considerations

No made ground or signs of significant contamination was found during the investigation.

6 GEO-ENVIRONMENTAL RISK ASSESSMENT

6.1 General

In order for land affected by contamination to cause harm, there must be a source of contamination, a receptor that can be harmed and a pathway by which the receptor can be exposed to the contamination. Based on the initial conceptual model an assessment of the risk posed by ground / groundwater contamination to potential receptors has been undertaken.

On the basis of the desk study information and walkover survey, the historic gas works and infilled quarry (gasses) near the site were considered the main theoretical sources of contamination. Chemical testing was undertaken to further assess the initial conceptual model with samples from around proposed garden areas tested.

TP08 was undertaken in the north western corner of the site, closest to the boundary where the former Gas Works was present on the opposite side of Clifton Road until the early 1900s. Samples of soil were collected from near surface and at depth in this pit to determine whether any contaminants associated with the Gas Works were present.

6.2 Environmental Soil Test Results

The results of the environmental laboratory testing, presented as Appendix E, have been summarised in Table 3 and compared to Suitable for Use Level (S4UL) values for residential developments with home grown produce. For organic substances a 1% Soil Organic Matter (SOM) has been used, unless otherwise indicated, which represent the most stringent threshold limit.

LQM/ CIEH S4ULs have been developed by Land Quality Management Ltd jointly with the Chartered Institute of Environmental Health, and provide values for the assessment of potential risks to human health posed by contaminants in soil, and are compliant with UK legislative policy and guidelines. In particular, these include components of TPH and PAH.

The S4ULs have been derived in accordance with UK legislation, national as well as Environment Agency (EA) policy, and using a modified version of the EA CLEA software.

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The Department for the Environment, Food & Rural Affairs (DEFRA) has published Category 4 Screening Levels (C4SLs) for six substances including lead. The C4SLs represent the most stringent guidance available for the assessment of lead contamination in soils, and have been used in this report.

Where other guidelines are not available, local guidance, Dutch standards or an in-house screening value is used to provide an initial comparison figure.

Table 3: Environmental Testing Summary

Determinants	S4UL/C4SL mg/kg	Source of GAC	Recorded Range mg/kg	Location of Exceedances
Arsenic	37	LQM/ CIEH	78 – 138	All exploratory holes
Cadmium	11	LQM/ CIEH	0.3	
Chromium (III)	910	LQM/ CIEH	144 – 251	
Copper	2400	LQM/ CIEH	14 – 52	
Lead	200	Defra	36 – 56	
Mercury (inorganic)	40	LQM/ CIEH	<1	
Nickel	130	LQM/ CIEH	65 – 97	
Selenium	250	LQM/ CIEH	<3	
Zinc	3700	LQM/ CIEH	170-249	
Cyanide (total)	50	DUTCH	<2	
TPH aliphatic C5-C6	42	LQM/ CIEH	<0.1	
TPH aliphatic C6-C8	100	LQM/ CIEH	<0.05	
TPH aliphatic C8-C10	27	LQM/ CIEH	<2	
TPH aliphatic C10-C12	130	LQM/ CIEH	<2	
TPH aliphatic C12-C16	1100	LQM/ CIEH	<3	
TPH aliphatic C16-C35	65000	LQM/ CIEH	<3	
TPH aromatic C5-C7	70	LQM/ CIEH	<0.01	
TPH aromatic C7-C8	130	LQM/ CIEH	<0.05	
TPH aromatic C8-C10	34	LQM/ CIEH	<2	
TPH aromatic C10-C12	74	LQM/ CIEH	<2	
TPH aromatic C12-C16	140	LQM/ CIEH	<2	
TPH aromatic C16-C21	260	LQM/ CIEH	<3	
TPH aromatic C21-C35	1100	LQM/ CIEH	<10	
Napthalene	2.3	LQM/ CIEH	<0.1	
Acenaphthylene	170	LQM/ CIEH	<0.1	
Acenaphthene	210	LQM/ CIEH	<0.1	
Flourene	170	LQM/ CIEH	<0.1	
Phenanthrene	95	LQM/ CIEH	<0.1	
Anthracene	2400	LQM/ CIEH	<0.1	
Flouranthene	280	LQM/ CIEH	<0.1 – 0.24	
Pyrene	620	LQM/ CIEH	<0.1 – 0.23	
Benzo(a)anthracene	7.2	LQM/ CIEH	<0.1 – 0.3	
Chrysene	15	LQM/ CIEH	<0.1	
Benzo(b)flouranthene	2.6	LQM/ CIEH	<0.1 – 0.24	
Benzo(k)flouranthene	77	LQM/ CIEH	<0.1 – 0.1	
Benzo(a)pyrene	2.4	DefraC4SL	<0.1 – 0.12	
Indeno(1,2,3-cd)pyrene	27	LQM/ CIEH	<0.1	
Dibenzo(a,h)anthracene	0.24	LQM/ CIEH	<0.1	
Benzo(g,h,i)perylene	320	LQM/ CIEH	<0.1	
Benzene	0.087	LQM/ CIEH	<2	
Toluene	130	LQM/ CIEH	<5	
Ethylbenzene	47	LQM/ CIEH	<2	
p & m xylene	59	LQM/ CIEH	<2	
O xylene	60	LQM/ CIEH	<2	

Total phenol concentrations were below detectable limits.

No asbestos fibres were identified in any of the samples tested.

On the basis of the above, the topsoil/ natural soils across the site contain concentrations of arsenic in excess of the C4SL values for the proposed end use.

6.3 Human Health (Soils) Risk Assessment

In order for land affected by contamination to cause harm, there must be a source of contamination, a receptor that can be harmed and a pathway by which the receptor can be exposed to the contamination. From the results of the investigation, it is noted the site is not grossly or significantly contaminated. However, elevated levels naturally occurring arsenic represent a source of contamination, future residents of the properties represent the receptor, and exposure to the soils containing the elevated lead levels represent the potential pathway. The results are further discussed in Section 6.3.1.

6.3.1 Arsenic

The arsenic concentrations were above the S4UL value for residential land use with uptake from home grown produce in all trial pits. The arsenic concentrations range between 69 and 138 mg/kg. Statistical T tests undertaken (results included in Appendix E) indicate the US95% value is 119.8 mg/kg.

The S4UL values assume that the total arsenic concentration is 100% bio-accessible (i.e. can be ingested and fully absorbed). This is rarely the case in naturally derived concentrations of metals, confirmed by Middleton et al (2017). To further assess the risk from these elevated values, Bio-Accessibiltiy Research Group of Europe (BARGE) method bio-accessible arsenic testing was undertaken on two samples near surface soils recovered from the site. These tests gave a maximum bio-accessible arsenic concentration of 0.5%.

Using CLEA software a Site Specific Assessment Criteria (SSAC) value of 161 mg/kg has been calculated based on the maximum bio-accessible arsenic concentration. Therefore, all concentrations are below this value, and so the soils are considered suitable for use, and no further works are necessary in this regard.

6.4 Controlled Waters Risk Assessment

The low concentrations of contaminants present, and the lack of sensitive receptors in the vicinity means that there is not considered to be a significant risk to controlled waters.

6.5 Water Pipe Selection

In January 2011, UK Water Industry Research (UKWIR) published "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21; the 'UKWIR Guidance'). Its aim was to ensure that the correct materials are selected for water pipes and components to be used below ground in brownfield sites to protect the quality of drinking water whilst taking into account the service life of the water distribution system. It superseded the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03 "Laying Pipes in Contaminated Land", which has been withdrawn.

The UKWIR Guidance was supplemented in January 2014 by "Contaminative Land Assessment Guidance" published by Water UK, which includes a risk assessment procedure for water pipes. The guidance is to be applied to greenfield and brownfield sites, but "where greenfield sites are not affected by contamination a preliminary risk assessment will suffice".

The 2014 guidance gives some direction about when testing is needed, stating: "*There are normally only three pathways by which contamination may come into contact with water pipes. These are direct contact with the soil or backfill, an excessive vapour phase or a contaminated groundwater regime. If none of these conditions exist onsite (adopting the source, pathway, receptor concept) then it is likely that extended and/or targeted soil testing will not be required and a simple risk assessment will suffice. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials.*"

The desk study did not identify any sources of Volatile Organic Compounds (VOC), Semi-Volatile Organic Compounds (SVOC), Ethers, Nitrobenzene, ketones, aldehydes, amines and therefore, these test groups were not tested for as part of the investigation.

The relevant contaminant concentrations for standard Poly Ethylene water pipe, for the determinands tested as part of this investigation are summarised in Table 4.

Table 4: Poly Ethylene Water Pipe Guideline Values

Determinand	PE Threshold (mg/kg)	Recorded Range
Total BTEX and MTBE	0.1	<5.0 µg/kg
EC5-EC10 aliphatic and aromatic hydrocarbons	2.0	<2.0 mg/kg
EC10-EC16 aliphatic and aromatic hydrocarbons	10	<3.0 mg/kg
EC16-EC40 aliphatic and aromatic hydrocarbons	500	<10 mg/kg
Phenols	2.0	<2.0

On the basis of the above, standard PE pipe work is considered appropriate for the development.

6.6 Ground Gas Assessment

Full radon protection measures are required for the development.

Whilst there is an infilled quarry located approximately 220m north east of the site, the quarry was backfilled by 1919. The quarry was of modest size (60 x 30m approx.) and is likely to be of limited depth as it would have been used to extract the Marlstone Rock Formation bedrock in the area, which based on historic borehole logs in the area is a maximum of 10m thick. Given the length of time since the landfill was completed (100+) years, the majority of any gas generation will likely be completed by now. Furthermore, distance from the development site means that significant lateral migration of gasses is not expected (i.e. not likely to migrate beneath development site). Instead, gasses would follow the path of least resistance and vent vertically to the atmosphere. On this basis, no further gas protection measures are required.

A conceptual model cross section, showing the low risk of gas migration from the infilled quarry to the development site is included in Appendix F.

6.7 Off-site Disposal

The materials to be excavated are essentially rock and soil associated with the Marlstone Rock Formation.

Levels of 'contaminants' recorded in the materials are low.

The results of the WAC testing indicate the determinands would suggest the material would be classified as inert.

Any facility that is chosen to take the material should be supplied with the details of this report and laboratory testing to ensure compliance with their own permit. This report alone does not allow for a receiving facility to make judgement on acceptance.

The above assessment relates to the natural soils derived from the bedrock geology only and does not consider topsoil.

6.8 Remediation Requirements

Although naturally occurring arsenic concentrations are elevated above the S4UL values for residential land use with plant uptake, a maximum bio-accessible arsenic concentration of 0.5% was recorded using the BARGE method bio-accessible testing. Using CLEA software a Site Specific Assessment Criteria (SSAC) value of 164 mg/kg has been calculated based on the maximum bio-accessible arsenic concentration. Therefore, all concentrations are below this value, and so the soils are considered suitable for use, and no further works are necessary in this regard.

Full radon protection measures are required.

No other gas protection measures are required.

Standard potable, water pipes are expected to be suitable.

Should any obviously contaminated soils be encountered during the construction phase of the works, advice should be sought from a suitably experienced Geo-environmental Engineer.

7 GEOTECHNICAL CONSIDERATIONS

7.1 General

At the time of the investigation, development proposals included the construction of residential properties, with associated gardens and access roads.

As discussed in Section 5.1, the results of this investigation has indicated the site is underlain by relatively minor thicknesses of cohesive soils which in turn overlie more granular materials that are essentially the Marlstone Rock Formation.

7.2 Foundations

In order to ensure a consistent bearing stratum as possible, it is recommended that foundations for the proposed units are taken down to the upper levels of the granular materials associated with the Marlstone Rock Formation. These materials were encountered at between 0.8 and 2.0m below ground level. A serviceable limit state (allowable) bearing capacity of 150 kN/m² is considered appropriate for foundation design.

A combination of traditional strip and shallow trench fill foundations will be appropriate with foundation depths largely dependent on proposed reductions in ground level.

Based on the low volume change potential cohesive soils near surface, a minimum foundation depth of 0.75m below final ground level will be required although, all cohesive soils should be fully penetrated to ensure a consistent, granular bearing stratum.

Where foundation depths exceed 1.5m, the inner face of these foundations will require compressible materials as recommended by NHBC.

A standard excavator bucket width of 600mm is likely to will provide adequate width foundations.

Lower loaded internal walls can be supported off 450mm wide foundations. Narrower widths are not recommended for practical setting-out reasons.

Any loose material should be removed prior to pouring of concrete. Should foundations be stepped to account for changes in topography, steps should not be higher than the thickness of the strip foundation and should not exceed 0.5m in height.

All foundation excavation bases should be inspected by a qualified and experienced engineer to ensure consistency.

Settlements of such foundations should be significantly less than the conventional 25mm limit.

7.3 Floors

Given the volume change potential of the near surface cohesive soils, suspended floors will be required. A void will be required beneath the floor with void dimensions as follows;

- 50mm under ground beams, and suspended in-situ concrete floor or,
- 200mm under suspended precast concrete or timber floors.

7.4 Groundwater and Excavations

Generally significant groundwater issues are not expected on the site although, some seasonal groundwater may be present towards the contact between the Marlstone Rock and the lower permeability Dyrham Formation at depth.

Cohesive soils are likely to be stable in the short term. More granular soils, especially wet granular soils are likely to be unstable.

7.5 Sulphate Classification

The three soluble sulphate test results indicate water soluble sulphate concentrations of between <0.01 and 0.05 g/l. The characteristic soluble sulphate value is 0.05 g/l.

pH values of between 7.2 and 7.9 were recorded during the lab testing. The characteristic pH value is 7.2.

Total potential sulphate concentrations of between 0.09 and 0.12 SO₄% have been calculated following the procedure outlined in C5.1.2 (BRE, 2005). The characteristic total potential sulphate value is 0.12 SO₄ %.

Groundwater should be considered mobile.

Concrete should be designed to a Design Sulphate Class of DS-1, and ACEC Class AC-1 (BRE Digest SD1, 2005).

7.6 Roads and Driveways

The six TRL DCP probes undertaken on the site indicate that high temporary CBR values (>10%) are present beneath the topsoil.

Assuming the access road is to be adopted by the Local Authority, a long term equilibrium California Bearing Ratio (CBR) Value of 3.0%, based on the Plasticity Index of the near surface cohesive soils, should be used for design. Using Design Guidance HD25 (2009) 320mm sub-base and 240mm capping would be required. The design CBR value is considered applicable providing the formation is not allowed to deteriorate prior to placement of capping materials.

For CBR values of 3% or less a separating geotextile is required.

In accordance with NHBC (2020), for a CBR value of 3%, a minimum sub-base thickness of 325mm without a geotextile beneath or 225mm with a geotextile would be required for driveways with use by light vehicles only.

Any organic soils should be removed down to a minimum depth of 300mm, and the formation proof rolled. Any soft spots identified by rolling should be removed and replaced with compacted capping.

The construction materials should be compacted in thin layers following the Specification for Highways Works, Table 6/4. As with all sites underlain by cohesive or silty soils, sound earthworks management by an experienced contractor will be critical to ensure optimum programme achievement and satisfactory construction standards.

7.7 General Earthworks Considerations

As with all sites underlain by cohesive soils, sound earthworks management by an experienced contractor will be critical to ensure optimum programme achievement and satisfactory construction standards. The quality of the bulk earthworks should be controlled by an earthworks filling specification, in accordance with Highways Agency (2016) Series 600 Earthworks, that is based on the findings of this report (i.e. considering the material types and intended purpose).

The presence of free water can soften soils, and trafficking soils in this condition raises pore water pressures and shears the soils to a much lower shear strength than in the undisturbed state. Therefore the following standard measures should be observed by the earthworks contractor:

- Suitable plant and materials for the conditions should always be used (e.g. tracked plant or use of track/ bog mats, geogrids etc. on soft subgrades).
- Working with soils in wet conditions should be avoided. Programmes should avoid the wetter seasonal periods and incorporate an element of down-time for inclement weather.
- Engineering fill should not be worked beyond their practical moisture content limits. Laboratory testing and a visual assessment should be undertaken during the earthworks in order to achieve suitable material performance within the optimum moist content range.
- Prepared subgrades and formations should be blinded as soon as practicable to prevent them from deteriorating.
- Temporary and permanent formations should always be sealed and shaped to shed water.
- Effective land drainage should be installed prior to works commencing and maintained to keep works dry.

7.8 Soakaways

Large scale soakaway testing was undertaken by RSK in 2018. Infiltration rates were good but further drainage design would be required to determine if soakaways were a suitable solution. CIRIA 156 (1996) recommends an infiltration rate of 3×10^{-6} m/s as the lower limit

Geotechnical and Geo-environmental Assessment

of acceptability for soakaway feasibility. All soakaway tests undertaken during the RSK investigation achieved faster rates than this.

During the 2021 investigation, trial pits were excavated to a maximum depth of 3.3m with no groundwater ingress. The base of any soakaways should be situated no closer than 1.0m above seasonal maximum groundwater levels.

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Author

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9 LIMITATIONS

This report has been prepared by SWG solely for the benefit of Blue Cedar Homes Ltd. It shall not be relied upon or transferred to any third party without the prior written authorisation of SWG.

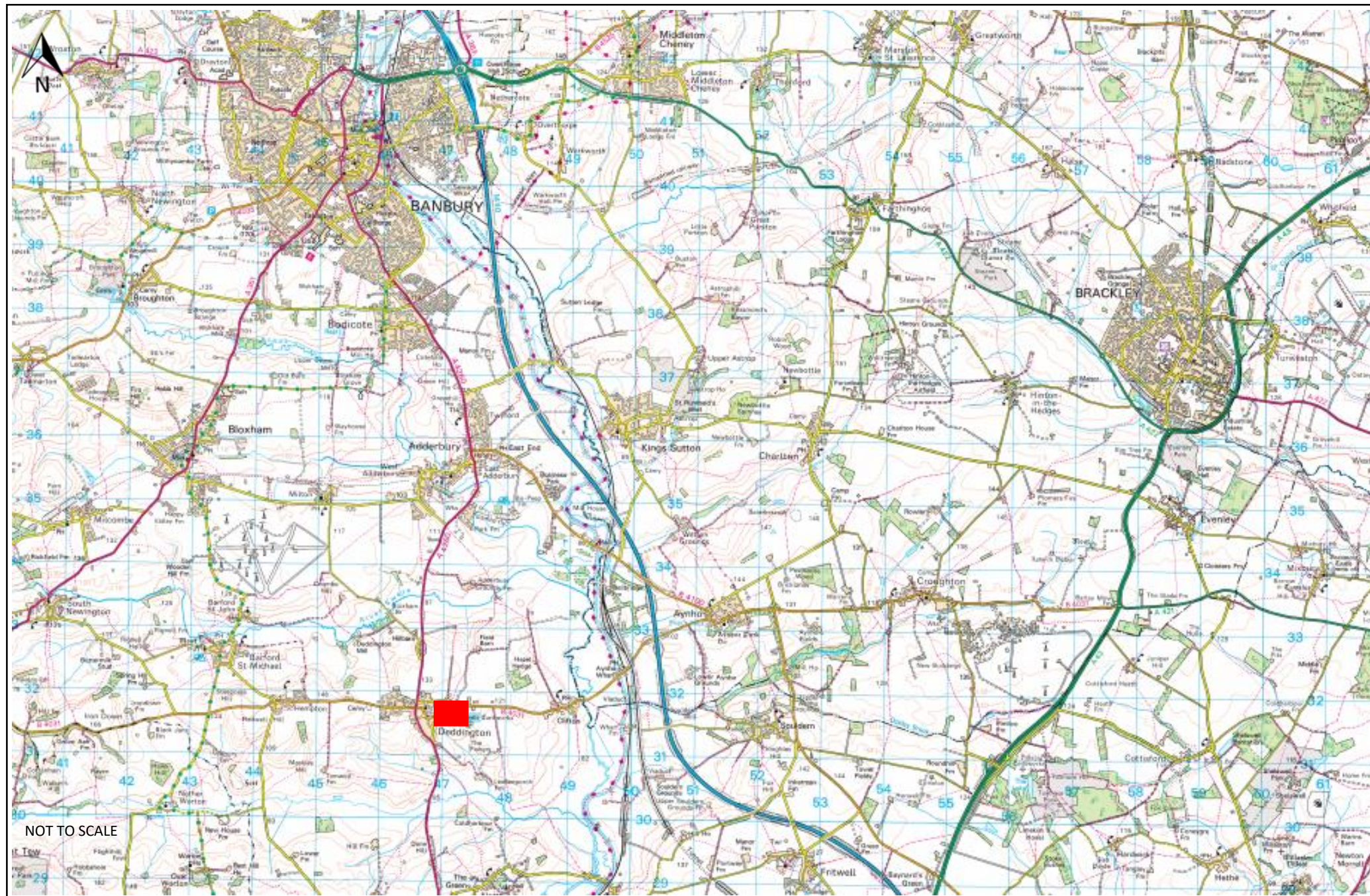
All information given in this report is based on the ground conditions encountered during the site work, and on the results of laboratory and field tests performed during the investigation. However, there may be conditions at the site which have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes.

It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those measured during the investigation.

British Standards Institute (BSI, 2015) ordinarily recommends that laboratory measurements of strength in cohesive soils be undertaken only on high-quality (Category 'A') undisturbed samples, necessitating the use of wire-line drilling or thin-wall samples tubes. However, given the relatively low geotechnical risk presented and the low probability of being able to recover Category 'A' samples from the anticipated strata, it is considered that the use of such techniques is neither appropriate nor cost-effective.

Appendix A

Site Location Plan



LEGEND:



Site Location

Land south of Clifton Road

Deddington, OX15 0TH

Job No. 13436

Site
Location Plan



SOUTH WEST GEOTECHNICAL

Appendix B

Exploratory Hole Location Plan



LEGEND:

13436 ground investigation EXP
hole locations:

 Trial pit excavation

 Dynamic cone
penetration test (DCP)

Land south of Clifton Road

Deddington, OX15 0TH

Job No. 13436

Exploratory Hole
Location Plan

Appendix C

Exploratory Hole Logs and Photographs

KEY TO EXPLORATORY HOLE LOGS

SAMPLING

Undisturbed

U	Driven tube sample (Blow count recorded in results column i.e. U = 20)
TW	Pushed thin wall tube sample
P	Pushed piston sample
L	Liner sample
CBR	CBR mould sample
BLK	Block sample
WS	Window sample
CS	Core sample

Disturbed

D	Small sample
B	Bulk sample

Other

W	Water sample
G	Gas sample
ES	Soil sample for environmental analysis
EW	Water sample for environmental analysis

IN-SITU TESTING

SPT S or SPT C	Standard Penetration Test, open shoe (S) or solid cone (C) As defined in BS 1377 : Part 9 (1990). Standard Penetration Test (SPT): a 50mm split spoon or solid cone sampler is driven 450mm into the base of the borehole using a 63.5 kg hammer with a 760mm drop. The penetration resistance (e.g. 21) is expressed as the N-value, and represents the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm. The depth on the borehole/ trial pit record is that of the start and end of the test. Where full penetration for the test has not been achieved, the final penetration depth is recorded.
HVP (kPa)	In-situ Hand Vane shear strength: a hand shear vane test (or average of a series), conducted on undisturbed samples or within trial pits.
GIVN (kPa)	Geonor in-situ vane shear strength carried out in base of borehole or self bored hole
VN (kPa)	Hand Vane shear strength, conducted on disturbed or remoulded samples.
PP (kg/cm ²)	Pocket penetrometer test: a pocket Penetrometer reading (or average of a series). If reported in kPa, the value has been converted to an equivalent undrained shear strength.
Ik	In situ permeability test
ICBR	In-situ CBR test
IPBT	In-situ plate bearing test
IPST	In-situ plate settlement test

All test results are provided in Results column

DRILLING RECORDS

TCR	Total Core Recovery %
SCR	Solid Core Recovery %
RQD	Rock Quality Designation %
FI	Fracture Spacing mm. Minimum, typical and maximum spacings are recorded.

GR002

Version 6

27/07/2018

GR002 Key to exploratory records

GROUNDWATER

-  Groundwater Strike
 Groundwater level after standing time

INSTALLATION

Standpipe/ piezometer

Details of standpipe/piezometer installations are given on the left side of the log. The column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill.

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer

NOTES

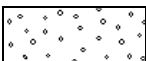
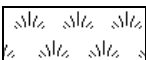
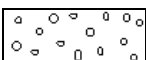
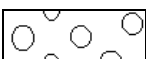
Water level observations of discernible entries during the advancing of the exploratory hole are given at the foot of the log and in the Legend column. The term "none observed" is used where no discrete entries are identified although this does not necessarily indicate that the hole has not been advanced below groundwater level. Under certain conditions groundwater cannot be observed, for instance, drilling with water flush or over water, or boring at a rate much faster than water can make its way into the borehole.

The declination of bedding and joints is given with respect to the normal to the core axis. Thus in a vertical borehole this will be the dip.

Remarks on chiselling times can be affected by a variety of factors not always related to the geotechnical properties of the strata. Chiselling records are given at the foot of the log.

The assessment of SCR, RQD and Fracture Spacing excludes artificial fractures.

KEY TO SOIL LEGENDS

	CLAY
	SILT
	SAND
	GRAVEL
	PEAT
	COBBLES
	BOULDERS
	TOPSOIL
	MADE GROUND

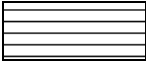
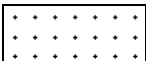
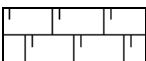
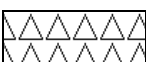
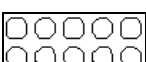
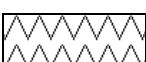
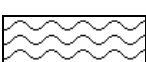
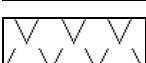
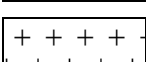
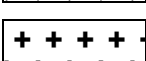
GR002

Version 6

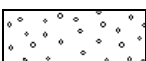
27/07/2018

GR002 Key to exploratory records

KEY TO ROCK LEGENDS

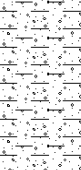
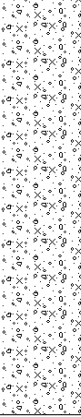
	MUDSTONE
	SILTSTONE
	SANDSTONE
	LIMESTONE
	CHALK
	COAL
	BRECCIA
	CONGLOMERATE
	FINE GRAINED METAMORPHIC
	MEDIUM/COARSE GRAINED METAMORPHIC
	FINE GRAINED IGNEOUS
	MEDIUM GRAINED IGNEOUS
	COARSE GRAINED IGNEOUS

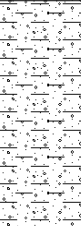
KEY TO BACKFILL LEGENDS

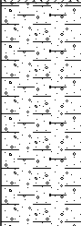
	BENTONITE
	ARISINGS
	SAND
	GRAVEL

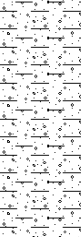
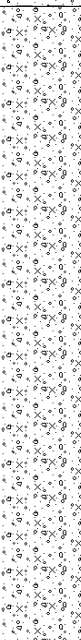
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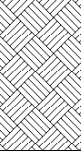
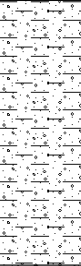
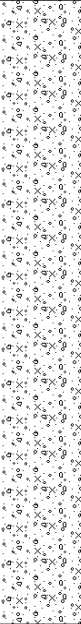
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Location: Deddington OX15 0TH						Dimensions (m): 0.70 2.90		Scale 1:20	
Client: Blue Cedar Homes						Depth 1.90		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rare fragments of roof slate. Rootlets.		
	0.30	ES					Firm orange brown gravelly slightly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	0.50	D		0.80	122.20		Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).		
	1.00	D							
	1.90	B		1.90	121.10		End of Pit at 1.900m		
Remarks: Groundwater not encountered.									
Stability: Moderate.									
									

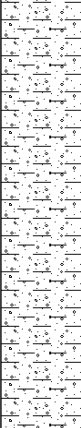
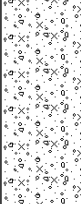
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Location: Deddington OX15 0TH						Dimensions (m): 0.70 3.10		Scale 1:20	
Client: Blue Cedar Homes						Depth 1.70		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rootlets.		
	0.50	ES					Firm orange brown gravelly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	0.80	D		0.90	122.10		Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).		
	1.00	D							
	1.70	B		1.70	121.30		End of Pit at 1.700m		
1 2 3 4									
Remarks: Groundwater not encountered.									
Stability: Poor.									

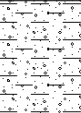
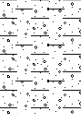
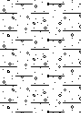
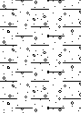
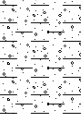
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Location: Deddington OX15 0TH						Dimensions (m): 4.00		Scale 1:20	
Client: Blue Cedar Homes						Depth 3.30		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.10	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rootlets.		
	0.50	ES					Firm orange brown gravelly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	0.60	D							
	0.80	D							
	0.90	D		122.10	Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).				
	1.00	D							
	1.50	D							
	2.30	D		120.70	Extremely weak light grey SILTSTONE. Laminated and micaceous. (DYRHAM FM).				
	2.50	D							
	3.00	D							
3.30			119.70		End of Pit at 3.300m				
Remarks: Groundwater not encountered.									
Stability: Moderate.									

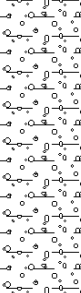
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Location: Deddington OX15 0TH						Dimensions (m): 0.70 3.00		Scale 1:20	
Client: Blue Cedar Homes						Depth 2.70		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rootlets.		
	0.40	ES					Firm orange brown gravelly slightly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	0.50	D							
	1.00	B		1.00	122.00		Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).		
	1.50	D							
	2.60	D		2.70	120.30		End of Pit at 2.700m		
Remarks: Groundwater not encountered.									
Stability: Poor.									



				Trial Pit Log			TrialPit No TP05 Sheet 1 of 1		
Project Name: Land south of Clifton Road				Project No. 13436		Co-ords: 447123.00 - 231746.00 Level: 123.00		Date 18/08/2021	
Location: Deddington OX15 0TH						Dimensions (m): 0.60 3.10		Scale 1:20	
Client: Blue Cedar Homes						Depth 2.75		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.40	122.60		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rootlets.		
	0.50	ES					Firm orange brown gravelly slightly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	0.70	D							
	1.00	D		1.10	121.90			Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).	
	1.50	D							
	2.00	D							
	2.50	D		2.75	120.25		End of Pit at 2.750m		
Remarks: Groundwater not encountered.									
Stability: Moderate.									

				Trial Pit Log			TrialPit No TP06 Sheet 1 of 1		
Project Name: Land south of Clifton Road				Project No. 13436		Co-ords: 447110.00 - 231760.00 Level: 123.00		Date 18/08/2021	
Location: Deddington OX15 0TH						Dimensions (m): 3.10 0.70		Scale 1:20	
Client: Blue Cedar Homes						Depth 2.10		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rootlets.		
	0.50	ES					Firm orange brown gravelly slightly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	0.70	D							
	1.00	D		1.50	121.50		Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).		
	1.50	B							
2.00	B		2.10	120.90		End of Pit at 2.100m			
Remarks: Groundwater not encountered.									
Stability: Poor.									
									

				Trial Pit Log			TrialPit No TP07 Sheet 1 of 1		
Project Name: Land south of Clifton Road				Project No. 13436		Co-ords: 447101.00 - 231769.00 Level: 123.00		Date 18/08/2021	
Location: Deddington OX15 0TH						Dimensions (m): 3.00		Scale 1:20	
Client: Blue Cedar Homes						Depth 3.00		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rootlets.		
	0.60	ES					Firm orange brown gravelly slightly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	1.00 1.01	ES D		2.00	121.00		Orange brown cobbly sandy clayey GRAVEL. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).		
	1.50	D							
	2.00	D		3.00	120.00		End of Pit at 3.000m		
3.00	D								
Remarks: Groundwater not encountered.									
Stability: Moderate.									

				Trial Pit Log			TrialPit No TP08 Sheet 1 of 1		
Project Name: Land south of Clifton Road				Project No. 13436		Co-ords: 447084.00 - 231773.00 Level: 123.00		Date 18/08/2021	
Location: Deddington OX15 0TH						Dimensions (m): 2.70 0.70		Scale 1:20	
Client: Blue Cedar Homes						Depth 2.10		Logged VF	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20	ES		0.30	122.70		Topsoil: brown slightly gravelly slightly sandy clayey SILT. Rare pottery fragments. Rootlets.		
	0.50 0.51	ES D					Firm orange brown gravelly slightly sandy CLAY. Low cobble content. Gravel and cobbles of ironstone and fossiliferous limestone.		
	1.00	D		1.30	121.70		Orange brown gravelly clayey COBBLES. Gravel and cobbles of subangular to angular ironstone and fossiliferous limestone. (MARLSTONE ROCK FM).		
	1.30	ES							
	1.50	B							
	2.00	B		2.10	120.90		End of Pit at 2.100m		
Remarks: Groundwater not encountered.									
Stability: Moderate.									
									



SITE OVERVIEW



Site entrance



Facing north



Blue Cedar Homes



Facing east



Facing south



EXCAVATIONS



TP01



TP01 side



TP01 spoil



Examples of boulders of fossiliferous rock in TP01



TP02



TP02 side



TP02 spoil



TP03



TP03 side, note layer of grey fine material in base



TP03 spoil



TP04



TP04 side



TP04 spoil



TP05



TP05 side



TP05 spoil



TP06



TP06 side



TP06 spoil



TP07



TP07 side



TP07 spoil



TP08



TP08 side



TP08 spoil

Appendix D

Geotechnical Laboratory Test Results



Test Report

South West Geotechnical Ltd
Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Job No:	13436	Date Received:	19/08/21
Job Name:	Land South of Clifton Road, Deddington, OX15 0TH	Date Sent:	03/09/21
Client Name:	South West Geotechnical Ltd	Transmittal Number:	T6815
Client Job No:	-	Senders Initials:	DT
Client Address	Unit 3 Brooklands, Howden Road, Tiverton, Devon, EX16 5HW	Report Revision No.	1
		Sampled by SWG lab staff?	NO

[illegible]

Sampling not performed by South West Geotechnical laboratory staff. Results apply to the samples as received.

Approved Signatories:

David Trowbridge (Laboratory Manager)

Matt Stokes (Senior Technician)

The results contained within this report only relate to the samples tested, as received from the client. This certificate shall not be reproduced except in full, without prior written approval of the laboratory.



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17025:2017



SOUTH WEST GEOTECHNICAL

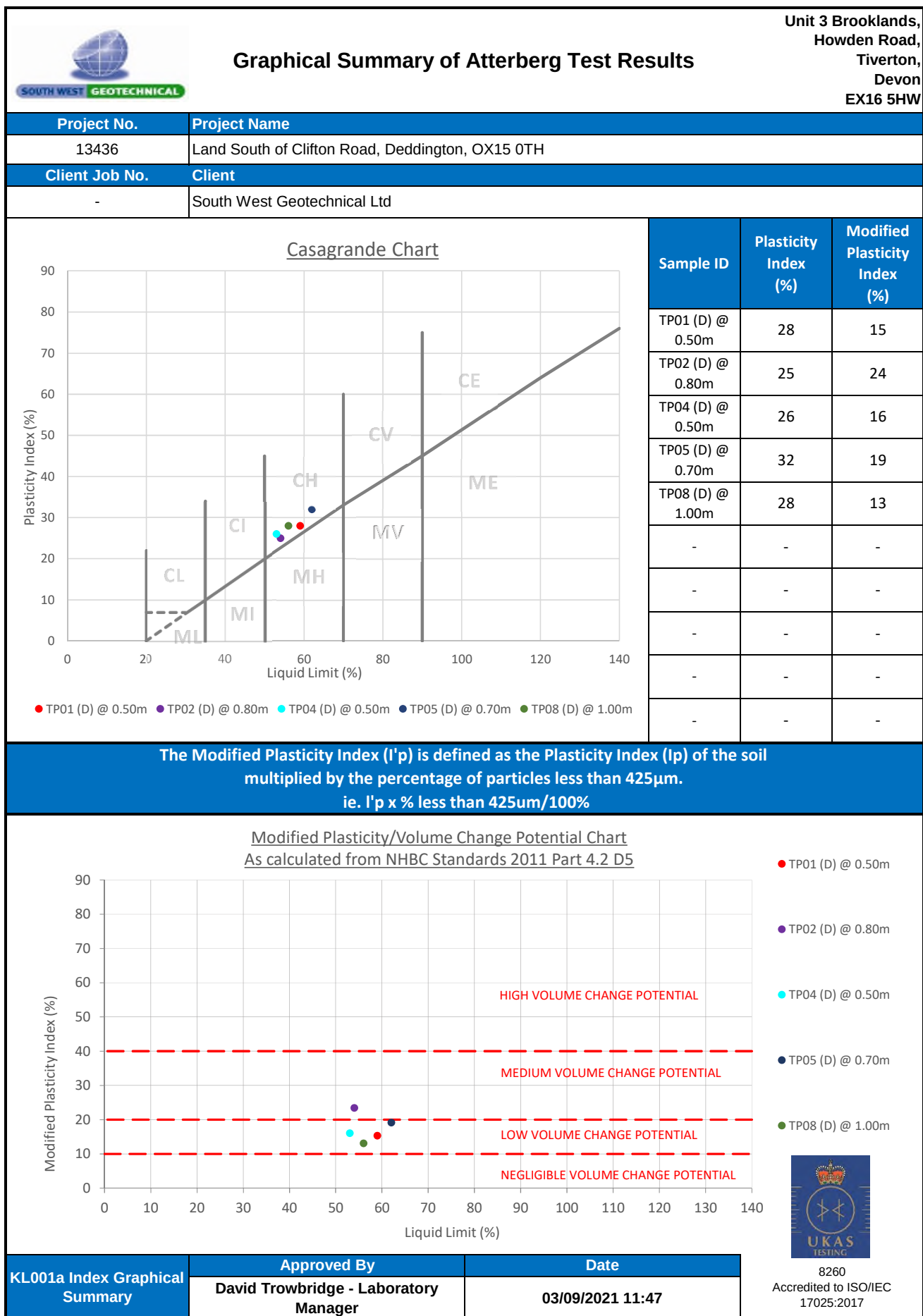
Summary of Classification Test Results

Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW



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ISO/IEC
17025:2017

Project No.		Project Name										
13436		Land South of Clifton Road, Deddington, OX15 0TH										
Client Job No.		Client										
-		South West Geotechnical Ltd										
Hole No.	Sample				Soil Description	WC	Passing 425µm	LL	PL	PI	Particle density	Remarks
	Type	Top	Base	Ref		%	%	%	%	%	Mg/m3	
TP01	D	0.50			Brown slightly gravelly slightly sandy CLAY	30.3	55 - Sieved	59	31	28	-	
TP02	D	0.80			Brown slightly gravelly slightly sandy CLAY	23.5	94 - Sieved	54	29	25	-	
TP04	D	0.50			Brown slightly gravelly slightly sandy CLAY	24.6	62 - Sieved	53	27	26	-	
TP05	D	0.70			Brown slightly gravelly slightly sandy CLAY	24.1	60 - Sieved	62	30	32	-	
TP08	D	1.00			Brown slightly sandy gravelly CLAY	24.3	47 - Sieved	56	28	28	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
						-	-	-	-	-	-	
Preparation in accordance with BS1377-1:2016 where applicable. Atterberg 4 point preparation in accordance with BS EN ISO 17892-12:2018												
Key Atterberg Limits 4pt - BS EN ISO 17892-12:2018 (30° cone and increasing water contents) unless : 1pt - BS1377-2:1990 (CL.4.4) Water Content (wc) % BS EN ISO 17892-1:2014 Particle density BS1377-2:1990 sp - small pyknometer CL.8.3 gj - gas jar CL.8.2						Date		Approved By		Page No.		1
						03/09/2021		Matt Stokes - Senior Technician		KL001R Index Summary		



Appendix E

Geo-environmental Laboratory Test and Statistical Assessment Results



David Trowbridge
South West Geotechnical Ltd
Unit 3 Brooklands
Howden Road
Tiverton
Devon
EX16 5HW

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 21-10401

Site Reference: Deddington

Project / Job Ref: 13436

Order No: None Supplied

Sample Receipt Date: 24/08/2021

Sample Scheduled Date: 24/08/2021

Report Issue Number: 2

Reporting Date: 08/10/2021

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

This report supersedes 21-10401, issue no.1.

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

For Topsoil and WAC analysis the expanded uncertainty measurement should be considered while evaluating results against compliance values.



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Maidstone
Kent ME17 2JN
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Soil Analysis Certificate						
DETS Report No: 21-10401	Date Sampled	18/08/21	18/08/21	18/08/21	18/08/21	18/08/21
South West Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Deddington	TP / BH No	TP01	TP01	TP03	TP03	TP04
Project / Job Ref: 13436	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	1.00	0.50	0.60	0.40
Reporting Date: 08/10/2021	DETS Sample No	561043	561044	561045	561046	561047

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected		Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	7.5	7.9	7.7	7.6
Total Cyanide	mg/kg	< 2	NONE	< 2		< 2	< 2
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	564	522	479	414
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.06	0.05	0.05	0.04
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS		53		< 10
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS		0.05		< 0.01
Total Sulphur	%	< 0.02	NONE		0.04		0.04
Sulphide	mg/kg	< 5	NONE	< 5		< 5	< 5
Organic Matter (SOM)	%	< 0.1	NONE	3.5		3.3	2.9
TOC (Total Organic Carbon)	%	< 0.1	NONE	2		1.9	1.7
Ammonium as NH ₄	mg/kg	< 0.5	MCERTS		1.1		1.6
Ammonium as NH ₄	mg/l	< 0.05	MCERTS		0.11		0.16
W/S Chloride (2:1)	mg/kg	< 1	MCERTS		16		6
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS		8.2		3.2
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS		7		9
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS		3.6		4.6
Arsenic (As)	mg/kg	< 2	MCERTS	105		138	115
W/S Boron	mg/kg	< 1	NONE	1.4		< 1	1.4
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3		0.3	0.3
Chromium (Cr)	mg/kg	< 2	MCERTS	214		251	235
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2		< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	26		14	14
Lead (Pb)	mg/kg	< 3	MCERTS	56		36	38
W/S Magnesium	mg/l	< 0.1	NONE		1.1		0.9
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1		< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	81		97	89
Selenium (Se)	mg/kg	< 2	MCERTS	< 3		< 3	< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	209		249	190
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2		< 2	< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS	< 6		< 6	< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 21-10401	Date Sampled	18/08/21	18/08/21	18/08/21	18/08/21	18/08/21
South West Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Deddington	TP / BH No	TP06	TP06	TP07	TP08	TP08
Project / Job Ref: 13436	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.70	1.00	0.20	1.30
Reporting Date: 08/10/2021	DETS Sample No	561048	561049	561050	561051	561052

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected			Not Detected
pH	pH Units	N/a	MCERTS	7.2	7.7		7.6
Total Cyanide	mg/kg	< 2	NONE	< 2			< 2
Total Sulphate as SO ₄	mg/kg	< 200	MCERTS	929	332		736
Total Sulphate as SO ₄	%	< 0.02	MCERTS	0.09	0.03		0.07
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS		< 10		
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS		< 0.01		
Total Sulphur	%	< 0.02	NONE		0.03		
Sulphide	mg/kg	< 5	NONE	< 5			< 5
Organic Matter (SOM)	%	< 0.1	NONE	3.6			2.8
TOC (Total Organic Carbon)	%	< 0.1	NONE	2.1			1.6
Ammonium as NH ₄	mg/kg	< 0.5	MCERTS		1.5		
Ammonium as NH ₄	mg/l	< 0.05	MCERTS		0.15		
W/S Chloride (2:1)	mg/kg	< 1	MCERTS		7		
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS		3.4		
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS		8		
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS		4.2		
Arsenic (As)	mg/kg	< 2	MCERTS	78			93
W/S Boron	mg/kg	< 1	NONE	1.8			1.3
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3			0.3
Chromium (Cr)	mg/kg	< 2	MCERTS	144			171
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			< 2
Copper (Cu)	mg/kg	< 4	MCERTS	21			42
Lead (Pb)	mg/kg	< 3	MCERTS	54			52
W/S Magnesium	mg/l	< 0.1	NONE		0.8		
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1			< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	65			74
Selenium (Se)	mg/kg	< 2	MCERTS	< 3			< 3
Zinc (Zn)	mg/kg	< 3	MCERTS	170			193
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2			< 2
EPH (C10 - C40)	mg/kg	< 6	MCERTS	< 6			< 6

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 21-10401	Date Sampled	18/08/21	18/08/21	18/08/21	18/08/21	18/08/21
South West Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Deddington	TP / BH No	TP01	TP03	TP04	TP06	TP08
Project / Job Ref: 13436	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.50	0.40	0.20	0.20
Reporting Date: 08/10/2021	DETS Sample No	561043	561045	561047	561048	561051

Determinand	Unit	RL	Accreditation					
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	< 0.1	< 0.1	< 0.1	0.24
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.23
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.30
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	0.24
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	0.12
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: 21-10401	Date Sampled	18/08/21				
South West Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Deddington	TP / BH No	TP08				
Project / Job Ref: 13436	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	1.30				
Reporting Date: 08/10/2021	DETS Sample No	561052				

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			



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Soil Analysis Certificate - TPH CWG Banded						
DETS Report No: 21-10401	Date Sampled	18/08/21	18/08/21	18/08/21	18/08/21	18/08/21
South West Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Deddington	TP / BH No	TP01	TP03	TP04	TP06	TP08
Project / Job Ref: 13436	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.50	0.40	0.20	0.20
Reporting Date: 08/10/2021	DETS Sample No	561043	561045	561047	561048	561051

Determinand	Unit	RL	Accreditation					
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	8	< 2
Aliphatic >C12 - C16	mg/kg	< 3	MCERTS	< 3	< 3	< 3	11	< 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: 21-10401	Date Sampled	18/08/21				
South West Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Deddington	TP / BH No	TP08				
Project / Job Ref: 13436	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	1.30				
Reporting Date: 08/10/2021	DETS Sample No	561052				

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			



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Rose Lane
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Maidstone
Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-10401	Date Sampled	18/08/21	18/08/21	18/08/21	18/08/21	18/08/21
South West Geotechnical Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Deddington	TP / BH No	TP01	TP03	TP04	TP06	TP08
Project / Job Ref: 13436	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.20	0.50	0.40	0.20	0.20
Reporting Date: 08/10/2021	DETS Sample No	561043	561045	561047	561048	561051

Determinand	Unit	RL	Accreditation					
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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Rose Lane
Lenham Heath
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Kent ME17 2JN
Tel : 01622 850410



Soil Analysis Certificate - BTEX / MTBE						
DETS Report No: 21-10401	Date Sampled	18/08/21				
South West Geotechnical Ltd	Time Sampled	None Supplied				
Site Reference: Deddington	TP / BH No	TP08				
Project / Job Ref: 13436	Additional Refs	None Supplied				
Order No: None Supplied	Depth (m)	1.30				
Reporting Date: 08/10/2021	DETS Sample No	561052				

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			

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3																																				
DETS Report No: 21-10401		Date Sampled		18/08/21		Landfill Waste Acceptance Criteria Limits <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%; padding: 5px;">Inert Waste Landfill</th> <th style="width: 33%; padding: 5px;">Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill</th> <th style="width: 33%; padding: 5px;">Hazardous Waste Landfill</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3%</td> <td style="text-align: center;">5%</td> <td style="text-align: center;">6%</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> <td style="text-align: center;">10%</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">500</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">100</td> <td style="text-align: center;">--</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;">>6</td> <td style="text-align: center;">--</td> </tr> <tr> <td style="text-align: center;">--</td> <td style="text-align: center;">To be evaluated</td> <td style="text-align: center;">To be evaluated</td> </tr> </tbody> </table>				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill	3%	5%	6%	--	--	10%	6	--	--	1	--	--	500	--	--	100	--	--	--	>6	--	--	To be evaluated	To be evaluated
Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill																																		
3%	5%	6%																																		
--	--	10%																																		
6	--	--																																		
1	--	--																																		
500	--	--																																		
100	--	--																																		
--	>6	--																																		
--	To be evaluated	To be evaluated																																		
South West Geotechnical Ltd		Time Sampled		None Supplied																																
Site Reference: Deddington		TP / BH No		TP07																																
Project / Job Ref: 13436		Additional Refs		None Supplied																																
Order No: None Supplied		Depth (m)		1.00																																
Reporting Date: 08/10/2021		DETS Sample No		561050																																
Determinand		Unit		MDL																																
TOC ^{MU}		%		< 0.1		1.8																														
Loss on Ignition		%		< 0.01		8.69																														
BTEX ^{MU}		mg/kg		< 0.05		< 0.05																														
Sum of PCBs		mg/kg		< 0.1		< 0.1																														
Mineral Oil ^{MU}		mg/kg		< 10		< 10																														
Total PAH ^{MU}		mg/kg		< 1.7		< 1.7																														
pH ^{MU}		pH Units		N/a		7.6																														
Acid Neutralisation Capacity		mol/kg (+/-)		< 1		< 1																														
Eluate Analysis				2:1 mg/l		8:1 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		< 0.01		< 0.2		0.5 2 25																										
Barium ^U				< 0.02		< 0.02		< 0.1		20 100 300																										
Cadmium ^U				< 0.0005		< 0.0005		< 0.02		0.04 1 5																										
Chromium ^U				< 0.005		< 0.005		< 0.20		0.5 10 70																										
Copper ^U				< 0.01		< 0.01		< 0.5		2 50 100																										
Mercury ^U				< 0.0005		< 0.0005		< 0.005		0.01 0.2 2																										
Molybdenum ^U				< 0.001		< 0.001		< 0.1		0.5 10 30																										
Nickel ^U				< 0.007		< 0.007		< 0.2		0.4 10 40																										
Lead ^U				< 0.005		< 0.005		< 0.2		0.5 10 50																										
Antimony ^U				< 0.005		< 0.005		< 0.05		0.06 0.7 5																										
Selenium ^U				< 0.005		< 0.005		< 0.05		0.1 0.5 7																										
Zinc ^U				< 0.005		< 0.005		< 0.2		4 50 200																										
Chloride ^U				4		5		51		800 15000 25000																										
Fluoride ^U				0.7		< 0.5		< 1		10 150 500																										
Sulphate ^U				5		3		36		1000 20000 50000																										
TDS				70		53		546		4000 60000 100000																										
Phenol Index				< 0.01		< 0.01		< 0.5		1 - -																										
DOC				12.6		11		112		500 800 1000																										
Leach Test Information																																				
Sample Mass (kg)				0.20																																
Dry Matter (%)				86.8																																
Moisture (%)				15.4																																
Stage 1																																				
Volume Eluate L2 (litres)				0.32																																
Filtered Eluate VE1 (litres)				0.17																																
Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion																																				
Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepancies with current legislation																																				
M Denotes MCERTS accredited test																																				
U Denotes ISO17025 accredited test																																				



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Tel : 01622 850410



Soil Analysis Certificate - Sample Descriptions

DETS Report No: 21-10401
South West Geotechnical Ltd
Site Reference: Deddington
Project / Job Ref: 13436
Order No: None Supplied
Reporting Date: 08/10/2021

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
561043	TP01	None Supplied	0.20	17.9	Light brown sandy clay
561044	TP01	None Supplied	1.00	10.7	Light brown sandy clay with stones
561045	TP03	None Supplied	0.50	16.9	Light brown sandy clay with stones
561046	TP03	None Supplied	0.60	15.6	Light brown sandy clay with stones
561047	TP04	None Supplied	0.40	14	Light brown sandy clay
561048	TP06	None Supplied	0.20	21.2	Brown sandy clay with vegetation
561049	TP06	None Supplied	0.70	15.5	Brown sandy clay
561050	TP07	None Supplied	1.00	13.2	Brown sandy clay
561051	TP08	None Supplied	0.20	16.5	Brown sandy clay with stones
561052	TP08	None Supplied	1.30	15.6	Brown sandy clay

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

Insufficient Sample ^{U/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 21-10401

South West Geotechnical Ltd

Site Reference: Deddington

Project / Job Ref: 13436

Order No: None Supplied

Reporting Date: 08/10/2021

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	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
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



DETS Ltd
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Maidstone
Kent ME17 2JN
Tel : 01622 850410



Water Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 21-10401

South West Geotechnical Ltd

Site Reference: Deddington

Project / Job Ref: 13436

Order No: None Supplied

Reporting Date: 08/10/2021

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Water	UF	Alkalinity	Determination of alkalinity by titration against hydrochloric acid using bromocresol green as the end point	E103
Water	F	Ammoniacal Nitrogen	Determination of ammoniacal nitrogen by discrete analyser.	E126
Water	UF	BTEX	Determination of BTEX by headspace GC-MS	E101
Water	F	Cations	Determination of cations by filtration followed by ICP-MS	E102
Water	UF	Chemical Oxygen Demand (COD)	Determination using a COD reactor followed by colorimetry	E112
Water	F	Chloride	Determination of chloride by filtration & analysed by ion chromatography	E109
Water	F	Chromium - Hexavalent	Determination of hexavalent chromium by acidification, addition of 1,5 diphenylcarbazide followed by	E116
Water	UF	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E115
Water	UF	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E115
Water	UF	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through liquid:liquid extraction with cyclohexane	E111
Water	F	Diesel Range Organics (C10 - C24)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Dissolved Organic Content (DOC)	Determination of DOC by filtration followed by low heat with persulphate addition followed by IR detection	E110
Water	UF	Electrical Conductivity	Determination of electrical conductivity by electrometric measurement	E123
Water	F	EPH (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E104
Water	F	Fluoride	Determination of Fluoride by filtration & analysed by ion chromatography	E109
Water	F	Hardness	Determination of Ca and Mg by ICP-MS followed by calculation	E102
Leachate	F	Leachate Preparation - NRA	Based on National Rivers Authority leaching test 1994	E301
Leachate	F	Leachate Preparation - WAC	Based on BS EN 12457 Pt1, 2, 3	E302
Water	F	Metals	Determination of metals by filtration followed by ICP-MS	E102
Water	F	Mineral Oil (C10 - C40)	Determination of liquid:liquid extraction with hexane followed by GC-FID	E104
Water	F	Nitrate	Determination of nitrate by filtration & analysed by ion chromatography	E109
Water	UF	Monohydric Phenol	Determination of phenols by distillation followed by colorimetry	E121
Water	F	PAH - Speciated (EPA 16)	Determination of PAH compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E105
Water	F	PCB - 7 Congeners	Determination of PCB compounds by concentration through SPE cartridge, collection in dichloromethane	E108
Water	UF	Petroleum Ether Extract (PEE)	Gravimetrically determined through liquid:liquid extraction with petroleum ether	E111
Water	UF	pH	Determination of pH by electrometric measurement	E107
Water	F	Phosphate	Determination of phosphate by filtration & analysed by ion chromatography	E109
Water	UF	Redox Potential	Determination of redox potential by electrometric measurement	E113
Water	F	Sulphate (as SO4)	Determination of sulphate by filtration & analysed by ion chromatography	E109
Water	UF	Sulphide	Determination of sulphide by distillation followed by colorimetry	E118
Water	F	SVOC	Determination of semi-volatile organic compounds by concentration through SPE cartridge, collection in dichloromethane followed by GC-MS	E106
Water	UF	Toluene Extractable Matter (TEM)	Gravimetrically determined through liquid:liquid extraction with toluene	E111
Water	UF	Total Organic Carbon (TOC)	Low heat with persulphate addition followed by IR detection	E110
Water	F	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 liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C35. C5 to C8 by headspace GC-MS	E104
Water	F	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 liquid:liquid extraction with hexane, fractionating with SPE followed by GC-FID for C8 to C44. C5 to C8 by headspace GC-MS	E104
Water	UF	VOCs	Determination of volatile organic compounds by headspace GC-MS	E101
Water	UF	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E101

Key

F Filtered
UF Unfiltered

Parameter	Matrix Type	Suite Reference	Expanded Uncertainty Measurement	Unit
TOC	Soil	BS EN 12457	20.0	%
Loss on Ignition	Soil	BS EN 12457	35.0	%
BTEX	Soil	BS EN 12457	14.0	%
Sum of PCBs	Soil	BS EN 12457	23.0	%
Mineral Oil	Soil	BS EN 12457	9.0	%
Total PAH	Soil	BS EN 12457	11.6	%
pH	Soil	BS EN 12457	0.28	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18.0	%
Arsenic	Leachate	BS EN 12457	18.7	%
Barium	Leachate	BS EN 12457	11.6	%
Cadmium	Leachate	BS EN 12457	20.3	%
Chromium	Leachate	BS EN 12457	18.3	%
Copper	Leachate	BS EN 12457	24.3	%
Mercury	Leachate	BS EN 12457	23.7	%
Molybdenum	Leachate	BS EN 12457	14.7	%
Nickel	Leachate	BS EN 12457	16.1	%
Lead	Leachate	BS EN 12457	15.7	%
Antimony	Leachate	BS EN 12457	17.9	%
Selenium	Leachate	BS EN 12457	22.0	%
Zinc	Leachate	BS EN 12457	17.4	%
Chloride	Leachate	BS EN 12457	15.3	%
Fluoride	Leachate	BS EN 12457	16.4	%
Sulphate	Leachate	BS EN 12457	20.6	%
TDS	Leachate	BS EN 12457	12.0	%
Phenol Index	Leachate	BS EN 12457	14.0	%
DOC	Leachate	BS EN 12457	10.0	%
Clay Content	Soil	BS 3882: 2015	15.0	%
Silt Content	Soil	BS 3882: 2015	14.0	%
Sand Content	Soil	BS 3882: 2015	13.0	%
Loss on Ignition	Soil	BS 3882: 2015	35.0	%
pH	Soil	BS 3882: 2015	0.14	Units
Carbonate	Soil	BS 3882: 2015	16.0	%
Total Nitrogen	Soil	BS 3882: 2015	12.0	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24.0	%
Potassium (Extractable)	Soil	BS 3882: 2015	20.0	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26.0	%
Zinc	Soil	BS 3882: 2015	14.9	%
Copper	Soil	BS 3882: 2015	16.0	%
Nickel	Soil	BS 3882: 2015	17.7	%
Available Sodium	Soil	BS 3882: 2015	23.0	%
Available Calcium	Soil	BS 3882: 2015	23.0	%
Electrical Conductivity	Soil	BS 3882: 2015	10.0	%



DETS

Certificate of Analysis

Certificate Number 21-19147

Issued: 27-Sep-21

Client DETS South
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone, Kent
ME17 2JN

Our Reference 21-19147

Client Reference 13436/10922

Order No (not supplied)

Contract Title Deddington

Description 2 Soil samples.

Date Received 09-Sep-21

Date Started 09-Sep-21

Date Completed 27-Sep-21

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

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

Approved By



Adam Fenwick
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 21-19147

Client Ref 13436/10922

Contract Title Deddington

Lab No	1901947	1901948
Sample ID	TP03	TP08
Depth	0.50	0.20
Other ID	563066	563067
Sample Type	SOIL	SOIL
Sampling Date	18/08/2021	18/08/2021
Sampling Time	n/s	n/s

Test	Method	LOD	Units		
Metals					
Arsenic Gastric % Bioaccessible (% of Total As)	DETSC 2400*	0	%	0.2	0.4
Arsenic Gastric mg/kg Bioaccessible	DETSC 2400*	0.5	mg/kg	< 0.5	< 0.5
Arsenic Gastro Intestinal % Bioaccessible (% of Total As)	DETSC 2400*	0	%	0.3	0.5
Arsenic Gastro Intestinal mg/kg Bioaccessible	DETSC 2400*	0.5	mg/kg	< 0.5	< 0.5
Arsenic	DETSC 2301#	0.2	mg/kg	120	69

Information in Support of the Analytical Results

Our Ref 21-19147
Client Ref 13436/10922
Contract Deddington

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1901947	TP03 0.50 SOIL	18/08/21	PG		
1901948	TP08 0.20 SOIL	18/08/21	PG		

Key: P-Plastic G-Bag

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

Soil Analysis Notes

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

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

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

Disposal

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

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

End of Report

South West Geotechnical Ltd

Geotechnical & Environmental Consultants - Site Investigation Services
Unit 3, Brooklands, Howden Road, Tiverton, EX16 5HW. Tel: 01884 252444
Email: mail@swgeotech.co.uk

Job Name: Clifton Road, Deddington

Job Number: 13436

Statistical Assessment - Mean Value Test - Natural Soils

[illegible]

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Job Name: Clifton Road, Deddington

Job Number: 13436

Statistical Assessment - Mean Value Test - Natural Soils

[illegible]

STEP 5: RESULTS

Find AC

Print Report

		Ratio of ADE to relevant Health	
		oral HCV	inhal HCV
Number	Chemical	(dimensionless)	(dimensionless)
1	Arsenic (C4SL adult)	0.97	1.00
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
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29			
30			

ports

[Back to Guide](#)

[illegible]

[illegible]

Contributions (%)

[illegible]

Appendix F

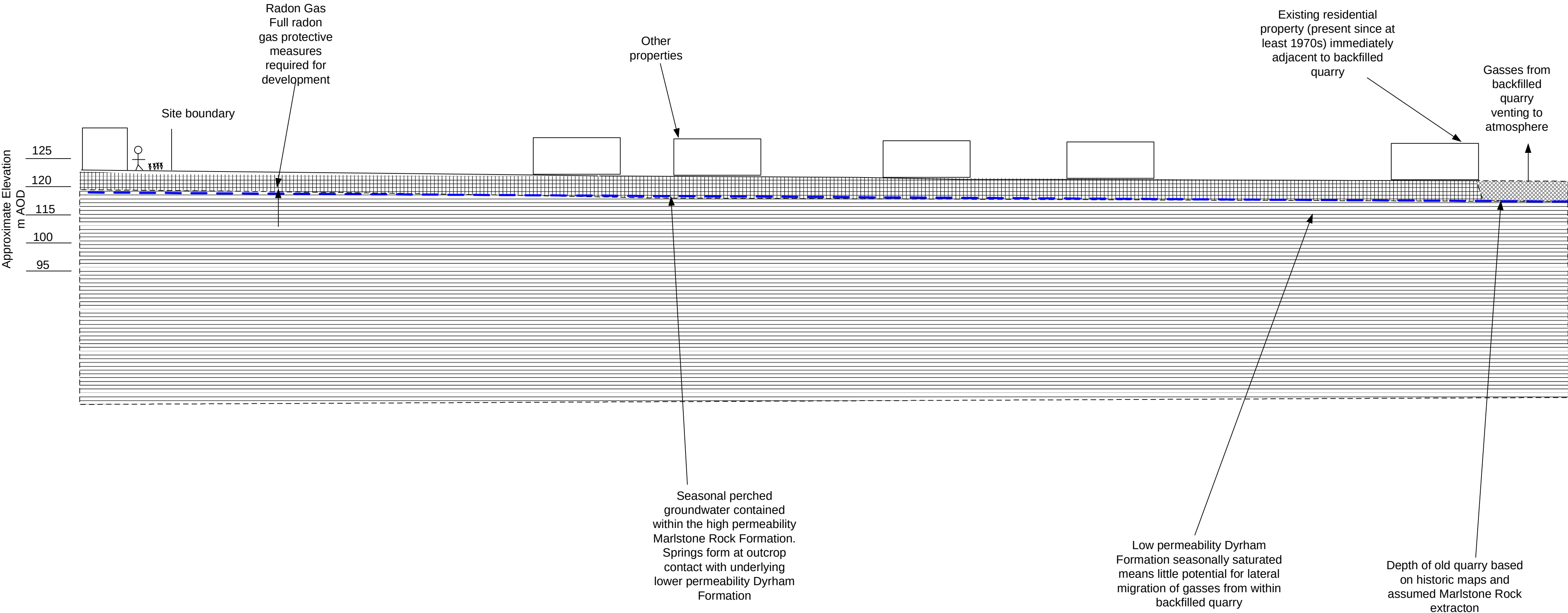
Conceptual Model (Landfill Gas)



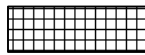
	Clifton Road, Deddington			
	Conceptual Model - Location			
01884 252444	SIZE A4	JOB NO 13436	DWG NO DWG1	REV 0
Drawn: BO	SCALE NTS	7/9/21	SHEET	1 of 1

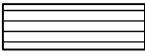
W

E

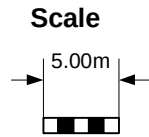


Key

- 

Marlstone Rock Formation (Limestone)
- 

Dyrham Formation (Siltstone)



	Clifton Road, Deddington			
	Conceptual Model			
01884 252444	SIZE A2	JOB NO 13436	DWG NO DWG1	REV 0
Drawn: BO	SCALE 1:500 @A2	7/9/21	SHEET	1 of 1

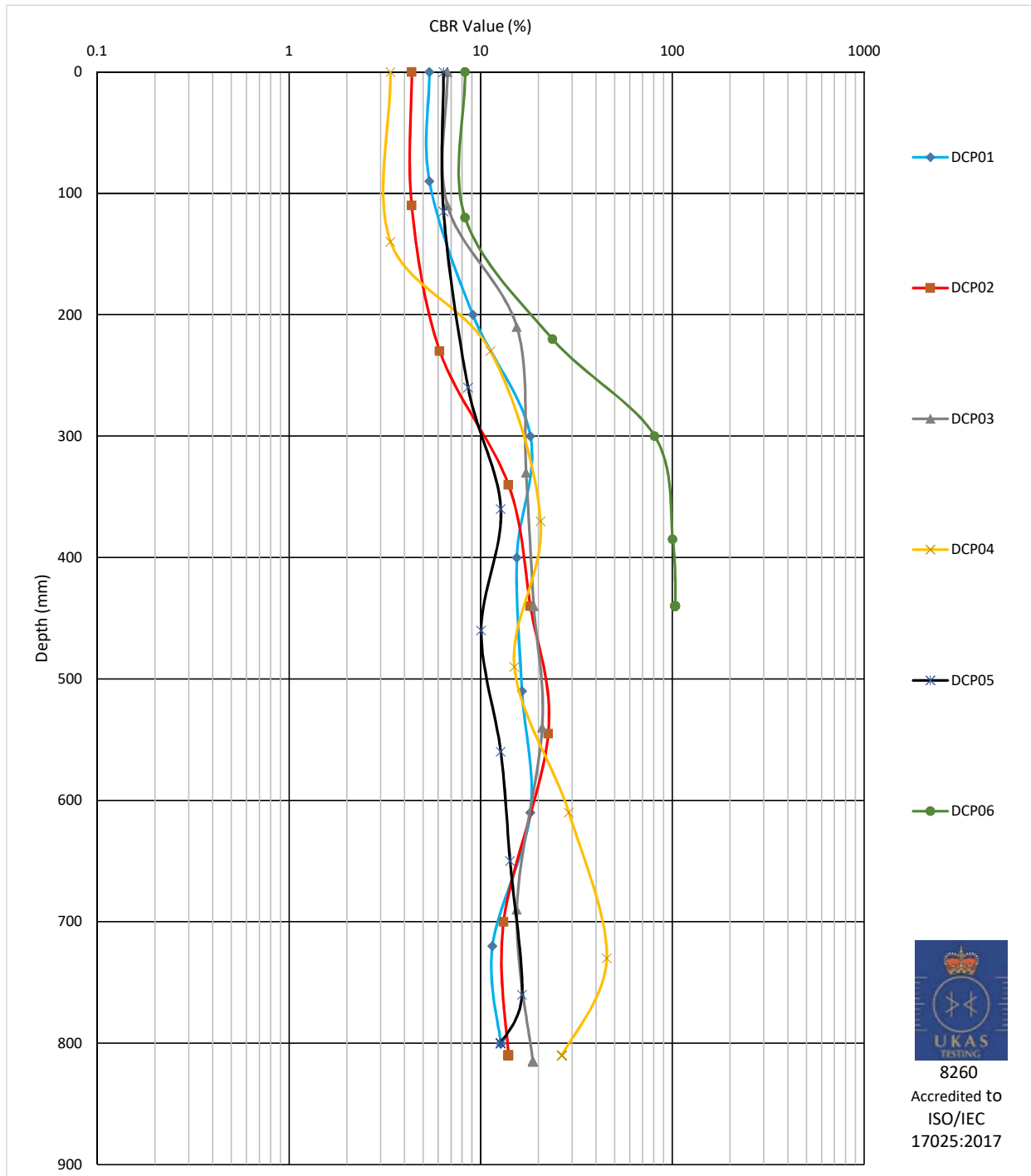
Appendix G

TRL DCP Plots

Graphical Summary of TRL DCP Results

Unit 3 Brooklands,
Howden Road,
Tiverton,
Devon
EX16 5HW

Project No.	Project Name
13436	Land South of Clifton Road, Deddington, OX15 0TH
Client Job No.	Client
-	South West Geotechnical Ltd



8260
Accredited to
ISO/IEC
17025:2017

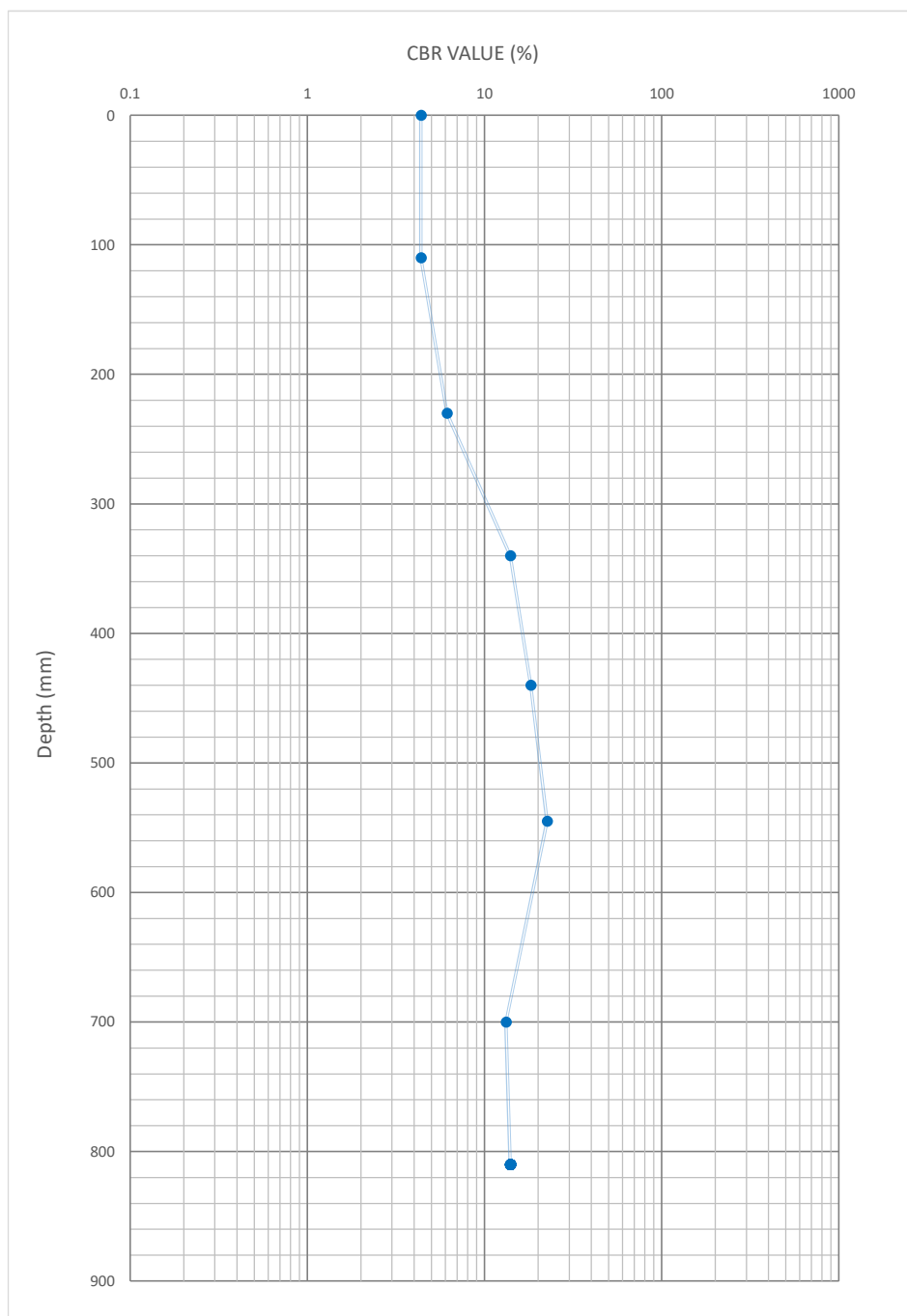
KL020R TRL DCP Graphical Summary	Approved By	Date
	David Trowbridge - Laboratory Manager	05/10/2021 11:57

	Determination of the In-Situ CBR of Soil using TRL Dynamic Cone Penetrometer Method - Design Manual for Roads/Pavement Foundations Draft HD 25 (2009)	Project No.	13436
		TRL DCP No.	DCP02
Project Name	Land South of Clifton Road, Deddington, OX15 0TH	Top Depth (m)	0
Soil Description	0	Easting	0
Client Job No.	-	Northing	0
Client Name	South West Geotechnical Ltd	Date of Test	18/08/21
Test Location	0	Weather	Sunny

Depth (mm)	CBR (%)
110	4.4
230	6.1
340	14
440	18
545	23
700	13
810	14



8260
Accredited to
ISO/IEC 17025:2017



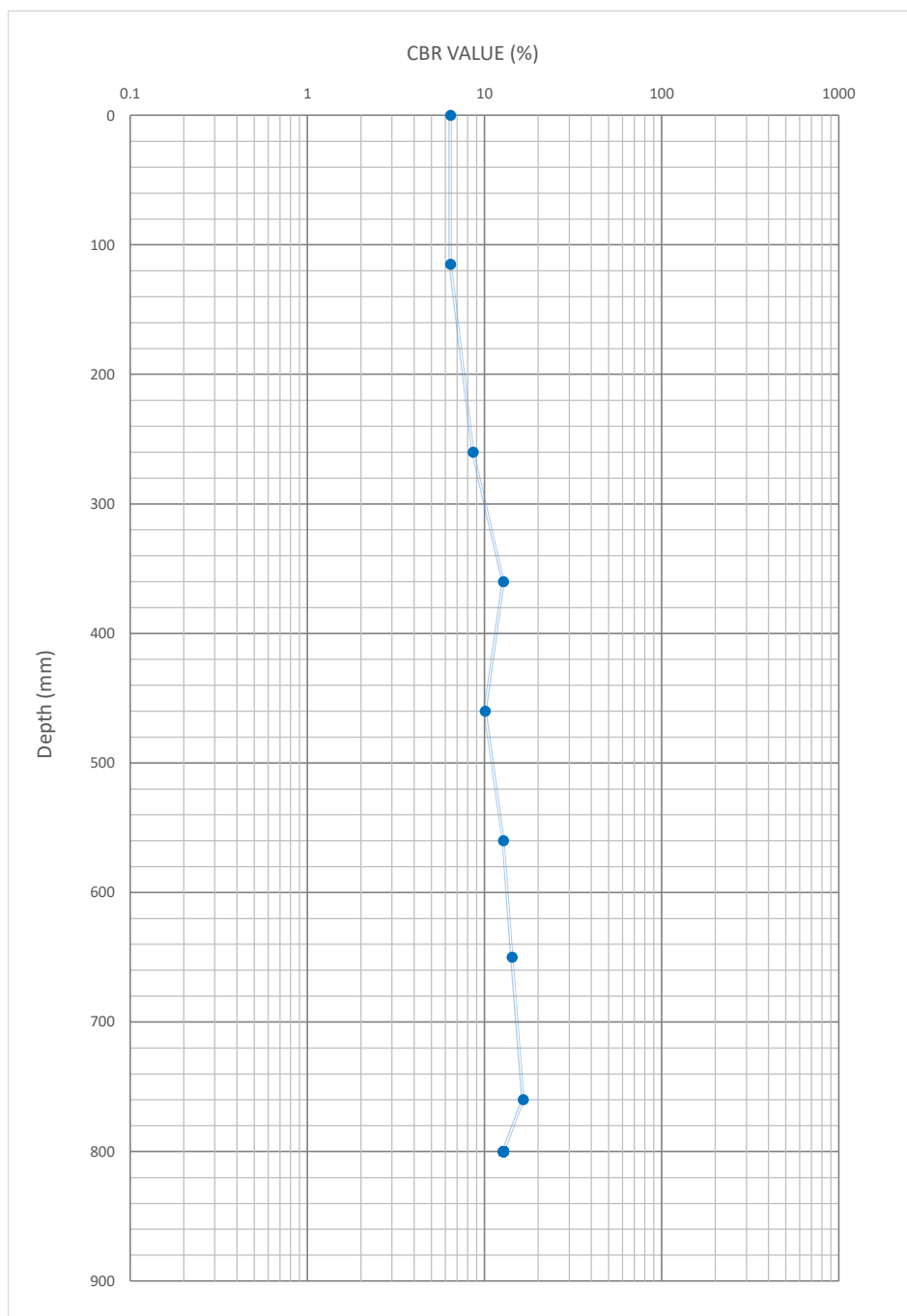
KL020R TRL DCP	Date	Approved	Remarks
Page No. 3	05/10/21		

	Determination of the In-Situ CBR of Soil using TRL Dynamic Cone Penetrometer Method - Design Manual for Roads/Pavement Foundations Draft HD 25 (2009)	Project No.	13436
		TRL DCP No.	DCP05
Project Name	Land South of Clifton Road, Deddington, OX15 0TH	Top Depth (m)	0
Soil Description	0	Easting	0
Client Job No.	-	Northing	0
Client Name	South West Geotechnical Ltd	Date of Test	18/08/21
Test Location	0	Weather	Sunny

Depth (mm)	CBR (%)
115	6.4
260	8.6
360	13
460	10
560	13
650	14
760	16
800	13



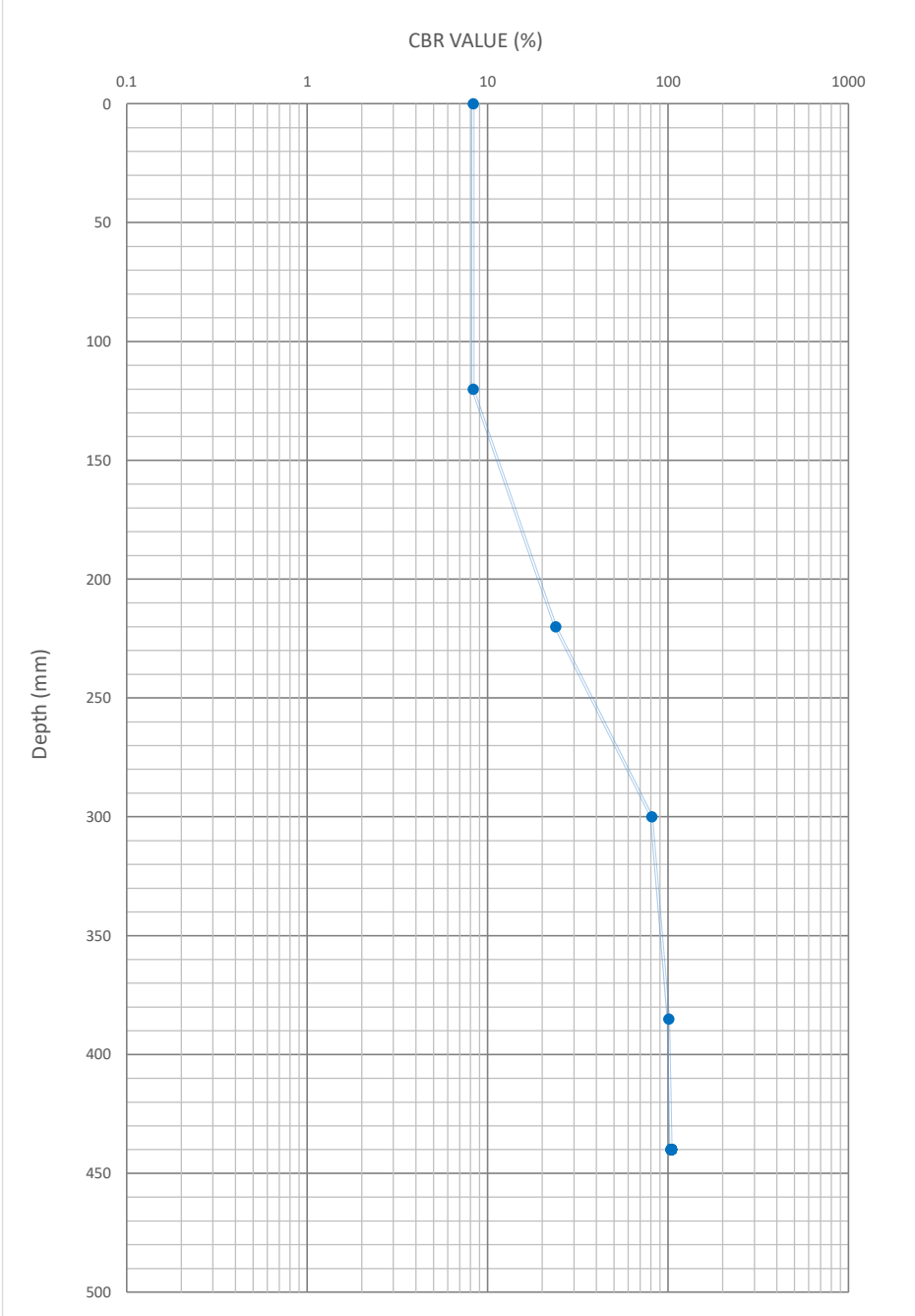
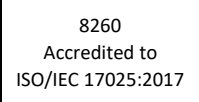
8260
Accredited to
ISO/IEC 17025:2017



KL020R TRL DCP	Date	Approved	Remarks
Page No. 6	05/10/21		



Depth (mm)	CBR (%)
0-25	100
25-50	100
50-75	100
75-100	100
100-125	100
125-150	100
150-175	100
175-200	100
200-225	100
225-250	100
250-275	100
275-300	100
300-325	100
325-350	100
350-375	100
375-400	100
400-425	100
425-450	100
450-475	100
475-500	100
500-525	100
525-550	100
550-575	100
575-600	100
600-625	100
625-650	100
650-675	100
675-700	100
700-725	100
725-750	100
750-775	100
775-800	100
800-825	100
825-850	100
850-875	100
875-900	100
900-925	100
925-950	100
950-975	100
975-1000	100



KL020R TRL DCP		Date	Approved	Remarks
Page No.	7	05/10/21		