Thomas Homes

Report

On

Ground Investigation

at

Land at Clifton Hampden
Oxon

February 2021

Report No. S.5632

GROUND INVESTIGATION SERVICES (Southern) Ltd

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CONTENTS

1.0 INTRODUCTION

1.1 Authority

Ground Investigation Services (Southern) Ltd (GIS) has been commissioned by Thomas Homes Ltd to undertake a ground investigation at the following (hereinafter referred to as the) 'site':

Land at Clifton Hampden, Oxfordshire

1.2 Development Proposals

The site is proposed for residential development. The design details and site layout were made available.

1.3 Purpose of Investigation

The purpose of the investigation was to establish the general ground conditions and groundwater regime in order to enable design of foundations and establish the potential of the ground to accept surface drainage water. In addition, it was required to assess whether soil contamination was present and comment on how this may impact the development.

1.4 Scope of Investigation

The scope comprised the following:

- conduct in-situ permeability tests in trial pits in accordance with BRE Digest DG365 - Soakaway Design
- Sink Windowless Sampling boreholes with insitu sampling and strength tests
- Install groundwater monitoring wells within boreholes
- undertake geotechnical and contamination soil analysis
- compile an interpretive report with recommendations in respect of the proposed development

1.5 Service Constraints

The report is subject to, and should be read in conjunction with, the Service Constraints presented as a foreword to the Appendices.

2.0 THE SITE

2.1 Site Setting

2.1.1 Site Location

The site is located on the western fringes of Clifton Hampden at Ordnance Survey National Grid Reference 454532E,195571N (site centred). The Location Plan is illustrated in Appendix A, Figure 1.

2.1.2 Site Description

The site comprises two individual plots separated by the main Abingdon Road. These have been titled: Northern Plot and Southern Plot for ease of description.

The Northern Plot comprises a rectangular shaped parcel of land which can be sub-divided into two equal sized plots; the northern end is an arable field, generally level and flat across its breadth/length while the southern end consists of part active and abandoned allotments and fallow scrubland, generally flat and level. Site boundaries comprise hedging with a deep drainage ditch forming the northern boundary. There are a number of semi-mature trees within an internal field boundary (east to west) and in isolated clumps in the southern end of the site and along the west and north facing boundaries. These have been classified as ranging from low to high Water Demand[1]

The Southern Plot comprises an irregularly shaped parcel which is predominantly used as a paddock. The land slopes down progressively via a gentle declivity to the south terminating in a steep 3m deep cutting along the southern boundary to floodplain land below.

There are a number of trees within the curtilage of the site and several mature species noted along all of the site boundaries. These have been classified as ranging from low to high Water Demand[1]

2.1.3 Surrounding Land Use

The immediate surrounding area is defined predominantly as residential land use and agricultural land use.

[1] NHBC Standards Chapter 4.2 Building near trees

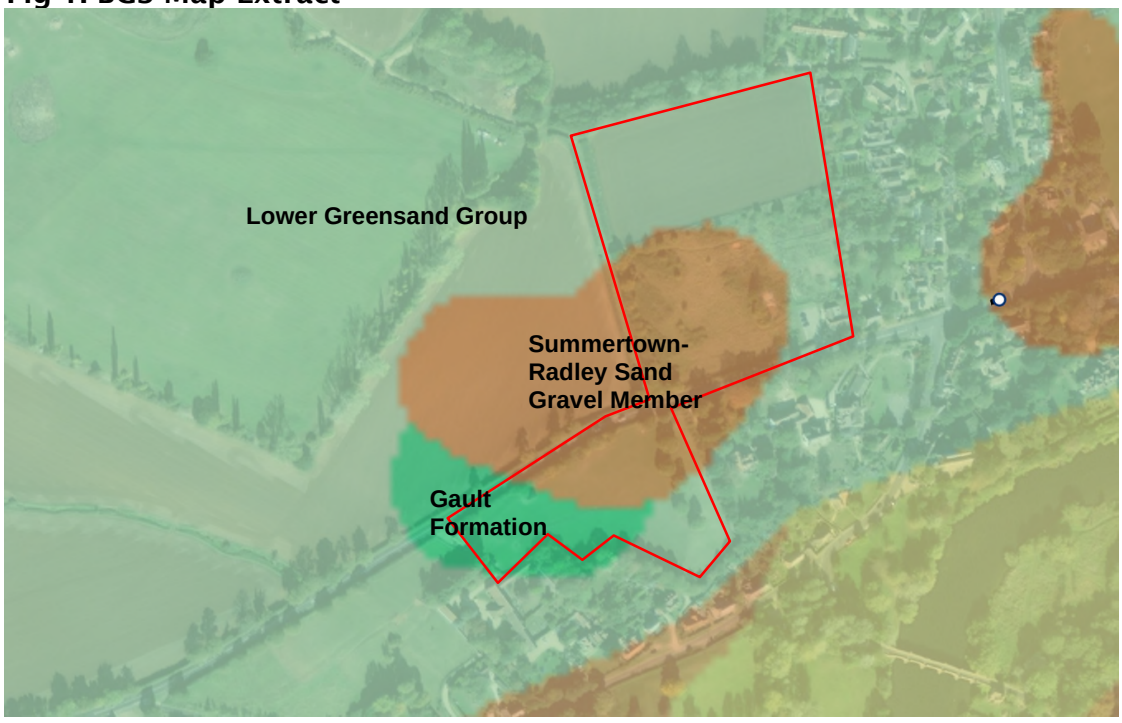
2.2 Published Geology

Reference to the British Geological Survey Solid and Drift Map for the area indicates the site is underlain by a range of strata including superficial deposits represented by Summertown Radley Sand and Gravel Member outcropping at the surface over the southeast corner of the Northern Plot and the northeast corner of the Southern Plot. This is underpinned by a small outcrop of Gault Clay in the Southern Plot while a majority of the site is underpinned by the chronologically older Lower Greensand Group.

- The Summertown-Radley Sand and Gravel Member is characterised by sand and gravel.
- The Gault Clay is characterised by clay and mudstone
- The lower Greensand is characterised by sand and sandstone

A map extract from the BGS 'Geology of Britain' is illustrated below:

Fig 1. BGS Map Extract



2.2.1 Natural Geological Hazards

The three principal geological units have been classified in terms of environmental geological risk in regard to future development. Both the Summertown-Radley Sand and Gravel Member and the Lower Greensand Group strata are classified as very low to negligible risk while the Gault Formation is considered a medium to high risk in terms of shrink-swell potential. This means that the soils are classified as high plasticity and have potential to shrink and swell under adverse conditions. Special precautions are required during and post construction for new build incorporating anti-heave/shrink measures.

2.3 Hydrogeology

2.3.1 Groundwater Vulnerability and Soil Classification

The Environment Agency has classified the bedrock soil (Lower Greensand Group) underlying the site as:

- **Secondary A Aquifer:** permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are aquifers formerly classified as minor aquifers.

The Environment Agency has classified the bedrock soil (Gault Formation) underlying the site as:

- **Unproductive Strata:** These are classified as soils with low permeability that have negligible significance for water supply or river base flow. These are aquifers formerly classified as non-aquifers.

The Environment Agency has classified the Superficial Deposits (Summertown-Radley Sand and Gravel Member) underlying the site as:

- **Secondary A Aquifer:** permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are aquifers formerly classified as minor aquifers.

The groundwater vulnerability is classified as HIGH VULNERABILITY which means the shallow soils are able to transmit pollution to groundwater due to high leaching potential and absence of low permeability soils.

The soils are classified as H2 and I1– Soils of High and Intermediate Leaching Potential which can readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.

3.0 GROUND INVESTIGATION

3.1 Introduction and General Standards

The intrusive geotechnical and geoenvironmental investigation has been conducted in general accordance with procedures outlined in the following:

3.1.1 General Standards

- BS 5930:2015+A1:2020 - *Code of Practice for Ground Investigations*
- Eurocode 7 BS EN 1997-2 (2007) Geotechnical Design - Part 2 *Ground Investigation and Testing*
- BS 1377:Part 9:1990 *Methods of test for Soils for civil engineering purposes In-situ tests*
- BS EN ISO 22476-3: 2005+A1:2011 *Geotechnical Investigation and Testing – Field Testing Standard Penetration Test*
- BS EN ISO 14688-1:2018 *Geotechnical Investigation and Testing – Identification and Classification of Soil Part 1: Identification and Description*
- BS EN ISO 14688-2:2018 *Geotechnical Investigation and Testing – Identification and Classification of Soil Part 1: Principles for a classification*
- BS EN ISO 14689:2018 *Geotechnical Investigation and Testing – Identification and Classification of Rock Part 1: Identification and Description*
- BS 10175: 2011+A2 2017 - *Investigation of potentially contaminated sites. Code of Practice*
- *BRE Digest DG365 Soakaway Design*

3.2 Fieldwork

3.2.1 General

The field-work was undertaken on the 22 October and between 14 and 16 December 2020. The weather was cold and wet during the first site visit and cold and dry on the second site visit

3.2.2 Location of Intrusive Test Positions and Preliminary Works

All intrusive test holes were located in advance on plan by GIS the locations of which were designed primarily to give representative information relevant to the proposed development.

A Cable Avoidance Tool was utilised to provide information on existing buried services. No buried services utilities were recorded.

3.2.3 Trial Pits and Infiltration Tests (BRE DG365)

Eight trial pits were excavated by 3T mechanical excavator to depths between 0.75m and 2.20m. These was logged and sampled by the engineer and samples of various soil horizons obtained and placed in airtight plastic bags for later geotechnical laboratory analysis. Trial pit depths in the Northern Plot were constrained by the ingress of shallow groundwater and limited to depths between 0.75m & 1.40m, while in the Southern Plot, ground conditions remained dry and pits depths extended into granular formation.

Each pit was subject to permeability testing in accordance with BRE DG365 provisions. The pits were filled with potable water, which was allowed to drain, while measurements of the falling head were recorded over three days. The results of this work are presented in Appendix A.

3.2.4 Boreholes

Six boreholes were advanced to depths of between 2.00 and 3.00m using windowless sampling techniques and utilising bore diameters of 96mm, 101mm and 116mm. Each of the boreholes terminated with very dense strata which was impenetrable using the drilling techniques deployed.

Representative Class 2 undisturbed continuous liner samples were obtained during the course of the boring for identification and laboratory testing. These were split and described by GIS representative on site and samples submitted to the laboratory for description and analysis.

In-situ Standard Penetration Tests (SPTs) were performed at 1.00m depth centres in order to provide an indication of the engineering grade of the soils.

Upon completion of the drilling works, each borehole was converted into groundwater monitoring wells. These comprised 50mm diameter HDPE plastic pipe, each installed to the base of each borehole and capped by lockable steel covers. Details of the installations are presented on respective borehole logs.

All information pertaining to the drilling works above is presented in the Borehole Logs, and with reference to the Notes and Abbreviations Sheet, in Appendix A.

3.2.5 California Bearing Ratio (CBR) Tests

Six in-situ California Bearing Ratio (CBR) tests were performed at 0.50m depths using an ELE reaction frame and utilising the weight of the excavator for stabilising kentledge. The results of this work are presented in Appendix A.

3.2.6 Geotechnical and Contamination Investigation and Sampling

Soil samples for subsequent laboratory 'classification' testing were taken from the boreholes. The samples were immediately placed in plastic bags and subsequently sealed and labelled. Soil samples were obtained to meet Category A Class 2 as described in BS EN I997-2:2007 (table 3.1) sufficient for laboratory testing being considered. Sample sizes were also appropriate for the laboratory test being considered (refer BS EN I997-2:2007 annex L).

Contamination samples were taken from both the trial pits and from hand dug trial pits at depths of between 0.10m and 0.20m.

Soil samples for contamination analysis were placed into laboratory supplied clean and airtight plastic tubs and 250ml amber jars. All of the containers were labelled with the project number, sample location, depth and date of sampling. The samples were stored and transported in a cool box with ice packs to ensure a nominal temperature of 5°C. Soil samples were submitted on 17 December 2020 to the UKAS and MCERTS accredited laboratory of

Element Materials Technology Ltd under full Chain of Custody Documentation.

3.2.7 Test Locations/Layout

The positions of the boreholes, trial pits/CBRs and contamination sample locations are illustrated in the Borehole/Trial Pit/CBR Location Plan in Appendix A, Figures 4 & 5.

3.3 Laboratory Testing

3.3.1 Geotechnical Analysis

Samples selected for laboratory testing will be tested in accordance with procedures outlined in BS 1377: 1990 'Methods of Test for Soils for Civil Engineering Purposes' and BS 1377-1:2016 'Methods of Test for Soils for Civil Engineering Purposes – Part 1 General requirements and sample preparation', and BS EN ISO 17892 'Geotechnical Investigation and Testing Laboratory testing of soil' and comprise the following:

The following table illustrates the type of test, methodology and reasoning behind the various test procedures.

TABLE 1. INITIAL LABORATORY TEST SCHEDULE

Test/Type	Reason for Test
Sulphate (aqueous soluble content and acid soluble content and sulphur) and pH BS 1377:Part 9:1990 *Methods of test for Soils for civil engineering purposes In-situ tests*	Assess acidity/alkalinity/sulphates of soil to allow design of buried concrete
Natural water content and Atterburg Limits (BS EN ISO 17892-12 : Clauses 5.3 and 5.5 : 2018)	Determine shrinkage potential/classification properties to assist in design of foundations and appropriate depths
Particle size distribution (Part 2, Method 9.3 dry/wet sieving method/hydrometer) and BS EN ISO 17892-4:2016 Clause 5.2/5.4 (pipette sedimentation)	Particle size expresses the size of the particles comprising a soil in terms of percentages by weight of individual sizes. This analysis is used for classification of sands and gravels and coarser particles. This can be used as an aid in establishing friction angles and density relationship for pile and pile mat design and basement design

3.3.2 Contamination Analysis

The details of the laboratory testing are itemised under Section 5.

4.0 GROUND AND GROUNDWATER CONDITIONS

4.1 Strata Encountered

The strata encountered during the exploratory works generally confirm the preliminary assessment, expounded in Section 2.2 with some additional capping layers of topsoil and a single isolated exposure of made ground.

The following general interpretation of the descending sequence of strata is made.

4.2 Northern Plot

4.2.1 Made ground

Made ground was exposed solely in BH3, located near to the car park, from ground level to 0.40m depth. This consists of either tarmacadam pavement layer over general stone hardcore or brown silty sand and flint/brick gravel.

4.2.2 Topsoil

Topsoil was identified in all other intrusive test positions and comprises brown silty humic sand with occasional fine medium gravel. The deposit extended down to depths ranging from 0.20m to 0.30m.

4.2.3 Summertown-Radley Sand and Gravel Member

The Summertown-Radley Sand and Gravel Member was encountered solely in SA4 extending down to 1.10m depth and found to comprise loose to medium dense light brown silty sand with a little fine medium gravel.

4.2.4 Lower Greensand Formation

Lower Greensand Formation was encountered in each intrusive test position and proven to a maximum depth of 3.00m. The formation consists of a highly uniform, in terms of vertical and lateral extent, light brown to reddish brown gravelly sand, initially loose to medium dense, progressively becoming dense and very dense. Gravel component is predominantly fine slightly medium sized rounded and composed of sandstone.

4.3 Southern Plot

4.3.1 Topsoil

Topsoil was identified in all intrusive test positions from ground level to depths between 0.30m and 0.45m and comprises dark brown mottled greyish brown humic clayey sand with occasional fine medium gravel.

4.3.2 Summertown-Radley Sand and Gravel Member

The Summertown-Radley Sand and Gravel Member was encountered solely in BH6 and SA8 extending down to depths of 2.00m and 1.50m respectively.

The formation comprised a laterally variable mixture of loose sand, loose gravelly sand and soft to firm very sandy gravelly clay.

4.3.3 Gault Formation

Gault Formation was encountered in SA5, SA6, BH4 and BH5 extending down to depths between 1.60m and 2.00m overlying the chronologically older Lower Greensand Formation. The formation consists of firm, rare stiff, brownish grey and grey occasionally mottled orange and olive brown intact occasionally friable clay

4.3.4 Lower Greensand Formation

Lower Greensand Formation was encountered in each intrusive test position, apart from SA8, underpinning the Gault Formation and topsoil/Summertown-Radley Sand and Gravel Member at depths ranging from 0.40m (SA7) and 2.10m (BH4) proven to a maximum depth of 3.00m. The formation consists of a highly uniform, in terms of vertical and lateral extent, light brown to reddish brown gravelly sand, initially medium dense, becoming dense and very dense. Gravel component is predominantly fine, medium rare coarse sized rounded and angular and composed of sandstone

4.2 Groundwater

Groundwater was encountered in each of the intrusive test positions in the Northern Plot but was absent during the initial ground investigation in the Southern Plot but developed as gradually developed as standing water. The details of the groundwater monitoring programme are itemised in the following table:

TABLE 2: GROUNDWATER STRIKE AND STANDING LEVELS

Test position	Stratum#	Strike (m bgl)	20/30 minutes standing (m bgl)	Date	Standing level (m bgl)
BH1	LG	0.80	0.70	22.10.20	
BH1				19.11.20	0.62 (in well)
BH1				17.12.20	0.60 (in well)
BH1				15.01.20	0.40 (in well)
BH1				15.02.20	0.24 (in well)
BH2	LG	1.32	1.17	22.10.20	
BH2				19.11.20	0.91 (in well)
BH2				17.12.20	0.70 (in well)
BH2				15.01.20	0.47 (in well)
BH2				15.02.20	0.25 (in well)
BH3	LG	1.57	1.42	22.10.20	
BH3				19.11.20	1.34 (in well)
BH3				17.12.20	1.26 (in well)
BH3				15.01.20	0.90 (in well)
BH3				15.02.20	0.62 (in well)
BH4		Dry (3.00m)	dry	22.10.20	
BH4				19.11.20	Dry (in well)
BH4				17.12.20	Dry (in well)
BH4				15.01.20	2.72 (in well)
BH4				15.02.20	1.81 (in well)
BH5		Dry (3.00m)	dry	22.10.20	
BH5				19.11.20	Dry (in well)
BH5				17.12.20	1.98 (in well)
BH5				15.01.20	1.95 (in well)
BH5				15.02.20	1.21 (in well)
BH6		Dry (3.00m)	dry	22.10.20	
BH6				19.11.20	Dry (in well)
BH6				17.12.20	Dry (in well)
BH6				15.01.20	Dry (in well)
BH6				15.02.20	1.77 (in well)
SA1	LG	0.75	0.75	14.12.20	0.75
SA2	LG	0.70	0.70	14.12.20	0.70
SA3	LG	0.90	0.90	14.12.20	0.90
SA4	SRSGM/LG	1.20	1.20	14.12.20	
				17.12.20	0.95
SA5	LG/GC	Dry (2.20)	dry	14.12.20	dry
SA6	LG/GC	Dry (2.00)	dry	14.12.20	dry
SA7	LG	Dry (1.30)	dry	14.12.20	dry
SA8	SRSGM	Dry (2.00)	dry	14.12.20	dry

SRSGM – Summertown-Radley Sand Gravel Member
GC – Gault Clay
LG – Lower Greensand Formation

Groundwater was shallow in the Northern Plot recorded between 0.70m and 1.57m depths and this continued to rise throughout the period of groundwater monitoring to present day (15.02.21) with levels ranging between 0.24m and 0.62m. It was particularly shallow in the northern half of the Northern Plot, slightly deeper in the south. Comparison of standing groundwater depths to heights above Ordnance data (AOD) suggest water levels are very level (between 54.21m-54.65m) with no particular deterministic gradient. Water levels continued to rise from 1st to 4th monitoring period with a maximum rise of 0.72m recorded in BH3.

In contrast groundwater was generally absent in the Southern Plot with no groundwater strikes in any of the intrusive test positions. Standing groundwater developed slowly during the 2nd, 3rd and 4th monitoring periods with peak (shallowest) water levels recorded at 1.21m in BH5 and deepest water level of 1.81m in BH4. Water levels rose very slowly over the period of monitoring with a maximum rise of 1.19m in BH4.

4.3 Site Test Results

4.3.1 Permeability Tests in Trial Pits

The results of the permeability tests undertaken within the Lower Greensand Formation, Summertown-Radley Sand and Gravel Member and Gault Clay indicate generally poor drainage characteristics with the following soil infiltration rates:

SA1 – 0.75m depth - 1.76×10^{-6} m/sec
SA2 – 0.75m depth - 1.78×10^{-6} m/sec
SA3 – 1.00m depth - 1.30×10^{-6} m/sec
SA4 – 1.40m depth - 1.11×10^{-5} m/sec
SA5 – 2.20m depth – N/a insufficient data
SA6 – 2.00m depth - 1.07×10^{-6} m/sec
SA7 – 1.30m depth – 3.34×10^{-6} m/sec
SA8 – 2.00m depth – N/a insufficient data

Soil Infiltration rates were based almost entirely on a single set of test results apart from SA7 where two tests were completed. Tests were not completed to full BRE365 requirements (3 repeat tests) due to the very slow fall in water levels.

The test results are illustrated in Appendix A.

4.3.2 California Bearing Ratio (CBR) Tests

Six insitu CBR tests were conducted within natural undisturbed sub-grade at a uniform depth of 0.50m. The results reveal bearing values of 1%, 1%, 1%, 2%, 2% and 2% for subgrade described as dark brown/brown silty gravelly sand (CBR A, CBR B & CBR C) and brown sandy slightly gravelly and gravelly clay (CBR D, CBR E and CBR F).

4.4 Laboratory Testing Schedule/Results - Geotechnical

The test schedule comprises the following:

TABLE 3: ITEMISED SCHEDULE OF GEOTECHNICAL TESTS

Test/Type	Soil Type	Number of Samples Tested	Sample Location	Sample Depths (m)
Natural Water Content and Atterburg Limits	Summertown-Radley Sand and Gravel Member	4	BH6 CBR D CBR E CBR F	1.00 0.50 0.50 0.50
	Gault Formation	4	BH4 BH5	1.00 & 2.00 0.50 & 1.00
	Lower Greensand Formation	3	CBR A CBR B CBR C	0.50 0.50 0.50
Particle Size Distribution	Lower Greensand Formation	4	BH1 BH2 BH3 BH6	1.00 2.00 1.00 2.00
pH, Sulphate and Sulphur	Summertown-Radley Sand and Gravel Member	1	BH6	1.00
	Lower Greensand Formation	4	BH1 BH2 BH3 BH5	1.00 0.50 1.00 2.00
	Gault Formation	2	BH4 BH5	1.00 0.50

The results of the geotechnical testing are tabulated in Appendix B and discussed in more detail as follows:

4.4.1 Atterburg Limits

- Superficial Deposits

Testing on samples of cohesive type material indicate the soil is classified as inorganic clay of low and medium plasticity and Non-shrinkage and Low Shrinkage potential.

- Gault Formation

Testing of cohesive samples of Gault Formation indicate the soil is classified as inorganic clay of high and very high plasticity and medium and high shrinkage potential.

- Lower Greensand Formation

Testing on a single sample of cohesive type material indicate the soil is classified as inorganic clay of low plasticity and Non- Shrinkage potential. All other samples of the Lower Greensand Formation are considered non-plastic.

All of the samples, apart from BH4 2.00m depth which was desiccated*, were normally hydrated with natural moisture content values in equilibrium condition.

4.4.2 Chemical Tests (pH/SO_4)

The results indicate neutral and alkaline pH conditions while water soluble and acid soluble sulphate and sulphur concentrations were universally low in all samples.

4.4.3 Particle Size Distribution

The four samples are broadly similar in composition, classified as silty very gravelly sand, (silty sand and gravel in BH1). The gravel constituent is fine medium rare coarse sandstone/flint. The grading classification could not be determined as the D_{10} value could not be calculated. However, the angle of slope of the particle size curve suggests the samples are Narrow-Graded and Gap-graded.

4.5 Contamination Laboratory Analysis

The testing schedule is itemised under Section 5.0 overleaf.

* *Desiccation defined in BRE Digest 412 Desiccation in clay soils (NMC less than 40% of LL)*

5.0 CONTAMINATION ANALYSIS

5.1 Guidelines and Assessment Criteria

5.1.1 Appropriate Guidance (Soils)

The following guidance documents have been referred to:

- Environment Agency – Contaminated Land Exposure (CLEA) model (software v1.06) and handbook
- Environment Agency – Science Report SCO50021/SR3: Updated Technical background to the CLEA Model and Science Report SCOO21/SR2: Human Health toxicological assessment of contaminants in soil
- LQM/CIEH Suitable 4 Use Levels
- Various Soil Guidance Values (SGV) reports
- WS Atkins ATRISK^{soil} Soil Screening Values (SSVs)
- BS 3882:2015 Specification for Topsoil
- Part IIA Category 4 Screening Levels (C4SL)

5.1.2 Selection of Appropriate Tier 1 Screening Values

In the UK there are currently no statutory limits by which to measure soil contamination. In order to assess whether soil beneath a site is contaminated, the results of the chemical analysis have to be compared with suitable guidelines.

In March 2009 DEFRA (Department of Environment, Food and Rural Affairs) and the Environment Agency released the revised CLEA (Contaminated Land Exposure Assessment) model and the first tranche of revised Soil Guideline Values (SGV) covering 8 contaminants: Selenium, Benzene, Ethylbenzene, Toluene, Xylene, Mercury, Arsenic and Nickel. In October 2009 further SGVs for dioxins, furans, and dioxin-like PCBs were released.

Generally there will be SGVs for each contaminant, for several different uses of land. At the moment the land uses are limited to residential (with and without plant uptake), allotments and commercial.

In the absence of currently published SGV values for other common occurring contaminants and for other land uses not covered by the DEFRA, W S Atkins have derived ATRISK^{soil} Soil Screening Values (SSVs) based on the 2009 guidance (SC050021/SR3 (the CLEA report) and SC050021/SR2) (the Tox report) for commercial/industrial/residential/open spaces and parks land uses. CLEA guidance is predicated on Soil Organic Matter (SOM) content of 6%. The SSVs produced by WS Atkins are similarly based on 6% SOM but also have SSVs for 1% SOM for a range of land uses.

Where neither of the aforementioned publications publish data for the various contaminants reference is made to the *LQM/CIEH Suitable 4 Use levels* published by CIEH and LQM (2015).

The aim of this report was to derive Soil Assessment Criteria (SAC) for an extended range of 89 substances. For each substance S4ULs have been derived for a range of generic land uses and soil organic matter (% SOM) contents. The assessment Criteria have been updated in line with developments in UK human health risk assessments since 2009, in particular the additional land uses and exposure assumptions presented in DEFRA's recent C4SL guidance. However, the S4ULs are all based on health criteria that represent minimum or tolerable levels of risks to health as described in the EA SR2 guidance, ensuring that the resulting assessment criteria are 'Suitable for use' under local authority planning.

For each substance S4ULs have been derived for six generic land uses (including two public open space land uses defined in C4SL guidance and a range of Soil Organic Matter (SOM) content for organic substances.

In addition reference has also been made to the recently introduced Part IIA Category 4 Screening Levels (C4SL) principally as an assessment tool for Lead in the soil as the SSV (WS Atkins) for lead has been withdrawn following recent appraisal of the toxicological parameters.

In the following sections, all Tier 1 assessment criteria have been collectively referred to as 'Site Acceptance Criteria' (SAC).

5.1.3 Contamination Assessment Rationale

It is understood that the site is proposed as residential development. Our assessment of the contamination test results has been undertaken based on the published soil guidance values for *Residential Land Use with homegrown produce.*

5.1.4 Site-Specific Considerations

The following site-specific considerations have been considered with respect to the soils at the site (as appropriate).

- Soil pH
- Soil type
- Soil Organic Matter (SOM) content

The SOM content and soil type are used to provide an assessment of the applicability of the Tier 1 SAC adopted.

5.2 Statistical Considerations

5.2.1 Application of Limit of Detection

Analytical techniques operate within a limit of detection (LOD). The LOD equates to a concentration below which the technique cannot detect the presence of a chemical. Accepted UK best practice is that where a concentration of a chemical is below the LOD of the technique, the LOD is adopted as the chemical concentration. It is necessary to adopt this approach in order to undertake a robust statistical analysis of the entire data set. Please note that SACs have only been adopted for determinants, which are present at concentrations in excess of the LOD on at least one occasion, or where key indicator compound assessment is required.

5.2.2 Assessment of Averaging Areas following Site Investigation Works

For the purposes of investigation and assessment a site can be divided into zones based on the historical usages or proposed end use and these zones can be further divided into averaging areas. These averaging areas can be used to assess different soil types revealed or different potential exposure pathways etc for the purposes of accurately modelling site conditions. Each averaging area can be considered independently of each other for human health exposure assessment. Based on the proposed end use of the site and the findings of the site investigation it is proposed that a single zone split into one averaging areas is appropriate for the site and defined as the **General Site Area** – topsoil.

5.2.3 Methodology

The chemical analysis results have been subjected to statistical analysis as detailed in the guidance produced by the Chartered Institute of Environmental Health (CIEH) (CIEH/CL:AIRE, May 2008). For details of the statistical tests and hypotheses, reference should be made to the aforementioned publication. However, a brief overview is presented below:
In the first instance, a Null Hypothesis (H_o) and Alternative Hypothesis (H_1) are defined as below, in this case based on the Planning Scenario:

H_o $\mu \geq Cc$ i.e. the true mean concentration (μ) is equal to or greater than the critical concentration (Cc).

H_1 $\mu \leq Cc$ i.e. the true mean concentration (μ) is less than the critical concentration (Cc).

The data is firstly split into averaging areas based on historic site uses etc. For this site the data has been designated as made ground concentrations and the averaging area is designated as the site. An outlier test (Grubb's Test) is undertaken to determine whether the soil concentrations for each determinant and averaging area belong to the same or are part of a separate population i.e. represent outliers or 'hot spots'.

A normality test is then undertaken to determine if the data is normally distributed, or otherwise. A significance test (dependent upon the distribution of the data) is then applied to the data to test H_o and H_1, and determine the associated level of evidence against H_o. The one sample t-test is undertaken for Normal data and the Chebychev test for Non-normal data. The former derives a single value for the level of evidence against H_o, whereas the latter derives upper and lower bound values. The ESI Ltd Contaminated Land Statistical Calculator has been used to undertake the aforementioned statistical assessments.

5.3 Sampling Strategy

5.3.1 Soils

The ground conditions encountered revealed the presence of two identifiable types of material relevant to the geoenvironmental investigation: topsoil and underlying natural strata.

It was decided on the basis of land usage and visual and olfactory evidence to increase the sample density within the Northern Plot. This is because evidence from potential contaminative activity, including allotment gardens, localised bonfires and agricultural arable land were recorded solely to this land. The Southern Plot in contrast, is a paddock used for grazing purposes, hence the environmental risk here is lower.

Selective Soil samples were subjected to chemical analysis for a suite of contaminants deemed appropriate on the Land Use Assessment as itemised in Table 4. The testing schedule is as follows:

TABLE 4: ITEMISED SCHEDULE OF CONTAMINATION TESTS (solid form)

Test	Type/Medium Soil/water	Number of Samples Tested	Sample Identifier	Sample Depths (m)
Arsenic, Cadmium, Hexavalent Chromium, Trivalent (total) Chromium, Lead, Mercury, Nickel, Selenium, Beryllium, Copper, Vanadium, Boron, Zinc, pH, Organic Matter Content and speciated Polycyclic Aromatic Hydrocarbons (PAH)	Topsoil	18	Sample A Sample B Sample C Sample D Sample E Sample F Sample G Sample H Sample J Sample K Sample L Sample M Sample N SA2 SA5 SA6 SA7 SA8	0.10 0.10 0.20 0.10 0.15 0.10 0.15 0.10 0.10 0.10 0.15 0.10 0.15 0.10 0.15 0.20 0.10 0.10
Pesticide and herbicides	Topsoil	2	Sample C Sample N	0.20 0.15

5.4 Site Specific Consideration

- Topsoil

Table 5 summarises the site-specific considerations applicable to the topsoil at the site:

Table 5 – SUMMARY OF TOPSOIL SITE SPECIFIC CONSIDERATIONS		
Parameter	Value	Comments
pH	7.59	Mean value
Soil Type	Silty loam	Visual observation
Soil Organic Matter	4.74%	Mean value

A soil organic matter of 2.5% has been used in the analysis and the Tier 1 SAC is based on the mean average of 4.73% calculated from the eighteen soil samples.

5.5 Contamination Test Results

5.5.1 Outliers

Outliers identified above the respective critical concentrations are summarised in Table 6 below. Those below the critical concentrations are not deemed to warrant any further consideration.

TABLE 6. OUTLIERS

Determinant	units	Critical Concentration (Cc)	Outlier Location	Outlier Concentration
Lead	Mg/kg	200	Sample E	226

In consideration of the outlier value and the sampling depths, positions etc it is considered that the outlier value presented above for lead should not be removed from evaluation of the true mean concentration. This is because the outlier value was recorded within soil considered similar in composition to other test samples.

5.5.2 Significance Tests

The outcome of the significance tests are summarised in the following tables together with respective critical concentrations, upper confidence limits and evidence levels. Where concentrations for a particular determinant do not exceed the critical concentration a significance test of the data has not been undertaken. The full set of results and the ESI statistical test data are presented in Appendix B - Laboratory Test Results.

TABLE 7. SIGNIFICANCE TESTS: TOPSOIL

Determinant	No. of samples tested	Critical Concentration (Cc) SSVs/GACs	Published Reference	Measured Range	No. of samples exceeding Tier 1 SAC	Sample Mean, (x)	Upper Confidence Limit (of true mean concentration μ)	Evidence Level (%)	Outcome	Reject Null Hypothesis (Ho) YES/NO
Metals, Semi- Metals and Non-Metals										
Arsenic	**18**	**37**	**S4ULs**	**30.7 – 42.6**	**9**	**36.7**	**38.2**	**62**	**μ>Cc**	**NO**
Cadmium	18	11	S4ULs	<0.1	0	N/A	N/A	N/A	N/A	N/A
Chromium III (total)	18	910	S4ULs	83 – 116.4	0	N/A	N/A	N/A	N/A	N/A
Chromium (VI)	18	6	S4ULs	<0.3	0	N/A	N/A	N/A	N/A	N/A
Copper	18	2400	S4ULs	14 - 50	0	N/A	N/A	N/A	N/A	N/A
Lead	**18**	**200**	**C4SLs**	**20 - 226**	**1**	**45.1**	**117.7**	**99**	**μ<Cc**	**YES**
Inorganic Mercury	18	40	S4ULs	<0.1 – 0.2	0	N/A	N/A	N/A	N/A	N/A
Nickel	18	180	S4ULs	22.7 – 42.9	0	N/A	N/A	N/A	N/A	N/A
Zinc	18	3700	S4ULs	82 - 199	0	N/A	N/A	N/A	N/A	N/A
Boron (Water soluble)	18	290	S4ULs	1.4 – 3.5	0	N/A	N/A	N/A	N/A	N/A
Selenium	18	250	S4ULs	1 - 3	0	N/A	N/A	N/A	N/A	N/A
Vanadium	18	410	S4ULs	93 - 187	0	N/A	N/A	N/A	N/A	N/A
Beryllium	18	60.3	SSV's	1.7 – 2.6	0	N/A	N/A	N/A	N/A	N/A
Polycyclic Aromatic Hydrocarbons										
Naphthalene	18	5.6	S4ULs	<0.04	0	N/A	N/A	N/A	N/A	N/A
Acenaphthylene	18	420	S4ULs	<0.03	0	N/A	N/A	N/A	N/A	N/A
Acenaphthene	18	510	S4ULs	<0.05	0	N/A	N/A	N/A	N/A	N/A
Fluorene	18	400	S4ULs	<0.04	0	N/A	N/A	N/A	N/A	N/A
Phenanthrene	18	220	S4ULs	<0.03 – 0.18	0	N/A	N/A	N/A	N/A	N/A
Anthracene	18	5400	S4ULs	<0.04	0	N/A	N/A	N/A	N/A	N/A
Fluoranthene	18	560	S4ULs	<0.05 – 0.7	0	N/A	N/A	N/A	N/A	N/A
Pyrene	18	1200	S4ULs	<0.03 – 0.64	0	N/A	N/A	N/A	N/A	N/A
Benzo(ah)anthracene	18	11	S4ULs	<0.06 – 0.47	0	4.5	N/A	N/A	N/A	N/A
Chrysene	18	22	S4ULs	<0.02 – 0.49	0	4.53	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	18	3.3	S4ULs	<0.05 – 0.65	0	6.91	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	18	93	S4ULs	<0.02 – 0.25	0	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	18	2.7	S4ULs	<0.04 – 0.38	0	6.1	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	18	36	S4ULs	<0.05 – 0.33	0	4.6	N/A	N/A	N/A	N/A
Dibenz(ah)anthracene	18	0.28	S4ULs	<0.04 – 0.06	0	1.33	N/A	N/A	N/A	N/A
Benzo(g,h,i)perylene	18	340	S4ULs	<0.04 – 0.33	0	N/A	N/A	N/A	N/A	N/A
Pesticides/Herbicides										
Acid Herbicides	2	Above detection	Professional judgement	<0.1	0	N/A	N/A	N/A	N/A	N/A
Organochlorine Pesticides	2	Above detection	Professional judgement	<0.01	0	N/A	N/A	N/A	N/A	N/A
Organophosphorus Pesticides	2	Above detection	Professional judgement	<0.01	0	N/A	N/A	N/A	N/A	N/A

Key

All measurements in mg/kg unless otherwise stated
Note: Null hypothesis (H_o): the level of contamination is the same as, or higher than, the critical concentration
SSVs – Soil Screening values for 1% SOM Residential with plant uptake
S4Uls – Soils screening values for 2.5% SOM Residential with homegrown produce
C4SL Part IIA Category 4 Screening Levels (C4SL)
#LQM/CIEH S4ULs

5.6 Discussion of Test Results

5.6.1 Assessment of Test Results (Human Risk)

The above assessments of samples of topsoil have revealed that all determinants assessed were found to be present at concentrations below the UCL Tier 1 SAC except for arsenic which exceeded the Tier 1 SAC in nine samples and lead which exceeded the Tier 1 SAC in a single sample.

The statistical analysis indicates that the Null Hypothesis can be rejected in favour of the Alternative Hypothesis for all the metal and organic determinants with the exception of arsenic and lead i.e. there is sufficient evidence that the true mean for each of the other metal and organic determinants is less than the relevant critical concentrations.

Lead

Lead exceeded the relevant Tier 1 SAC of 200mg/kg in a single sample (Sample E) with a value of 230mg/kg. The data were non-normal distributed and the Chebychev Test for non-normal data was undertaken on the results. A 99% upper confidence limit of 117.7mg/kg was established for the site which does not exceed the Tier 1 SAC of 200mg/kg.

Therefore the null hypothesis for arsenic can be rejected in favour of the alternative hypothesis, i.e. there is sufficient evidence that the true sample mean for lead is equal to or less than the critical concentration.

Arsenic

Arsenic exceeded the relevant Tier 1 SAC of 37mg/kg in nine samples with values ranging between 38mg/kg and 42mg/kg.

The data were normal distributed and the One-Sample T Test for normal data was undertaken on the results. A 62% upper confidence limit of 38.2mg/kg was established for the site which exceeds the Tier 1 SAC of 37mg/kg.

Therefore the null hypothesis for arsenic cannot be rejected in favour of the alternative hypothesis, i.e. there is sufficient evidence that the true sample mean for arsenic is equal to or greater than the critical concentration.

5.6.2 Assessment of Test Results (Vegetation)

In order to assess the risk posed to vegetation on site from potentially phytotoxic contaminants, the concentrations of arsenic, chromium, copper, zinc, boron and nickel were compared against values given in BS 3882:2015 '*Specification for Topsoil*, the ICRCL Guidance Note 70/90 and for values not stated in these publications reference has been made to ICRCL 59/83 for boron and the Dutch ecotoxicological intervention value for total chromium (trivalent).

Based on the pH values the mean average of which is 7.6pH, the concentrations of copper, zinc, nickel, arsenic, boron and chromium were compared against the appropriate guidelines of 200mg/kg, 300mg/kg 110mg/kg, 250mg/kg, 7mg/kg, and 230mg/kg respectively.

None of the determinants recorded by the chemical analysis were found to exceed the adopted phytotoxic screening values. Therefore, the existing ground conditions does not pose a risk to potential phytotoxic receptors.

5.7 Contamination Conclusions

The site investigation has revealed a potential risk to humans from contact with arsenic contamination recorded within topsoil. This contamination will pose a risk to human health through exposure pathways including skin contact, ingestion (soil pica - children particularly) of soil particles and inhalation of dust particles.

5.2.1 Non-Interventionist Approach

The results of the contamination analysis indicate most contaminant levels are below their respective UCL Tier 1 SAC except for arsenic which was marginally elevated in topsoil. The origin of the arsenic is thought to be derived from the weathering process of the bedrock soils which contain slightly higher concentrations of naturally occurring arsenic. The site is underlain by a geological bedrock documented with elevated levels of arsenic, which can degrade and weather producing high concentrations of arsenic which become incorporated into surface soils.

There was no evidence of any contaminative uses or anthropogenic practices that relate to the use of the site both in present or historical context that may explain the abnormally high levels of arsenic, therefore the high levels of arsenic can be attributed to the bedrock soil.

Reference to the EA *UK Soil and Herbage Pollutant Survey* June 2007 cite ambient levels of arsenic in the ground in the UK as ranging from 0.5 – 143mg/kg. Reference to the publication.

Reference to the publication by the British Geological Survey *Normal background concentrations (NBCs) of contaminants in English soils* states that the normal background concentrations for arsenic within areas associated with Lower Greensand Formation or downstream of this lithology may exceed 25mg/kg.

To illustrate this point, GIS have undertaken numerous environmental surveys on neighbouring land (west) within topsoil formation over a number of years between 2014 and 2020. The work undertaken for UKAEA was limited to samples of topsoil formation at depths between GL and 0.30m which superposed both superficial deposits and Lower Greensand Formation (directly and indirectly). These surveys revealed upper confidence limits of 37.54mg/kg based on seventeen samples recorded in 2014 and 39.5mg/kg based on twenty-two samples recorded in 2020. A copy of these data will be made available with the clients (UKAEA) consent.

On the basis that the site lies within an extensive geographic area that is underlain by bedrock soils that contain naturally occurring metals (arsenic inter-alia) and for the reasons elaborated in the foregoing sections GIS consider that remediation will not be necessary as its effectiveness cannot be attested. This is because neighbouring contiguous land is similarly affected and in order to prevent migration to the site via various pathways, including: air, surface runoff and spillage etc, extreme measures such as solid masonry walls and other containment structures would have to be erected around the site to be considered 100% effective.

We advise that the Environmental Protection Officer for the local authority be contacted for their input in regards to their general approach to this issue.

6.0 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

6.1 Proposed Development

The site is proposed for residential development incorporating a number of detached and terraced houses and a new surgery building and new access roads and car parking bays[2].

It is estimated that unfactored loads for perimeter walls for two-storey structures will be in the order of 50kN/m (suspended concrete floors).

6.2 Building Regulations

Current Approved Document A of the building Regulations references Eurocodes and their UK National Annexes as practical guidance in meeting part A requirements. Approved document A advises there may be alternative ways of achieving compliance with requirements where it can be demonstrated that the use of withdrawn standards no longer maintained by the British Standards Institution continues to meet Part A requirements.

This chapter also provides building foundation design parameters ('Traditional Methods') which relate (in part) to withdrawn British Standards as we understand that the development will likely follow such "traditional" method of design and construction. It is for the foundation designer to select the design methodology and demonstrate compliance with part A requirements. Should it be required GIS can provide a foundation strategy for the proposed development and geotechnical design parameters to comply with Eurocode 7 (BSEN1997-1:2004 '*Geotechnical Design – part 1 General Rules'* and the corresponding UK National Annex).

6.3 Geotechnical Assessment

The site comprises a thin capping of topsoil and a single exposure of made ground superposing outcrops of Summertown-Radley Sand and Gravel Member, Gault Formation and Lower Greensand Formation. Typically, both the northern and southern plots are underpinned by the Chronologically older Lower Greensand Formation with a thin capping layer of Gault Formation exposed solely within a small area of the Southern Plot, while the Summertown-Radley Sand and Gravel Member outcrops in the northern end of the Southern Plot and in the southern end of the Northern Plot. This mirrors the BGS map data outlined in Section 2.2.

The Summertown-Radley Sand and Gravel Member comprises a composite layer (0.80-1.70m thick) of loose to medium dense sand and gravel and firm to stiff clay.

The Gault Formation forms a capping layer (1.25-1.80m thick) of soft to firm, firm to stiff brown and grey clay of high and very high plasticity and high shrinkage potential

[2] Change in development as illustrated in Fig 2 and Fig 3 (Proposed Development Plan) as supplied by Thomas Homes via email dated 09.06.22 (ref drawing reference 191 12.003 dated June 2020

The Lower Greensand Formation consists of a highly uniform orange brown to brown silty gravelly sand, medium dense to dense becoming very dense with increasing depth. It is classified as low to Non shrinkage potential.

Groundwater was encountered in each test position in the Northern Plot at relatively shallow depth rising progressively close to ground level at the last monitoring visit (15.02.21). Groundwater developed more slowly and at greater depth in the Southern Plot with levels between 1.21m and 1.81m (15.02.21)

Infiltration test data demonstrate generally low permeability of the various soil strata.

CBR test data reveal low CBR values in the range 1% to 2%.

Chemical test data indicates alkaline pH values and negligible sulphate/sulphur concentrations.

The majority of the soils in the Northern Plot are classified as either low shrinkage potential or non-shrinkage potential, while the Gault Formation and cohesive layers of the Summertown-Radley Sand and Gravel Member in the Southern Plot are classified as both low, medium and high shrinkage potential . Some desiccation of the Gault Formation in BH4 was recorded.

6.4 Geotechnical Hazards

A summary of commonly occurring geotechnical hazards is given in Table 8 together with an assessment of whether the site may be affected by each of the stated hazards

TABLE 8. Summary of Potential Hazards that may affect site

Hazard Category	Hazard Status on Investigation Findings	Engineering Considerations
Shrinkable Clay Soils	Shrinkable soils (Low to High shrinkage potential) predominantly in Southern Plot mainly identified as Gault Formation with some isolated exposures of clay with the Summertown-Radley Sand and Gravel Member	Design to NHBC Standards Chapter 4 – Building near trees- use worst case scenario for design purposes
High groundwater table	In general groundwater in the northern Plot is very shallow (near ground level) particularly in the north	Will affect permanent works (Foundations and other buried substructures) and temporary works
Soil permeability	Very low soil infiltration rates and shallow groundwater will limit scope for surface water drainage	Consider alternative solutions to conventional drainage systems
Waterlogged ground and localised flooding	Local flooding (pools and water logged ground) identified in parts of Southern Plot	Consider drainage solutions to remove surface water flooding in short and long term (Permanent and temporary)

6.5 Site Preparation and Excavation

The site investigation did not reveal any unusual buried structures (tanks drains etc) that may impede construction. There will be site trafficability issues particularly in winter and spring months on slopes and lower ground where water-logging of shallow subsoils may hinder contractors plant vehicular movements. Temporary or permanent hardstanding surfaces for both vehicular parking and movements across the site should be installed prior to site works.

6.6 Foundation Design

Assessment of the foundation options relevant to the proposed design build are predicated on the basis of ground conditions, anticipated bearing pressures, site history and design layout.

6.6.1 Spread Foundations

- Northern Plot

From the information available and assessment of the ground conditions, it is considered the site may be successfully developed utilising conventional spread foundations.

Calculations based on the Standard Penetration Test results indicate a net allowable bearing pressure of 110kPa is advised for foundations constructed within the Lower Greensand Formation at a minimum depth of 1.00m, allowing for settlement within acceptable limits (maximum of 25mm) which should take place during the construction phase. This recommended bearing pressure has been calculated on the basis that groundwater levels will rise to foundation level.

The sand and gravel may also become weakened upon disturbance during excavation for foundation trenches resulting in a further reduction in relative density. GIS recommend foundation widths in general should be a minimum of 0.60m to avoid potential 'punching' failure with incorporation of some integral longitudinal and traverse steel bars/mesh reinforcement to mitigate the effects of differential settlement. This particular caveat is required to give added confidence to the long-term stability of the structure.

There will no requirement to install anti heave precautions as the founding medium at 1.00m depths is classified as non-shrinkable and given the distance from foundations to boundary trees, which is likely to exceed 10m.

It is recommended the groundworks proceed during the summer or autumn season when groundwater levels are anticipated to be at a level that will allow free unhindered access to excavations without an expensive and time-consuming dewatering programme If time permits. It is recommended groundwater levels are continually monitored over an annual period to establish peaks of high and low groundwater levels.

- Southern Plot

From the information available and assessment of the ground conditions, it is considered the site may be successfully developed utilising conventional spread foundations and deep trench-fill foundations.

The zone of development incorporating the five individual building plots is directly underlain by Gault Formation underpinned at a mean average depth of 1.48m by Lower Greensand Formation. Given the High Shrinkage Potential of the Gault Formation and the close proximity of trees allied with some evidence of desiccation in these clay soils GIS recommend foundations are taken down through the Gault Formation end bearing upon the Lower Greensand Formation at presumed depths ranging between 0.90m (SA7) and 2.10m (BH4).

Calculations based on the Standard Penetration Test results indicate a net allowable bearing pressure of 100kPa can be achieved for conventional footings 600mm wide, with settlement within acceptable limits (maximum of 25mm) which should take place during the construction period. This recommended bearing pressure has been calculated on the basis that groundwater levels may rise to or above foundation level.

It is recommended the groundworks proceed during the spring, summer or autumn season when groundwater levels are anticipated to be at a level that will allow free unhindered access to excavations without an expensive and time-consuming dewatering programme If time permits. It is recommended groundwater levels are continually monitored over an annual period to establish peaks of high and low groundwater levels.

6.6.2 Pile Foundations

Should the client consider the method of foundation recommended above to be unworkable or the design bearing pressures exceed the bearing capacity of the soil then alternative approach should be considered such as deep pile foundations

Deep piles end bearing within the bedrock (Lower Greensand Formation) will be acceptable subject to the establishment of pile parameters based additional deep exploratory boreholes. GIS recommend a minimum of five boreholes are sunk to a depth of ten metres with insitu geotechnical testing and undisturbed sample retrieval for laboratory stress tests in order to allow design of pile foundations.

6.7 Ground Floor Slab

The subgrade soil conditions beneath the footprint of the ground floor comprises soft and firm sandy clay and clay of low to high shrinkage potential. Given the distance to trees, those to be retained or removed and the heightened risk from continued shrink and swell brought about by tree root dehydration and high water table, GIS recommend the floor slab is suspended to offset the possibility of future heave/shrinkage/consolidation.

Reference to NHBC Standards, Chapter 5.2 - *Suspended Ground Floors* is recommended.

6.8 Excavations and Ground Stability

Excavations for foundations and service trenches will remain stable in the short term but will require temporary shoring if left open for a prolonged period of time. It is recommended all excavations in excess of 1.20m depth should be supported at all times, in compliance with health and safety at work requirements.

Excavations in the Northern Plot within the non-cohesive sand and gravel subsoil primarily for foundation and service trenches, are likely to become unstable in the very short term due to the granular nature of the soils encountered and may require temporary shoring or cut back to a safe minimum angle of 33˚. All excavations in excess of 1.20m should be supported at all times, in compliance with health and safety at work requirements and in accordance with advice given the Construction Design and Management Regulations (2015) and in compliance with health and safety at work requirements and in accordance with advice given in HSE - Health and Safety in Construction HSG 150.

Groundwater levels are highly variable depending upon location and in respect of local hydrogeological conditions and seasonal variations. Current groundwater levels were recorded during a period of seasonally high precipitation and these are expected to stabilise and fall during spring months and summer months.

Groundwater ingress can be dealt with by a series of sumps and pumping off site. Any system of sump pumping or well points will have to be of sufficiently high capacity to adequately remove excess groundwaters. Any temporary reduction in groundwater levels should be short term to avoid excessive dewatering and consequential fines removal of granular stratum beneath future sub-structures. Advice on the temporary control of groundwater in excavations is given in CIRIA Report 113 (1998) - *Control of Groundwater in Temporary Works*.

6.9 Sub-Surface Concrete

The results of the laboratory testing indicate sulphate concentrations of less than 0.5 g/l (2:1 water: soil extract), with pH values in excess of 5.5pH. Such results, for a site which is neither brown-field nor pyritic with static groundwater conditions, conform to Design Sulphate Class DS-1 and ACEC Class AC-1 conditions of BRE Special Digest 1. Therefore the designer should use the above classifications in order to produce the sub-surface concrete specification.

Therefore the designer should utilise the above classifications in order to produce the sub-surface concrete specification i.e. DS-1 and AC-1.

6.10 Soakaway Assessment

Infiltration testing has demonstrated the very poor drainage characteristics of the host soils to discharge drainage waters. Testing was performed in a range of strata, comprising clayey and silty sands and gravel sand and intact clay.

Soil infiltration rates are in the range 1.11×10^{-5} m/sec to 1.07×10^{-6} m/sec.

Testing was curtailed by the high groundwater table in the Northern Plot at the time of the test programme which has risen close to ground level during the period of January/February 2021.

The Southern Plot may offer more scope for drainage with provision for soakaway drains installed within the granular horizons of the Lower Greensand Formation and Summertown-Radley Sand and Gravel Member, avoiding the Gault Formation which is impermeable.

Overall drainage design should avoid overloading the rear embankment supporting the south facing perimeter boundary here. Soakaway chamber depths should be limited to a minimum of 0.50m above the groundwater standing level

For the northern Plot, local soakaways will not be effective owing to the high groundwater table (between 0.20m and 0.62m). Alternative methods and systems of discharge should be considered that include off-site discharge (water courses or surface water sewer) or within the site via local swales, permeable paving, installation of geogrids for temporary storage or rain water harvesting etc.

6.11 Road and Hardstanding Pavement Design

Results of the CBR test work reveal the ground at test depths of 500mm has a bearing value of between 1% and 2% for both the Northern Plot and the Southern Plot.

On the basis of the test results we advise a CBR Design value of 1% should be adopted for road pavements subject to local authority approval. Reference to *HA Interim Advice Note 73/06 (2009) Design Guidance for Road Pavement Foundations (Draft HD25)* indicates for subgrades with CBR values less than <2.5% then the soils should be removed and replaced by more suitable materials. A depth of removal is quoted between 0.50m and 1.00m depth.

The subgrade which is susceptible to softening and conversely stiffening if left exposed during pavement construction should be promptly protected by a capping layer following exposure, if this is not practicable it should be cut with a cross-fall and drainage provided. Where high shrinkage soils are exposed in the Southern Plot or loose silty sands are encountered in the Northern Plot it is recommended the soils are stabilised by installation of a geotextile/geogrid membrane for additional reinforcement and capping layers to forestall differential settlement.

We note that the presence of mature trees just along site boundaries which may affect the long-term serviceability of road pavements, particularly in respect of desiccation and subgrade shrinkage. Therefore, measures to ameliorate these effects should be considered including an allowance for increasing the depth of pavement and/or provision of a root barrier. Groundwater is also an issue that should be factored in the design and timing of construction. We advise construction of capping and sub-base layers are undertaken during a period of 'dry conditions' when standing water levels are below final design formation level.

6.12 Future Work

Continued groundwater monitoring (every month) is currently in operation to establish the full range in seasonal water levels in order to determine the maximum depth of soakaway chambers to prevent flooding and maintain operational use.

If the option of piling is considered mandatory, then we advise additional deep boreholes (4 No.) are sunk to give definitive geotechnical data to allow for pile design.

6.13 Supplementary work required to existing Report

GIS have been advised of the revision to the development layout since the issue of the first draft report which may require addition geotechnical input. This is particularly relevant to the north side plot where new structures are scheduled on land currently lacking any survey data.

7.0 REFERENCES

1. British Standards Institute, Code of Practice for Ground Investigations BS 5930:2015+A1:2020

2. Eurocode 7 BS EN 1997-2 (2007) Geotechnical Design - Part 2 *Ground Investigation and Testing*

3. BS EN ISO 14688-1: (2018) *Geotechnical Investigation and Testing – Identification and Classification of Soil Part 1: Identification and Description*

4. BS EN ISO 14688-1: (2018) *Geotechnical Investigation and Testing – Identification and Classification of Soil Part 1: Principles for a classification*

5. BS EN ISO 14689-1: (2018) *Geotechnical Investigation and Testing – Identification and Classification of Rock Part 1: Identification and Description*

6. BS EN ISO 22476-3: (2005) *Geotechnical Investigation and Testing – Field Testing Part 3 Standard Penetration Test*

7. British Standards Institute, Methods of Test for Soils for Civil Engineering Purposes, BS 1377 : 1990

8. HSE - The Construction (Health, Safety and Welfare) Regulations 2015

9. HSE Health and Safety in Excavations HSG 185

10. BRE Digest 1 (2005) - Concrete in Aggressive Ground

11. Department of the Environment, Food and Rural Affairs and The Environment Agency - The Contaminated Land Exposure Assessment (CLEA) Model 2009

12. WS Atkins ATRISK^{soil} Soil Screening Values (SSVs)

13. BS 10175: 2011+A2:2017 - *Investigation of potentially contaminated sites. Code of Practice*

14. DG BRE Digest DG365 - Soakaway Design

15. The LQM/CIEH S4ULs for Human Health Risk Assessment

16. Part IIA Category 4 Screening Levels (C4SL)

SERVICE CONSTRAINTS

1. This report and the site investigation (the "Services") were compiled and carried out by Ground Investigation Services (Southern) Ltd (GIS) in accordance with the terms of a contract between GIS and the "client". The Services were performed by GIS with skill and care taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between GIS and the client.

2. Unless otherwise agreed the Services were performed by GIS exclusively for the purposes of the client. Unless expressly provided in writing, GIS does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, be made known to any third party, such party using any information within the report do so at their own risk.

3. It is GIS's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without GIS's review and advice shall be at the client's sole and own risk.

4. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of GIS. In the absence of such written advice of GIS, reliance on the report in the future shall be at the client's own and sole risk.

5. The Services are based upon GIS's observations of existing physical conditions at the site together with GIS's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which GIS was reasonably entitled to rely.

6. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site.

7. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

CLIENT:	Thomas Homes
LOCATION:	Land at Clifton Hampden
REPORT NO.:	S.5632
DATE:	February 2021

APPENDICES

APPENDIX A	SITE DATA
APPENDIX B	LABORATORY TEST RESULTS

APPENDIX A

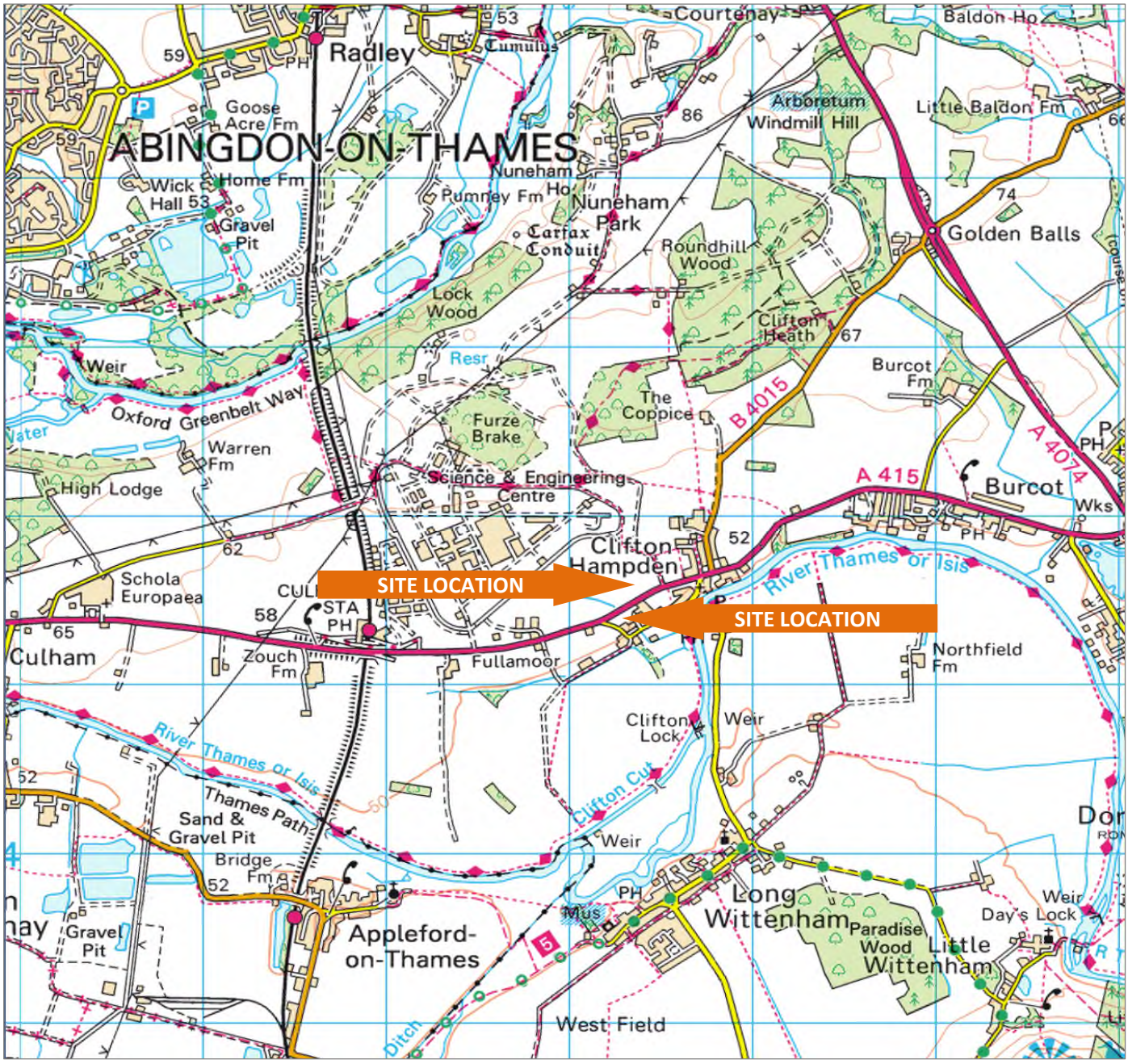
SITE DATA

Figure 1	Site Location Plan
Figures 2 & 3	Proposed development Plans
Figures 4 & 5	Borehole/Trial Pit/CBR Location Plan
Key 1	Notes and Abbreviations Sheet
Figures 6 to 11	Borehole Logs
Figures 12 to 19	Trial Pit Logs
Figures 20 to 27	Infiltration Test Data
Figures 28 to 33	CBR test Logs

APPENDIX B

LABORATORY TEST RESULTS

Table B1	Index Properties
Figures B1 to B4	Particle Size Distribution
Table B2	Contamination Sample Descriptions
Pages 1 to 12	Element Materials Technology Test Report 20/18438
Pages 1 – 8	GIS Selection of Human Health Generic Assessment Criteria (GAC)
Page 1	ESI Statistical Analysis Calculator Sheet



CLIENT:	**Thomas Homes**
SITE:	**Land at Clifton Hampden, Oxon**
Date:	**February 2021**

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton
Abingdon OX13 6DD
Tel 01865 326011

GIS (Southern) Ltd	**SITE LOCATION PLAN**	Report No. S.5632	**Fig** 1

Client: **Thomas Homes**

Site: **Land at Clifton Hampden, Oxon**

Date: **February 2021**

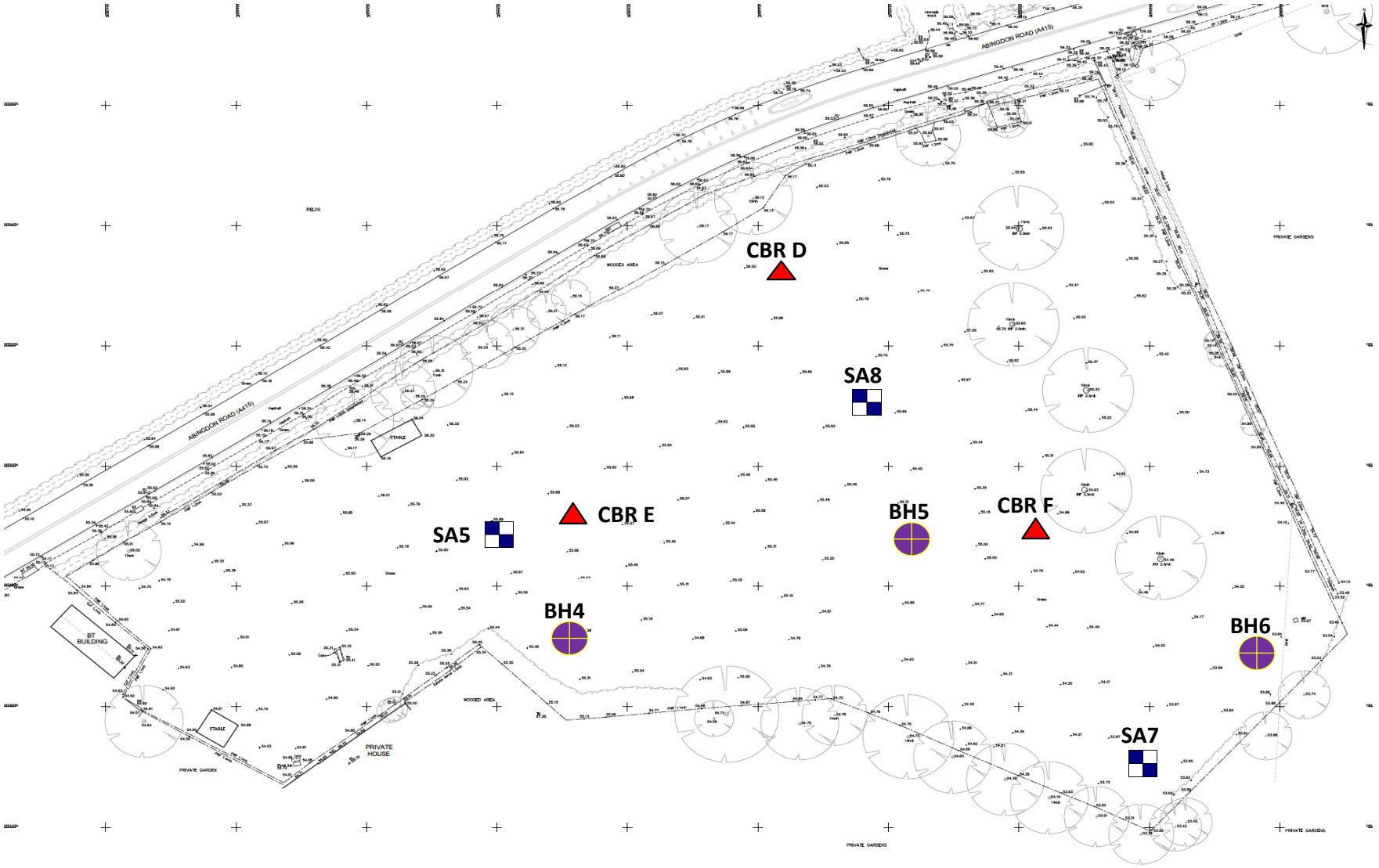
Ground Investigation Services (Southern) Ltd 40 Home Close, Wootton OX13 6DD Tel 01865 326011	**PROPOSED DEVELOPMENT PLAN**	Report No. S.5632	**Fig** 2

Client: **Thomas Homes**

Site: **Land at Clifton Hampden, Oxon**

Date: **February 2021**

Ground Investigation Services (Southern) Ltd 40 Home Close, Wootton OX13 6DD Tel 01865 326011	**PROPOSED DEVELOPMENT PLAN**	Report No. S.5632	**Fig** 3



Client: **Thomas Homes**

Site: **Land at Clifton Hampden**

Date: **February 2021**

Windowless sampling borehole

California Bearing Ratio Test

Trial Pit and Infiltration Test

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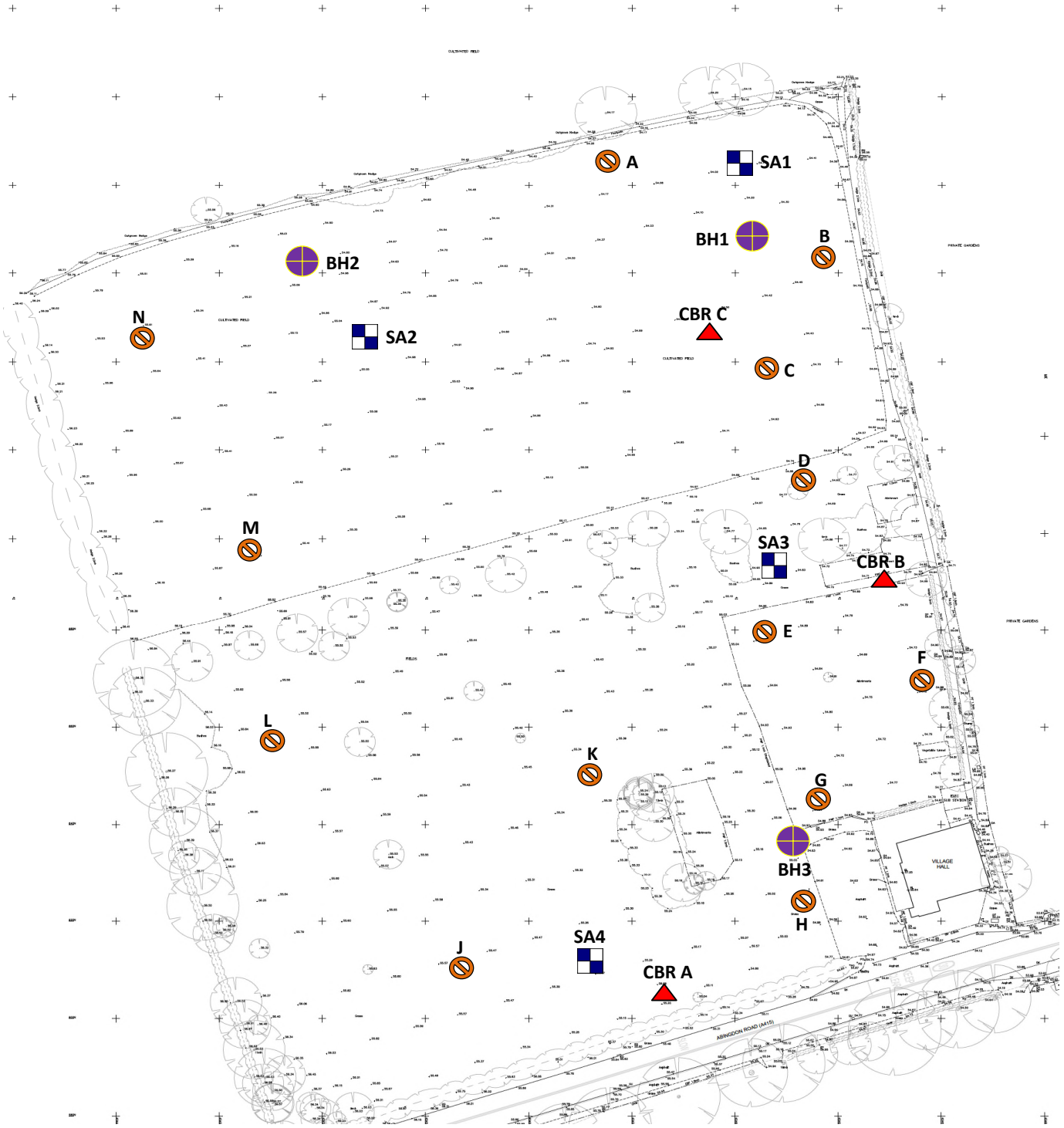
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE/TRIAL PIT/CBR LOCATION PLAN

Report No. S.5632

Fig 4



Windowless Sampling Borehole

Contamination Sample Location

Trial Pit and infiltration test

California Bearing Ratio Test

CLIENT:	**Thomas Homes**
SITE:	**Land at Clifton Hampden, Oxon**
Date:	**February 2021**

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon, Oxon OX13 6DD
Tel: 01865 326011

GIS (Southern) Ltd	**BOREHOLE/TRIAL PIT/CBR PIT LOCATION PLAN**	Report No. S.5632	**Fig** 5

NOTES ON EXPLORATORY HOLE RECORDS

GENERAL NOTES

1 OPERATING PROCEDURES

The procedure used for cable percussion boring, rotary drilling, trial pitting, sampling, in situ and laboratory testing and sample descriptions are generally in accordance with BS5930:2015+A1:2021'Code of practice for Ground investigations', BS EN ISO 14688-1:2002 'Geotechnical investigation and testing – Identification and classification of soil – Part 1 Identification and description', BS EN ISO 14689-1:2003 'Geotechnical investigation and testing – Identification and classification of rock – Part 1 Identification and description' as appropriate, and BS1 377:1990 'Methods of test for soils for civil engineering purposes', unless stated otherwise.

2 GROUNDWATER

Exploratory hole water levels are recorded together with the depths at which seepages or inflows of water are detected. These observations are noted on the Records, but may be misleading for the following reasons:

a) The exploratory hole is rarely left open at the relevant depth for a sufficient time for the water level to reach equilibrium.

b) A permeable stratum may have been sealed off by the borehole casing.

c) Water may have been added to the borehole to facilitate progress.

d) The permeability may have been altered by the excavation/boring/drilling process.

Standpipes or piezometers should be installed when an accurate record of groundwater level is required, however, it should be noted that groundwater levels may vary significantly due to seasonal, climatic or man made effects. Water levels recorded during the investigation and any advice or comment made accordingly may, therefore, not be appropriate to particular foundation, geotechnical design, or temporary works solutions. Long term monitoring of standpipes or piezometers is always recommended when water levels are likely to have a significant effect on design.

3 CHISELLING

The remarks in the Borehole Records contain information on the time spent advancing the borehole by 'Chiselling Techniques', and the depth of borehole over which it was required. Such information may be affected by a wide range of variable factors, unrelated to the geotechnical properties of the strata. Such factors include, but are not restricted to: plant, equipment and operator. The data should, therefore, only be used subjectively and with extreme caution.

4 IDENTIFICATION AND DESCRIPTION OF SOILS - SEE SEPARATE SHEET

The identification system follows the Company's Engineering: Geotechnical Procedures Manual which is based on BS EN ISO 14688-1:2002 and appropriate clarifications in the National Foreword, BS 5930:1999 and BS EN ISO 14689- 1:2003

Relative density terms are given where supported by SPT N values, with the exception of Made Ground. The field assessment of compactness or relative density for coarse grained soils is only given on trial pit records where appropriate assessment of the soils has been undertaken.

Where the terms 'soft to firm', 'firm to stiff' etc. are used they indicate a strength which is close to the borderline between the two terms and cannot be precisely defined by inspection only, and/or which is indicated as borderline or ranging between the two terms after consideration also of in situ and laboratory test results. Consistencies may have been amended in the light of test results

Where 'to' links two terms, as in 'slightly sandy to sandy' this again represents a borderline case or a range, where the precise proportions cannot be determined as outlined previously.

The name of the geological formation is only given where this has been requested and can be determined with confidence (see Clause 41.5 of BS 5930:1999).

5 INTERPRETATION OF THE RESULTS OF THE INVESTIGATION

The description of ground conditions encountered and any engineering interpretation included in the report are based on the results of the boreholes and trial pits and the field and laboratory testing carried out. There may be ground conditions at the site which have not been revealed by the investigation and consequently have not been taken into account.

Any interpolation or extrapolation of strata between exploratory holes shown on any cross sections or site plans is an estimate only of the likely stratification based on general experience of the ground conditions and is subject to the interpretation of the reader.

The term "TOPSOIL" is used in this report to describe the surface, usually organic rich, layer including turf, subsoil and weathered material with roots. The use of this term may not imply that the soil satisfies the requirements of Clause 3 of BS 3882:1994, 'Specification for topsoil', or is suitable for general horticultural and agricultural purposes.

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of a Geotechnical Specialist is sought.

NOTES ON EXPLORATORY HOLE RECORDS

IN SITU TESTING AND SAMPLING

STANDARD PENETRATION TESTS

S( ) Standard Penetration Test (SPT). A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.6kg hammer with a 760mm drop. The penetration resistance (also known as the 'N' value) is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm which is taken through any ground which may be disturbed at the base of the borehole. The test is usually completed when the number of blows recorded during the test drive only reaches 50 in soils or 100 in weak rock. If a sample is not recovered in the sampler, a disturbed sample is taken on completion of the test and given the same depth as the top of the Standard Penetration Test drive.

C( ) Standard Penetration Test carried out with a 60 degree cone. The test is usually conducted in coarse granular soils or weak rock using the same procedure as for the SPT, but with a 50mm diameter, 60 degree apex, solid cone fitted to the split barrel. A bulk disturbed sample is taken and given the same depth as the top of the test drive.

The depth on the borehole record at the left hand side of the 'depth' column is that at the start of the normal 450mm penetration. Where the full penetration of 300mm for the test drive is obtained, the penetration resistance ('N' value) is reported in the 'SPT Blows/N' column. If the full penetration of 300mm in the test drive is not obtained, then the length of drive (test length in mm) and the penetration resistance (number of blows) are both reported. Blows through the initial seating drive (normally 150mm) are not reported.

* in the 'Test Length' column denotes that the blows and penetration were all in the initial Seating Drive section.

OTHER IN SITU TESTS

The following in situ tests are reported on the **Exploratory Hole Records**, in the 'Test' or 'Type' and 'Results' columns where appropriate.

k In situ Permeability Test - refer to detailed test results for permeability values

PMT Pressuremeter Test - refer to detailed test results for modulus values, etc.

VN/R( ) Borehole Shear Vane Test (undrained shear strength - c_u - in kPa) - refer also to detailed test results, N - 'Natural' or peak shear strength, R - Remoulded shear strength

VN/R( ) Hand Shear Vane Test (Direct reading of undrained shear strength in kPa). 'N' and 'R' as above. The values are indicative and should not be taken as being equivalent to laboratory test results. The Pilcon vane results have a factor varying from about a sixth for the 33mm vane to a third for the 19mm vane which reduces the BS1 377 shear vane value. The values presented are therefore approximate and should be treated with great caution if used for design purposes

PP( ) Pocket Penetrometer. Unconfined Strength (UCS) reported in kg/cm^2 to the nearest 0.25 kg/cm^2 or kPa with the same accuracy. Equivalent c_u in kPa is very approximately UCS x 50. Pocket Penetrometers are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated

CBR( ) California Bearing Ratio Test (CBR%) - refer also to detailed test results

PID( ) Photo-Ionisation Detector Readings in headspace of small disturbed chemical samples. Result given in ppm by volume

SAMPLES

U General purpose open tube sample. Sample normally taken with open tube sampler approximately 0.1m diameter and 0.45m long and driven with 80kg sinker bar and 56kg sliding hammer, unless noted otherwise. "XX" in U100 blows column denotes the number of hammer blows. The height of hammer drop can be variable depending on operator technique. Depths are given to the top of the sample if full penetration and recovery are achieved, otherwise actual lengths of penetration and recovery are given in the appropriate columns.

U(X) General purpose open tube sample (X) mm diameter

TW(X) Thin wall (push) sample (X) mm diameter

P(X) Piston sample (X) mm diameter

CBR Sample taken in CBR Mould

D Small disturbed sample (plastic tub or jar with air tight lid)

B Bulk disturbed sample (polythene bag, tied at neck - size dependent on purpose)

W Water sample

Sample not recovered

C Core sample (CS – short core, generally about 100mm; CL – long core, generally 200mm to 300mm)

CD Sample for chemical analysis in a plastic tub

K Sample for chemical analysis in an amber glass jar

V Sample for chemical analysis in a glass vial

CDKV Set of samples for chemical analysis as above

WAC Sample for Waste Acceptance Criteria

ES Environmental Sample

EW Environmental Water Sample

Recommended symbols for soils and rocks – BS 5930:2015+A1:2021

 Made ground

 Topsoil

 Boulders and Cobbles

 Gravel

 Sand

 Silt

 Clay

 Peat

Composite soil types may signified
By combined symbols, e.g.

 Sandy CLAY with a trace of fine medium gravel

 Silty slightly clayey SAND

 Chalk

 Limestone

 Conglomerate

 Brecia

 Coal

 Shale

 Siltstone

 Sandstone

 Mudstone/Claystone

NOTES ON EXPLORATORY HOLE RECORDS

IDENTIFICATION AND DESCRIPTION OF SOILS

	Basic Soil Type	Particle Size (mm)		Visual Identification
Very Coarse Soils	BOULDERS		200	Large Boulders >630mm. These soils only seen complete in pits or exposures. Often difficult to recover from boreholes.
	COBBLES			
COARSE SOILS (Typically over 65% Sand & Gravel Sizes)	GRAVEL	coarse	63	Easily visible to naked eye; particle shape can be described, grading can be described. Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented).
		medium	20	
		fine	6.3	
			2	
	SAND	coarse	0.63	Visible to naked eye; no cohesion when dry; grading can be described. Well graded and poorly graded: as above
		medium	0.2	
		fine		
FINE SOILS (Typically over 35% Silt & Clay Sizes)	SILT	coarse	0.063	Only coarse silt visible with hand lens; exhibits little plasticity and marked dilatancy; slightly granular or silky to touch. Disintegrates in water; lumps dry quickly; possesses cohesion but powders easily between fingers. Term "SILT" or "CLAY" must be used, "SILT/CLAY" not allowed. Dry lumps can be broken but not powdered between the fingers; they also disintegrate under water but more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying usually showing cracks. Intermediate and high plasticity clays show these properties to a moderate and high degree, respectively.
		medium	0.02	
		fine	0.0063	
	CLAY		0.002	
Organic Soils	ORGANIC CLAY, SILT or SAND	Varies		Contains varying amounts of organic vegetable matter - defined by colour: grey - slightly organic; dark grey – organic; black – very organic.

Composite Soil Types (Mixtures of basic soil

Scale of secondary constituents with coarse and very coarse soils. Term before, description after

Term before (term in ' [ ] ' may be used for 2nd'ry parts, matrix etc)	Principal Soil Type	Description after	Approx % 2nd'ry soil type
Slightly (sandy*) [occasional / little]	SAND, GRAVEL; (COBBLES OR BOULDERS (See notes)	Used to describe components of secondary constituents. e.g. Gravel is fine and medium subangular fine sandstone and mudstone.	<5
--(sandy*) [some]			5 – 20
Very (sandy*) [much / many]			20 to 40†
--		and (sand*) or and (cobbles+)	50†

* Fine or coarse soil type as appropriate
\+ Very coarse soil type – see Notes
† described as fine soil depending on behaviour

Scale of secondary constituents with fine soils. Terms before, description after principal constituent.

Term before	Principal Soil Type	Description after	Approx % 2nd'ry soil type
Slightly (sandy*)	CLAY OR SILT	Used to describe components of secondary constituents e.g. gravelly sandy CLAY. Gravel is coarse rounded quartzite	<35
-- (sandy*)			35 to 65†
Very (sandy*)			>65†

* Coarse soil type as appropriate
† or described as coarse soil depending on mass behaviour

EXAMPLES OF COMPOSITE TYPES
(indicating preferred order for description)

Loose brown very sandy subangular coarse GRAVEL with many pockets (<5mm across) of soft grey clay.

Firm thinly interlaminated brown SILT and CLAY. Dense light brown clayey fine and medium SAND.

Density / Consistency / Peat Condition

For very coarse soils qualitative description by inspection of voids and particle packaging.

Standard Penetration Test in Boreholes for Coarse Soils

No of blows	Relative Density
<4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
>50	Very Dense
Slightly cemented	Visual Examination: pick removes soil in lumps which can be abraded.

Silty CLAY or clayey SILT – use prefix only when secondary constituent has significant affect on material characteristics. Terms 'slightly' or 'very' not applicable.

Consistency

Very soft	Finger easily pushed in up to 25mm. Exudes between fingers
Soft	Finger pushed in up to 10mm. Moulded by fingers
Firm	Thumb makes impression easily. Rolls to thread
Stiff	Can be indented slightly by thumb. Crumbles if rolled
Very Stiff	Indented by thumbnail. Cannot be moulded
Hard	Can be scratched by thumb nail
Firm Peat	Fibres compressed together
Spongy Peat	Very compressible, open
Plastic Peat	Moulded in hand, smears

Structure

Term	Field Identification
Homo-geneous	Deposit consists essentially of one type
Interbedded or interlaminated	Alternating layers of varying types. Pre-qualified by thickness term if in equal proportions. Otherwise thickness of, and spacing between, subordinate layers defined
Hetero-geneous	A mixture of types
Weathered (granular)	Particles may be weakened and may show concentric layering
Weathered (cohesive)	Usually has crumb or columnar structure
Fissured	Breaks into blocks along unpolished discontinuities
Sheared	Breaks into blocks along polished discontinuities
Intact	No fissures
Fibrous Peat	Plant remains recognisable and retain some strength. When squeezed only water, no solids
Pseudo-fibrous Peat	Plant remains recognisable, strength lost. Partial decomposition. Turbid water when squeezed, <50% solids
Amorphous Peat	Recognisable plant remains absent, full decomposition. When squeezed only paste with >50% solids
Gyttja	Decomposed plant & animal remains, maybe inorganic constituents
Humus	Plant remains, living organisms & inorganic constituents in topsoil

Interval Scales

Scale of Bedding Spacing	Mean Spacing (mm)	Scale of Spacing of Other Discontinuities / [Blocks]
Very thickly bedded	over 2000	Very widely spaced / [Very large]
Thickly bedded	2000-600	Widely spaced / [Large]
Medium bedded	600-200	Medium spaced / [Medium]
Thinly bedded	200-60	Closely spaced / [Small]
Very thinly bedded	60-20	Very closely / [Very small]
Thickly laminated	20-6	Extremely closely spaced
Thinly laminated	under 6	

Spacing terms may also be used for distance between partings, isolated beds or laminae, desiccation cracks, rootlets etc. Terms such as partings or dustings may be used for laminae less than 2mm and less than 0.6mm respectively.

Discontinuity Shape (See Standard for Persistence/Openness)	Small scale (mm's) rough, smooth Medium scale (cm's) planar, stepped, undulating Large scale (m's) wavy, curved, straight

Particle Nature

Particle Shape & Form

Very angular
(Sub) angular
(Sub) rounded
Well rounded

Low Sphericity
Flat or Elongate

High Sphericity
Cubic

Particle Surface Texture

Rough
Smooth
Polished

NOTES Identification and descriptive method, and descriptions, generally in accordance with BS5930:2015+A1:2021 Section 6 clauses 41 and 43 and BS EN ISO 14688 1:2002
Additional notes relating to BS EN ISO 14688-2:2004 – modified terms for content of secondary fraction given in Annex B Table B1 are not comparable to 5930 and are not be used.
Organic Content :- Low – 2 to 6%; Medium - 6 to 20%; High - >20%. Terms not used on borehole records
Carbonate content :- Only noted if field test with dilute HCl undertaken – Carbonate free if no effervescence; Calcareous if slight effervescence; Highly calcareous if strong reaction
Undrained shear strength :- terms from laboratory or in situ tests not given on borehole records.
Very Coarse Soils – described by initially removing very coarse materials and describing residue before adding back the very coarse soils. If residue is cohesive then described as ' (COBBLES / BOULDERS) with low (cobble / boulder) content with (some / much etc) matrix of ' If residue is granular then described as ' with matrix of ' or as a coarse soil. **Cobbles :-** <10% - low cobble content; 10 to 20% - medium content; >20% - high content; **Boulders** <5% - low boulder content; 5 to 20% - medium content; >20% - high content

GROUND INVESTIGATION SERVICES (SOUTHERN) LTD

Date	Borehole No.
January 2021	**One**

CLIENT	Ground Level (m OD)	Co-ordinates	Sheet 1 of 1
Thomas Homes	54.40		
SITE LOCATION	**Boring Method:**	**Diameter of (casings) and bore (mm) :**	Report No.
Land at Clifton Hampden, Oxon	Windowless Sampling	96, 101 & 116	**S.5632**

SAMPLES AND TESTS										Windowless Sample Recovery	Water depth	Reduced Level	Depth (thickness)	Legend	Strata Description	Backfill/ Installation	Depth
Depth	Type	SPT records energy ratio = 76%					'N' Value	PID	HSV								
metres	& No.	150mm	75mm	75mm	75mm	75mm		ppm	kN/m2		m	m (AOD)	metres				
GL - 1.00	1/U116									GL-1.00 90%	4 ▼ 3 ▼ 1/2 ▼ ▽		0.20		Grass over brown silty fine SAND with some fine flint gravel **TOPSOIL**		
													(0.30)		Soft brown sandy CLAY with a little fine medium gravel		
													0.50		Medium dense brown silty very gravelly SAND. Gravel is fine rare medium rounded sandstone		
1.00-1.45	2/DS	5	5	5	6	7	23			1.00-2.00 100%							
1.00-2.00	3/U101																
													(2.50)				
2.00-2.45	4/DS	9	7	8	10	11	36			2.00-3.00 100%					2.00m - dense with some thin grey clay lenses		
2.00-3.00	5/U96																
3.00-3.45	6/DS	14	12	13	14	11	50					51.40	3.00		- very dense **LOWER GREENSAND FORMATION**		
		*50 blows for 290mm pen'															

Casing Record			Chiselling record			Water level Observations (depths in metres below GL)							
Date	Diam' (mm)	Depth	Time	From (m)	To (m)	Date	Time	strike	Water level (after 20min)	Flow	Casing level	Standing	Remarks
						22.10.20	09.20	0.80	0.70	slow			
						19.11.20						0.62 [1]	
						17.12.20						0.60 [2]	
						15.01.21						0.40 [3]	
						15.02.21						0.24 [4]	

Key

U	Undisturbed Sample	SPT/S	Split Spoon
B	Bulk sample	SPT/C	Solid Cone
D	Disturbed Sample	HSV	Hand Shear Vane
W	Water Sample	Hand pen'	Hand penetrometer
E	Environmental Glass Jar/Plastic tub	▽	Groundwater strike
PID	Photo-ionisation Detector	▼	Groundwater standing

REMARKS

Weather: Cold and wet

Logged by:	SD
Date:	22.10.20
Checked by	JMH
Date:	24.02.21
Approved by	MPB
Date	26.02.21

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

Scale : 1:30

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE LOG

Report No. S.5632

Figure 6

GROUND INVESTIGATION SERVICES (SOUTHERN) LTD

Date	Borehole No.
January 2021	**Two**

CLIENT	Ground Level (m OD)	Co-ordinates	Sheet 1 of 1
Thomas Homes	54.90m		
SITE LOCATION	**Boring Method:**	**Diameter of (casings) and bore (mm) :**	Report No.
Land at Clifton Hampden, Oxon	Windowless Sampling	96, 101 & 116	**S.5632**

SAMPLES AND TESTS											Windowless Sample Recovery	Water depth	Reduced Level	Depth (thickness)	Legend	Strata Description	Backfill/ Installation	Depth
Depth	Type	SPT records energy ratio = 76%					'N' Value	PID	HSV									
metres	& No.	150mm	75mm	75mm	75mm	75mm		ppm	kN/m2		m	m (AOD)	metres				
GL - 1.00	1/U116									GL-1.00 90%	4 1					Grass over brown silty fine SAND with some fine flint gravel **TOPSOIL**		
													0.20			Medium dense brown mottled orange brown slightly clayey gravelly SAND. Gravel is fine rounded sandstone		
											3		(0.70)					
											2							
1.00-1.45	2/DS	5	5	6	7	7	25			1.00-2.00 100%			0.90			Medium dense brown silty very gravelly SAND. Gravel is fine rare medium rounded sandstone		1
1.00-2.00	3/U101																	
														(2.10)				
2.00-2.45	4/DS	12	8	9	11	13	41			2.00-3.00 100%						2.00m - dense - reddish brown		2
2.00-3.00	5/U96																	
																- very dense		
3.00-3.45	6/DS	16	10	11	13	15	49					51.90	3.00			**LOWER GREENSAND FORMATION**		3
																		4
																		5

Casing Record			Chiselling record			Water level Observations (depths in metres below GL)							
Date	Diam' (mm)	Depth	Time	From (m)	To (m)	Date	Time	strike	Water level (after 20min)	Flow	Casing level	Standing	Remarks
						22.10.20	10.00	1.32	1.17	slow			
						19.11.20						0.91 [1]	
						17.12.20						0.70 [2]	
						15.01.21						0.47 [3]	
						15.02.21						0.25 [4]	

Key

U	Undisturbed Sample	SPT/S	Split Spoon
B	Bulk sample	SPT/C	Solid Cone
D	Disturbed Sample	HSV	Hand Shear Vane
W	Water Sample	Hand pen'	Hand penetrometer
E	Environmental Glass Jar/Plastic tub	▽	Groundwater strike
PID	Photo-ionisation Detector	▼	Groundwater standing

REMARKS

Weather: Cold and wet

Logged by:	SD
Date:	22.10.20
Checked by	JMH
Date:	24.02.21
Approved by	MPB
Date	26.02.21

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

Scale : 1:30

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE LOG

Report No. S.5632

Figure 7

GROUND INVESTIGATION SERVICES (SOUTHERN) LTD

Date	Borehole No.
January 2021	**Three**

CLIENT	Ground Level (m OD)	Co-ordinates	Sheet 1 of 1
Thomas Homes	54.90m		
SITE LOCATION	**Boring Method:**	**Diameter of (casings) and bore (mm) :**	Report No.
Land at Clifton Hampden, Oxon	Windowless Sampling	101 & 116	**S.5632**

SAMPLES AND TESTS										Windowless Sample Recovery	Water depth	Reduced Level	Depth (thickness)	Legend	Strata Description	Backfill/ Installation	Depth
Depth	Type	SPT records energy ratio = 76%					'N' Value	PID	HSV								
metres	& No.	150mm	75mm	75mm	75mm	75mm		ppm	kN/m2		m	m (AOD)	metres				
GL - 1.00	1/U116									GL-1.00 90%					Grass over brown silty fine SAND with some gravel sized brick flint and concrete fragments		
												54.50	0.40		**MADE GROUND**		
											4				Medium dense brown silty SAND with a little fine flint and sandstone gravel		
											3						
1.00-1.45	2/DS	8	7	9	9	11	36			1.00-2.00 100%					1.00m - dense		1
1.00-2.00	3/U101												(1.30)				
											2						
											1						
													1.70		Dense to very dense orange brown silty slightly gravelly SAND. Gravel is fine sandstone		
													(0.30)		**LOWER GREENSAND FORMATION**		
2.00-2.45	4/DS	25	27	23			50*					52.90	2.00				2
		*50 blows for 135mm pen'															3
																	4
																	5

Casing Record			Chiselling record			Water level Observations (depths in metres below GL)							
Date	Diam' (mm)	Depth	Time	From (m)	To (m)	Date	Time	strike	Water level (after 20min)	Flow	Casing level	Standing	Remarks
						22.10.20	11.00	1.57	1.42	slow			
						19.11.20						1.34 [1]	
						17.12.20						1.26 [2]	
						15.01.21						0.90 [3]	
						15.02.21						0.62 [4]	

Key

U	Undisturbed Sample	SPT/S	Split Spoon
B	Bulk sample	SPT/C	Solid Cone
D	Disturbed Sample	HSV	Hand Shear Vane
W	Water Sample	Hand pen'	Hand penetrometer
E	Environmental Glass Jar/Plastic tub	▽	Groundwater strike
PID	Photo-ionisation Detector	▼	Groundwater standing

REMARKS

Weather: Cold and wet

Logged by:	SD
Date:	22.10.20
Checked by	JMH
Date:	24.02.21
Approved by	MPB
Date	26.02.21

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

Scale : 1:30

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE LOG

Report No. S.5632

Figure 8

GROUND INVESTIGATION SERVICES (SOUTHERN) LTD

CLIENT Thomas Homes	**Ground Level (m OD)** 55.40m	**Date** January 2021 / **Co-ordinates**	**Borehole No.** Four / Sheet 1 of 1
SITE LOCATION Land at Clifton Hampden, Oxon	**Boring Method:** Windowless Sampling	**Diameter of (casings) and bore (mm) :** 96, 101 & 116	Report No. **S.5632**

Depth (metres)	Type & No.	SPT 150mm	75mm	75mm	75mm	75mm	'N' Value	PID (ppm)	HSV (kN/m2)	Windowless Sample Recovery	Water depth (m)	Reduced Level m (AOD)	Depth (thickness) metres	Strata Description
GL - 1.00	1/U116									GL-1.00 90%				Grass over dark brown humic very clayey fine SAND with a little fine gravel **TOPSOIL**
													0.30	Firm grey intact CLAY with a trace of fine medium rounded flint gravel
1.00-1.45	2/DS	2	3	2	3	3	11			1.00-2.00 100%			(1.30)	0.90m firm to stiff clay
1.00-2.00	3/U101													
													1.60	Stiff light brown mottled olive brown intact and friable CLAY
											4 ▼		(0.50)	
2.00-2.45	4/DS	6	6	7	11	14	38			2.00-3.00 100%				**GAULT FORMATION**
2.00-3.00	5/U101											53.30	**2.10**	Dense orange brown gravelly SAND. Gravel is fine rare medium sandstone
											3 ▼		(0.90)	
3.00-3.45	6/DS	13	9	11	13	15	48					52.40	**3.00**	**LOWER GREENSAND FORMATION**

Casing Record: Date	Diam' (mm)	Depth	Chiselling record: Time	From (m)	To (m)	Water level Observations (depths in metres below GL): Date	Time	strike	Water level (after 20min)	Flow	Casing level	Standing	Remarks
						22.10.20	12.00	dry					
						19.11.20						dry	
						17.12.20						dry	
						15.01.21						2.72 [3]	
						15.02.21						1.81 [4]	

Key

U	Undisturbed Sample	SPT/S	Split Spoon
B	Bulk sample	SPT/C	Solid Cone
D	Disturbed Sample	HSV	Hand Shear Vane
W	Water Sample	Hand pen'	Hand penetrometer
E	Environmental Glass Jar/Plastic tub	▽	Groundwater strike
PID	Photo-ionisation Detector	▼	Groundwater standing

REMARKS

Weather: Cold and wet

Logged by:	SD
Date:	22.10.20
Checked by	JMH
Date:	24.02.21
Approved by	MPB
Date	26.02.21

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020 Scale : 1:30

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE LOG

Report No. S.5632 Figure 9

GROUND INVESTIGATION SERVICES (SOUTHERN) LTD

Date	Borehole No.
January 2021	**Five**

CLIENT	Ground Level (m OD)	Co-ordinates	Sheet 1 of 1
Thomas Homes	55.30m		
SITE LOCATION	**Boring Method:**	**Diameter of (casings) and bore (mm) :**	Report No.
Land at Clifton Hampden, Oxon	Windowless Sampling	101 & 116	**S.5632**

SAMPLES AND TESTS										Windowless Sample Recovery	Water depth	Reduced Level	Depth (thickness)	Legend	Strata Description	Backfill/ Installation	Depth
Depth	Type	SPT records energy ratio = 76%					'N' Value	PID	HSV								
metres	& No.	150mm	75mm	75mm	75mm	75mm		ppm	kN/m2		m	m (AOD)	metres				
GL - 1.00	1/U116									GL-1.00 90%					Grass over dark brown humic very clayey fine SAND **TOPSOIL**		
													0.30		Soft to firm brown mottled light brown intact CLAY		
													(0.30)				
													0.60		Firm light grey mottled light brown intact CLAY		
1.00-1.45	2/DS	1	2	3	3	2	10			1.00-2.00 100%							
1.00-2.00	3/U101										4 ▼		(1.00)				
												53.70	**1.60**		**GAULT FORMATION**		
															Dense to very dense brown silty fine gravelly SAND with some cream silt lenses. Gravel is fine sandstone		
													(0.40)				
2.00-2.45	4/DS	13	14	20	16		50*				3 2 ▼▼	53.30	**2.00**		**LOWER GREENSAND FORMATION**		
		*50 blows for 190mm pen'															

Casing Record			Chiselling record			Water level Observations (depths in metres below GL)							
Date	Diam' (mm)	Depth	Time	From (m)	To (m)	Date	Time	strike	Water level (after 20min)	Flow	Casing level	Standing	Remarks
						22.10.20	13.00	dry					
						19.11.20						dry	
						17.12.20						1.98 [2]	
						15.01.21						1.95 [3]	
						15.02.21						1.21 [4]	

Key

U	Undisturbed Sample	SPT/S	Split Spoon
B	Bulk sample	SPT/C	Solid Cone
D	Disturbed Sample	HSV	Hand Shear Vane
W	Water Sample	Hand pen'	Hand penetrometer
E	Environmental Glass Jar/Plastic tub	▽	Groundwater strike
PID	Photo-ionisation Detector	▼	Groundwater standing

REMARKS

Weather: Cold and wet

Logged by:	SD
Date:	22.10.20
Checked by	JMH
Date:	24.02.21
Approved by	MPB
Date	26.02.21

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

Scale : 1:30

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE LOG

Report No. S.5632

Figure 10

GROUND INVESTIGATION SERVICES (SOUTHERN) LTD

Date	Borehole No.
January 2021	**Six**

CLIENT	Ground Level (m OD)	Co-ordinates	Sheet 1 of 1
Thomas Homes	53.82m		
SITE LOCATION	**Boring Method:**	**Diameter of (casings) and bore (mm) :**	Report No.
Land at Clifton Hampden, Oxon	Windowless Sampling	101 & 116	**S.5632**

SAMPLES AND TESTS											Windowless Sample Recovery	Water depth	Reduced Level	Depth (thickness)	Legend	Strata Description	Backfill/ Installation	Depth
Depth	Type	SPT records energy ratio = 76%					'N' Value	PID	HSV									
metres	& No.	150mm	75mm	75mm	75mm	75mm		ppm	kN/m2		m	m (AOD)	metres				
GL - 1.00	1/U116									GL-1.00 90%						Grass over dark brown humic very clayey fine SAND with much fine medium flint gravel **TOPSOIL**		
													0.30			Loose dark brown humic silty friable organic silty SAND		
													(0.50)					
													0.80			Soft to firm orange brown mottled brown very sandy CLAY with a little fine medium sandstone gravel and a trace of medium rounded flint gravel		
1.00-1.45	2/DS	3	2	3	3	5	13			1.00-2.00 100%								
1.00-2.00	3/U101												(0.70)					
																SUMMERTOWN-RADLEY SAND AND GRAVEL MEMBER		
												52.32	**1.50**			Dense to very dense orange brown silty fine gravelly SAND. Gravel is fine rare medium sandstone		
											4 ▼							
2.00-2.45	4/DS	13	9	13	17	11	50*			2.00-2.50 100%			(1.00)					
2.00-2.50		*50 blows for 260mm pen'																
																LOWER GREENSAND FORMATION		
												51.32	**2.50**					

Casing Record			Chiselling record			Water level Observations (depths in metres below GL)							
Date	Diam' (mm)	Depth	Time	From (m)	To (m)	Date	Time	strike	Water level (after 20min)	Flow	Casing level	Standing	Remarks
						22.10.20	15.00	dry					
						19.11.20						dry	
						17.12.20						dry	
						15.01.21						dry	
						15.02.21						1.77 [4]	

Key

U	Undisturbed Sample	SPT/S	Split Spoon
B	Bulk sample	SPT/C	Solid Cone
D	Disturbed Sample	HSV	Hand Shear Vane
W	Water Sample	Hand pen'	Hand penetrometer
E	Environmental Glass Jar/Plastic tub	▽	Groundwater strike
PID	Photo-ionisation Detector	▼	Groundwater standing

REMARKS

Weather: Cold and wet

Logged by:	SD
Date:	22.10.20
Checked by	JMH
Date:	24.02.21
Approved by	MPB
Date	26.02.21

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

Scale : 1:30

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

BOREHOLE LOG

Report No. S.5632

Figure 11

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA1

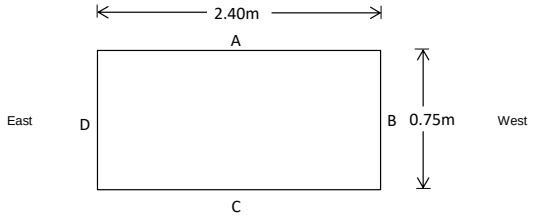
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
0.50		D				▽		0.30		Brown silty humic SAND with a little fine rounded flint gravel **TOPSOIL**
								(0.45)		Medium dense light brown clayey SAND with a little fine medium coarse rounded flint gravel 0.65m- very gravelly **LOWER GREENSAND FORMATION**
								0.75		

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	0.75m
Groundwater (standing):	0.75m (after 30 minutes duration)
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA2

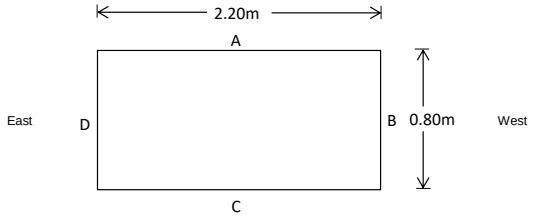
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
0.10		ES						0.28		Brown silty humic SAND with a little fine medium rounded flint gravel **TOPSOIL**
0.50		D				▽		(0.47)		Medium dense light brown silty SAND with a little fine medium coarse rounded flint gravel and very thin clay bands **LOWER GREENSAND FORMATION**
								0.75		

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	0.70m
Groundwater (standing):	0.70m (after 30 minutes duration)
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA3

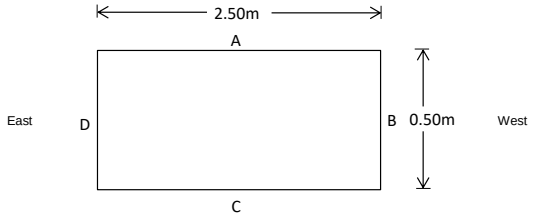
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
								0.20		Brown silty humic SAND **TOPSOIL**
0.50		D						(0.50)		Loose light brown silty fine SAND
						▽		0.70		
1.00		B						(0.30)		Medium dense reddish brown mottled grey silty gravelly medium coarse SAND **LOWER GREENSAND FORMATION**
								1.00		

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	0.90m
Groundwater (standing):	0.90m (after 30 minutes duration)
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA4

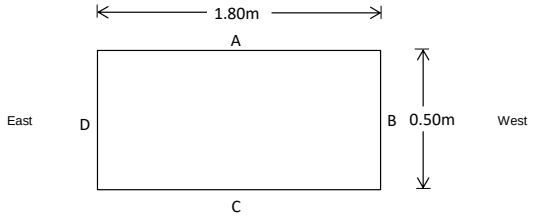
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
								0.30		Brown silty humic SAND with a trace of fine medium gravel **TOPSOIL**
0.50		D						(0.80)		Loose to medium dense light brown silty fine SAND with a little fine medium rounded flint gravel
1.00		B				▽		1.10		
								(0.30)		Medium dense reddish brown and brown gravelly coarse SAND Gravel is fine medium rare coarse sandstone **LOWER GREENSAND FORMATION**
								1.40		

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	1.20m
Groundwater (standing):	1.20m (after 30 minutes duration)
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA5

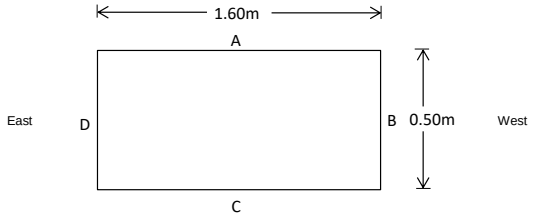
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
								0.30		Dark brown mottled greyish brown humic clayey SAND **TOPSOIL**
0.50		D						(0.40)		Firm brownish grey mottled light brown intact CLAY with a little fine medium coarse rounded flint gravel
								0.70		Firm light grey intact CLAY
1.00		B						(1.30)		
1.50		B								1.50m - with some cream silt lenses
										1.80m - orange brown mottling
2.00		B						2.00		**GAULT FORMATION**
								(0.20)		Medium dense light brown silty SAND **LOWER GREENSAND FORMATION**
								2.20		

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	dry
Groundwater (standing):	dry
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA6

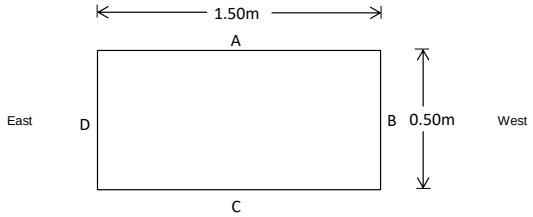
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
								0.45		Dark brown mottled greyish brown humic clayey SAND with some large roots **TOPSOIL**
0.50		D						(0.65)		Firm grey slightly sandy intact and friable CLAY
1.00		B						1.10		
								(0.40)		Firm to stiff orange brown mottled light grey intact CLAY
1.50		B						1.50		
								(0.20)		Firm orange brown mottled grey slightly sandy CLAY with a little fine medium sandstone gravel
								1.70		**GAULT FORMATION**
								(0.30)		Medium dense orange brown SAND with much fine medium coarse angular sandstone gravel
2.00		B						2.00		**LOWER GREENSAND FORMATION**

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	dry
Groundwater (standing):	dry
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

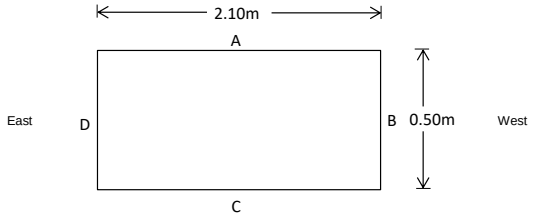
For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd 40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011	Date: February 2021 Ground Level : Orientation: East-west	TRIAL PIT **SA7**
CLIENT Thomas Homes	Co-Ordinates (NGR):	Sheet 1 of 1
SITE LOCATION Land at Clifton Hampden, Oxon		Report No. **S.5632**

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
										Dark brown mottled greyish brown humic clayey SAND with some fine medium roots **TOPSOIL***
0.50		D						**0.40**		Medium dense orange brown silty SAND and fine rare medium angular sandstone GRAVEL
1.00		B						(0.90)		
								1.30		**LOWER GREENSAND FORMATION**

PHOTOGRAPH MISSING

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	dry
Groundwater (standing):	dry
Logged by	SD
Checked by	MPB

General Remarks:

* Topsoil was 0.40m depth along the west face but dropped down to 1.00m along the east face

Scale 1:30

For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

GROUND INVESTIGATION SERVICES (Southern) Ltd

40 Home Close, Wootton, Abingdon, Oxon OX13 6DD Tel 01865 326011

CLIENT

Thomas Homes

SITE LOCATION

Land at Clifton Hampden, Oxon

Date: February 2021

Ground Level :

Orientation: East-west

Co-Ordinates (NGR):

TRIAL PIT

SA8

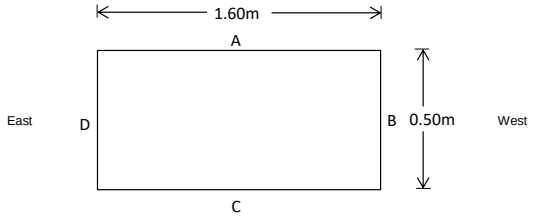
Sheet 1 of 1

Report No.

S.5632

SAMPLES AND TESTS						water	Reduced	Depth	Legend	STRATA AND DESCRIPTION
Depth metres	No.	Type	PID % v/v	Hand pen' kN/m2	HSV kN/m2	depth m	Level m (AOD)	(thickness) metres		
								0.30		Dark brown mottled greyish brown humic clayey SAND **TOPSOIL**
0.50		D						(0.50)		Firm grey mottled medium grey sandy friable CLAY with a little medium coarse rounded flint gravel
								0.80		
1.00		B						(0.70)		Firm to stiff light brown and grey intact CLAY with pockets of light brown gravelly sand and a trace of rounded flint cobble
1.50		B						1.50		
								(0.50)		Loose to medium dense light brown slightly gravelly clayey SAND with pockets of cream brown and grey clayey sand
2.00		B						2.00		**SUMMERTOWN-RADLEY SAND AND GRAVEL MEMBER**

Trial Pit Dimensions



Date of logging:	14 December 2021
Excavation plant:	3T excavator
Pit stability:	Stable
Weather:	Cold and dry
Groundwater (strike):	dry
Groundwater (standing):	dry
Logged by	SD
Checked by	MPB

General Remarks:

Scale 1:30

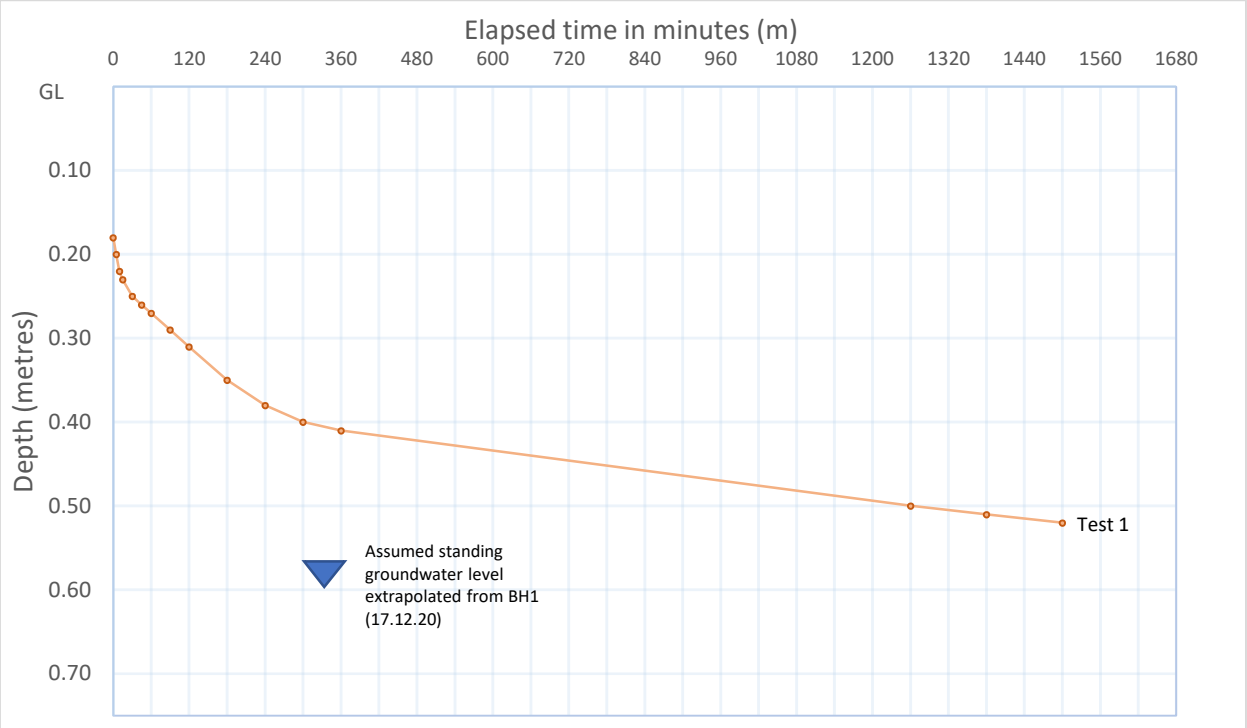
For explanation of symbols and abbreviations see preface to Borehole records. All depths in metres. Logged in accordance with BS5930:2015+A1:2020

CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.18		
5	0.20		
10	0.22		
15	0.23		
30	0.25		
45	0.26		
60	0.27		
90	0.29		
120	0.31		
180	0.35		
240	0.38		
300	0.40		
360	0.41		
1260	0.50		
1380	0.51		
1500	0.52		

TRIAL PIT	**SA1**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	0.75m	Date of test	14-16.12.2020
Standing:	0.60m*		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.75**
Soakage Trial Pit Length L_t (m) =	**2.40**
Total Depth from ground level D_{tb} (m) =	**0.75 (0.60)***
Internal Surface Area of trial pit a_{p50} (m) =	**3.13**
Storage Volume between 75-25% V_p (m) =	**0.38**
Time for water to fall from 75-25% t_p (minutes) =	**1148.25**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**
SOIL INFILTRATION RATE* (f) =	**1.76 x 10^{-6} m/sec**



COMMENTS: * Standing groundwater level substituted trial pit base depth in order to calculate Soil infiltration Rate

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

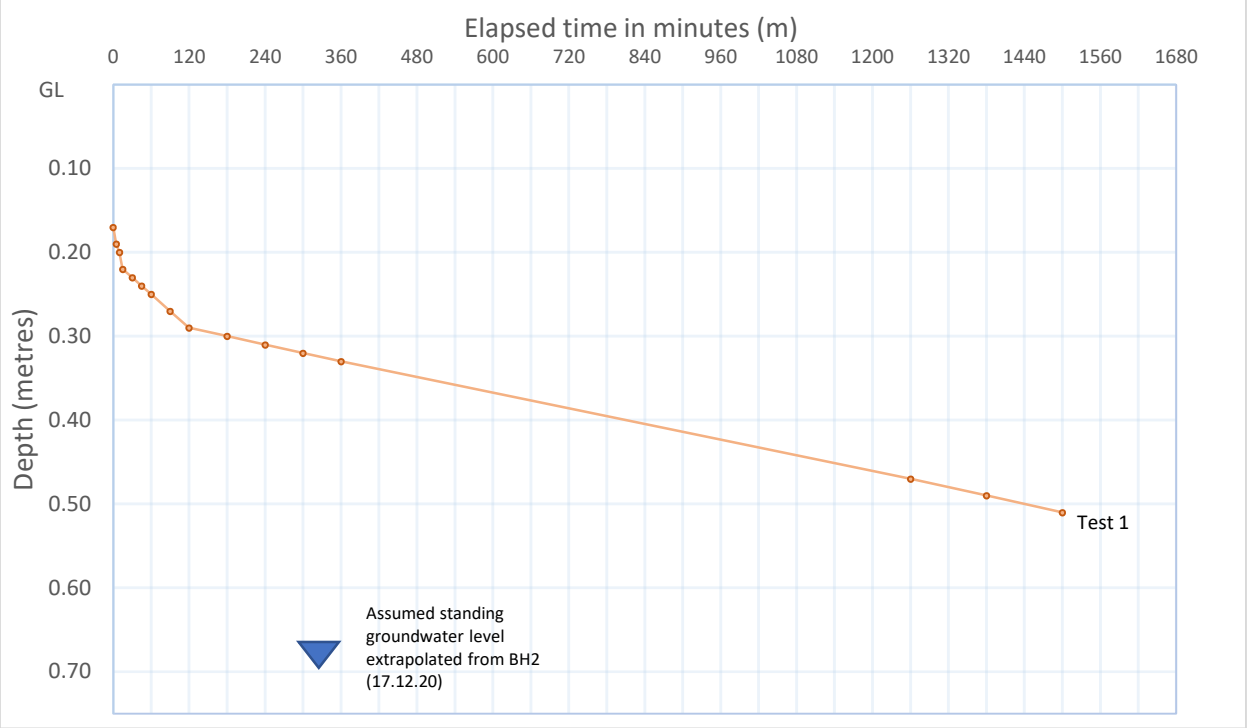
Fig. 20

CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.17		
5	0.19		
10	0.20		
15	0.22		
30	0.23		
45	0.24		
60	0.25		
90	0.27		
120	0.29		
180	0.30		
240	0.31		
300	0.32		
360	0.33		
1260	0.47		
1380	0.49		
1500	0.51		

TRIAL PIT	**SA2**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	0.75m	Date of test	14-16.12.2020
Standing:	0.70m*		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.80**
Soakage Trial Pit Length L_t (m) =	**2.20**
Total Depth from ground level D_{tb} (m) =	**0.75 (0.70)***
Internal Surface Area of trial pit a_{p50} (m) =	**3.35**
Storage Volume between 75-25% V_p (m) =	**0.47**
Time for water to fall from 75-25% t_p (minutes) =	**1305**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**
SOIL INFILTRATION RATE* (f) =	**1.78 x 10^{-6} m/sec**



COMMENTS: * Standing groundwater level substituted trial pit base depth in order to calculate Soil infiltration Rate

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

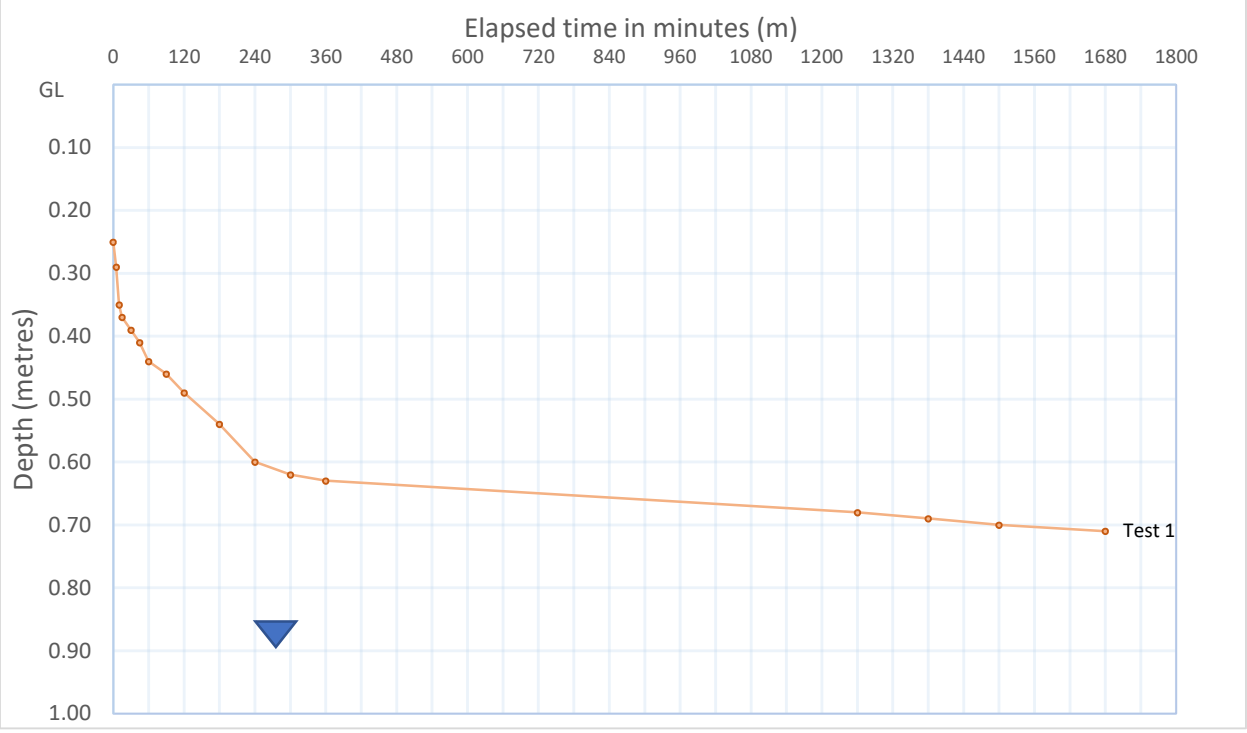
Fig. 21

CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.25		
5	0.29		
10	0.35		
15	0.37		
30	0.39		
45	0.41		
60	0.44		
90	0.46		
120	0.49		
180	0.54		
240	0.60		
300	0.62		
360	0.63		
1260	0.68		
1380	0.69		
1500	0.70		
1680	0.71		

TRIAL PIT	**SA3**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	0.90m	Date of test	14-16.12.2020
Standing:	0.90m		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.50**
Soakage Trial Pit Length L_t (m) =	**2.50**
Total Depth from ground level D_{tb} (m) =	**1.00 (0.90)***
Internal Surface Area of trial pit a_{p50} (m) =	**3.20**
Storage Volume between 75-25% V_p (m) =	**0.41**
Time for water to fall from 75-25% t_p (minutes) =	**1633.7**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**
SOIL INFILTRATION RATE* (f) =	**1.30 x 10^{-6} m/sec**



COMMENTS: * Standing groundwater level substituted trial pit base depth in order to calculate Soil infiltration Rate

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

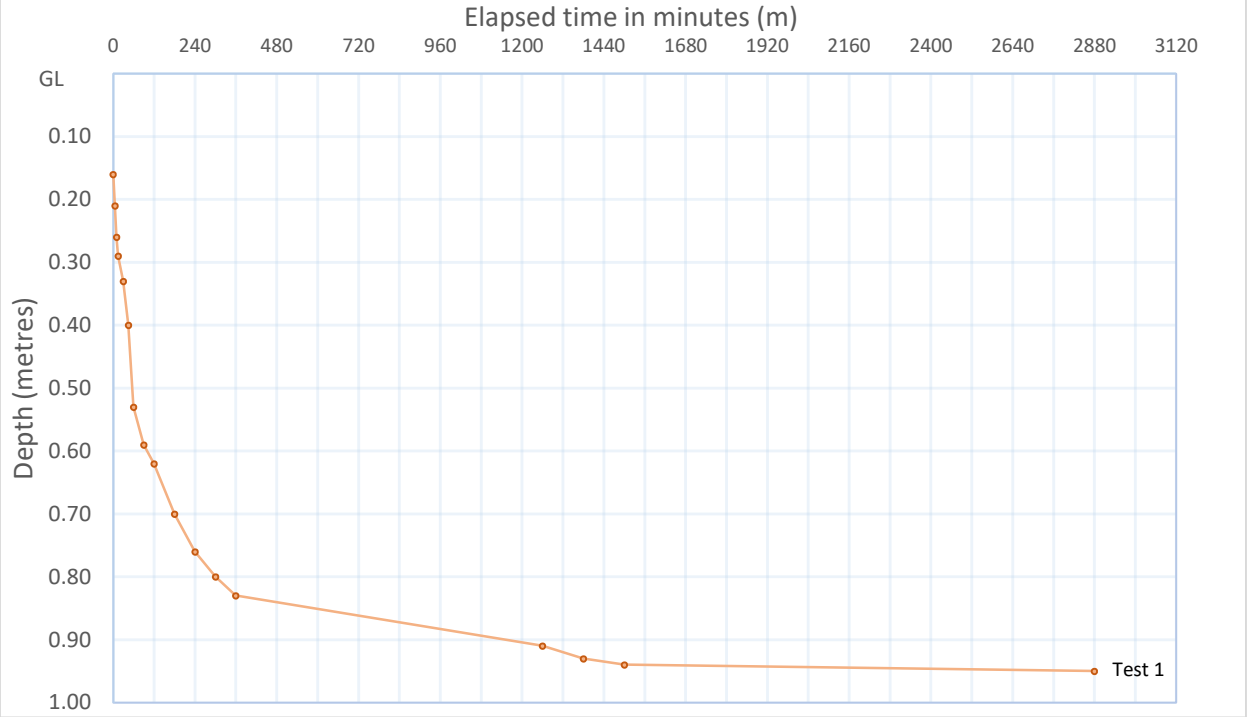
Fig. 22

CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.16		
5	0.21		
10	0.26		
15	0.29		
30	0.33		
45	0.40		
60	0.53		
90	0.59		
120	0.62		
180	0.70		
240	0.76		
300	0.80		
360	0.83		
1260	0.91		
1380	0.93		
1500	0.94		
2880	0.95		

TRIAL PIT	**SA4**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	1.20m	Date of test	14-16.12.2020
Standing:	1.20m		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.50**
Soakage Trial Pit Length L_t (m) =	**1.80**
Total Depth from ground level D_{tb} (m) =	**1.40 (0.95)***
Internal Surface Area of trial pit a_{p50} (m) =	**3.20**
Storage Volume between 75-25% V_p (m) =	**0.41**
Time for water to fall from 75-25% t_p (minutes) =	**1633.7**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**
SOIL INFILTRATION RATE* (f) =	**1.11 x 10^{-5} m/sec**



COMMENTS: * Standing groundwater level substituted trial pit base depth in order to calculate Soil infiltration Rate

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

Fig. 23

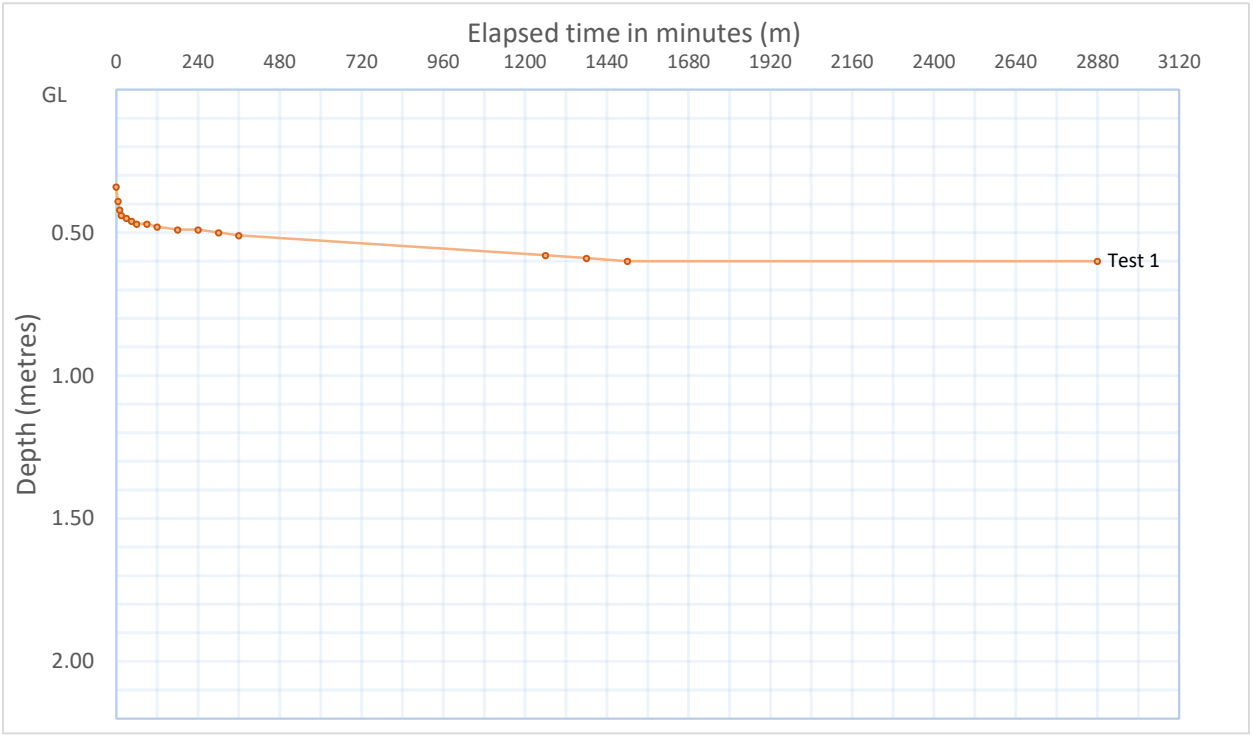
CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.34		
5	0.39		
10	0.42		
15	0.44		
30	0.45		
45	0.46		
60	0.47		
90	0.47		
120	0.48		
180	0.49		
240	0.49		
300	0.50		
360	0.51		
1260	0.58		
1380	0.59		
1500	0.60		
2880	0.60		

TRIAL PIT	**SA5**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	dry	Date of test	14-16.12.2020
Standing:	dry		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.50**
Soakage Trial Pit Length L_t (m) =	**1.60**
Total Depth from ground level D_{tb} (m) =	**2.20**
Internal Surface Area of trial pit a_{p50} (m) =	**4.71**
Storage Volume between 75-25% V_p (m) =	**0.74**
Time for water to fall from 75-25% t_p (minutes) =	**#DIV/0!**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**

SOIL INFILTRATION RATE* (f) = N/A



COMMENTS:

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

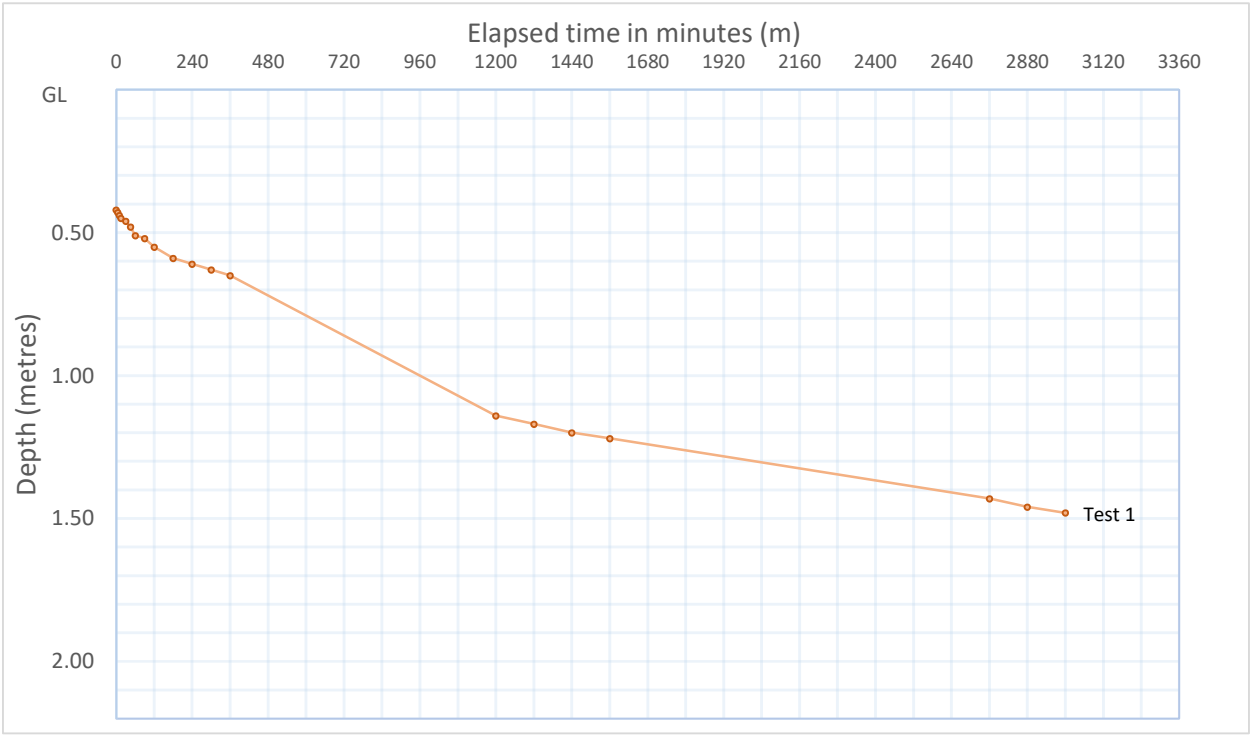
Fig. 24

CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.42		
5	0.43		
10	0.44		
15	0.45		
30	0.46		
45	0.48		
60	0.51		
90	0.52		
120	0.55		
180	0.59		
240	0.61		
300	0.63		
360	0.65		
1200	1.14		
1320	1.17		
1440	1.20		
1560	1.22		
2760	1.43		
2880	1.46		
3000	1.48		

TRIAL PIT	**SA6**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	dry	Date of test	14-16.12.2020
Standing:	dry		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.50**
Soakage Trial Pit Length L_t (m) =	**1.50**
Total Depth from ground level D_{tb} (m) =	**2.00**
Internal Surface Area of trial pit a_{p50} (m) =	**3.91**
Storage Volume between 75-25% V_p (m) =	**0.59**
Time for water to fall from 75-25% t_p (minutes) =	**2357.1**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**
SOIL INFILTRATION RATE* (f) =	**1.07 x 10^{-6}m/sec**



COMMENTS:

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

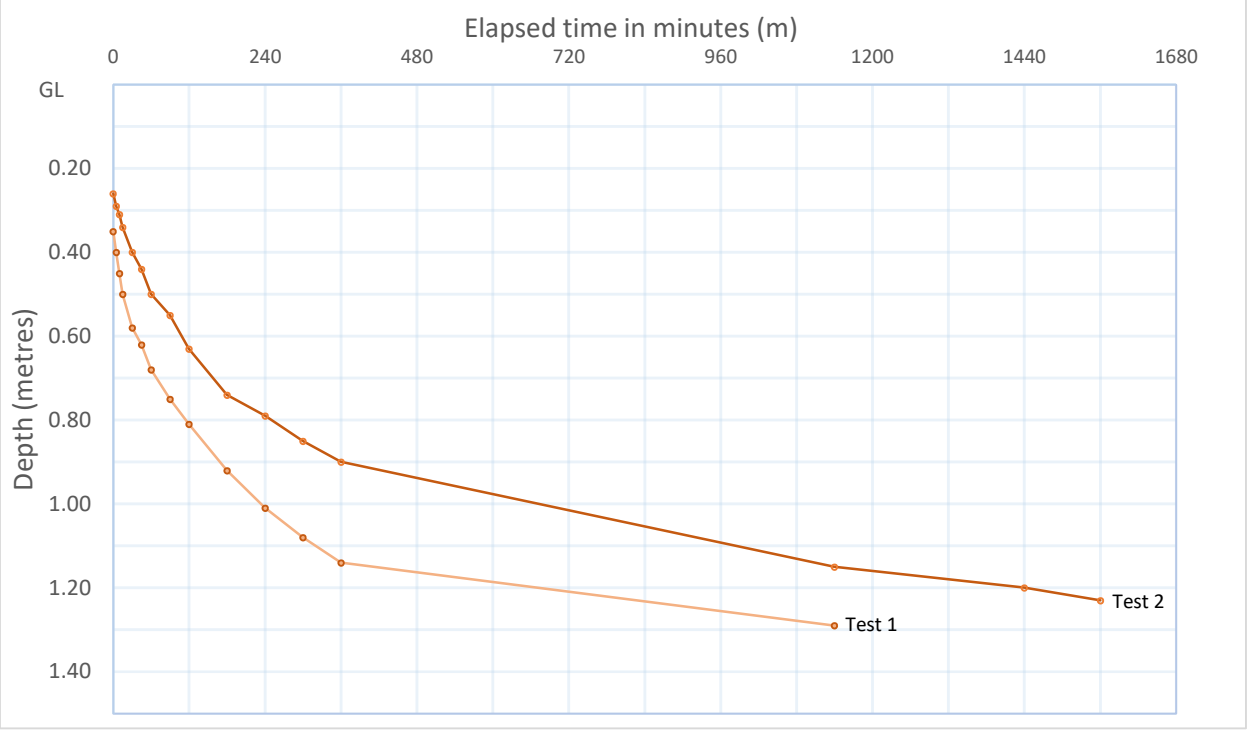
Fig. 25

CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.35	0.26	
5	0.40	0.29	
10	0.45	0.31	
15	0.50	0.34	
30	0.58	0.40	
45	0.62	0.44	
60	0.68	0.50	
90	0.75	0.55	
120	0.81	0.63	
180	0.92	0.74	
240	1.01	0.79	
300	1.08	0.85	
360	1.14	0.90	
1140	1.29	1.15	
1440		1.20	
1560		1.23	

TRIAL PIT	**SA7**	Logged by:	M Boughton
Test No.	2	Checked by:	J Huxham
Groundwater Strike:	dry	Date of test	14-16.12.2020
Standing:	dry		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.50**
Soakage Trial Pit Length L_t (m) =	**2.10**
Total Depth from ground level D_{tb} (m) =	**1.30**
Internal Surface Area of trial pit a_{p50} (m) =	**3.75**
Storage Volume between 75-25% V_p (m) =	**0.42**
Time for water to fall from 75-25% t_p (minutes) =	**724.8**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**
SOIL INFILTRATION RATE* (f) =	**3.34 x 10^{-6}m/sec**



COMMENTS:

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

Fig. 26

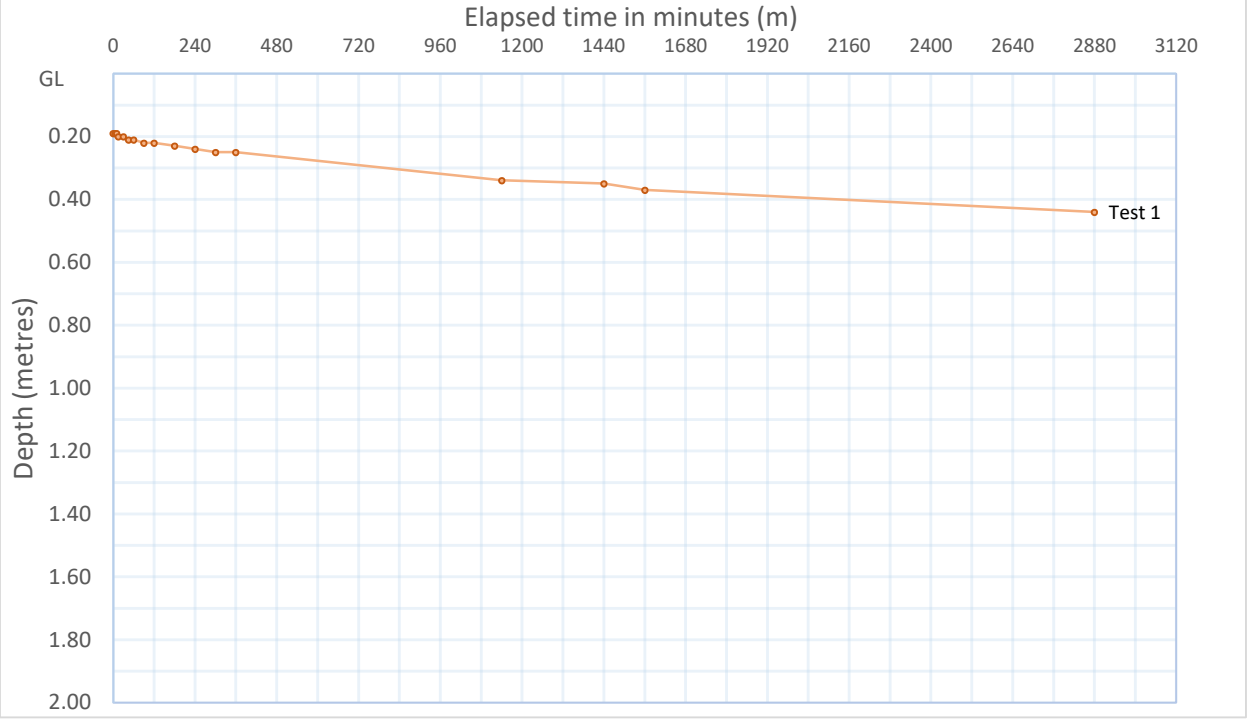
CALCULATION OF SOIL INFILTRATION RATE

Elapsed time in minutes	Depth to water (m) Test 1	Test 2	Test 3
0	0.19		
5	0.19		
10	0.19		
15	0.20		
30	0.20		
45	0.21		
60	0.21		
90	0.22		
120	0.22		
180	0.23		
240	0.24		
300	0.25		
360	0.25		
1140	0.34		
1440	0.35		
1560	0.37		
2880	0.44		

TRIAL PIT	**SA8**	Logged by:	M Boughton
Test No.	1	Checked by:	J Huxham
Groundwater Strike:	dry	Date of test	14-16.12.2020
Standing:	dry		
Weather	Cold and wet		

Soakage Trial Pit Width W_t (m) =	**0.50**
Soakage Trial Pit Length L_t (m) =	**1.60**
Total Depth from ground level D_{tb} (m) =	**2.00**
Internal Surface Area of trial pit a_{p50} (m) =	**4.60**
Storage Volume between 75-25% V_p (m) =	**0.72**
Time for water to fall from 75-25% t_p (minutes) =	**#DIV/0!**
Allowance for infiltration through soakaway base	NO/~~YES~~
Free volume in aggregate (%) =	**100**

SOIL INFILTRATION RATE* (f) = N/a



COMMENTS:

CLIENT: **Thomas Homes**

SITE : **Land at Clifton Hampden, Oxon**

Date: **February 2021**

BRE DIGEST DG365: 2016

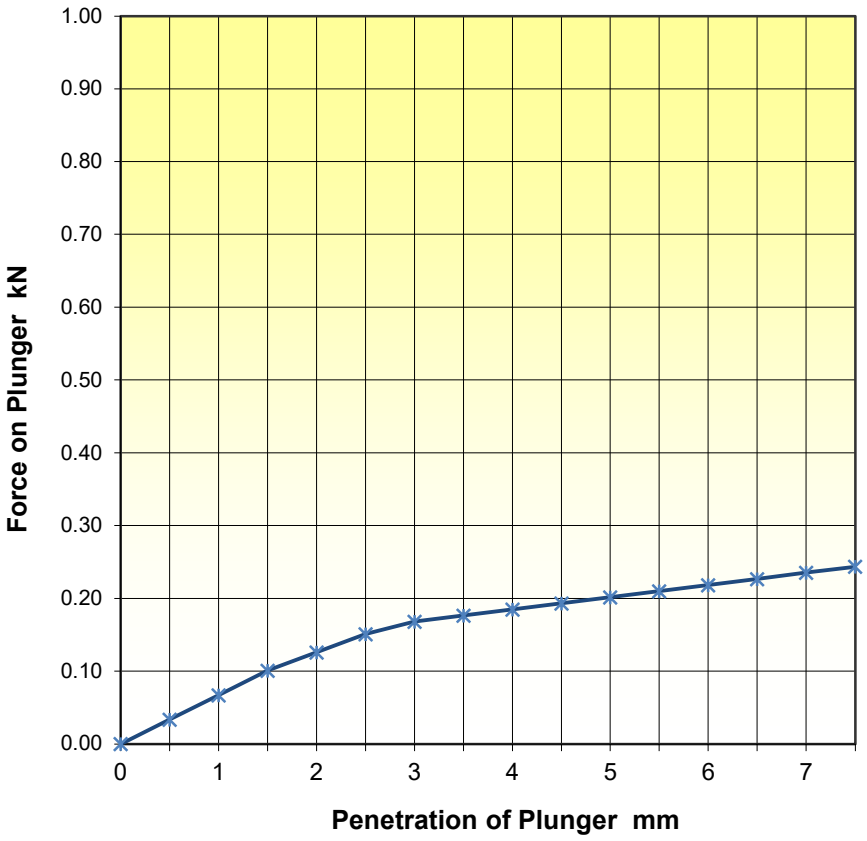
SOAKAWAY DESIGN

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton, Abingdon OX13 6DD
Tel 01865 326011

INFILTRATION TEST DATA

Report No. S.5632

Fig. 27



Pen' of plunger	Force on plunger	
mm	Load gauge	kN
0	0	0
0.5	4	0.0336
1	8	0.0672
1.5	12	0.1008
2	15	0.1008
2.5	18	0.1512
3	20	0.168
3.5	21	0.1764
4	22	0.1848
4.5	23	0.1932
5	24	0.2016
5.5	25	0.21
6	26	0.2184
6.5	27	0.2268
7	28	0.2352
7.5	29	0.2436

TEST SAMPLE DESCRIPTION (depth in m)

0.50 Dark brown silty fine humic SAND

Area of annulus of disc used	16216	mm^2
Mass of surcharge	4	kg
Proving ring size	10kN	
Calibration of ring	8.4*	
* Proving ring calibration certificate KL01213 (0.0084kN/Div)		
Water content	21	%
Plasticity Index		%
Weather	Mild with rain	

CBR TEST RESULTS

Penetration mm	Force kN	Standard Force kN	CBR %
2.5	0.15	13.2	1.1
5.0	0.20	20.0	1.0

ACCEPTED CBR ..1 %

Remarks:

Test No. **CBR A** **Depth below existing GL:** **0.50m**

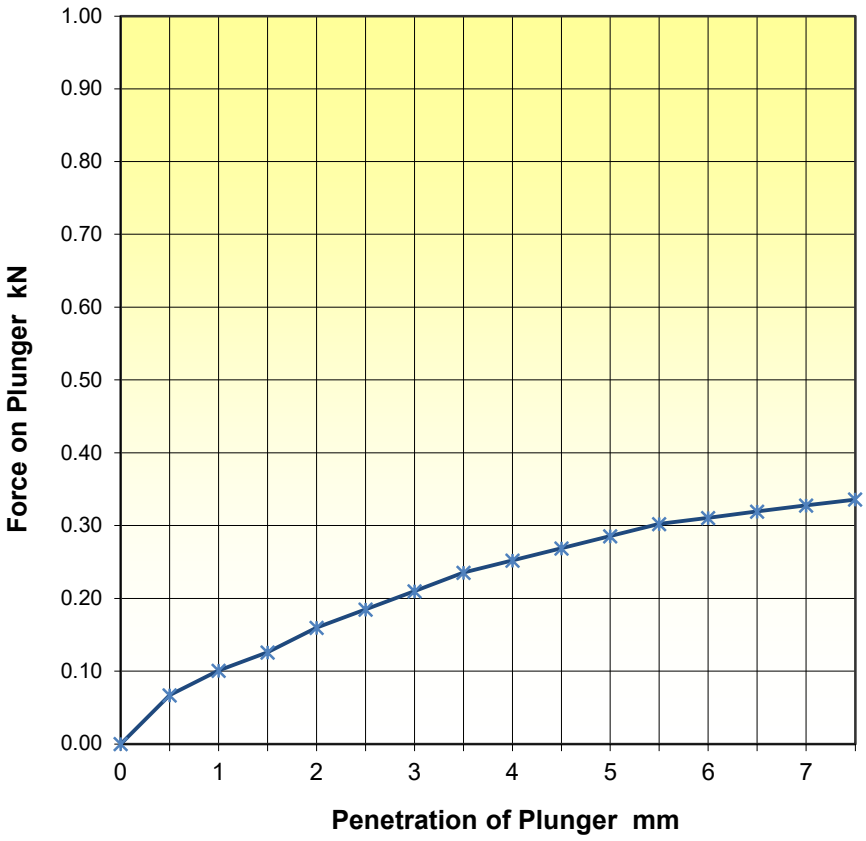
CLIENT: **Thomas Homes Ltd**

LOCATION: **Land at Clifton Hampden, Oxon**

DATE OF TEST: **15 December 2020**

Test Method BS 1377
Part 9 1990 - Method 4.3
Determination of the in-situ
California Bearing Ratio (CBR)
* proving ring calibration

GIS (Southern) Ltd	**CALIFORNIA BEARING RATIO TEST**	Report No. S.5632	**Fig.** 28



Pen' of plunger	Force on plunger	
mm	Load gauge	kN
0	0	0
0.5	8	0.0672
1	12	0.1008
1.5	15	0.126
2	19	0.126
2.5	22	0.1848
3	25	0.21
3.5	28	0.2352
4	30	0.252
4.5	32	0.2688
5	34	0.2856
5.5	36	0.3024
6	37	0.3108
6.5	38	0.3192
7	39	0.3276
7.5	40	0.336

TEST SAMPLE DESCRIPTION (depth in m)

0.50 Dark brown silty fine humic SAND

Area of annulus of disc used	16216	mm^2
Mass of surcharge	4	kg
Proving ring size	10kN	
Calibration of ring	8.4*	
* Proving ring calibration certificate KL01213 (0.0084kN/Div)		
Water content	19	%
Plasticity Index		%
Weather	Mild with rain	

CBR TEST RESULTS

Penetration mm	Force kN	Standard Force kN	CBR %
2.5	0.18	13.2	1.4
5.0	0.29	20.0	1.4

ACCEPTED CBR ..1 %

Remarks:

Test No. **CBR B** **Depth below existing GL:** **0.50m**

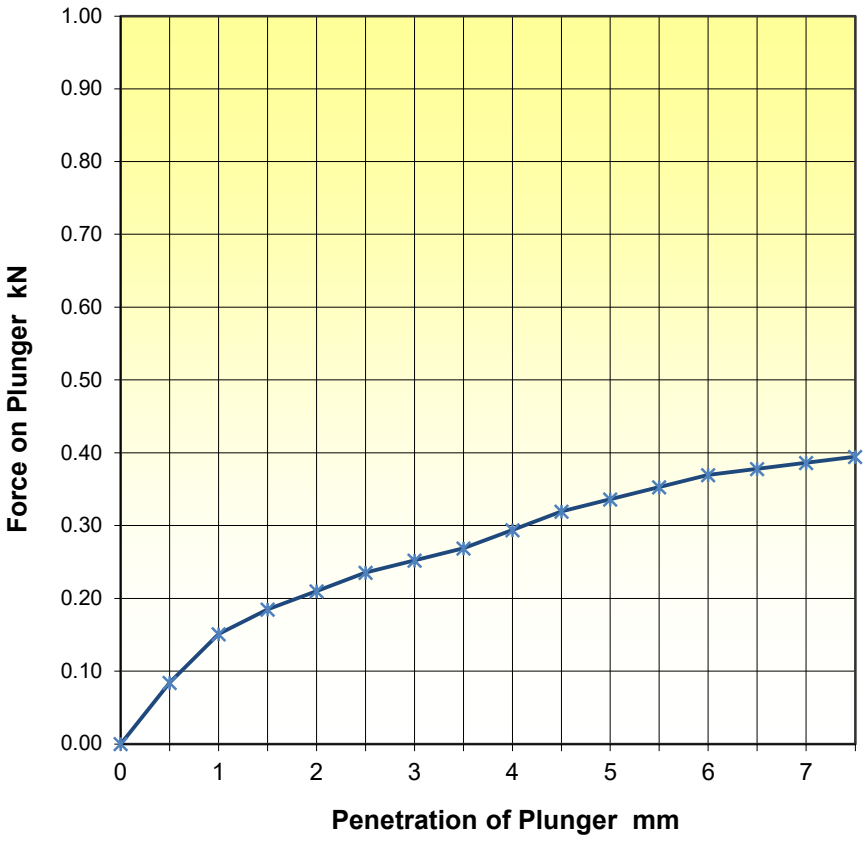
CLIENT: **Thomas Homes Ltd**

LOCATION: **Land at Clifton Hampden, Oxon**

DATE OF TEST: **15 December 2020**

Test Method BS 1377
Part 9 1990 - Method 4.3
Determination of the in-situ
California Bearing Ratio (CBR)
* proving ring calibration

GIS (Southern) Ltd	**CALIFORNIA BEARING RATIO TEST**	Report No. S.5632	**Fig.** 29



Pen' of plunger	Force on plunger	
mm	Load gauge	kN
0	0	0
0.5	10	0.084
1	18	0.1512
1.5	22	0.1848
2	25	0.1848
2.5	28	0.2352
3	30	0.252
3.5	32	0.2688
4	35	0.294
4.5	38	0.3192
5	40	0.336
5.5	42	0.3528
6	44	0.3696
6.5	45	0.378
7	46	0.3864
7.5	47	0.3948

TEST SAMPLE DESCRIPTION (depth in m)

0.50 Light brown and brown silty slightly clayey fine SAND

Area of annulus of disc used	16216	mm^2
Mass of surcharge	4	kg
Proving ring size	10kN	
Calibration of ring	8.4*	
* Proving ring calibration certificate KL01213 (0.0084kN/Div)		
Water content	18	%
Plasticity Index	11	%
Weather	Mild with rain	

CBR TEST RESULTS

Penetration mm	Force kN	Standard Force kN	CBR %
2.5	0.24	13.2	1.8
5.0	0.34	20.0	1.7

ACCEPTED CBR ..2 %

Remarks:

Test No. **CBR C** **Depth below existing GL:** **0.50m**

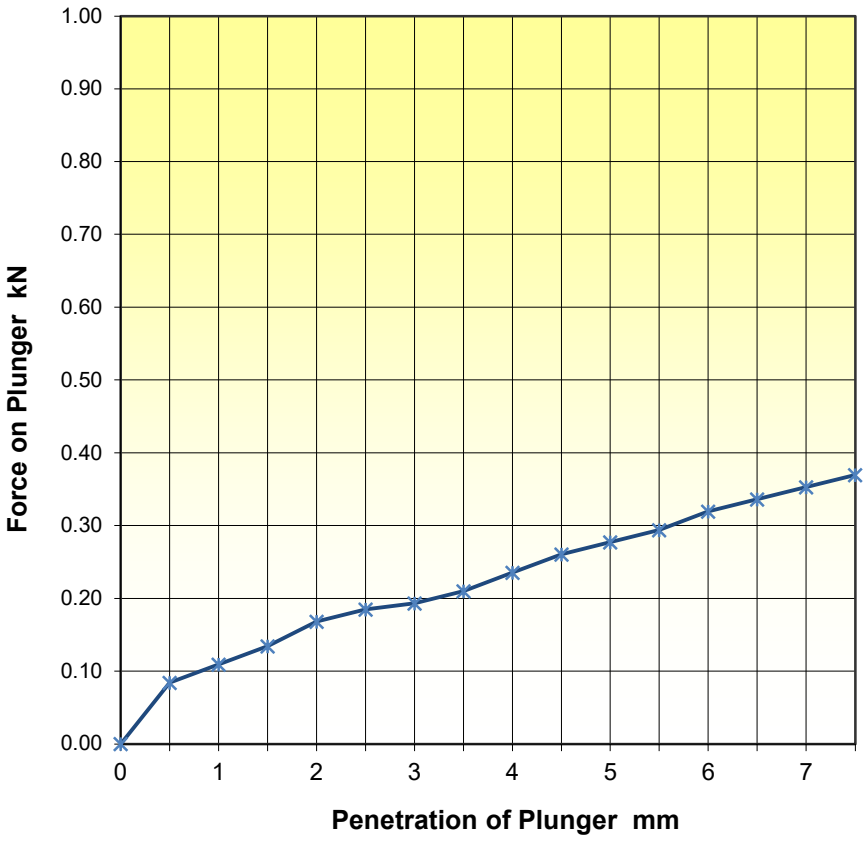
CLIENT: **Thomas Homes Ltd**

LOCATION: **Land at Clifton Hampden, Oxon**

DATE OF TEST: **15 December 2020**

Test Method BS 1377
Part 9 1990 - Method 4.3
Determination of the in-situ
California Bearing Ratio (CBR)
* proving ring calibration

GIS (Southern) Ltd	**CALIFORNIA BEARING RATIO TEST**	Report No. S.5632	**Fig.** 30



Pen' of plunger	Force on plunger	
mm	Load gauge	kN
0	0	0
0.5	10	0.084
1	13	0.1092
1.5	16	0.1344
2	20	0.1344
2.5	22	0.1848
3	23	0.1932
3.5	25	0.21
4	28	0.2352
4.5	31	0.2604
5	33	0.2772
5.5	35	0.294
6	38	0.3192
6.5	40	0.336
7	42	0.3528
7.5	44	0.3696

TEST SAMPLE DESCRIPTION (depth in m)

0.50 Medium brown and brown gravelly CLAY

Area of annulus of disc used	16216	mm^2
Mass of surcharge	4	kg
Proving ring size	10kN	
Calibration of ring	8.4*	
* Proving ring calibration certificate KL01213 (0.0084kN/Div)		
Water content	25	%
Plasticity Index	16	%
Weather	Mild with rain	

CBR TEST RESULTS

Penetration mm	Force kN	Standard Force kN	CBR %
2.5	0.18	13.2	1.4
5.0	0.28	20.0	1.4

ACCEPTED CBR ..1 %

Remarks:

Test No. **CBR D** **Depth below existing GL:** **0.50m**

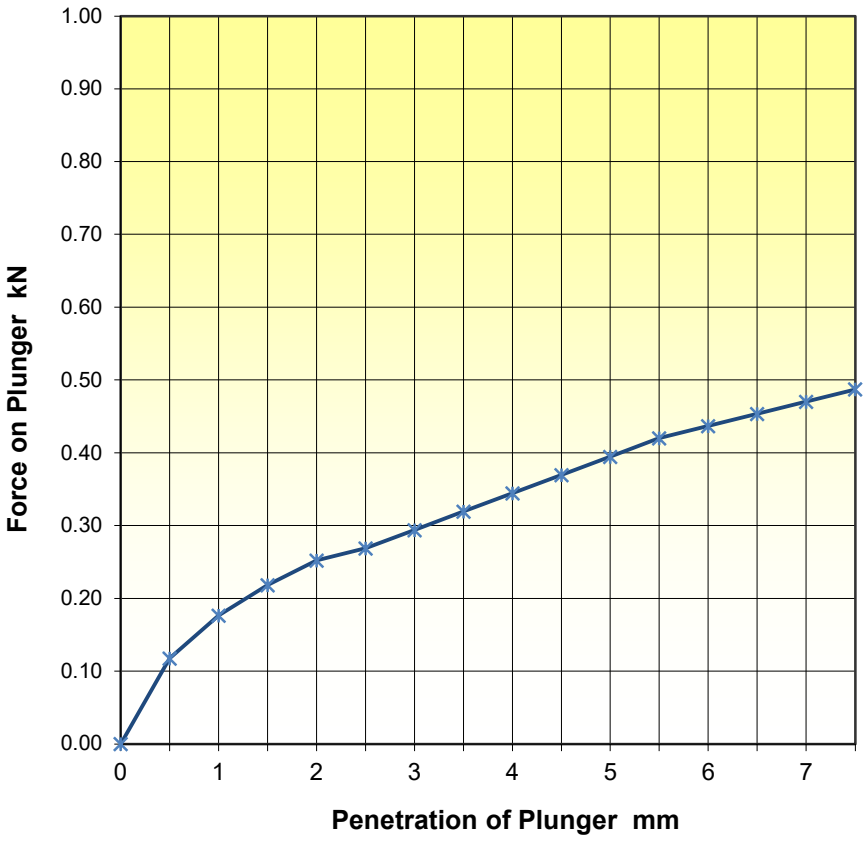
CLIENT: **Thomas Homes Ltd**

LOCATION: **Land at Clifton Hampden, Oxon**

DATE OF TEST: **15 December 2020**

Test Method BS 1377
Part 9 1990 - Method 4.3
Determination of the in-situ
California Bearing Ratio (CBR)
* proving ring calibration

GIS (Southern) Ltd	**CALIFORNIA BEARING RATIO TEST**	Report No. S.5632	**Fig.** 31



Pen' of plunger	Force on plunger	
mm	Load gauge	kN
0	0	0
0.5	14	0.118
1	21	0.176
1.5	26	0.218
2	30	0.218
2.5	32	0.269
3	35	0.294
3.5	38	0.319
4	41	0.344
4.5	44	0.370
5	47	0.395
5.5	50	0.420
6	52	0.437
6.5	54	0.454
7	56	0.470
7.5	58	0.487

TEST SAMPLE DESCRIPTION (depth in m)

0.50 Brown/medium brown gravelly CLAY

Area of annulus of disc used	16216	mm^2
Mass of surcharge	4	kg
Proving ring size	10kN	
Calibration of ring	8.4*	
* Proving ring calibration certificate KL01213 (0.0084kN/Div)		
Water content	24	%
Plasticity Index	17	%
Weather	Mild with rain	

CBR TEST RESULTS

Penetration mm	Force kN	Standard Force kN	CBR %
2.5	0.27	13.2	2.0
5.0	0.39	20.0	2.0

ACCEPTED CBR ..2 %

Remarks:

Test No. **CBR E** **Depth below existing GL:** **0.50m**

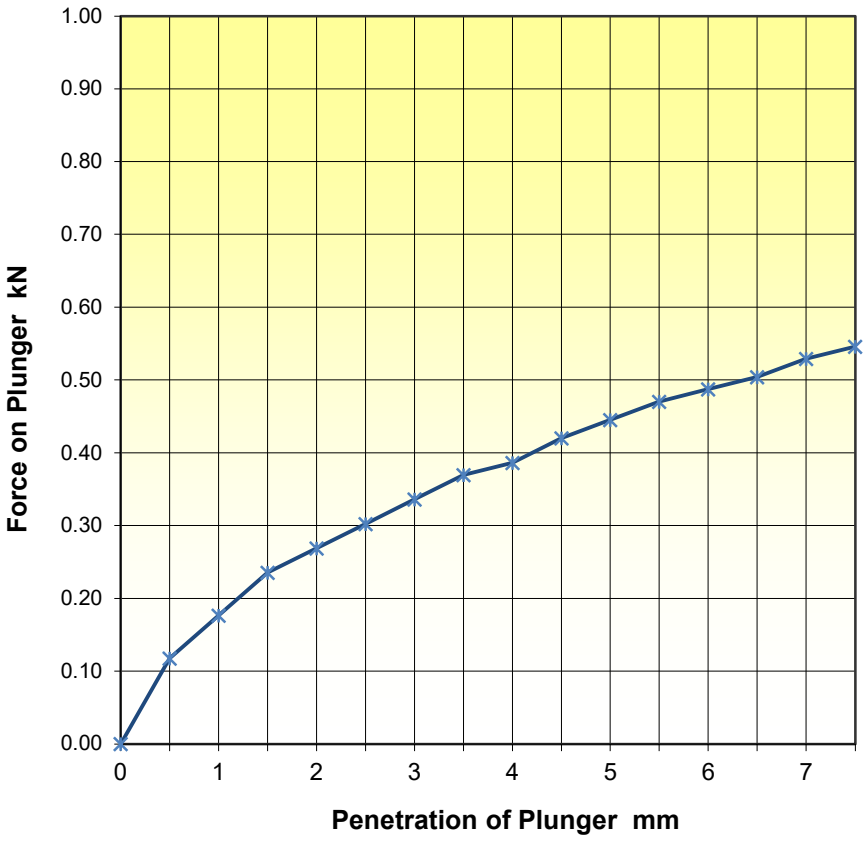
CLIENT: **Thomas Homes Ltd**

LOCATION: **Land at Clifton Hampden, Oxon**

DATE OF TEST: **15 December 2020**

Test Method BS 1377
Part 9 1990 - Method 4.3
Determination of the in-situ
California Bearing Ratio (CBR)
* proving ring calibration

GIS (Southern) Ltd	**CALIFORNIA BEARING RATIO TEST**	Report No. S.5632	**Fig.** 32



Pen' of plunger	Force on plunger	
mm	Load gauge	kN
0	0	0
0.5	14	0.118
1	21	0.176
1.5	28	0.235
2	32	0.235
2.5	36	0.302
3	40	0.336
3.5	44	0.370
4	46	0.386
4.5	50	0.420
5	53	0.445
5.5	56	0.470
6	58	0.487
6.5	60	0.504
7	63	0.529
7.5	65	0.546

TEST SAMPLE DESCRIPTION (depth in m)

0.50 Firm orange brown mottled brown slightly sandy friable CLAY

Area of annulus of disc used	16216	mm^2
Mass of surcharge	4	kg
Proving ring size	10kN	
Calibration of ring	8.4*	
* Proving ring calibration certificate KL01213 (0.0084kN/Div)		
Water content	21	%
Plasticity Index	16	%
Weather	Mild with rain	

CBR TEST RESULTS

Penetration mm	Force kN	Standard Force kN	CBR %
2.5	0.30	13.2	2.3
5.0	0.45	20.0	2.2

ACCEPTED CBR ..2 %

Remarks:

Test No. **CBR F** **Depth below existing GL:** **0.50m**

CLIENT: **Thomas Homes Ltd**

LOCATION: **Land at Clifton Hampden, Oxon**

DATE OF TEST: **15 December 2020**

Test Method BS 1377
Part 9 1990 - Method 4.3
Determination of the in-situ
California Bearing Ratio (CBR)
* proving ring calibration

GIS (Southern) Ltd	**CALIFORNIA BEARING RATIO TEST**	Report No. S.5632	**Fig.** 33

Ref No.	Sample Depth m	Moisture content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Plasticity Index (Adjusted) %	Mass Passing 425µm %	Shrinkage potential NHBC Guidelines	Classification BS 1377-Part 2: 1990	Sample Description
BH4	1.00	29	70	34	36	36	100	M	CH/CV	Clay
BH4	2.00	22	64	33	31	29	95	M	CH	Clay
BH5	0.50	23	51	28	23	23	100	M	CH	Clay
BH5	1.00	31	75	31	44	44	100	H	CV	Clay
BH6	1.00	12	30	20	10	9	85	N	CL	Silty sand
CBR A	0.50	21								Silty sand
CBR B	0.50	19								Silty sand
CBR C	0.50	18	30	19	11	11	97	L	CL	Silty sand
CBR D	0.50	25	43	27	16	15	92	L	CI	Sandy clay
CBR E	0.50	24	44	27	17	11	65	L	CI	Sandy gravelly cly
CBR F	0.50	21	43	27	16	14	85	L	CI	Sandy gravelly clay

REMARKS:

CL	Inorganic CLAY low plasticity	ML	Inorganic SILT low compressibility
CI	Inorganic CLAY medium plasticity	MI	Inorganic SILT medium compressibility
CH	Inorganic CLAY high plasticity	MH	Inorganic SILT high compressibility
CV	Inorganic CLAY very high plasticity	MV	Inorganic SILT very high compressibility
CE	Inorganic CLAY extremely high plasticity	ME	Inorganic SILT extremely high compressibility
N	Non shrinkage Potential	(O)	Organic matter
L	Low shrinkage Potential		
M	Medium shrinkage Potential		
H	High shrinkage Potential		

CLIENT: **Thomas Homes**

SITE: **Land at Clifton Hampden, Oxon**

Ref:

DATE: **February 2021**

(BS EN ISO 17892-12 : Clauses 5.3 and 5.5 : 2018)
Natural water content
Liquid limit - cone penetrometer method (definitive method)
Plastic limit and plasticity index

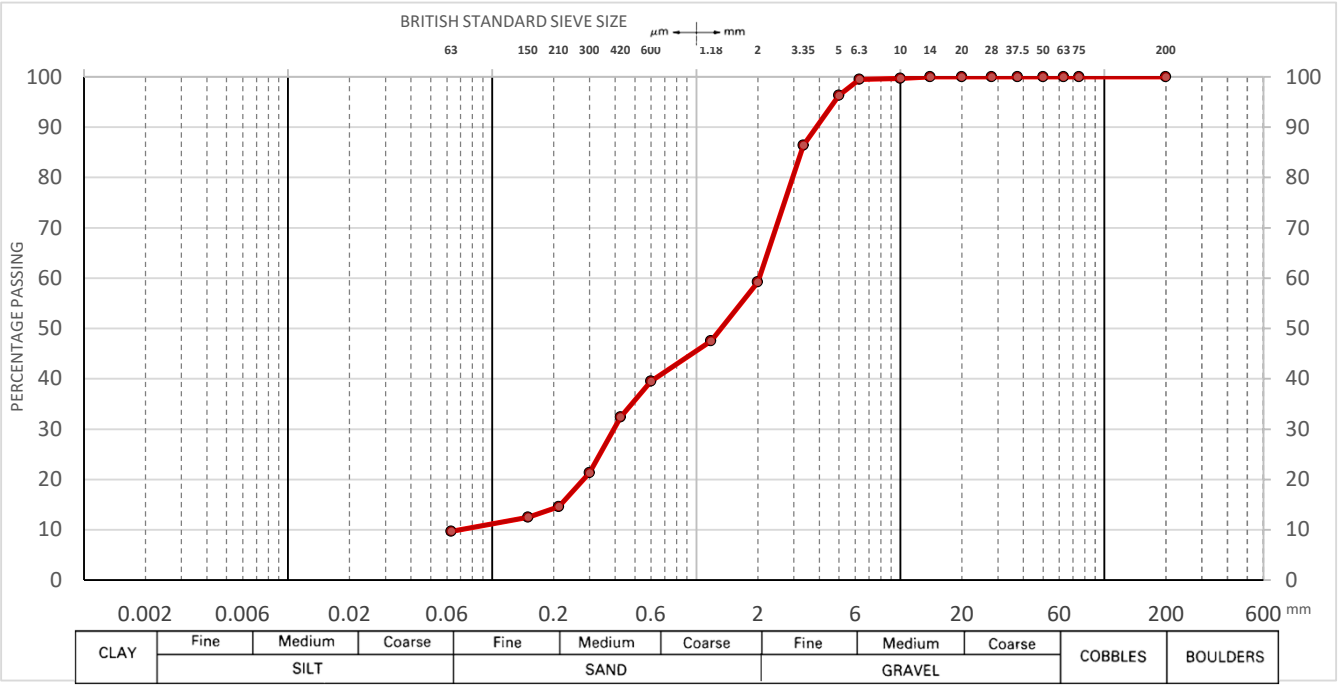
Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton OX13 6DD
Tel 01865 326011

INDEX PROPERTIES

Report No. S.5632

Table B1

Soil description or classification	Sieving		Sedimentation		Percentage particle sizes				
	Preparation	Mass kg	Pre-treatment	Mass g	Clay	Silt	Sand	Gravel	Cobbles
Orange brown silty fine medium coarse SAND and fine gravel LOWER GREENSAND FORMATION	oven dried	1.56			10		50	40	0



BS Test Sieve size mm	Mass Retained %	Total Passing %
200	0	100
75	0	100
63	0	100
50	0	100
37.5	0	100
28	0	100
20	0	100
14	0	100
10	0.3	99.7
6.3	0.2	99.5
5	3.2	96.3
3.35	9.9	86.4
2	27.2	59.2
1.18	11.7	47.5
Microns		
600	8	39.5
425	7.1	32.4
300	11.1	21.3
212	6.7	14.6
150	2.1	12.5
63	2.8	9.7
Passing 63	10	
Sedimentation Analysis		

* Tested in accordance with the following clauses of BS EN ISO 17892-4:2016: Clause 5.2, 5.3 and 5.4 Particle Size Distribution

5.2* Wet sieve

5.3 Sedimentation by hydrometer

5.4 Sedimentation by pipette

Borehole No. One

Sample No. 1

Depth: 1.00m

Date of testing: 07 January 2021

GRADING CLASSIFICATION:

coefficient of curvature C_C = n/a

uniformity coefficient C_U = n/a

NARROW-GAP GRADED

Drawn by	Checked by	Approved by

CLIENT: **Thomas Homes**

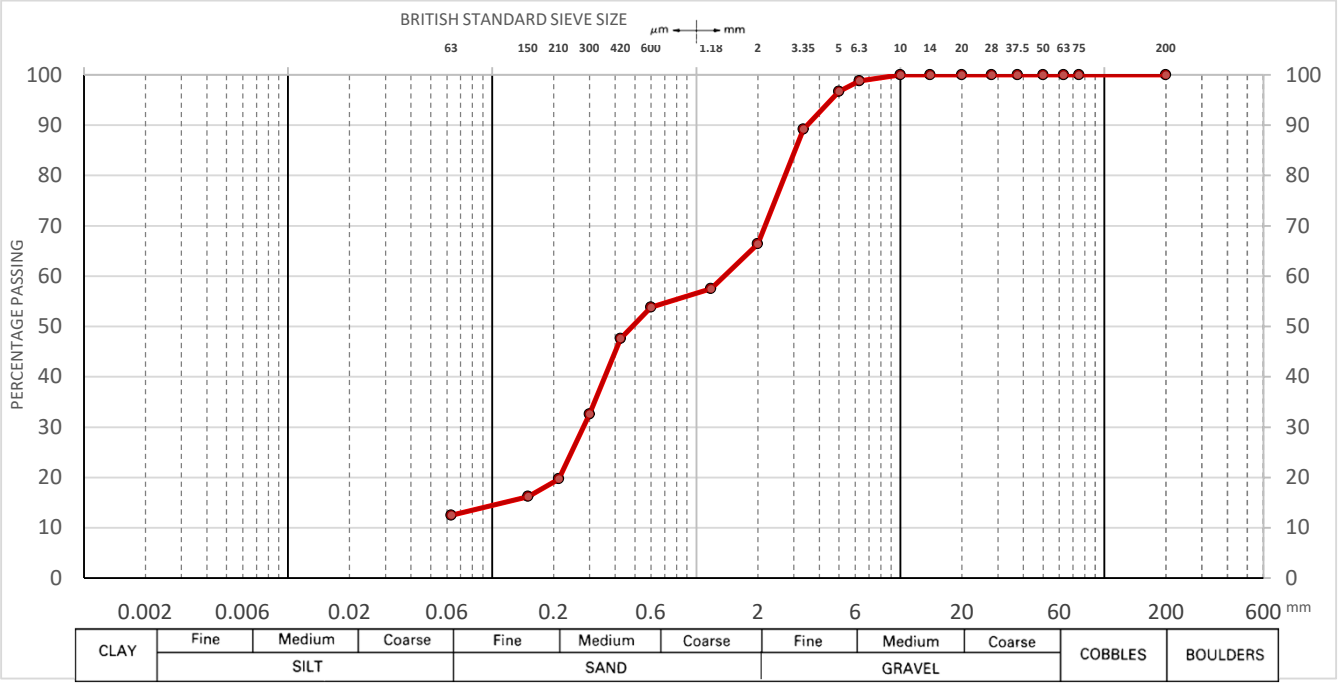
SITE: **Land at Clifton Hampden, Oxon**

Date: **February 2021**

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton,
Abingdon OX13 6DD
Tel: 01865 326011

GIS (Southern) Ltd	**PARTICLE SIZE DISTRIBUTION**	**Report No.** S.5632	**Fig** B1

Soil description or classification	Sieving		Sedimentation		Percentage particle sizes				
	Preparation	Mass kg	Pre-treatment	Mass g	Clay	Silt	Sand	Gravel	Cobbles
Medium brown silty very gravelly fine medium coarse SAND. Gravel is fine sandstone LOWER GREENSAND FORMATION	oven dried	1.03			12		54	34	0



BS Test Sieve size mm	Mass Retained %	Total Passing %
200	0	100
75	0	100
63	0	100
50	0	100
37.5	0	100
28	0	100
20	0	100
14	0	100
10	0	100
6.3	1.2	98.8
5	2.1	96.7
3.35	7.5	89.2
2	22.8	66.4
1.18	8.9	57.5
Microns		
600	3.7	53.8
425	6.2	47.6
300	15	32.6
212	12.9	19.7
150	3.5	16.2
63	3.7	12.5
Passing 63	12.4	
Sedimentation Analysis		

* Tested in accordance with the following clauses of BS EN ISO 17892-4:2016: Clause 5.2, 5.3 and 5.4 Particle Size Distribution

5.2* Wet sieve

5.3 Sedimentation by hydrometer

5.4 Sedimentation by pipette

Borehole No. Two

Sample No. 3

Depth: 2.00m

Date of testing: 07 January 2021

GRADING CLASSIFICATION:

coefficient of curvature C_C = n/a

uniformity coefficient C_U = n/a

NARROW-GAP GRADED

Drawn by	Checked by	Approved by

CLIENT: **Thomas Homes**

SITE: **Land at Clifton Hampden, Oxon**

Date: **February 2021**

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton,
Abingdon OX13 6DD
Tel: 01865 326011

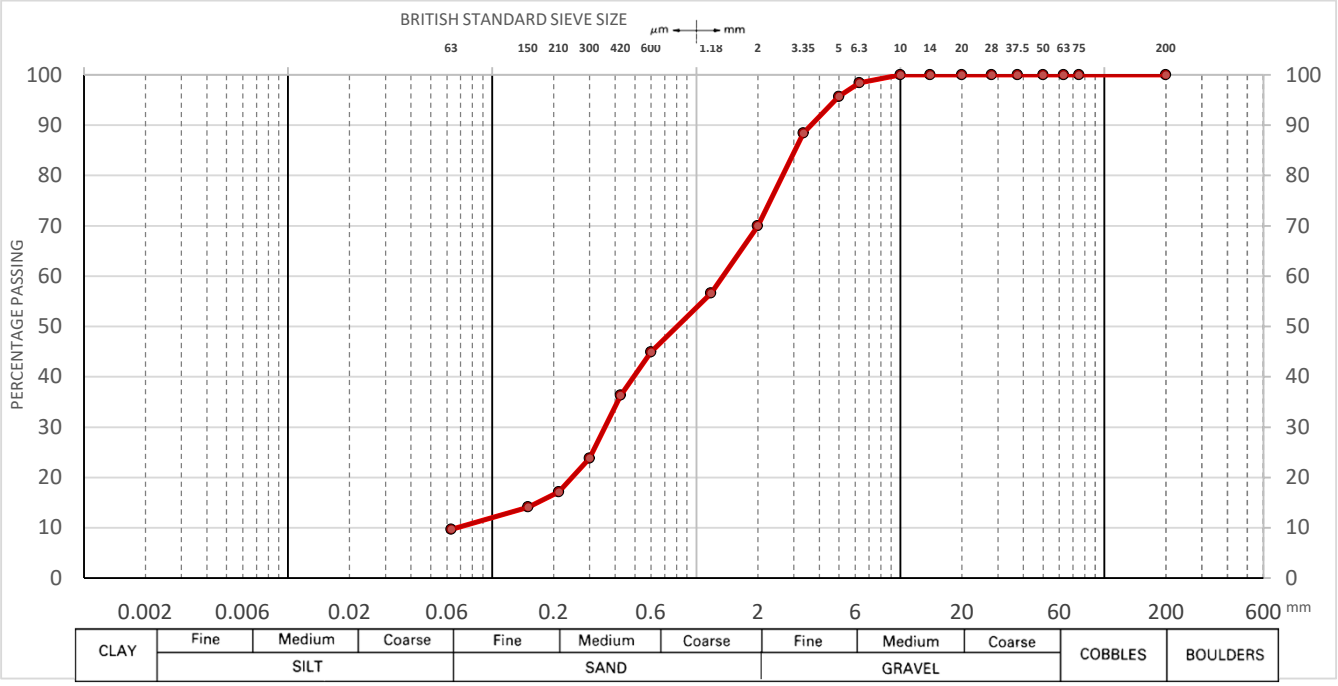
GIS (Southern) Ltd

PARTICLE SIZE DISTRIBUTION

Report No. S.5632

Fig B2

Soil description or classification	Sieving		Sedimentation		Percentage particle sizes				
	Preparation	Mass kg	Pre-treatment	Mass g	Clay	Silt	Sand	Gravel	Cobbles
Brown silty very gravelly fine medium coarse SAND. Gravel is fine rare medium sandstone LOWER GREENSAND FORMATION	oven dried	0.95			10		60	30	0



BS Test Sieve size mm	Mass Retained %	Total Passing %
200	0	100
75	0	100
63	0	100
50	0	100
37.5	0	100
28	0	100
20	0	100
14	0	100
10	0	100
6.3	1.6	98.4
5	2.7	95.7
3.35	7.3	88.4
2	18.4	70
1.18	13.4	56.6
Microns		
600	11.7	44.9
425	8.6	36.3
300	12.5	23.8
212	6.7	17.1
150	3	14.1
63	4.4	9.7
Passing 63	9.8	
Sedimentation Analysis		

* Tested in accordance with the following clauses of BS EN ISO 17892-4:2016: Clause 5.2, 5.3 and 5.4 Particle Size Distribution

5.2* Wet sieve

5.3 Sedimentation by hydrometer

5.4 Sedimentation by pipette

Borehole No. Three

Sample No. 1

Depth: 1.00m

Date of testing: 07 January 2021

GRADING CLASSIFICATION:

coefficient of curvature C_C = n/a

uniformity coefficient C_U = n/a

NARROW-GAP GRADED

Drawn by	Checked by	Approved by

CLIENT: **Thomas Homes**

SITE: **Land at Clifton Hampden, Oxon**

Date: **February 2021**

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton,
Abingdon OX13 6DD
Tel: 01865 326011

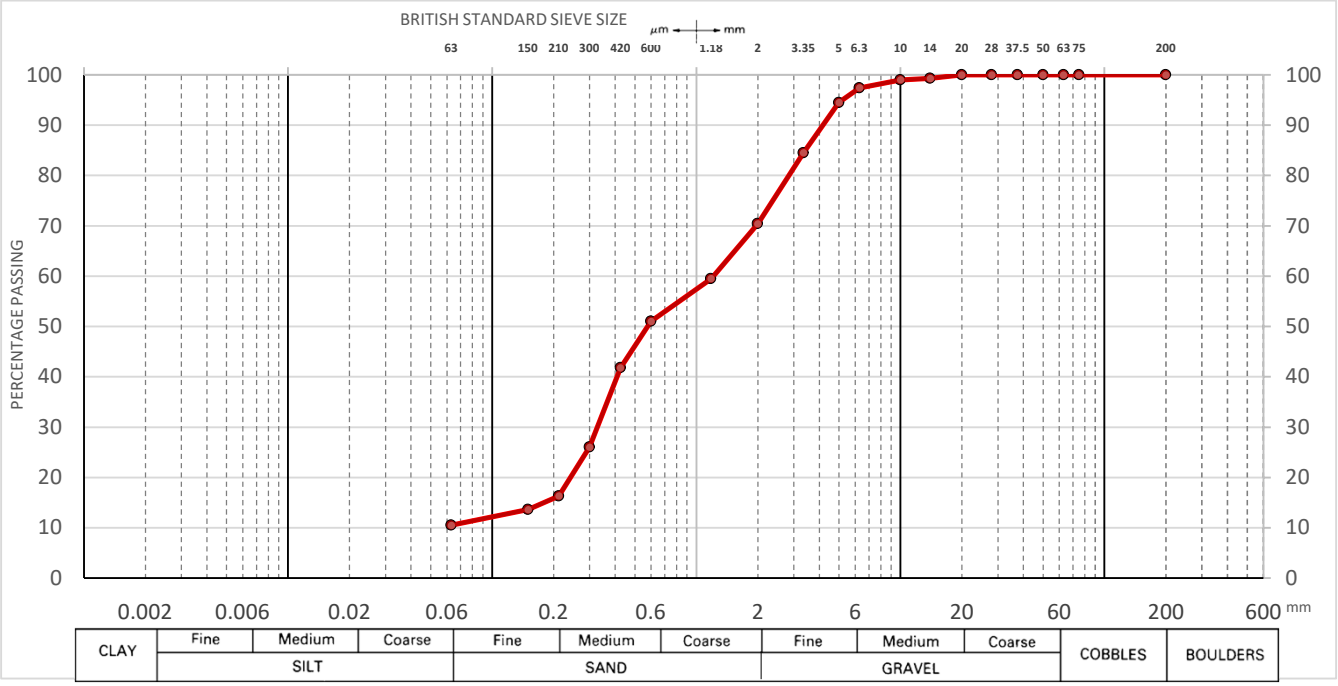
GIS (Southern) Ltd

PARTICLE SIZE DISTRIBUTION

Report No. S.5632

Fig B3

Soil description or classification	Sieving		Sedimentation		Percentage particle sizes				
	Preparation	Mass kg	Pre-treatment	Mass g	Clay	Silt	Sand	Gravel	Cobbles
Orange Brown silty very gravelly fine medium coarse SAND. Gravel is fine rare medium sandstone LOWER GREENSAND FORMATION	oven dried	1.32			10		60	30	0



BS Test Sieve size mm	Mass Retained %	Total Passing %
200	0	100
75	0	100
63	0	100
50	0	100
37.5	0	100
28	0	100
20	0	100
14	0.7	99.3
10	0.3	99
6.3	1.6	97.4
5	2.9	94.5
3.35	10	84.5
2	14.1	70.4
1.18	10.9	59.5
Microns		
600	8.5	51
425	9.2	41.8
300	15.8	26
212	9.7	16.3
150	2.7	13.6
63	3.1	10.5
Passing 63	10.5	
Sedimentation Analysis		

* Tested in accordance with the following clauses of BS EN ISO 17892-4:2016: Clause 5.2, 5.3 and 5.4 Particle Size Distribution

5.2* Wet sieve

5.3 Sedimentation by hydrometer

5.4 Sedimentation by pipette

Borehole No. Six

Sample No. 3

Depth: 2.00m

Date of testing: 07 January 2021

GRADING CLASSIFICATION:

coefficient of curvature C_C = n/a

uniformity coefficient C_U = n/a

NARROW-GAP GRADED

Drawn by	Checked by	Approved by

CLIENT: **Thomas Homes**

SITE: **Land at Clifton Hampden, Oxon**

Date: **February 2021**

Ground Investigation Services (Southern) Ltd
40 Home Close, Wootton,
Abingdon OX13 6DD
Tel: 01865 326011

GIS (Southern) Ltd	**PARTICLE SIZE DISTRIBUTION**	**Report No.** S.5632	**Fig** B4

Sample A – 0.10 depth	Dark brown clayey humic SAND with a little fine medium gravel TOPSOIL
Sample B – 0.10m depth	Dark brown silty humic SAND with a little fine medium gravel TOPSOIL
Sample C – 0.20m depth	Dark brown clayey humic SAND with a little fine medium gravel TOPSOIL
Sample D – 0.10m depth	Dark brown clayey humic SAND with a little fine medium gravel and fine medium roots TOPSOIL
Sample E – 0.15m depth	Brown silty humic SAND with a little fine gravel TOPSOIL
Sample F – 0.10m depth	Dark brown silty humic SAND with a little fine medium gravel TOPSOIL
Sample G – 0.15m depth	Dark brown clayey humic SAND with a little fine medium gravel TOPSOIL
Sample H – 0.10m depth	Dark brown clayey humic SAND with a little fine medium gravel and a trace of red brick TOPSOIL
Sample J – 0.10m depth	Dark brown clayey humic SAND with a little fine medium gravel and some fine medium roots TOPSOIL
Sample K – 0.10m depth	Dark brown clayey humic SAND with a little fine medium gravel and some fine medium roots TOPSOIL
Sample L – 0.10m depth	Dark brown clayey humic SAND with a little fine medium gravel and some fine medium roots TOPSOIL
Sample M – 0.15m depth	Brown silty humic SAND with a little fine medium gravel TOPSOIL
Sample N – 0.10m depth	Dark brown clayey humic SAND with a little fine medium gravel and some fine medium roots TOPSOIL

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Ground Investigation Services
40 Home Close
Wooton
Oxon
OX13 6DD

Attention :	Martyn Boughton
Date :	8th January, 2021
Your reference :	
Our reference :	Test Report 20/18438 Batch 1
Location :	Clifton Hampden
Date samples received :	30th December, 2020
Status :	Final report
Issue :	1

Twenty five samples were received for analysis on 30th December, 2020 of which twenty five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton
EMT Job No: 20/18438

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4	5	6	7	8	9	10	LOD/LOR	Units	Method No.
Sample ID	A	B	C	D	E	F	G	H	J	K			
Depth	0.10	0.10	0.20	0.10	0.15	0.10	0.15	0.10	0.10	0.10			
COC No / misc													
Containers	J	J	J	J	J	J	J	J	J	J			
Sample Date	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020			
Arsenic #	34.4	35.5	36.6	40.5	41.9	31.6	35.7	36.5	31.3	38.1	<0.5	mg/kg	TM30/PM15
Beryllium	1.9	1.9	1.9	2.1	1.9	1.9	1.9	2.0	1.7	2.4	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Chromium #	88.9	87.8	94.7	94.6	80.2	87.0	88.1	96.5	102.7	114.3	<0.5	mg/kg	TM30/PM15
Copper #	21	50	17	18	25	30	28	21	17	20	<1	mg/kg	TM30/PM15
Lead #	88	69	63	51	226	99	105	75	45	73	<5	mg/kg	TM30/PM15
Mercury #	0.2	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2	<0.1	mg/kg	TM30/PM15
Nickel #	23.7	24.6	24.2	28.2	27.0	24.8	26.0	27.5	24.0	29.6	<0.7	mg/kg	TM30/PM15
Selenium #	2	2	3	2	2	2	2	3	<1	1	<1	mg/kg	TM30/PM15
Sulphur as S	-	-	-	-	-	-	-	-	-	-	<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	-	-	-	-	-	-	-	-	-	-	<0.01	%	TM50/PM29
Vanadium	137	149	155	168	141	136	135	169	140	180	<1	mg/kg	TM30/PM15
Water Soluble Boron #	2.0	2.0	1.7	2.2	1.8	3.0	3.5	3.4	1.7	1.6	<0.1	mg/kg	TM74/PM32
Zinc #	109	113	105	117	143	165	199	152	101	128	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	0.07	<0.03	<0.03	0.09	0.18	0.09	0.04	<0.03	0.05	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.04	0.22	0.05	0.08	0.18	0.70	0.24	0.08	0.08	0.15	<0.03	mg/kg	TM4/PM8
Pyrene #	0.04	0.21	0.05	0.08	0.15	0.64	0.20	0.07	0.07	0.12	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	0.16	<0.06	0.09	0.11	0.47	0.16	0.08	<0.06	0.12	<0.06	mg/kg	TM4/PM8
Chrysene #	0.02	0.16	0.04	0.06	0.13	0.49	0.16	0.05	0.06	0.11	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	0.24	<0.07	0.13	0.26	0.90	0.25	0.09	0.11	0.16	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	0.16	<0.04	<0.04	0.11	0.38	0.14	0.05	0.05	0.06	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	0.10	<0.04	<0.04	0.10	0.33	0.09	<0.04	<0.04	0.06	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	0.10	<0.04	<0.04	0.10	0.33	0.09	<0.04	<0.04	0.05	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	1.4	<0.6	<0.6	1.2	4.6	1.4	<0.6	<0.6	0.9	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	0.17	<0.05	0.09	0.19	0.65	0.18	0.06	0.08	0.12	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	0.07	<0.02	0.04	0.07	0.25	0.07	0.03	0.03	0.04	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	94	93	86	84	94	83	89	98	88	89	<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton
EMT Job No: 20/18438

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4	5	6	7	8	9	10	LOD/LOR	Units	Method No.
Sample ID	A	B	C	D	E	F	G	H	J	K			
Depth	0.10	0.10	0.20	0.10	0.15	0.10	0.15	0.10	0.10	0.10			
COC No / misc													
Containers	J	J	J	J	J	J	J	J	J	J			
Sample Date	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020			
Pesticides													
Organochlorine Pesticides													
Aldrin	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Alpha-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Beta-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Delta-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Dieldrin	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endosulphan I	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endosulphan II	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endosulphan sulphate	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endrin	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Gamma-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Heptachlor	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Heptachlor Epoxide	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
p,p'-DDE	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
p,p'-DDT	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
p,p'-TDE	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Total Methoxychlor	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Organophosphorus Pesticides													
Azinphos methyl	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Diazinon	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Dichlorvos	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Disulfoton	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Ethion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Ethyl Parathion (Parathion)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Fenitrothion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Malathion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Methyl Parathion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Mevinphos	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Triazine Herbicides													
Atrazine	-	-	<100	-	-	-	-	-	-	-	<100	ug/kg	TM39/PM8
Simazine	-	-	<200	-	-	-	-	-	-	-	<200	ug/kg	TM39/PM8
Natural Moisture Content	23.8	21.9	23.6	25.6	22.7	28.1	31.5	35.2	20.7	21.2	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	-	-	-	-	-	-	-	-	-	-	<0.0015	g/l	TM38/PM20
Organic Matter	3.9	4.8	4.1	4.3	4.8	15.9	7.8	6.7	3.5	4.0	<0.2	%	TM21/PM24
pH #	7.73	7.55	7.55	7.61	7.51	7.79	8.64	7.67	7.73	7.43	<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton
EMT Job No: 20/18438

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	11	12	13	14	15	16	17	18	19	20	LOD/LOR	Units	Method No.
Sample ID	L	M	N	SA2	SA5	SA6	SA7	SA8	BH1	BH2			
Depth	0.15	0.10	0.15	0.10	0.15	0.20	0.10	0.10	1.00	0.50			
COC No / misc													
Containers	J	J	J	J	J	J	J	J	T	T			
Sample Date	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020			
Arsenic #	42.6	42.0	38.3	34.1	30.7	40.7	41.3	39.6	-	-	<0.5	mg/kg	TM30/PM15
Beryllium	2.6	2.5	2.0	1.9	1.6	2.0	2.0	1.8	-	-	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	-	-	<0.1	mg/kg	TM30/PM15
Chromium #	116.4	109.5	95.2	101.1	83.0	109.8	113.4	98.2	-	-	<0.5	mg/kg	TM30/PM15
Copper #	17	18	17	14	24	22	15	18	-	-	<1	mg/kg	TM30/PM15
Lead #	58	47	56	40	20	93	37	39	-	-	<5	mg/kg	TM30/PM15
Mercury #	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	mg/kg	TM30/PM15
Nickel #	32.1	28.5	25.1	22.7	42.9	44.7	34.8	40.8	-	-	<0.7	mg/kg	TM30/PM15
Selenium #	2	1	3	1	<1	<1	1	1	-	-	<1	mg/kg	TM30/PM15
Sulphur as S	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	%	TM50/PM29
Vanadium	184	153	163	153	93	156	187	123	-	-	<1	mg/kg	TM30/PM15
Water Soluble Boron #	2.0	1.4	1.7	1.6	1.7	1.4	1.9	1.8	-	-	<0.1	mg/kg	TM74/PM32
Zinc #	130	111	97	82	135	144	118	120	-	-	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.09	0.12	0.04	0.05	<0.03	<0.03	<0.03	<0.03	-	-	<0.03	mg/kg	TM4/PM8
Pyrene #	0.09	0.10	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	-	-	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.09	0.12	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	-	-	<0.06	mg/kg	TM4/PM8
Chrysene #	0.06	0.07	0.02	0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.11	0.15	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	-	-	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.05	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	<0.04	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	-	-	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	0.7	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	-	-	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.08	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.03	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-	-	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	88	83	81	96	90	98	97	94	-	-	<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton
EMT Job No: 20/18438

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	11	12	13	14	15	16	17	18	19	20	LOD/LOR	Units	Method No.
Sample ID	L	M	N	SA2	SA5	SA6	SA7	SA8	BH1	BH2			
Depth	0.15	0.10	0.15	0.10	0.15	0.20	0.10	0.10	1.00	0.50			
COC No / misc													
Containers	J	J	J	J	J	J	J	J	T	T			
Sample Date	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020			
Pesticides													
Organochlorine Pesticides													
Aldrin	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Alpha-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Beta-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Delta-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Dieldrin	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endosulphan I	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endosulphan II	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endosulphan sulphate	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Endrin	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Gamma-HCH (BHC)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Heptachlor	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Heptachlor Epoxide	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
p,p'-DDE	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
p,p'-DDT	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
p,p'-TDE	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Total Methoxychlor	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Organophosphorus Pesticides													
Azinphos methyl	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Diazinon	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Dichlorvos	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Disulfoton	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Ethion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Ethyl Parathion (Parathion)	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Fenitrothion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Malathion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Methyl Parathion	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Mevinphos	-	-	<10	-	-	-	-	-	-	-	<10	ug/kg	TM42/PM8
Triazine Herbicides													
Atrazine	-	-	<100	-	-	-	-	-	-	-	<100	ug/kg	TM39/PM8
Simazine	-	-	<200	-	-	-	-	-	-	-	<200	ug/kg	TM39/PM8
Natural Moisture Content	23.0	15.9	24.6	21.7	24.6	23.6	20.1	25.4	-	-	<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	-	-	<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	-	-	-	-	-	-	-	-	0.0091	0.0057	<0.0015	g/l	TM38/PM20
Organic Matter	4.9	2.8	5.4	2.9	1.7	2.2	2.5	3.0	-	-	<0.2	%	TM21/PM24
pH #	7.70	7.60	7.54	7.47	7.47	6.77	7.61	7.30	7.87	7.77	<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton
EMT Job No: 20/18438

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	21	22	23	24	25						LOD/LOR	Units	Method No.
Sample ID	BH3	BH4	BH5	BH5	BH6								
Depth	1.00	1.00	0.50	2.00	1.00								
COC No / misc													
Containers	T	T	T	T	T								
Sample Date	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020								
Arsenic #	-	-	-	-	-						<0.5	mg/kg	TM30/PM15
Beryllium	-	-	-	-	-						<0.5	mg/kg	TM30/PM15
Cadmium #	-	-	-	-	-						<0.1	mg/kg	TM30/PM15
Chromium #	-	-	-	-	-						<0.5	mg/kg	TM30/PM15
Copper #	-	-	-	-	-						<1	mg/kg	TM30/PM15
Lead #	-	-	-	-	-						<5	mg/kg	TM30/PM15
Mercury #	-	-	-	-	-						<0.1	mg/kg	TM30/PM15
Nickel #	-	-	-	-	-						<0.7	mg/kg	TM30/PM15
Selenium #	-	-	-	-	-						<1	mg/kg	TM30/PM15
Sulphur as S	<0.01	<0.01	0.01	0.01	<0.01						<0.01	%	TM30/PM15
Total Sulphate as SO4 BRE	<0.01	0.01	0.02	0.02	<0.01						<0.01	%	TM50/PM29
Vanadium	-	-	-	-	-						<1	mg/kg	TM30/PM15
Water Soluble Boron #	-	-	-	-	-						<0.1	mg/kg	TM74/PM32
Zinc #	-	-	-	-	-						<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
Acenaphthylene	-	-	-	-	-						<0.03	mg/kg	TM4/PM8
Acenaphthene #	-	-	-	-	-						<0.05	mg/kg	TM4/PM8
Fluorene #	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
Phenanthrene #	-	-	-	-	-						<0.03	mg/kg	TM4/PM8
Anthracene #	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
Fluoranthene #	-	-	-	-	-						<0.03	mg/kg	TM4/PM8
Pyrene #	-	-	-	-	-						<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	-	-	-	-	-						<0.06	mg/kg	TM4/PM8
Chrysene #	-	-	-	-	-						<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	-	-	-	-	-						<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	-	-	-	-	-						<0.04	mg/kg	TM4/PM8
PAH 16 Total	-	-	-	-	-						<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	-	-	-	-	-						<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	-	-	-	-	-						<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	-	-	-	-	-						<0	%	TM4/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton
EMT Job No: 20/18438

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	21	22	23	24	25						LOD/LOR	Units	Method No.
Sample ID	BH3	BH4	BH5	BH5	BH6								
Depth	1.00	1.00	0.50	2.00	1.00								
COC No / misc													
Containers	T	T	T	T	T								
Sample Date	17/12/2020	17/12/2020	17/12/2020	17/12/2020	17/12/2020								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	30/12/2020	30/12/2020	30/12/2020	30/12/2020	30/12/2020								
Pesticides													
Organochlorine Pesticides													
Aldrin	-	-	-	-	-						<10	ug/kg	TM42/PM8
Alpha-HCH (BHC)	-	-	-	-	-						<10	ug/kg	TM42/PM8
Beta-HCH (BHC)	-	-	-	-	-						<10	ug/kg	TM42/PM8
Delta-HCH (BHC)	-	-	-	-	-						<10	ug/kg	TM42/PM8
Dieldrin	-	-	-	-	-						<10	ug/kg	TM42/PM8
Endosulphan I	-	-	-	-	-						<10	ug/kg	TM42/PM8
Endosulphan II	-	-	-	-	-						<10	ug/kg	TM42/PM8
Endosulphan sulphate	-	-	-	-	-						<10	ug/kg	TM42/PM8
Endrin	-	-	-	-	-						<10	ug/kg	TM42/PM8
Gamma-HCH (BHC)	-	-	-	-	-						<10	ug/kg	TM42/PM8
Heptachlor	-	-	-	-	-						<10	ug/kg	TM42/PM8
Heptachlor Epoxide	-	-	-	-	-						<10	ug/kg	TM42/PM8
p,p'-DDE	-	-	-	-	-						<10	ug/kg	TM42/PM8
p,p'-DDT	-	-	-	-	-						<10	ug/kg	TM42/PM8
p,p'-TDE	-	-	-	-	-						<10	ug/kg	TM42/PM8
Total Methoxychlor	-	-	-	-	-						<10	ug/kg	TM42/PM8
Organophosphorus Pesticides													
Azinphos methyl	-	-	-	-	-						<10	ug/kg	TM42/PM8
Diazinon	-	-	-	-	-						<10	ug/kg	TM42/PM8
Dichlorvos	-	-	-	-	-						<10	ug/kg	TM42/PM8
Disulfoton	-	-	-	-	-						<10	ug/kg	TM42/PM8
Ethion	-	-	-	-	-						<10	ug/kg	TM42/PM8
Ethyl Parathion (Parathion)	-	-	-	-	-						<10	ug/kg	TM42/PM8
Fenitrothion	-	-	-	-	-						<10	ug/kg	TM42/PM8
Malathion	-	-	-	-	-						<10	ug/kg	TM42/PM8
Methyl Parathion	-	-	-	-	-						<10	ug/kg	TM42/PM8
Mevinphos	-	-	-	-	-						<10	ug/kg	TM42/PM8
Triazine Herbicides													
Atrazine	-	-	-	-	-						<100	ug/kg	TM39/PM8
Simazine	-	-	-	-	-						<200	ug/kg	TM39/PM8
Natural Moisture Content	-	-	-	-	-						<0.1	%	PM4/PM0
Hexavalent Chromium #	-	-	-	-	-						<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0056	0.0082	0.0215	0.0127	0.0038						<0.0015	g/l	TM38/PM20
Organic Matter	-	-	-	-	-						<0.2	%	TM21/PM24
pH #	7.81	8.16	7.02	8.66	8.16						<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigation Services
Reference:
Location: Clifton Hampden
Contact: Martyn Boughton

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/18438						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/18438

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/18438

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM39	Modified US EPA method 8270D v5:2014. Determination of Triazine Herbicides by GC-MS	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM42	Modified US EPA method 8270D v5:2014. Pesticides and herbicides by GC-MS	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes

EMT Job No: 20/18438

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.			AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes

HUMAN HEALTH RISK ASSESSMENT

1.1 Introduction

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

1.2 General Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

1.2.1 Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment Model (CLEA).

The CLEA Guidance comprises the following documents:

- EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil.
- EA Science Report SC050021/SR3: Updated technical background to the CLEA model.
- EA CLEA Bulletin (2009).
- CLEA software version 1.04 (2009)
- Toxicological reports and SGV technical notes.

The CLEA guidance and tools:

1. do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
2. do not cover risks to the environment, such as groundwater, ecosystems or buildings.
3. do not provide a definitive test for telling when human health risks are significant.
4. are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.

1.3 Soil Guideline Values (2009)

The EA are publishing a series of SGV reports for a selection of common contaminants relevant to the assessment of land contamination. SGV's are generic assessment criteria based on CLEA standard land-uses and can be used to simplify the assessment of human health risks from long-term exposure to

chemical contamination in soil. They do not cover short-term exposure (i.e. construction and maintenance workers), acute exposure or other risks such as fire, suffocation or explosion, as might arise from an accumulation of gases such as methane and carbon dioxide, or either odour or aesthetic issues. SGV's represent 'trigger values', indicators that soil concentrations above the SGV level may pose a possibility of *significant harm* to human health. The converse, where soil concentrations are less that the SGV, is that the long-term human health risks are considered to be tolerable or minimal.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

1.4 Ongoing development of CLEA based guidance

The EA is involved in a programme of publishing SGV's and related toxicity data (the TOX reports). As at July 2009 ten SGV's and matching TOX reports had been published. Soil Assessment Criteria (SAC's) may be derived using toxicity data from the updated TOX reports, where these are published, or from the original TOX reports. SGV reports also take account of recent updates for plant uptake and other factors.

- GAC's developed by CLEA guidance and given in this report will need to be assessed against updated TOX reports and SGV's when these are published.
- SGV reports may give values that differ from the GAC's used in this report.
- These variations may materially alter the remediation requirement for the site, requiring either an increase or decrease in the extent, type and cost of remediation.

1.5 Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

- *ICRCL 70/90: Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.*
- *BS 3882:2015 Specification for topsoil*

1.6 Other Generic Assessment Criteria

If an SGV is not available for a substance identified in the soil then the range of Generic Assessment Criteria published from a collaborative research by Land Quality Management Limited (LQM) and the Chartered Institute of Environmental Health (CIEH) are used for example. In the case of Lead, Category 4 screening levels (C4SLs) have replaced the AtRisk Soil SSV.

1.6.1 EIC/AGS/CL: AIRE

The report represents the collaborative effort of risk assessors from 26 EIC and AGS member companies to produce generic assessment criteria (GAC) for soils for human health risk assessment. The project involved the collation and review of physico-chemical data, toxicological data and information on background

exposure for 44 contaminants sometimes encountered on land affected by contamination in the UK and the derivation of GAC for 351 of these using the CLEA model (v1.06). The GAC are intended to complement soil guideline values (SGV) produced by the Environment Agency of England and Wales and the 2nd edition GAC produced by LQM and CIEH (Nathanail et al, 2009). All three sets of assessment criteria have been derived in general accordance with the Environment Agency of England and Wales Contaminated Land Exposure Assessment (CLEA) guidance and thus the combined efforts of these three groups have resulted in a useful set of screening criteria for the assessment of risks to human health from soil contamination for more than 120 potentially contaminative substances.

1.6.2 Category 4 screening levels (C4SLs) (2014)

A new statutory DEFRA guidance recently (i.e. August 2014) published some GACs with a more pragmatic (but still strongly precautionary) approach in their derivation called the Category 4 screening levels (C4SLs). These values provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land. They are intended as generic screening values, (ii) they describe a level of risk that whilst above 'minimal' is still 'low' and (iii) they provide a 'higher simple test' for deciding that land is suitable for use and definitely not contaminated. These values were derived for four generic land uses: residential, commercial, allotments, and public open space.

1.6.3 LQM/CIEH Suitable 4 Use Level (S4UL) (2015)

The new S4UL's ((Nathanail *et al*, 2015), was developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants. The S4ULs were:

- based on Health Criteria Values, updated to reflect changes since 2009
- derived for the standard CLEA land uses and the two public open space scenarios developed by Defra SP1010
- developed for ca 85 substances (those previously covered by the LQM/CIEHGAC and the SGV substances);
- Compliant with SR2 and the long standing principle of 'suitable for use' and reflecting changes to exposure parameters produced by Defra SP101

For derivation of these Generic Assessment Criteria reference must be made to: Nathanial, P., McCaffrey, C., Ashmore, M., Cheng, Y., Gillet, A., Ogden, R., Scott, D. *The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (3nd edition)*. **Land Quality Press**. 2015.

1.7 Standard Land-use Scenarios

The standard land-use scenarios used to develop conceptual exposure models are presented in the following sections:

1.7.1 Residential

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
- Building type is a two-storey small terraced house.

A sub-set of this land-use is residential apartments with communal landscaped gardens where the consumption of home-grown vegetables will not occur.

1.7.2 Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

1.7.3 Commercial/Industrial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

1.7.4 Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
- Predominantly used by children for playing and may be used for activities such as a football kick about
- Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
- older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
- ingestion rate 75 $mg.day^{-1}$

1.7.5 *Public Open Space Park*

This generic scenario refers to any public park that is more than 0.5ha in area:

- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% cover)
- Female child age classes 1-6
- Soil ingestion rate of 50 $mg.day^{-1}$
- Occupancy period outdoors = 2 $hours.day^{-1}$
- Exposure frequency of 170 days.year-1 for age classes 2-18 and 85
- $days.year^{-1}$ for age class 1
- Outdoor exposure pathways only (no tracking back).

1.8 Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an SGV/GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a DQRA may be undertaking to develop site specific values for relevant soil contaminants.

- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
- Developing more accurate parameters using site data.

1.9 Current Criteria

Table 1 presents the current Generic Assessment Criteria and reference should be made to the original publications if needed**.**

1.10 Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) and Category 4 screening levels (C4SLs) (2014) addressed the statistical treatment of test results and their comparison to Soil Guideline Values. Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CL:AIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CL:AIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

Treatment of Hot-Spots

- A statistical test is applied to establish whether the data is a part of a single set, or whether data outliers are present.
- Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, the hot-spot(s) may be excluded and the mean of the remaining data assessed.

Tier 1 Soil Guidance Values

The following table presents the Tier 1 Soil Guidance Values (SGVs) Revision 002 based on LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment (unless stated otherwise).

Land-Use Scenario

Determinant	Residential with Homegrown Produce	Residential without Homegrown Produce	Public Open Space (POS) Residential	Public Open Space (POS) Park	Allotment	Commercial and Industrial
Metals and Metalloids						
Arsenic	37	40	79	**170**	43	640
Boron	290	11000	21000	**46000**	45	240000
Cadmium	11	85	120	**532**	1.9	190
Chromium (Hexavalent)	6	6	7.7	**220**	1.8	33
Chromium	910	910	1500	**33000**	18000	8600
Copper	2400	7100	12000	**44000**	520	68000
Lead (C4SL Criteria)	200	310	630	**1300**	80	2330
Elemental Mercury	1.2	1.2	16	**30**	21	58
Inorganic Mercury	40	56	120	**240**	19	1100
Nickel	180	180	230	**3400**	230	980
Selenium	250	430	1100	**1800**	88	12000
Vanadium	410	1200	2000	**5000**	91	9000
Zinc	3700	40000	81000	**170000**	620	730000
Other Inorganics						
pH	6-9 Units					
Asbestos	If Detected					
Cyanide (Dutch Intervention Value)	20	20	20	20	20	-
Phenol (based on 2.5% SOM)						
Phenol (Total)	550	1300	760	760	66	760
Total Petroleum Hydrocarbons (TPH) (based on 2.5% SOM)						
Aliphatic (5-6)	78	78	570000	95000	730	3200
Aliphatic (6-8)	230	230	600000	150000	2300	7800
Aliphatic (8-10)	65	65	13000	14000	320	2000
Aliphatic (10-12)	330	330	13000	21000	2200	9700
Aliphatic (12-16)	2400	2400	13000	25000	11000	59000
Aliphatic (16-35)	65000	92000	250000	450000	260000	1600000
Aliphatic (35-44)	65000	92000	250000	450000	260000	1600000
Aromatic (5-7 benzene)*	140	690	72(56000)	90(76000)	0.017(13)	27(26000)
Aromatic (7-8 toluene)	290	1800	56000	87000	22	56000
Aromatic (8-10)	83	110	5000	7200	8.6	3500
Aromatic (10-12)	180	590	5000	9200	13	16000
Aromatic (12-16)	330	2300	5100	10000	23	36000
Aromatic (16-21)	540	1900	3800	7600	46	28000
Aromatic (21-35)	1500	1900	3800	7800	370	28000
Aromatic (35-44)	1500	1900	3800	7800	370	28000
BTEX (based on 2.5% SOM)						
Benzene	0.17	0.7	73	110	0.075	90
Toluene	290	1900	56000	100000	120	180000
Ethylbenzene	110	190	25000	27000	91	27000
m-Xylene	140	190	43000	32000	170	31000
p-Xylene	130	180	43000	31000	160	30000
o-Xylene	140	210	43000	33000	160	33000

All values in mg/kg unless stated otherwise

* Benzene values to be used as a conservative screen for TPH Aromatic C5-C7 range hydrocarbons if Speciated BTEX results are not available. If Speciated BTEX are available then TPH Aromatic C5-C7 screening value in () can be adopted.

Tier 1 Soil Guidance Values (Cont.)

Land-Use Scenario

Determinant	Residential with Homegrown Produce	Residential without Homegrown Produce	Public Open Space (POS) Residential	Public Open Space (POS) Park	Allotment	Commercial and Industrial
Polycyclic Aromatic Hydrocarbons (PAH) (based on 2.5% SOM)						
Naphthalene	5.6	*5.6*	4900	***1200***	*4.1*	*190*
Acenaphthene	510	*35000*	15000	***29000***	*34*	*84000*
Acenapthylene	420	*4600*	30000	***29000***	*28*	*83000*
Fluorene	400	*3800*	9900	***20000***	*27*	*63000*
Anthracene	5400	*35000*	74000	***150000***	*380*	*520000*
Fluoranthene	560	*1600*	3100	***6300***	*52*	*23000*
Phenanthrene	220	*1500*	3100	***6200***	*15*	*22000*
Pyrene	1200	*3800*	7400	***15000***	*110*	*54000*
Benzo(a)anthracene	11	*14*	29	***49***	*2.9*	*170*
Chrysene	22	*31*	57	***93***	*4.1*	*350*
Benzo(b)fluoranthene	3.3	*4*	7.2	***13***	*0.99*	*44*
Benzo(k)fluoranthene	93	*110*	190	***370***	*37*	*1200*
Benzo(ghi)perylene	340	*360*	640	***1400***	*290*	*3900*
Benzo(a)pyrene	2.7	*3.2*	5.7	***11***	*0.97*	*35*
Dibenzo(ah)anthracene	0.28	*0.32*	0.57	***1.1***	*0.14*	*3.5*
Indeno(123-cd)pyrene	36	*46*	82	***150***	*9.5*	*500*

All values in mg/kg unless stated otherwise

References

LQM/CIEH Suitable 2 Use Levels (S4UL) for Human Health Assessment – Land Quality Management Limited (LQM) and Chartered Institute of Environmental Health (CIEH) Land Quality Press (2015)

SP1010: Development of Category 4 Screening Levels (C4SL) for Assessment of Land Affected by Contamination - Department for Environment, Food and Rural Affairs (2014)

Dutch Target and Intervention Values (the New Dutch List) (2000)

Descriptions of Public Open Space (POS): Section 1.4.2 of The LQM S4UL for Human Health Assessment

POS Residential: Includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930s-1970s housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

POS Park: An area of open space, usually owned and maintained by the Local Authority, provided for recreational uses including family visits and picnics, children's play area, informal sporting activities such as football (but not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into the place of residence will be negligible.

SOM – Soil Organic Matter

Soil Guidance Values for Organics are presented are based on 2.5% SOM. In the event of exceedance, the actual SOM content of the sample(s) should be reviewed to determine if a lower value based on 1.0% or 6.0% can be adopted.

ESI Statistical Analysis: Land at Clifton Hampden, Oxon

Client/client ref	Thomas Homes Ltd
Project ref	Land at Clifdon Hampden
Site ref	S.5632
Data description	Topsoil
Contaminant(s)	Lead and Arsenic
Test scenario	Planning: is true mean lower than critical concentration (μ < Cc)?
Date	24.02.2021
User details	M Boughton

Statistics calculator (version 1)

Developed by:

On behalf of:

Chartered Institute of Environmental Health

Input data

This spreadsheet has been produced based on the document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration (CIEH/CL:AIRE, 2008)'. Users of this spreadsheet should always refer to this guidance, the CIEH Statistics Calculator User Manual and to relevant guidance on UK legislation and policy, in order to understand how the procedure should be applied in an appropriate context.

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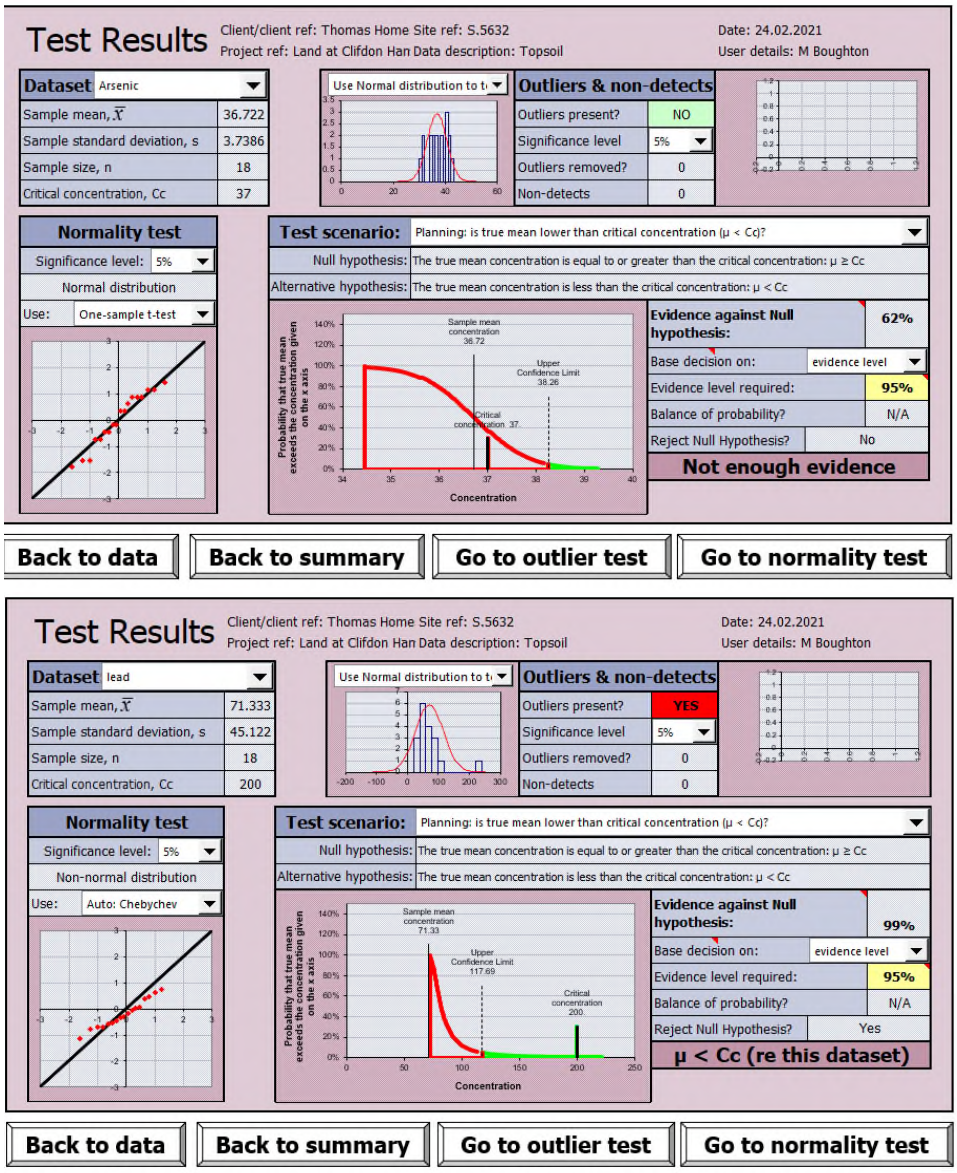

Table 1 ESI Statistical Analysis Calculator sheet