Compass Geotechnical

Geotechnical, Geoenvironmental and Civil Engineering Consultants

REPORT ON A PHASE 2 GROUND INVESTIGATION AND CONTAMINATION ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT, SITE ADJACENT TO BATEMANS LANE AND WEELEY ROAD, LITTLE CLACTON, ESSEX

Report No: 212970B

March 2022

Compass Geotechnical Limited
13 Willow Park, Upton Lane, Stoke Golding, Warwickshire, CV13 6EU
[redacted]

Report Title: REPORT ON A PHASE 2 GROUND INVESTIGATION AND CONTAMINATION ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT, SITE ADJACENT TO BATEMANS LANE AND WEELEY ROAD, LITTLE CLACTON, ESSEX

Report No: 212970B

Report Status: Final

Report Date: March 2022

Report Prepared For:
R Eleven Limited
18 Fourth Avenue,
Frinton on Sea,
Essex,
CO13 9DU

Report Prepared By:
Compass Geotechnical Limited
13 Willow Park
Upton Lane
Stoke Golding
CV13 6EU

Document Production Record

Document	Name	Signature	Date	Position
Prepared by	Rachel Foord	[redacted]	02.03.22	Director
Reviewed by	E J Murray		10.03.22	Consultant
Approved by	Rachel Foord		10.03.22	Director

Document Revision Record

Issue Number	Date	Details of Revision
1	02.03.22	Draft
2	10.03.22	Final

Document Issue Record

Report Status	Date of Issue	Issued to	Type of Report
Final	10.03.22	Client	Electronic
	10.03.22	File	Original

REPORT ON A PHASE 2 GROUND INVESTIGATION AND CONTAMINATION ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT, SITE ADJACENT TO BATEMANS LANE AND WEELEY ROAD, LITTLE CLACTON, ESSEX

Contents

Appendix (iii) Trial Pit Logs
Appendix (iv) Laboratory Test Results – Materials Properties
Appendix (v) Laboratory Test Results - Contamination
Appendix (vi) ULS & SLS Calculations

REPORT ON A PHASE 2 GROUND INVESTIGATION AND CONTAMINATION ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT, SITE ADJACENT TO BATEMANS LANE AND WEELEY ROAD, LITTLE CLACTON, ESSEX

1. INTRODUCTION AND OBJECTIVES

1.1 This report has been prepared on instructions given by the Client, R Eleven Limited (18 Fourth Avenue, Frinton on Sea, Essex, CO13 9DU).

1.2 The site is located on the north western side of Batemans Lane and south west of Weeley Road, on the northern side of the village of Little Clacton as shown on Figure 1, Appendix (i). Little Clacton lies 4km to the north of Clacton on Sea, Essex. As shown on Figure 2, Appendix (i), the site is rectangular in shape comprising an open area of land. The site is at and around National Grid Reference 616120 219840 and covers an area of around 0.33ha (Reference 1).

1.3 The site has been the subject of a previous desk study as referenced below.

- Compass Geotechnical Limited Report on a Phase 1 Desk Study and Risk Assessment for a Proposed Residential Development, Site Adjacent to Batemans Lane and Weeley Road, Little Clacton, Essex. Report No: 212970A Dated February 2022.

1.4 Proposals are to develop the site with housing with private gardens, garages, driveways and areas of landscaping. A plan showing the proposed layout is presented as Figure 3, Appendix (i). It is understood that current proposals include four houses however, consideration is being given to a fifth house at the site.

1.5 The aims of the intrusive investigation were to:

- Investigate the ground and groundwater conditions so that suitable methods of design and construction may be adopted for the development of the site with houses.
- Undertake materials property testing and contamination testing of samples recovered from an intrusive investigation.
- Provide information for the assessment of contamination.
- Assess the nature, extent and severity of any contamination at the site.
- Undertake risk assessments.
- Appraise remedial options.
- Present an interpretative report on the findings.

1.6 The investigation, assessment and reporting has been carried out in general accordance with the following:

- BS 5930:2015+A1:2020. Code of Practice for Ground Investigations.
- BS EN ISO 14688-1:2018. Geotechnical investigation and testing – Identification and classification of a soil – Part 1: Identification and description.

- BS EN ISO 14688-2:2018. Geotechnical investigation and testing – Identification and classification of a soil – Part 2: Principles for a classification.
- BS EN ISO 22476-2:2005+A1:2011. Geotechnical investigation and testing – Field testing – Part 2: Dynamic Probing.
- BS EN ISO 22476-3:2005+A1:2011. Geotechnical investigation and testing – Field testing – Part 3: Standard Penetration Test.
- BS EN ISO 14689:2018. Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description.
- BS EN ISO 22475-1:2006. Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principles for execution.
- BS 1377-9:1990. Soils for civil engineering purposes – Part 9 In-situ tests.
- BS EN 1997-1:2004+A1:2013 Eurocode 7: Geotechnical design – Part 1: General Rules.
- NA to BS EN 1997-1:2004+A1:2013. UK National Annex to Eurocode 7: Geotechnical design – Part 1: General Rules.
- BS EN 1997-2:2007. Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing.
- NA to BS EN 1997-2:2007. UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing.
- BS 10175:2011+A2:2017. Investigation of Potentially Contaminated Sites – Code of Practice.
- BS 8576:2013 Guidance on Investigations for ground gases – Permanent gases and Volatile Organic Compounds (VOCs).
- BS 8485:2015 + A1:2109. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.
- Environment Agency 2010 GPLC3 Reporting Checklists.

2. FINDINGS OF THE DESK STUDY

2.1 The following is based on information contained in the report of Section 1.3.

2.2 The historical information obtained as part of the desk study indicates that the site comprised part of an open field from at least 1874 onwards and has not previously been developed. The surrounding area was predominantly fields and houses. By 1958 a garage was shown around 30m to the north of the site with a caravan park developed north of the garage during the 1970s. In recent years the sites of the caravan park and garage have been redeveloped for houses.

2.3 The walkover survey did not identify any potential significant sources of contamination on the site. The former garage to the north is unlikely to be a significant source of contamination as it has been redeveloped for housing.

2.4 Geological information (e.g. Reference 2) indicates that the site is underlain by solid deposits of the Thames Group and no superficial deposits are shown at the site.

2.5 The desk study indicates that the solid deposits of the Thames Group are unclassified in terms of groundwater vulnerability and are deemed to be unproductive strata. The site does not lie in a groundwater source protection zone.

2.6 The available map information indicates that that the closest surface feature is a drain/ditch around 163m to the south west of the site. There is no information on water quality within 2km of the site.

2.7 No landfill sites, waste transfer stations or similar operations are documented within influencing distance of the site.

2.8 The desk study highlighted some potential risks to end users, construction workers, buildings and services and the groundwater and the surface water environment primarily associated with the former garage off site to the north. The Phase 1 Desk Study recommended an intrusive investigation including some check contamination testing.

3. SITE RECONNAISANCE

3.1 As shown on Figure 2, Appendix (i), the site is roughly rectangular in shape and is accessed from Weeley Road in the east. The site comprises an open, rough, grassed area of land and some pockets of standing water were noted at the time of the walkover. In the western corner were two small trees, a container, building materials, pipes, water containers, wood, other materials and a mound of sand. Towards the south western boundary a mound of vegetation and wood and a vegetated mound of soil were noted. The north eastern boundary along Weeley Road is marked by a hedge and heras fencing and new close boarded fencing has been installed along the northern western, south western and part of the south eastern boundaries.

To the north west is a new house and further houses are present to the north east on the opposite side of Weeley Road. To the south west and south east, beyond Batemans Lane, are open fields.

3.2 The topography of the general area falls gently to the south east.

3.3 No evidence of significant contamination was uncovered during the site walkover.

4. SITE WORK

4.1 Two exploratory holes (BH1 and BH2) of 150mm diameter was drilled by light cable percussive methods to depths of 15m to provide geotechnical information. Within the borehole, open tube (100mm diameter) samples were recovered from the cohesive strata and Standard Penetration Tests (SPTs) were undertaken at regular intervals. Small disturbed samples were recovered from all of the strata encountered in the boreholes. Selected samples of the near surface soils were recovered for contamination testing.

4.2 A series of six trial pits were excavated by hand across the site. TP1 to TP4 were to recover samples of the near surface soils for contamination testing. The remaining two pits (CBR1 and CBR2) were located in the north east of the site close to Weeley Road to recover bulk samples for laboratory CBR tests as requested by the Client's Engineer.

4.3 Samples for contamination testing from all of the exploratory holes were sealed into amber glass jars to prevent sample deterioration and placed in cool boxes for transport to the laboratory as quickly as possible. All contamination samples were taken in appropriately sized containers and where necessary headspace and storage times were minimized. Representative small disturbed samples were also recovered from the strata encountered.

4.4 The site work was undertaken on 17th and 18th February 2022.

4.5 The investigation and sampling strategies were to obtain representative samples of any fill, natural deposits and groundwater, where encountered, and to recover materials for soil property and contamination analysis and appraisal. Laboratory testing was undertaken to determine levels and distribution of contaminants and material properties. The investigation was in general accordance with the documents of Section 1.6.

4.6 All of the samples were transported to the laboratory for detailed examination and selected samples were programmed for testing.

4.7 Details of the strata encountered in the exploratory holes are given on the borehole logs presented in Appendix (ii) and the trial pit logs of Appendix (iii). The positions of the exploratory holes are shown on Figure 3, Appendix (i).

5. LABORATORY WORK

5.1 Detailed below in Table 5.1 is the material property testing undertaken as part of this investigation:

Table 5.1 Summary of Material Property Tests

Material Property Test	Number of Tests Natural Soils
Undrained Multistage Triaxial Strength Tests	6
Natural Moisture Content	3
Liquid and Plastic Limit	3
Soluble Sulphate Content	5
pH Value	5
Recompacted CBR (2.5kg rammer)	2

5.2 The following testing was undertaken on samples of the natural soils encountered to determine possible contamination at the site:

Table 5.2 Summary of Laboratory Contamination Tests

Contamination Test	Number of Tests Natural Soils
Suite of Heavy Metals	6
pH Value	6
Speciated PAH	6
TPH Banded (C8-C40)	6
Volatile Organic Compounds (VOC)	1

5.3 The material property test results are included as Appendix (iv) and the contamination test results are presented in Appendix (v).

5.4 The laboratory testing was undertaken during the period 21st February to 9th March 2022.

5.5 The testing was undertaken at UKAS and MCERTS accredited laboratories.

6. ENGINEERING ASSESSMENT AND RECOMMENDATIONS

6.1 Soil Profile

Beneath the turf, topsoil was present in all of the exploratory hole locations to depths of up to 0.40m below ground level. Beneath the topsoil were natural clays of firm and stiff consistency thought to represent the Thames Group. Rare inclusions of gravel were noted in the upper horizons of the Thames Group deposits suggesting some of the upper soils may have been geologically reworked. A thin horizon of mudstone was encountered in BH1 between 4.5 and 4.8m below ground level. Reference should be

made to the exploratory hole logs of Appendix (ii) and Appendix (iii) for a full description of the materials present. Geotechnical parameters for the Thames Group are summarized in Table 6.1 below.

Table 6.1 Geotechnical Parameters for Thames Group

Parameter (units)	Results	Classification	Comments
Undrained Shear Strength (kPa) Cohesive deposits	48 - 142 (triaxial test results) (32 – 176 range based on SPT) (86 – 176 typical based on SPT	Medium and high strength	General increase in strength with depth. SPT to Cu conversion based on Reference 5
SPT N Value Cohesive deposits	7 – 39 (range) 19 – 39 (typical)		
Water Content (%)	28.8 – 33.3		
Liquid Limit (%)	85 – 87	CV Soils High Shrinkability	
Plastic Limit (%)	27 – 30		
Plasticity Index (%)	56 - 60		
Modified Plasticity Index (%)	n/a		
Soluble Sulphate Content SO_4 (g/l)	0.042 – 0.14	AC-1s based on soluble sulphate.	
pH Value	7.9 – 8.5		

The deposits of the Thames Group were proved to the full depth of the investigation (15m).

6.2 Ground Contamination Observations

No visual or olfactory evidence of significant contamination was noted during the investigation.

6.3 Groundwater Conditions

No groundwater seepages were encountered during the investigation.

It should be borne in mind that groundwater conditions can vary with seasonal and other effects and thus at times may be at variance with the conditions noted at the time of the site work.

6.4 Excavations

Random falls and collapse of vertical excavation faces can be expected dependent on the depth of excavation, the length of time excavations stand open, and the incidence of any groundwater entries.

Consideration should be given to providing at least intermittent support in deepened vertical sided excavations where personnel are required to enter. The adequacy of all excavation support should be continually assessed and inspected by experienced personnel.

6.5 Structural Foundations

It is understood that the development is to comprise bungalows of traditional construction. Foundation recommendations for buildings take account of the following:-

- Ultimate Limit State (ULS) (stability)
- Serviceability Limit State (SLS) (settlements and ground movements)

The ULS assessment of stability examines the bearing resistance of the ground. The SLS assessment limits the settlements to assessed acceptable limits. The SLS also requires that suitable foundation depths and construction are adopted to cater for the potential ground movements due to the presence of trees and other major vegetation (including future planting) in close proximity to the proposed buildings.

The near surface deposits comprise cohesive deposits of the Thames Group which are described as firm at around 1.0m but appear to become stiffer with depth.

Strip or trench fill foundations may prove acceptable for the proposed development depending on the proposed loadings. Foundations could be taken down to bear in the firm clays at around 1.0m depth. A characteristic undrained shear strength of 48kPa has been adopted based on the triaxial test result in the upper 1m. Calculations suggest that a preliminary design bearing resistance of around 88kPa would be acceptable for a strip foundation, 0.6m wide, bearing on the firm clays at around 1.0m depth. Under these conditions the footing would have an adequate factor of safety against shear failure and settlements should be limited to less than 25mm. The ULS and SLS calculations are presented in Appendix (vi). If foundations are carried down to bear in the stiffer clays at around 2.0m depth the design bearing resistance could be increased to around 125kPa for a 0.6m wide strip foundation.

There are a number of trees around the perimeter of the site and consideration may need to be given to deepening of foundations within influencing distance of the trees in accordance with NHBC Standards (Reference 6).

As an alternative, consideration could be given to raft foundations. If the houses are within influencing distance of the trees it may be necessary to form the raft on a compacted stone bed 1m thick in accordance with the recommendations contained in Reference 6.

Consideration could also be given to a piled foundation with piles taken down to bear in the stiff clays of the Thames Group at depth below the site. A cfa or bored pile would prove acceptable, although the advice of a specialist contractor should be sought. Due to the proximity of the adjacent property, a driven pile is not considered suitable. Consideration may need to be given to sleeving of piles within influencing distance of trees and the potential for uplift particularly given the highly shrinkable nature of the clays of the Thames Group. Heave precautions may need to be placed on the underside of ground beams and on the internal faces of external ground beams.

As a guide to likely pile loading calculations, which assess the Ultimate Limit State (ULS) of the ground (Geo Limit State) and the Serviceability Limit State (SLS) (settlements), an analysis has been undertaken and is presented in Appendix (iv). The characteristic geotechnical parameters for the clays are based on an assessment of the reported SPT results, laboratory testing and examination of the materials. A characteristic undrained shear strength of 100kPa has been adopted for the clays. SLS and ULS calculations suggest a carrying capacity of around 330kN for a 0.3m diameter cfa pile, 15m in length in the absence of pile testing.

6.6 Ground Floor Slabs

Over much of the site, other than within influencing distance of trees, ground bearing floor slabs would be considered acceptable. Where the surrounding trees influence the houses ground floor slabs should be constructed as suspended over a void in accordance with the recommendations of Reference 6.

6.7 Chemical Attack on Concrete

Laboratory determinations of soluble sulphate content have been undertaken on samples of the natural clay soil present at the site. Reported concentrations were between 0.042 and 0.14g/l SO_4 in association with slightly alkaline pH values.

In accordance with BRE Special Digest 1 (Reference 7) the site has been classed as 'natural ground' the groundwater regime is considered 'static' as relatively low permeability clays are present on site.

Comparison of the characteristic sulphate contents for the soil (based on the mean of the highest two results) and pH concentrations with Table C1 of Reference 7 suggests the ACEC class for the site is AC-1s.

6.8 Road Pavement Design

Two samples (CBR1 and CBR2) taken from around 0.5-1.0m below existing ground level have been the subject of recompacted laboratory CBR tests. The reported CBR values are 1.8% and 4.7% respectively. For preliminary design purposes a worst case CBR value of <2% should be adopted. Further testing prior to construction may be necessary and possibly justify the adoption of a greater CBR value for pavement design.

6.9 Soakaways

The ground conditions at the site comprise low permeability clays from immediately below the topsoil. Although no insitu or laboratory percolation tests have been undertaken it is considered that soakaways would not be suitable for the disposal of surface water at the site.

7. CONTAMINATION ASSESSMENT

7.1 Assessing Contamination

The processes for assessing contamination should be based on the protection of human health, building materials and the environment using the SOURCE-PATHWAY-RECEPTOR concept. The sources, pathways and receptors relevant to the site are identified using a conceptual site model as outlined in Guidance for the Safe Development of Housing on Land Affected by Contamination (Reference 8). Reference is also made to the procedures in the Environment Agency Land Contamination Risk Managements (Reference 9), BS 10175:2011+A2:2017 (Reference 4), the Essex Contaminated Land Consortium Document (Reference 42) and the DEFRA Contaminated Land Statutory Guidance (Reference 40). Reference should be made to the original desk study report for full details of the conceptual model.

7.2 Discussion of Results

The results of the contamination testing are discussed in the following sections. Laboratory contamination testing has been carried out on samples of the made ground and natural soils encountered in the investigation as a check on conditions. The soils have been tested for a variety of contaminants and comments are made on the spatial distribution of the contaminants along with an indication of whether the results are elevated in relation to guideline values. In this instance, as an initial appraisal, the guideline values used are the critical concentrations for a residential end use with consumption of home grown vegetables. Reference should be made to Section 7.3 for a detailed explanation of critical concentrations.

7.2.1 Natural Soils

Samples of the natural soils have been tested for a range of contaminants. In the majority of samples no elevated levels were reported. However, in TP1 in the west of the site near the container and stored materials, slightly elevated levels of some Total Petroleum Hydrocarbons (TPH) were encountered as summarized in Table 7.1 below.

Table 7.1 Summary of Elevated Results – Natural Soils

Determinand	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Critical Concentration (mg/kg)	Number of Results >Critical Concentration
TPH >C8-C10	< 1.0	**140**	27	1/6
TPH >C10-C12	< 1.0	**120**	74	1/6

The full test results for the made ground are discussed and presented in section 7.3.1.

7.3 Risk Estimation

Part IIa of the Environmental Protection Act 1990 provides the main regulatory regime for the identification and remediation of contaminated land. However, there is no single methodology covering all aspects of the assessment of potentially contaminated land and groundwater. Therefore, the approach adopted for this investigation is made

up of a number of procedures designed to protect human health, building materials and the environment. All of the procedures are based on a risk assessment methodology centred on the identification and analysis of source-pathway-receptor linkages and take account of the procedures outlined in Guidance for the Safe Development of Housing on Land Affected by Contamination (Reference 8). Reference is also made to the procedures in the Environment Agency Land Contamination Risk Management (Reference 9), the Essex Contaminated Land Consortium Document (Reference 42) and the DEFRA Contaminated Land Statutory Guidance (Reference 40). The sources-pathways and receptors relevant to the site were identified in the desk study along with details of the initial conceptual site model.

To assess potential risks, samples from the site have been analysed for a range of general contaminants based on assessed recent and previous uses. Consideration has also been given to the requirements of Reference 39 for the selection of water supply pipes. However, it should be noted that the desk study and assessments have not highlighted potential sources for some of the contaminants contained in Reference 39. Testing has been carried out on samples from natural soils. In accordance with current practice (Reference 8) where sufficient results are available they have been statistically analysed. Where only a few results are available they have been compared directly with published critical concentrations. The approach is based on the methodology set out in the CL:AIRE document Profession Guidance: Comparing Soil Contamination Data with a Critical Concentration (Reference 10). The guidance allows examination of the robustness of the data set, the identification of statistical outliers and the use of appropriate statistical techniques based on the distribution of the data set (whether normal or non-normal). The guidance can be used to determine:

- Whether land is suitable for a new use under the land use planning system (Planning Scenario).

Or

- Whether land falls within the scope of Part 2A of the Environment Protection Act 1990 (Part 2A Scenario).

In this case the Planning Scenario is appropriate as the site is to be developed. The aim is thus to demonstrate 'suitability for use' by rejection of the Null Hypothesis (H_0) that the level of contamination (based on the mean of the data set) is the same as, or higher than the critical concentration. If this is demonstrated then the Alternative Hypothesis (H_1) holds true that the level of contamination is lower than the critical concentration.

The selection of appropriate critical concentrations of contaminants for the assessment of risks to human health is based on the CLEA guidance (References 11 to 13). This was updated in autumn 2008 and replaces all previous guidance. This most recent guidance allows derivation of Soil Guideline Values (SGVs) based on: generic assumptions about the fate and transport of chemicals in the environment; a generic conceptual model for site conditions and human behaviour to estimate exposure to soil contaminants for those living, working and/or playing on contaminated sites over

a long period of time; and Health Criteria Values that represent a tolerable or minimal risk to health from chronic exposure.

The Environment Agency published SGVs for eleven contaminants (References 14 to 35), including mercury and nickel which have now been withdrawn, and was proposing to publish further SGVs during 2010 but has not done so to date. The former guidelines (Reference 36), the recent DEFRA Category 4 Screening Levels (Reference 37) and the recent LQM/CIEH S4ULs (Reference 38) have been used as initial screening values in the following assessments where no new SGVs have been published. The LQM/CIEH Suitable for Use Levels (S4ULs) also include criteria for the eleven contaminants covered by the SGVs but take into account more recent research on contamination. Site Specific Assessment Criteria (SSAC) and Generic Assessment Criteria (GACs) for individual contaminants can be derived using CLEA v1.07.

The published criteria relate to standard land uses for residential end use (both with and without uptake of vegetables), allotments, commercial/industrial use, and public open space including amenity areas within residential developments and public parks. The residential end use criteria are protective of the health of young children (0 to 6 years) and assume daily exposure to contaminants over a six year period. The commercial/industrial use relates to adults and is for exposure durations based on a standard working week. The proposed development is for a residential end use with private gardens and the relevant guideline values have been used in the following assessments.

7.3.1 Human Health Risk Assessment – Natural Soils

The assessment of possible risks to human health from the soils at the site is based on the 'suitability for use' as described in Section 7.3. Table 7.2 below summarises the outcome of the comparison of the results for heavy metals from the natural soils. The results have been compared directly with the critical concentrations. The critical concentrations relate to a residential end use with uptake of homegrown produce.

Table 7.2 Comparison of Data for Metals – Natural Soils

Determinand	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Critical Concentration (mg/kg)
Arsenic	1.8	7.6	37
Cadmium	<0.10	0.15	11
Chromium (VI)	<0.50	<0.50	6
Copper	6	14	2400
Mercury	<0.10	<0.10	1.2
Nickel	6.7	16	180
Lead	8	23	200
Selenium	<0.20	0.26	250
Zinc	21	58	3700
pH	7.5	8.8	

The results do not indicate any elevated concentrations of heavy metals and no risks to end users.

Six samples of the natural soils were screened for PAHs and the results are summarised in Table 7.3 below.

Table 7.3 Comparison of Data for PAHs – Natural Soils

Determinand	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Critical Concentration (mg/kg)
Naphthalene	<0.10	0.73	2.3
Acenaphthylene	<0.10	0.18	170
Acenaphthene	<0.10	0.17	210
Fluorene	<0.10	0.16	170
Phenanthrene	<0.10	1.2	95
Anthracene	<0.10	0.42	2400
Fluoranthene	0.21	1.9	280
Pyrene	0.34	2.1	620
Benzo(a)Anthracene	<0.10	1.1	2.2
Chrysene	<0.10	1.8	15
Benzo(b)fluoranthene	<0.10	1.2	2.6
Benzo(k)fluoranthene	<0.10	0.65	77
Benzo(a)Pyrene	<0.10	1.2	2.2
Indeno(123-cd)Pyrene	<0.10	<0.10	27
Dibenzo(ah)Anthracene	<0.10	<0.10	0.24
Benzo(ghi)Perylene	<0.10	<0.10	320

The results for the PAHs indicate the presence of some of the individual PAH congeners however, none exceed the relevant guideline values and do not suggest significant contamination.

Six samples of the natural soils were screened for TPHs using banded analysis. The results are detailed in Table 7.4 below along with the relevant critical concentrations assuming worst case conditions of a soil organic matter content of 1%.

Table 7.4 Comparison of Data for TPHs – Natural Soils

Determinand	BH1 0.50m mg/kg	BH2 0.5m mg/kg	TP1 0.3m mg/kg	Critical Concentration mg/kg
TPH >C8-C10	< 1.0	< 1.0	**140**	27
TPH >C10-C12	< 1.0	< 1.0	**120**	74
TPH >C12-C16	< 1.0	< 1.0	8.1	140
TPH >C16-C21	26	< 1.0	< 1.0	260
TPH >C21-C35	64	< 1.0	< 1.0	1100
TPH >C35-C40	< 1.0	< 1.0	< 1.0	1100
Hazard Index (HI)	0.16	-	**6.86**	

Determinand	TP2 0.3m mg/kg	TP3 0.3m mg/kg	TP4 0.3m mg/kg	Critical Concentration mg/kg
TPH >C8-C10	< 1.0	< 1.0	< 1.0	27
TPH >C10-C12	< 1.0	< 1.0	< 1.0	74
TPH >C12-C16	< 1.0	< 1.0	< 1.0	140
TPH >C16-C21	< 1.0	33	< 1.0	260
TPH >C21-C35	< 1.0	49	< 1.0	1100
TPH >C35-C40	< 1.0	< 1.0	< 1.0	1100
Hazard Index (HI)	-	0.17	-	

Most of the results from the natural soils do not indicate the presence of TPH however, the results from TP1 0.3m do suggest some elevated hydrocarbons in the C8-10 and C10-12 bands. The results summarized in Table 7.3 above indicate some potential risks to end users.

In line with good practice, consideration has been given to possible cumulative effects with calculation of the Hazard Index (HI) (Reference 41). As the HI is greater than one in the sample from TP1 0.3m depth there are potential cumulative effects.

7.4 Risk Evaluation

The purpose of the risk evaluation is to assess whether there are any unacceptable risks to potential receptors from contamination at the site. The risk evaluation considers individually the receptors and pathways identified in the original conceptual model and represents a further refinement of the model. The updated conceptual model is discussed in Section 7.5. The preliminary contamination testing has indicated the presence of some TPHs in the sample from TP1 0.30m depth in the western corner, but no contamination has been identified elsewhere at the site.

Table 7.5 Risk Evaluation

Receptor	Risk Evaluation
Site Workers	Risks to site workers are considered to come through direct and indirect contact with contaminated soils either by direct skin contact, inhalation of dust/vapour or ingestion by hand to mouth transfer. In order to minimize risks and in accordance with good practice gloves, boots and overalls should be worn to reduce the risks of skin contact. A high standard of personal hygiene should be maintained on site to reduce risks of hand to mouth transfer.
End Users	Risks to end users usually come from direct contact with the ground, ingestion or inhalation of soil particles/vapour or indirect contact such as ingestion of plants or vegetables grown in contaminated soils. Where the site is to be covered by proposed buildings and other hard cover there is not deemed to be a viable pathway by which end users could come into contact with the underlying soils. However, in garden and soft landscaping areas there is the potential for end users to come into contact with soils. Potential risks to end users have been identified in the area of TP1 towards the western corner and either further investigation or localized remedial measures are considered necessary in this area (see Section 7.5).
Building Materials	Guidance provided by Anglian Water (Reference 39) based on UKWIR 10/WM/03/21 Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites suggests extensive testing for a wide range of contaminants however, the desk study has not indicated sources for all of the contaminants. The soil testing has found concentrations of organic contaminants (TPH) in the natural soils in the western corner which may indicate the need for barrier pipe locally. However, this is within a garden and possibly not where water supply pipes are likely to be laid. The results should be forwarded to the water supply company for their comment.
Local Environment	Groundwater resources and surface water can be affected by the migration of contaminants. The Environment Agency web site indicates that the site is underlain by Unproductive Strata and the site is not within a groundwater source protection zone. Although some TPH contamination has been identified in the near surface natural soils locally in the western corner of the site risks to the Local Environment are considered minimal.

7.5 Updated Conceptual Site Model

The investigation carried out has identified the presence of limited contamination in the form of TPH, in TP1 in the western corner of the site where a container and materials are store. No risks were identified in the natural soils elsewhere at the site. The updated conceptual model of pollution linkages is detailed in Table 7.6 below.

Table 7.6 Updated Conceptual Model of Pollution Linkages

Sources Potentially Present	Receptors	Pathways	Qualitative Assessment of Risk
TPH in upper natural soils in TP1 in western corner of site	End Users – On site	Contact with soils, ingestion, dust inhalation in garden and landscape areas. Potential for vapour inhalation	Low to moderate risk in garden/landscaped areas
	Controlled Waters	Migration	Low to Negligible risk
	Buildings/services	Ingress into water supply pipes	Negligible with appropriate selection of water supply pipes
	Construction workers	Contact with soils	Negligible with appropriate PPE
	End Users – Off Site	Migration	Negligible Risk

7.6 Discussion and Further Works

The presence of TPH in TP1 in the western corner of the site will require further investigation and possibly some remedial action to safe guard the health of end users. It is thought that the contamination may be associated with the materials stored in this part of the site and further sampling and testing would be deemed appropriate to determine the extent of the contamination. There is no indication that the contamination is widespread and it is thought that it is localized to the western corner.

Depending on the findings of further sampling and testing any remedial action necessary may be limited to localized removal of the upper material.

Prior to any remedial operations being undertaken a Remediation Method Statement should be drawn up. Any remedial measures undertaken will need to be independently checked and validated to the satisfaction of the Local Authority, NHBC and other statutory bodies. Any remedial works should be independently checked and verified by a suitably experienced Engineer and a validation report drawn up on

completion of the work. The remedial works should be inspected and a photographic record made of the work. Any materials imported to site for use as clean cover should be checked and validated prior to use. Records should be kept of materials removed from site for disposal and details included in the validation report. The above investigation constitutes a spot check only and more severe or unexpected contamination may be present.

If further contamination is uncovered during development works this should be reported immediately so appropriate action may be taken.

[redacted]

R. Foord BSc, MSc, MCSM, CGeol, FGS

REFERENCES

1. Ordnance Survey 1:50,000 Series Sheet 169 Ipswich & The Naze Clacton on Sea 1997.

2. British Geological Survey 1:50,000 Series Sheet 224/242 Colchester and Brightlingsea Bedrock and Superficial Deposits 2010.

3. HPA-RPD-033 2007 Indicative Atlas of Radon in England and Wales. Public Health England.

4. BS 10175: 2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice. British Standards Institution

5. Stroud, M. A. and Butler, F. G. 1975. 'The Standard Penetration Test and the Engineering Properties of Glacial Materials' Proceedings of the Symposium of University of Birmingham 21-23 April 1975.

6. NHBC Standards Chapter 4.2 2022 'Building Near Trees' National House Building Council.

7. BRE Special Digest 1:2005 Third Edition Concrete in Aggressive Ground. BRE Construction Division.

8. Environment Agency and NHBC (2008) 'Guidance for the Safe Development of Housing on Land Affected by Contamination' R & D Publication 66. Environment Agency.

9. Environment Agency 2021 Land Contamination Risk Management (LCRM).

10. CL:AIRE 2020: Profession Guidance: Comparing Soil Contamination Data with a Critical Concentration. CL:AIRE, Buckinghamshire.

11. Environment Agency 2009 Updated technical background to the CLEA model: Science Report – Final SC050021/SR3.

12. Environment Agency 2009 Human Health toxicological assessment of contaminants in soil. Science Report – Final SC050021/SR2.

13. Environment Agency 2008 Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values. Science Report SC050021/SR7.

14. Environment Agency 2009 Soil Guideline Values for Selenium in Soil. Science Report SC050021/Selenium SGV.

15. Environment Agency 2009 Soil Guideline Values for Mercury in Soil. Science Report SC050021/Mercury SGV. (Withdrawn).

16. Environment Agency 2009 Soil Guideline Values for Benzene in Soil. Science Report SC050021/Benzene SGV.

17. Environment Agency 2009 Soil Guideline Values for Ethyl benzene in Soil. Science Report SC050021/Ethylbenzene SGV.

18. Environment Agency 2009 Soil Guideline Values for Toluene in Soil. Science Report SC050021/Toluene SGV.

19. Environment Agency 2009 Soil Guideline Values for Xylene in Soil. Science Report SC050021/Xylene SGV.

20. Environment Agency 2009 Soil Guideline Values for Arsenic in Soil. Science Report SC050021/Arsenic SGV.

21. Environment Agency 2009 Soil Guideline Values for Nickel in Soil. Science Report SC050021/Nickel SGV. (Withdrawn).

22. Environment Agency 2009 Soil Guideline Values for Cadmium in Soil. Science Report SC050021/Cadmium SGV.

23. Environment Agency 2009 Soil Guideline Values for Phenol in Soil. Science Report SC050021/Phenol SGV.

24. Environment Agency 2009 Soil Guideline Values for Dioxins, Furans and Dioxin Like PCBs in Soil. Science Report SC050021/Dioxins, Furans and Dioxin Like PCBs SGV.

25. Environment Agency 2009 Supplementary Information for the derivation of SGV for Selenium. Science Report: SC050021/Technical Review selenium.

26. Environment Agency 2009 Supplementary Information for the derivation of SGV for Mercury. Science Report: SC050021/Technical Review mercury. (Withdrawn).

27. Environment Agency 2009 Supplementary Information for the derivation of SGV for Benzene. Science Report: SC050021/Technical Review benzene.

28. Environment Agency 2009 Supplementary Information for the derivation of SGV for Ethyl benzene. Science Report: SC050021/Technical Review ethyl benzene.

29. Environment Agency 2009 Supplementary Information for the derivation of SGV for Toluene. Science Report: SC050021/Technical Review toluene.

30. Environment Agency 2009 Supplementary Information for the derivation of SGV for Xylene. Science Report: SC050021/Technical Review xylene.

31. Environment Agency 2009 Supplementary Information for the derivation of SGV for Arsenic. Science Report: SC050021/Technical Review arsenic.

32. Environment Agency 2009 Supplementary Information for the derivation of SGV for Nickel. Science Report: SC050021/Technical Review nickel. (Withdrawn).

33. Environment Agency 2009 Supplementary Information for the derivation of SGV for Cadmium. Science Report: SC050021/Technical Review cadmium.

34. Environment Agency 2009 Supplementary Information for the derivation of SGV for Phenol. Science Report: SC050021/Technical Review phenol.

35. Environment Agency 2009 Supplementary Information for the derivation of SGV for Dioxins, Furans and Dioxin Like PCB's. Science Report: SC050021/Technical Review dioxins, furans and dioxin like PCB's.

36. Department of the Environment, Food and Rural Affairs and Environment Agency 2002 Soil Guideline Values for Chromium Contamination R & D Publication SGV 4.

37. CL:AIRE 2013 Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Report SP1010.

38. Nathanail, C. P., et al 2014 The LQM/CIEH S4ULs for Human Health Risk Assessment. S4UL3487. Land Quality Press, Nottingham.

39. Anglian Water (2011) 'Information for Developers about contaminated land and ground condition assessment guidance and advice given by Anglian Water.

40. DEFRA 2012. Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance. H M Government

41. Environment Agency (2005) 'The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils' Science Report P5-080/TR3.

42. Essex Contaminated Land Consortium. Land Affected By Contamination. Technical Guidance for Applicants & Developers. Third Edition 30th September 2014.

GENERAL NOTES

The copyright of this report and other plans and documents prepared by Compass Geotechnical Limited are owned by them. The copyright in the written materials shall remain the property of Compass Geotechnical Limited but with a royalty-free perpetual license to the client deemed to be granted on payment in full to Compass Geotechnical Limited by the client of the outstanding monies.

The report is provided for the sole use of the client and is confidential to them, their professional advisors, no responsibility whatsoever for the contents of the report will be accepted to any person other than the client.

New information, improved practices, changes in legislation, or changes in guidelines from Statutory Bodies may necessitate a re-interpretation of the report in whole or part after its original submission.

The report and/or opinion will be prepared and written for the specific purposes and/or development stated in the document and in relation to the nature and extent of proposals made available to us at the time of writing. The recommendations should not be used for other schemes on or adjacent to the site.

The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. Conditions between exploratory holes have been interpolated, however soil conditions are highly variable and may differ from the interpolation. There may be conditions, appertaining to the site, which may not be revealed by the investigation, and which may not be taken into account in the report.

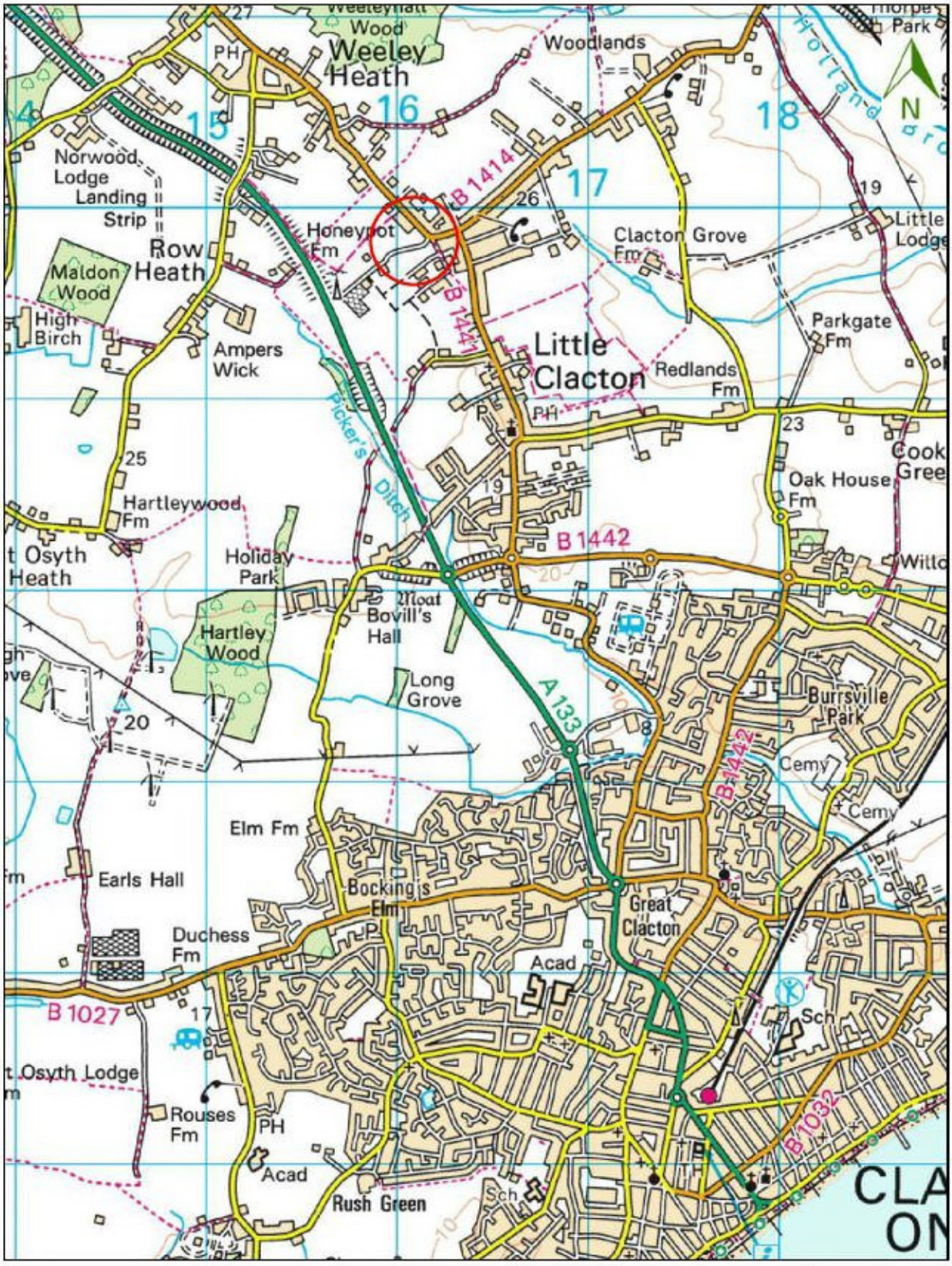
The accuracy of the results reported will depend on the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristic of the strata as a whole. Where such measurements are critical, the technique of the investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the company where necessary.

The economic viability of the proposal referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to the geotechnical considerations hence its evaluation will be outside the scope of the report.

Where any data supplied by the Client or from other sources, including previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by Compass Geotechnical Limited for inaccuracies in the data supplied by any other party.

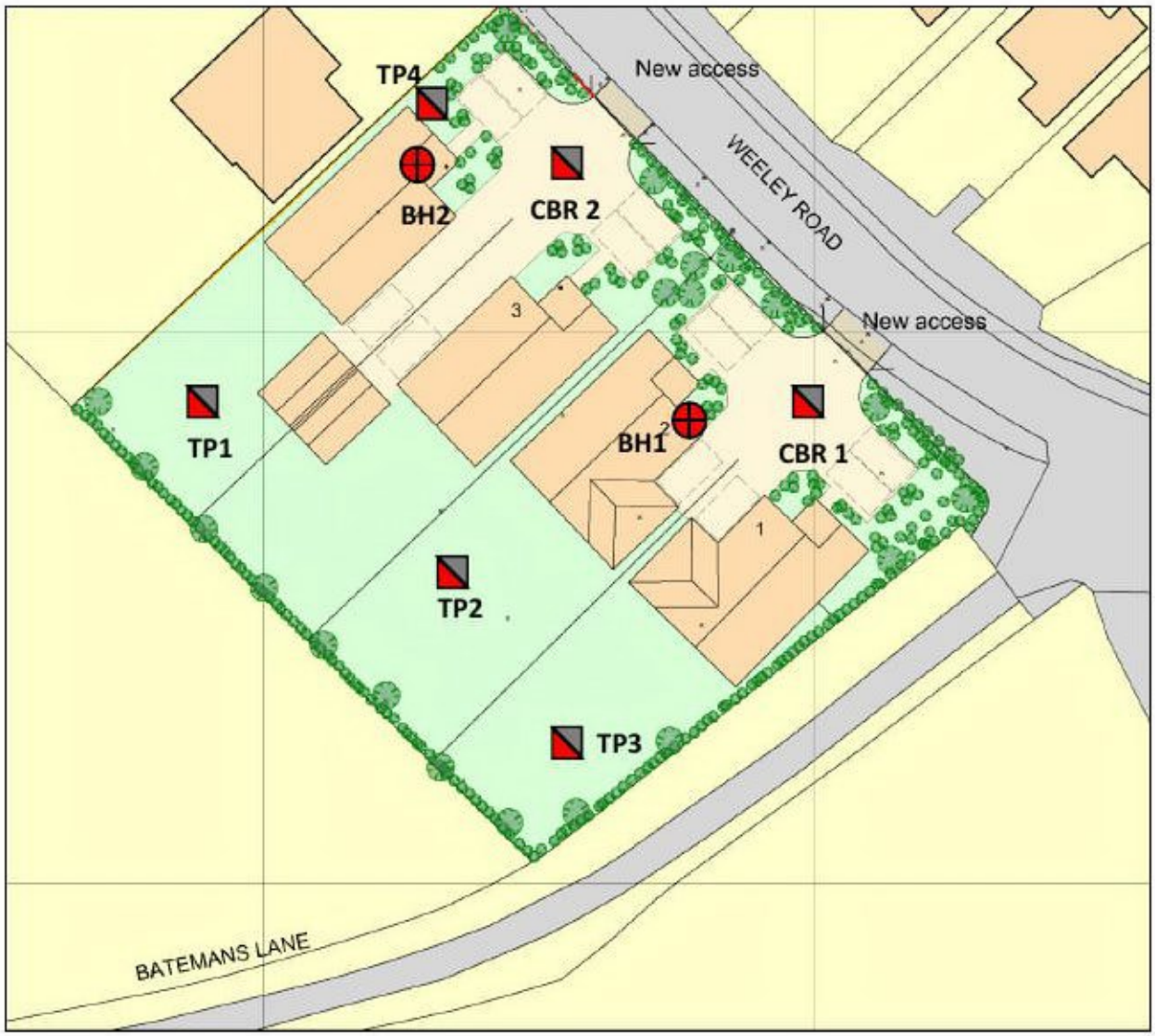
The investigation does not include the identification of Japanese Knotweed. Any such survey should be undertaken by a specialist.

Appendix (i)
Figures



Reproduced with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown Copyright Licence No: AL100034022.	**Figure 1**	Site Location Plan
	Date	March 2022
	Not to Scale	

Extract from C E Bass Civil Engineering Building and Surveying Services Drawing No: 03/20-07 BDY2 dated 16th April 2020.	**Figure 2**	Exploratory Hole Plan
	Date	February 2022
	Not to Scale	



Extract from Tim Snow Architects Location and Block Plan. Drawing No 947-04C dated October 2020	**Figure 3**	Proposed Site Plan with Exploratory Hole Positions
	Date	March 2022
	Not to Scale	

Appendix (ii)
Borehole Logs

Introduction

All sampling and in-situ test methods are carried out in accordance with the relevant British and European standards as referenced below.

Abbreviations Used

Exploratory hole records are presented in graphical format with the use of standard abbreviations as outlined below.

Sampling Method

BH	Borehole
TP	Trial Pit
WS	Windowless Sample Hole
CC	Concrete Cored Hole

Sample Types

D	Disturbed Sample
B	Bulk Sample
ES	Environmental Sample
PID	Sample for total VOC screen
L	Liner Tube Sample
U	Undisturbed Sample
UT	Thin Wall Undisturbed Sample
NR	No Recovery
W	Water Sample
C	Rotary Core

In-Situ Tests

DP	Dynamic Probe Test
CPT	Cone Penetrometer Test
SPT	Standard Penetrometer Test
V	Hand Shear Vane Strength Determination (kPa) – manufacturer's calibration of 1.491 applied to direct reading
V*	Hand Shear Vane Strength Determination (kPa) on excavated block of material

References

BS 5930:2015 + A1:2020 Code of Practice for Ground Investigations

BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice

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 2 Principles of Classification.

BS EN ISO 22475-1:2006 Geotechnical Investigation and Testing – Sampling Methods and Groundwater measurements: Part 1 Technical Principles for Execution.

BS EN ISO 22476-2:2005+A1:2011 Field Testing Part 2: Dynamic Probing.

BS EN ISO 22476-3:2005 + A1:2011 Geotechnical Investigation and Testing – Field Testing: Part 3: Standard Penetration Test.

EUR 26227 EN, 2013 Eurocode 7 Chapter 5 Ground Investigation and Testing.

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Cable Percussion Borehole Log

Project ID	Borehole No.
212970	BH1
	Sheet 1 of 2
	Scale: 1:50

Project Title:	Location:	Client:	Date Drilled
Batemans Lane	Site adjacent to Batemans Lane and Weeley Road, Little Clacton	R Eleven Limited	17/02/2022
			Rig Crew: RW
			Logged: RF
Easting:	Northing:	Level (mAOD):	Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
						Turf over brown clayey Topsoil.(0.30m)			
				0.30		Firm becoming stiff fissured yellowish brown mottled grey CLAY with rare fine white sub angular quartz gravel in upper horizons and rare roots. [Thames Group](4.20m)			
0.50	ES								
0.60	D								
1.00 - 1.45	SPT(S)	N=7 (2/1,2,2,2)					1		
1.00 - 1.45	D								
2.00 - 2.40	U						2		
2.40 - 2.45	D								
3.00 - 3.45	SPT(S)	N=33 (9/7,8,8,10)					3		
3.00 - 3.45	D								
4.00 - 4.40	U						4		
4.50 - 4.80	D			4.50		Greyish brown MUDSTONE. [Thames Group].(0.30m)			
				4.80		Stiff yellowish brown mottled grey CLAY with rare selenite crystals. [Thames Group].(1.40m)			
5.00 - 5.45	SPT(C)	N=33 (12/6,8,8,11)					5		
5.00 - 5.45	D								
							6		
				6.20		Stiff becoming very stiff locally fissured greyish brown rarely mottled dark grey and yellowish brown CLAY. [Thames Group]. (8.80m)			
6.50 - 6.90	U								
6.95 - 7.00	D						7		
8.00 - 8.45	SPT(S)	N=28 (8/5,7,7,9)					8		
8.00 - 8.45	D								
							9		
9.50 - 9.90	U								
9.95 - 10.00	D						10		
						Continued next sheet			

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)
					15.00	150	1.40	150

Remarks:

Chiselling & Pits				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	01:00	Service pit				
4.50	4.80	01:00	Chiselling				

Groundwater Observations					
Strike at (m)	Casing at (m)	Sealed at (m)	Time (min)	Rose to (m)	Remarks
					No groundwater seepages

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Cable Percussion Borehole Log

Project ID: 212970

Borehole No.: BH1
Sheet 2 of 2
Scale: 1:50

Project Title: Batemans Lane
Location: Site adjacent to Batemans Lane and Weeley Road, Little Clacton
Client: R Eleven Limited
Date Drilled: 17/02/2022
Rig Crew: RW
Logged: RF
Checked:
Easting:
Northing:
Level (mAOD):

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
						Stiff becoming very stiff locally fissured greyish brown rarely mottled dark grey and yellowish brown CLAY. [Thames Group]. (8.80m)			
11.00 - 11.45	SPT(S)	N=37 (11/7,9,9,12)					11		
11.00 - 11.45	D								
12.50 - 12.90	U						12		
12.95 - 13.00	D						13		
14.50 - 14.95	SPT(S)	N=39					14		
14.50 - 14.95	D	(13/9,8,10,12)							
				15.00		Borehole Completed at 15.000m	15		
							16		
							17		
							18		
							19		
							20		

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
15.00	150

Casing Diameter

Depth (m)	Dia (mm)
1.40	150

Remarks:

Chiselling & Pits

From (m)	To (m)	Duration	Remarks
0.00	1.00	01:00	Service pit
4.50	4.80	01:00	Chiselling

Installation

Top (m)	Base (m)	Type	Dia (mm)

Groundwater Observations

Strike at (m)	Casing at (m)	Sealed at (m)	Time (min)	Rose to (m)	Remarks
					No groundwater seepages

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Cable Percussion Borehole Log

Project ID: 212970

Borehole No.: BH2
Sheet 1 of 2
Scale: 1:50

Project Title: Batemans Lane
Location: Site adjacent to Batemans Lane and Weeley Road, Little Clacton
Client: R Eleven Limited
Date Drilled: 17/02/2022
Rig Crew: RW
Logged: RF
Checked:
Easting:
Northing:
Level (mAOD):

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
						Turf over brown clayey Topsoil.(0.30m)			
				0.30		Firm to stiff orange brown mottled yellowish brown and grey slightly gravelly CLAY with rare roots and rare black carbonaceous matter. Gravel is rare white and black fine to coarse sub angular chert. (Thames Group - possibly reworked).(0.70m)			
0.50	ES								
0.70	D								
1.00 - 1.40	U			1.00		Firm becoming stiff brown occasionally mottled grey CLAY with occasional calcareous concretions, rare orange brown silt pockets and rare roots. [Thames Group].(6.30m)	1		
1.45 - 1.50	D								
2.00 - 2.45	SPT(S)	N=14 (5/3,3,3,5)					2		
2.00 - 2.45	D								
3.00 - 3.40	U					*Locally fissured.*	3		
3.45	D								
4.00 - 4.45	SPT(S)	N=19 (7/5,4,4,6)					4		
4.00 - 4.45	D								
5.00 - 5.40	U						5		
5.45	D					*Rare selenite crystals.*			
							6		
6.50 - 6.95	SPT(S)	N=31 (10/6,7,8,10)							
6.50 - 6.95	D						7		
				7.30		Stiff to very stiff fissured dark greyish brown slightly silty CLAY. [Thames Group].(7.70m)			
8.00 - 8.40	U						8		
8.45	D								
							9		
9.50 - 9.95	SPT(S)	N=34 (12/8,8,10,8)							
9.50 - 9.95	D								
							10		

Continued next sheet

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)
					15.00	150	1.40	150

Remarks:

Chiselling & Pits				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)
0.00	1.00	01:00	Service pit				

Groundwater Observations

Strike at (m)	Casing at (m)	Sealed at (m)	Time (min)	Rose to (m)	Remarks
					No groundwater seepages

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU

Cable Percussion Borehole Log

Project ID: 212970

Borehole No.: BH2
Sheet 2 of 2
Scale: 1:50

Project Title: [redacted] Batemans Lane
Location: Site adjacent to Batemans Lane and Weeley Road, Little Clacton
Client: R Eleven Limited
Date Drilled: 17/02/2022
Rig Crew: RW
Logged: RF
Checked:
Easting:
Northing:
Level (mAOD):

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
						Stiff to very stiff fissured dark greyish brown slightly silty CLAY. [Thames Group].(7.70m)			
11.00 - 11.40	U						11		
11.45	D								
							12		
12.50 - 12.95	SPT(S)	N=35 (14/8,9,8,10)							
12.50 - 12.95	D								
							13		
14.00 - 14.40	U						14		
14.45	D								
15.00	D			15.00		Borehole Completed at 15.000m	15		
							16		
							17		
							18		
							19		
							20		

Start & End of Shift Observations

Date	Time	Depth (m)	Casing (m)	Water (m)

Borehole Diameter

Depth (m)	Dia (mm)
15.00	150

Casing Diameter

Depth (m)	Dia (mm)
1.40	150

Remarks:

Chiselling & Pits

From (m)	To (m)	Duration	Remarks
0.00	1.00	01:00	Service pit

Installation

Top (m)	Base (m)	Type	Dia (mm)

Groundwater Observations

Strike at (m)	Casing at (m)	Sealed at (m)	Time (min)	Rose to (m)	Remarks
					No groundwater seepages

Appendix (iii)
Trial Pit Logs

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Trial Pit Log

Project ID
212970

Trial Pit No.
TP1
Sheet 1 of 1
Scale: 1:25

Project Title:	**Location:**	**Client:**	**Date Excavated**
Batemans Lane	Site adjacent to Batemans Lane and Weeley Road, Little Clacton	R Eleven Limited	17/02/2022
Easting:	**Northing:**	**Level (mAOD):**	**Logged:** CT
			Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
0.30	ES			0.25		Turf over brown clayey Topsoil.(0.25m)			
				1.00		Stiff yellowish brown mottled grey CLAY with rare fine white sub angular quartz gravel and rare roots.(0.75m)			
						Trial Pit Completed at 1.000m			

Pit Dimensions		Pit Stability and Comments			Water Strikes		Observations		
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Remarks	Strike at (m)	Sealed at (m)	Time Mins	Rose to (m)	Remarks
0.60	0.60	Stable	None						No groundwater seepages

Plant Used:
Hand tools

Remarks:

Compass Geotechnical
13 Willow Park, Stoke Golding
[redacted]

Trial Pit Log

Project ID
212970

Trial Pit No.
TP2
Sheet 1 of 1
Scale: 1:25

Project Title: Batemans Lane	**Location:** Site adjacent to Batemans Lane and Weeley Road, Little Clacton	**Client:** R Eleven Limited	**Date Excavated** 17/02/2022
Easting:	**Northing:**	**Level (mAOD):**	**Logged:** CT
			Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Back fill installation
0.30	ES			0.25		Turf over brown clayey Topsoil.(0.25m)			
				1.00		Stiff yellowish brown mottled grey CLAY with rare fine white sub angular quartz gravel and rare roots.(0.75m)			
						Trial Pit Completed at 1.000m			

Pit Dimensions		Pit Stability and Comments			Water Strikes		Observations		
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Remarks	Strike at (m)	Sealed at (m)	Time Mins	Rose to (m)	Remarks
0.60	0.60	Stable	None						No groundwater seepages

Plant Used:
Hand tools

Remarks:

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Trial Pit Log

Project ID
212970

Trial Pit No.
TP3
Sheet 1 of 1
Scale: 1:25

Project Title:
Batemans Lane

Location:
Site adjacent to Batemans Lane and Weeley Road, Little Clacton

Client:
R Eleven Limited

Date Excavated
17/02/2022

Logged: CT

Easting:

Northing:

Level (mAOD):

Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
0.30	ES			0.25		Turf over brown clayey Topsoil.(0.25m)			
				1.00		Stiff yellowish brown mottled grey CLAY with rare fine white sub angular quartz gravel and rare roots.(0.75m)			
						Trial Pit Completed at 1.000m			

Pit Dimensions		Pit Stability and Comments			Water Strikes		Observations		
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Remarks	Strike at (m)	Sealed at (m)	Time Mins	Rose to (m)	Remarks
0.60	0.60	Stable	None						No groundwater seepages

Plant Used:
Hand tools

Remarks:

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU

Trial Pit Log

Project ID
212970

Trial Pit No.
TP4
Sheet 1 of 1
Scale: 1:25

Project Title: [redacted] Batemans Lane

Location: Site adjacent to Batemans Lane and Weeley Road, Little Clacton

Client: R Eleven Limited

Date Excavated
17/02/2022

Logged: CT

Easting:

Northing:

Level (mAOD):

Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
0.30	ES			0.25		Turf over brown clayey Topsoil.(0.25m)			
				1.00		Stiff yellowish brown mottled grey CLAY with rare fine white sub angular quartz gravel and rare roots.(0.75m)			
						Trial Pit Completed at 1.000m			

Pit Dimensions		Pit Stability and Comments			Water Strikes		Observations		
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Remarks	Strike at (m)	Sealed at (m)	Time Mins	Rose to (m)	Remarks
0.60	0.60	Stable	None						No groundwater seepages

Plant Used:
Hand tools

Remarks:

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Trial Pit Log

Project ID
212970

Trial Pit No.
CBR1
Sheet 1 of 1
Scale: 1:25

Project Title:	**Location:**	**Client:**	**Date Excavated**
Batemans Lane	Site adjacent to Batemans Lane and Weeley Road, Little Clacton	R Eleven Limited	17/02/2022
Easting:	**Northing:**	**Level (mAOD):**	**Logged:** CT
			Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Back fill Installation
						Turf over brown clayey Topsoil.(0.25m)			
				0.25		Soft brown and light yellowish brown mottled grey slightly gravelly slightly sandy silty CLAY with rare roots Gravel is white fine to coarse sub angular chert gravel.(0.75m)			
0.50 - 1.00	B								
				1.00		Trial Pit Completed at 1.000m			

Pit Dimensions		Pit Stability and Comments			Water Strikes		Observations		
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Remarks	Strike at (m)	Sealed at (m)	Time Mins	Rose to (m)	Remarks
0.60	0.60	Stable	None						No groundwater seepage

Plant Used:

Remarks:

Compass Geotechnical
13 Willow Park, Stoke Golding
CV13 6EU
[redacted]

Trial Pit Log

Project ID
212970

Trial Pit No.
CBR2
Sheet 1 of 1
Scale: 1:25

Project Title:	**Location:**	**Client:**	**Date Excavated**
Batemans Lane	Site adjacent to Batemans Lane and Weeley Road, Little Clacton	R Eleven Limited	17/02/2022
Easting:	**Northing:**	**Level (mAOD):**	**Logged:** CT
			Checked:

Samples & In Situ Testing			Strata Details				Groundwater		
Depth (mBGL)	Sample / Test ID	Test Result	Level (mAOD)	Depth (mBGL)	Legend	Strata Description	Depth (mBGL)	Water Strike	Backfill Installation
				0.25		Turf over brown clayey Topsoil.(0.25m)			
0.50 - 1.00	B					Stiff brown and light yellowish brown mottled grey slightly gravelly slightly sandy silty CLAY with rare roots Gravel is white fine to coarse sub angular chert gravel.(0.75m)			
				1.00		Trial Pit Completed at 1.000m			

Pit Dimensions		Pit Stability and Comments			Water Strikes		Observations		
Pit Length (m)	Pit Width (m)	Pit Stability	Shoring Used	Remarks	Strike at (m)	Sealed at (m)	Time Mins	Rose to (m)	Remarks
0.60	0.60	Stable	None						No groundwater seepages

Plant Used:

Remarks:

Appendix (iv)
Laboratory Test Results – Material Properties

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

0998

Contract	**Clacton**
Serial No.	**40230_1**

Client:

Compass Geotechnical Limited

13 Willow Park
Upton Lane
Stoke Golding
Nuneaton
Warwickshire
CV13 6EU

Soil Property Testing Ltd

**15, 16, 18 Halcyon Court, St Margaret's Way,
Stukeley Meadows, Huntingdon,
Cambridgeshire, PE29 6DG**

[redacted]

Samples Submitted By:

Compass Geotechnical Limited

Samples Labelled:

Clacton

Approved Signatories:

☑ **J.C. Garner B.Eng (Hons) FGS**

Technical Director & Quality Manager

☐ **W. Johnstone**

Materials Lab Manager

[redacted]

Date Received:	22/02/2022	**Samples Tested Between:**	22/02/2022 **and** 09/03/2022

Remarks:

For the attention of Rachel Foord

Notes:

1. All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
2. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
3. Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
4. This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.
5. The results within this report only relate to the items tested or sampled.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

0998

Contract	**Clacton**		
Serial No.	**40230_1**	**Target Date**	08/03/2022
Scheduled By	Compass Geotechnical Limited		

Schedule Remarks

Bore Hole No.	Type	Sample Ref.	Top Depth	Water Content (BSEN)	Liquid/Plastic Limits	Triaxial Test	California Bearing Ratio Test															Sample Remarks
BH1	U	1	2.00	1	1	1																
BH1	U	3	6.50			1																
BH1	U	5	12.50			1																
BH2	U	1	1.00	1	1	1																
BH2	U	2	3.00	1	1	1																
BH2	U	6	14.00			1																
CBR1	B	-	0.50				1															
CBR2	B	-	0.50				1															
Totals				**3**	**3**	**6**	**2**															**End of Schedule**

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

0998

Contract	**Clacton**
Serial No.	**40230_1**

SUMMARY OF WATER CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole /Pit No.	Depth (m)	Type	Ref.	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti-city Index (%)	Liquid-ity Index	Sample Preparation				Description	Class
									Method	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs)		
BH1	2.00	U	1	28.8	85	29	56	0.00	From Natural	0 (A)		27	Stiff (high strength) fissured yellowish brown CLAY with occasional calcareous aggregations, rare grey mottling and decayed roots	CV
BH2	1.00	U	1	33.3	87	27	60	0.11	From Natural	0 (A)		27	Firm (medium strength) fissured yellowish brown CLAY with rare calcareous aggregations	CV
BH2	3.00	U	2	30.7	87	30	57	0.01	From Natural	0 (A)		27	Stiff (high strength) fissured yellowish brown CLAY with occasional grey mottling	CV

Method Of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:4.2
Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3, 5.4
Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:

Table Notation: Ret'd 0.425mm: (A) = Assumed, (M) = Measured

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

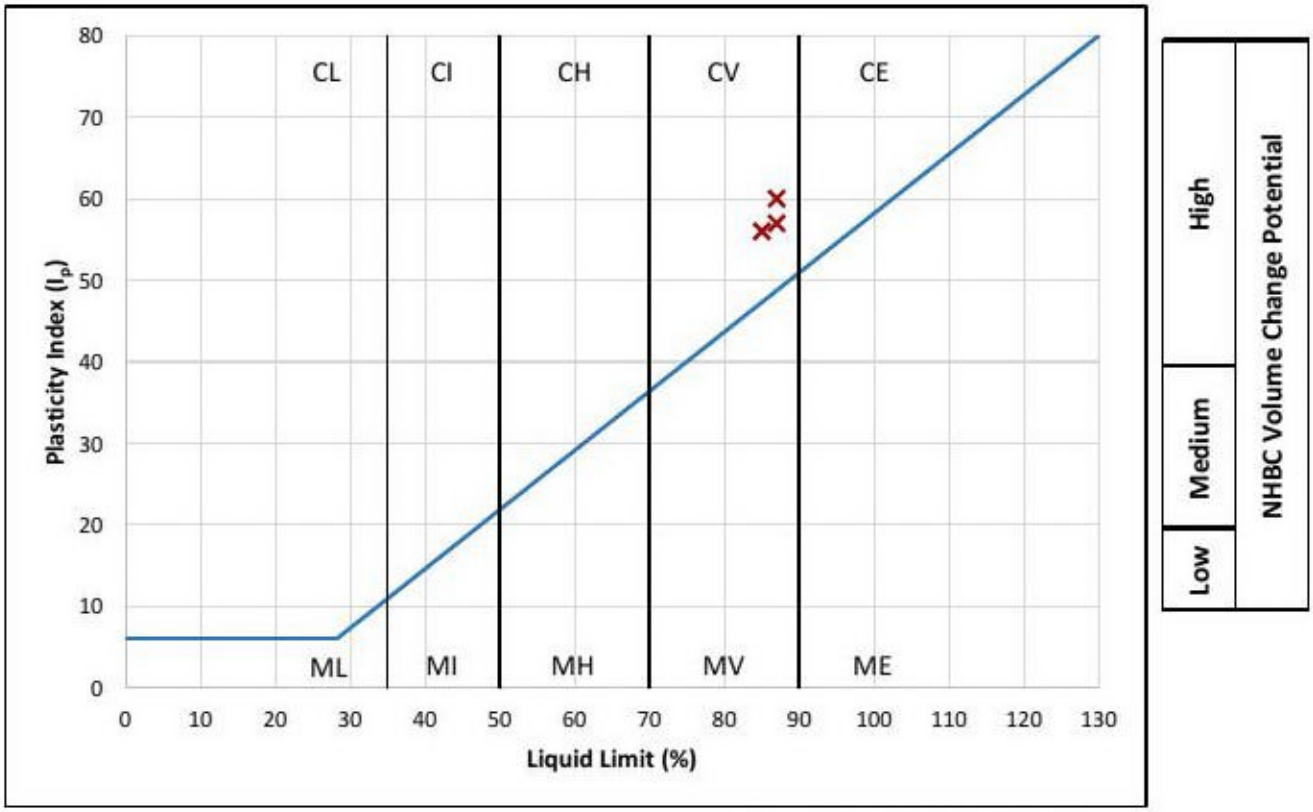
DATE ISSUED: 09/03/2022

0998

Contract	Clacton
Serial No.	40230_1

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART

Plasticity				
Low	Medium	High	Very High	Extremely High



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation:	BS 1377: Part 2: 1990: 4.2
Method of Test:	BS1377: Part 2: 3.2, 4.4, 5.3, 5.4
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Volume Change Potential: NHBC Standards Chapter 4.2 Unmodified Plasticity Index

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

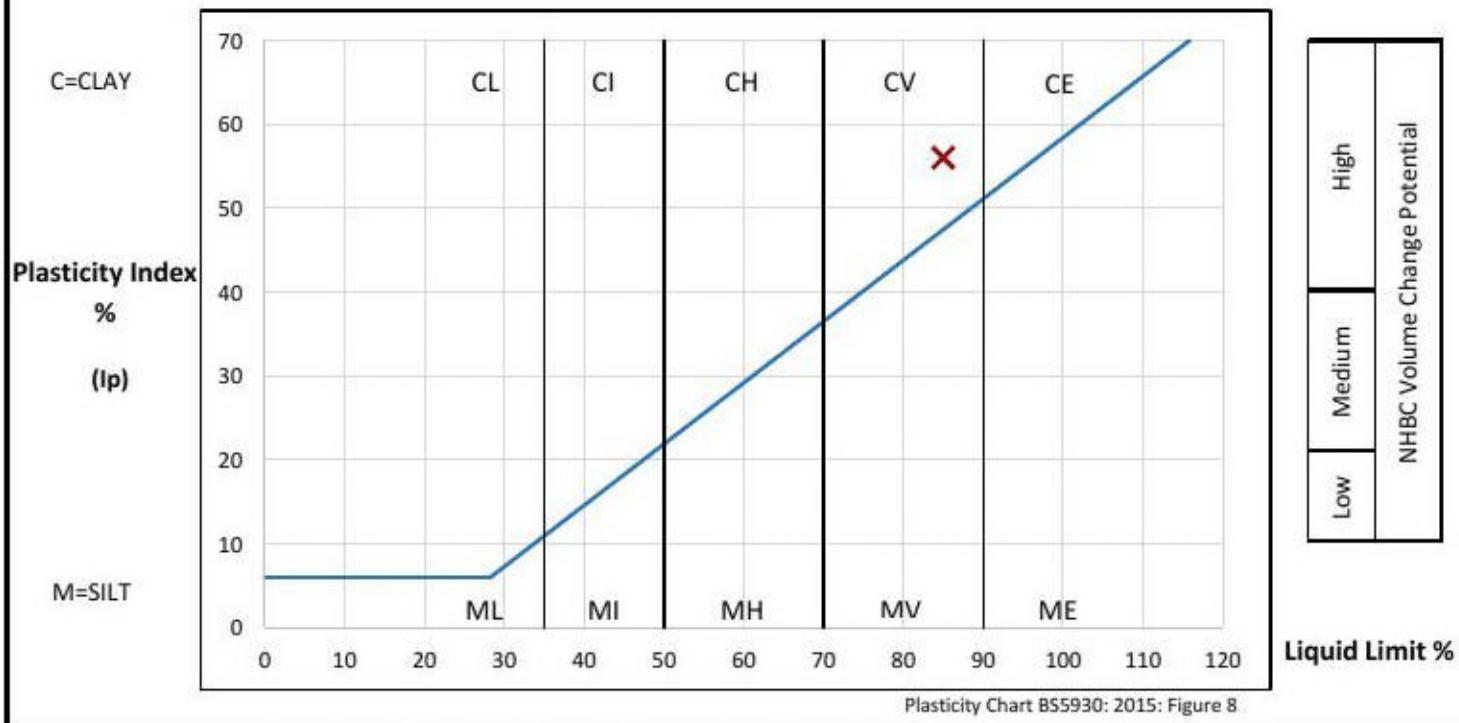
0998

Contract	**Clacton**
Serial No.	**40230_1**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
BH1	2.00	U	1	28.8	Stiff (high strength) fissured yellowish brown CLAY with occasional calcareous aggregations, rare grey mottling and decayed roots	

PREPARATION				Liquid Limit	85 %
Method of preparation			From natural	Plastic Limit	29 %
Sample retained 0.425mm sieve	(Assumed)		0 %	Plasticity Index	56 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.00
Sample retained 2mm sieve	(Assumed)		0 %	NHBC Modified (I'p)	n/a
Curing time	27 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4

Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter

Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

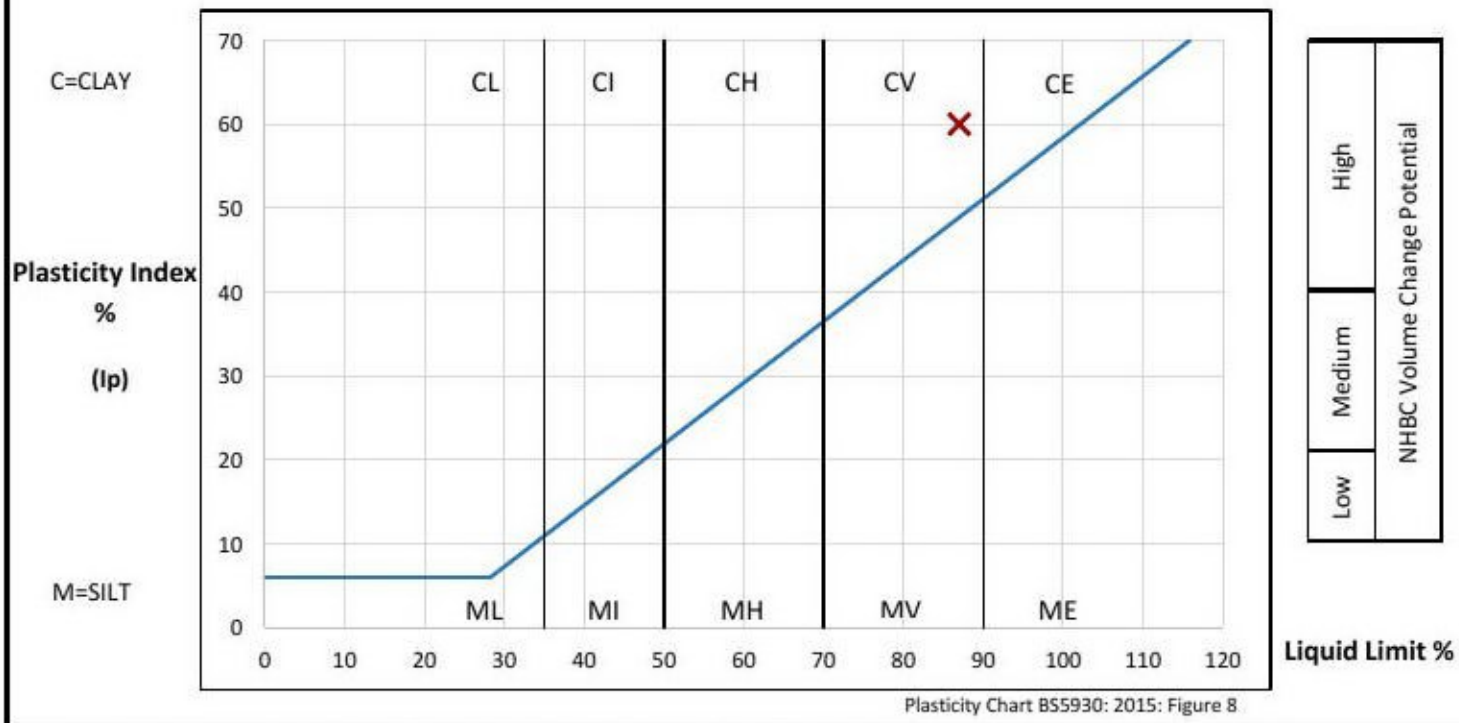
0998

Contract	**Clacton**
Serial No.	**40230_1**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
BH2	1.00	U	1	33.3	Firm (medium strength) fissured yellowish brown CLAY with rare calcareous aggregations	

PREPARATION				Liquid Limit	87 %
Method of preparation			From natural	Plastic Limit	27 %
Sample retained 0.425mm sieve	(Assumed)		0 %	Plasticity Index	60 %
Corrected water content for material passing 0.425mm				Liquidity Index	0.11
Sample retained 2mm sieve	(Assumed)		0 %	NHBC Modified (I'p)	n/a
Curing time	27 hrs	Clay Content	Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4

Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter

Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

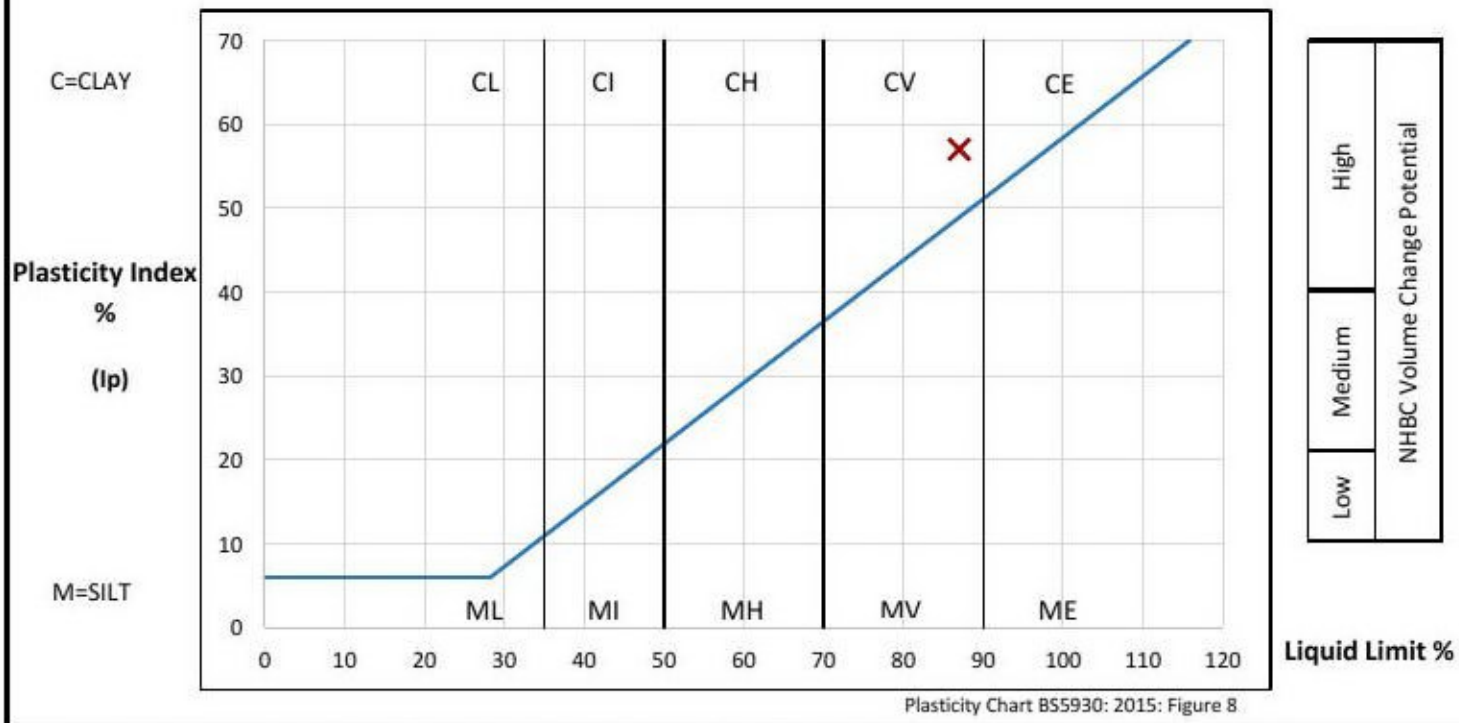
0998

Contract	**Clacton**
Serial No.	**40230_1**

DETERMINATION OF WATER CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole / Pit No.	Depth m	Sample Type	Sample Reference	Water Content (W) %	Description	Remarks
BH2	3.00	U	2	30.7	Stiff (high strength) fissured yellowish brown CLAY with occasional grey mottling	

PREPARATION			Liquid Limit	87 %
Method of preparation		From natural	Plastic Limit	30 %
Sample retained 0.425mm sieve	(Assumed)	0 %	Plasticity Index	57 %
Corrected water content for material passing 0.425mm			Liquidity Index	0.01
Sample retained 2mm sieve	(Assumed)	0 %	NHBC Modified (I'p)	n/a
Curing time	27 hrs	Clay Content: Not analysed	Derived Activity	Not analysed



Plasticity Chart BS5930: 2015: Figure 8

Method of Preparation: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 4.2

Method of Test: BS EN ISO: 17892-1: 2014 & BS 1377: Part 2: 1990: 3.2, 4.4, 5.3, 5.4

Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter

Comments:

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

UKAS TESTING
0998

Contract	**Clacton**
Serial No.	**40230_1**

DETERMINATION OF DENSITY, WATER CONTENT AND UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASURMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)	Lateral Pressure (kPa)	Deviator Stress (kPa)	Shear Stress (kPa)	Mohrs Circle Analysis Cu (kPa)	Mohrs Circle Analysis Ø degrees	Description
BH1	2.05	U	1	28.8	1.98	1.54	40 84	255 253	128 127			Stiff (high strength) fissured yellowish brown CLAY with occasional calcareous aggregations, rare grey mottling and decayed roots
BH1	6.62	U	3	30.0	1.95	1.50	132 261 390	159 168 172	80 84 86	76	1.3	Stiff (high strength) fissured dark greyish brown CLAY with rare weak claystone fragments
BH1	12.54	U	5	30.8	1.96	1.50	251 506 752	244 256 258	122 128 129	118	0.8	Stiff (high strength) fissured brown CLAY with occasional dark grey and yellowish brown mottling and rare calcareous powder
BH2	1.02	U	1	33.3	1.89	1.42	22 45 56	94 96 91	47 48 46			Firm (medium strength) fissured yellowish brown CLAY with rare calcareous aggregations
BH2	3.04	U	2	30.7	1.92	1.47	64 116 179	156 165 163	78 83 82	74	1.9	Stiff (high strength) fissured yellowish brown CLAY with occasional grey mottling
BH2	14.03	U	6	30.1	1.94	1.49	280 559 803	298 314 317	149 157 159	142	1.1	Stiff (high strength) fissured dark greyish brown CLAY with rare dark grey mottling

Method of Preparation: BS 1377: Part 1: 1990: 7.4.2 & 8, Part 2: 1990: 7.2, Part 7: 1990: 8.3

Method of Test: BS 1377: Part 2: 1990:3 Determination of Moisture Content, Part2: 1990:7 Determination of Density, Part 7: 1990: 8 Undrained Shear Strenth, 9 Multistage Loading

Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

Comments:

Remarks to Include: Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

UKAS TESTING 0998

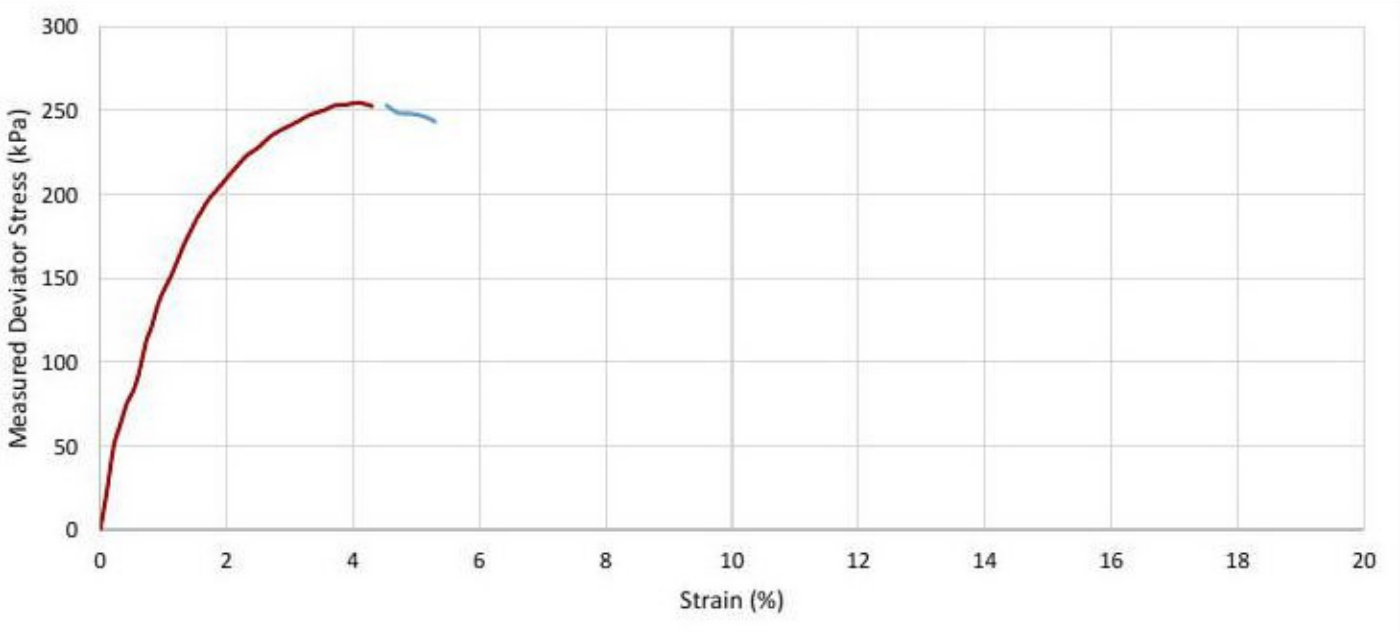
Contract	Clacton
Serial No.	40230_1

DETERMINATION OF UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Description	Remarks
BH1	2.00	U	1	Stiff (high strength) fissured yellowish brown CLAY with occasional calcareous aggregations, rare grey mottling and decayed roots	Specimen sheared on increasing to 2nd confining pressure

Initial Specimen	Height (mm)	Diameter (mm)	Weight (g)	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)
Depth of Top of Specimen (m) 2.05	199.3	102.3	3250	28.8	1.98	1.54

TEST INFORMATION — Rate of Strain 1.0 % per Min — Rubber Membrane Thickness 0.3 mm



Specimen at failure	Measured Cell Pressure, σ3 (kPa)	Strain at Failure (%)	Stress Corrections (kPa)		Corrected Max. Deviator Stress, (σ1-σ3)f (kPa)	Shear Stress Cu, ½(σ1-σ3)f (kPa)	Mohrs Circle Analysis	
			Rubber Membrane	Piston Friction			Cu (kPa)	PHI (degrees)
	40	4.1	0.3	/	255	128		
	84	4.5	0.4	0.0	253	127		

Method of Preparation:	BS 1377: Part 1: 1990
Method of Test:	BS 1377: Part 7: 1990: 8 Definitive Method, 1990: 9 Multi-stage loading
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Tested in Vertical Condition UKAS Calibration - loads from 0.2 to 10kN
Remarks to Include:	Sample disturbance, loss of moisture, variation form test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

0998

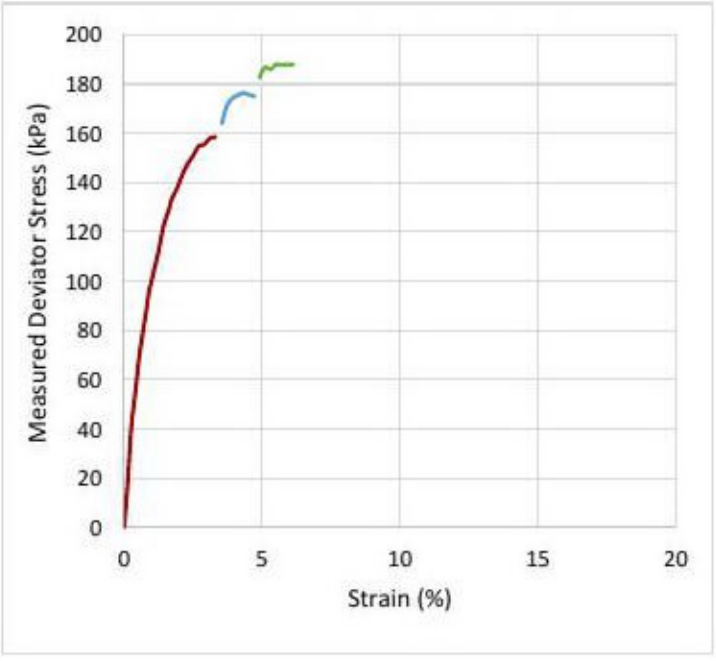
Contract	Clacton
Serial No.	40230_1

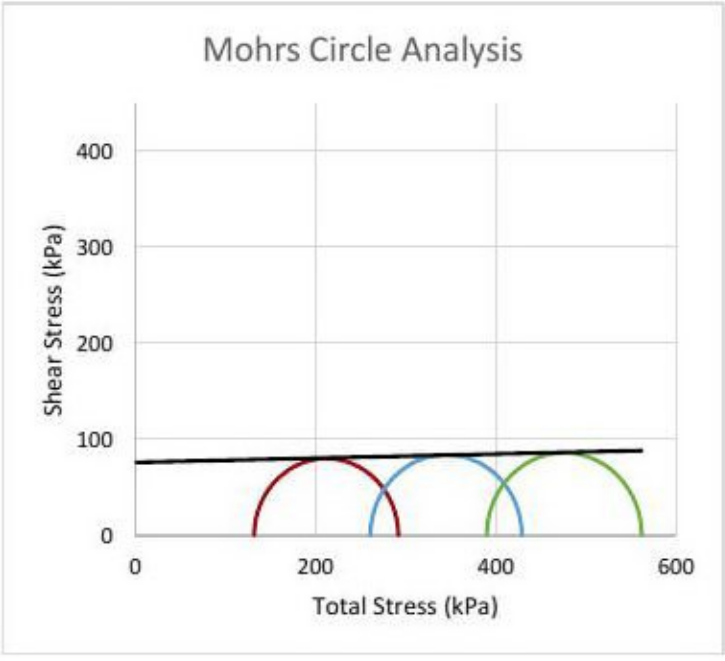
DETERMINATION OF UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Description	Remarks
BH1	6.50	U	3	Stiff (high strength) fissured dark greyish brown CLAY with rare weak claystone fragments	

Initial Specimen	Height (mm)	Diameter (mm)	Weight (g)	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)
Depth of Top of Specimen (m) 6.62	199.1	103.2	3248	30.0	1.95	1.50

TEST INFORMATION — Rate of Strain 1.0 % per Min — Rubber Membrane Thickness 0.3 mm





Specimen at failure	Measured Cell Pressure, σ3 (kPa)	Strain at Failure (%)	Stress Corrections (kPa)		Corrected Max. Deviator Stress, (σ1-σ3)f (kPa)	Shear Stress Cu, ½(σ1-σ3)f (kPa)	Mohrs Circle Analysis	
			Rubber Membrane	Piston Friction			Cu (kPa)	PHI (degrees)
	132	3.3	0.3	/	159	80		
	261	4.3	0.3	7.8	168	84	76	1.3
	390	5.5	0.4	15.8	172	86		

Method of Preparation:	BS 1377: Part 1: 1990
Method of Test:	BS 1377: Part 7: 1990: 8 Definitive Method, 1990: 9 Multi-stage loading
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Tested in Vertical Condition UKAS Calibration - loads from 0.2 to 10kN
Remarks to Include:	Sample disturbance, loss of moisture, variation form test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

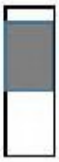
DATE ISSUED: 09/03/2022

0998

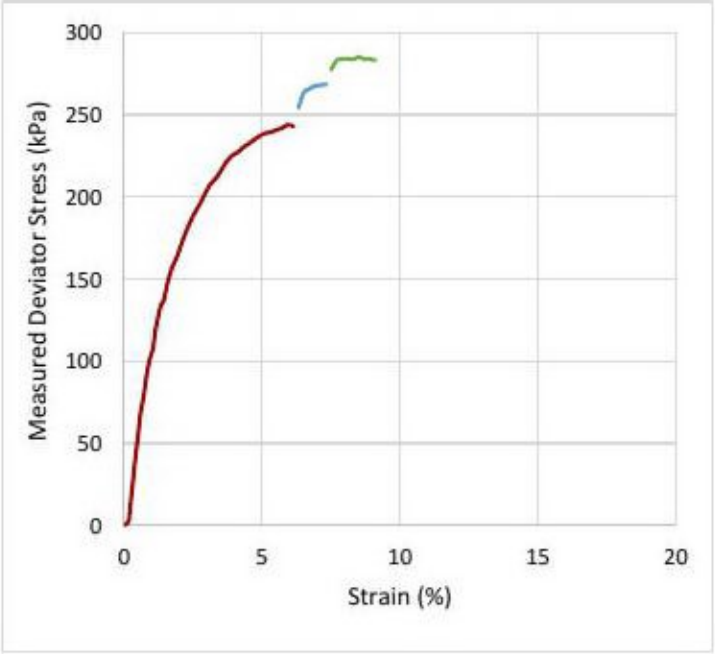
Contract	Clacton
Serial No.	40230_1

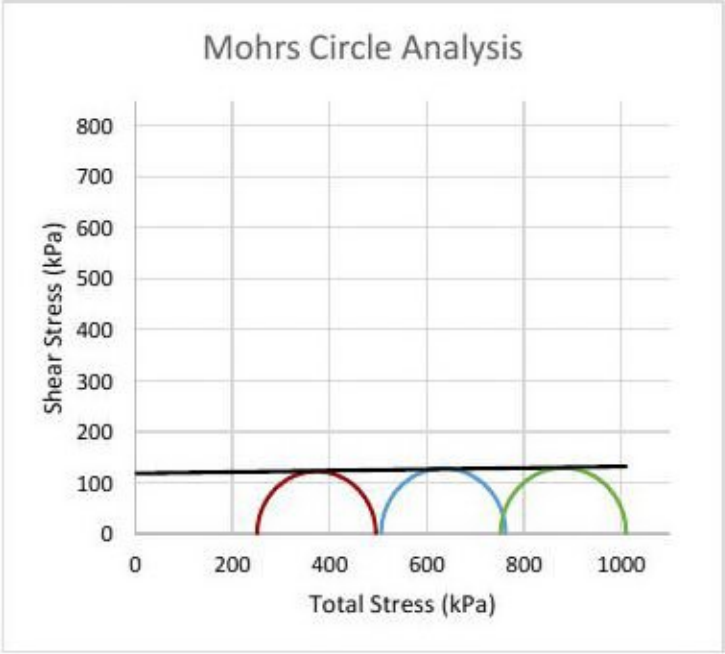
DETERMINATION OF UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Description	Remarks
BH1	12.50	U	5	Stiff (high strength) fissured brown CLAY with occasional dark grey and yellowish brown mottling and rare calcareous powder	

Initial Specimen	Depth of Top of Specimen (m)	Height (mm)	Diameter (mm)	Weight (g)	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)
	12.54	199.0	103.2	3268	30.8	1.96	1.50

TEST INFORMATION — Rate of Strain: 1.0 % per Min — Rubber Membrane Thickness: 0.3 mm





Specimen at failure	Measured Cell Pressure, σ3 (kPa)	Strain at Failure (%)	Stress Corrections (kPa)		Corrected Max. Deviator Stress, (σ1-σ3)f (kPa)	Shear Stress Cu, ½(σ1-σ3)f (kPa)	Mohrs Circle Analysis	
			Rubber Membrane	Piston Friction			Cu (kPa)	PHI (degrees)
	251	5.9	0.5	/	244	122		
	506	7.3	0.5	11.7	256	128	118	0.8
	752	8.5	0.6	26.2	258	129		

Method of Preparation: BS 1377: Part 1: 1990

Method of Test: BS 1377: Part 7: 1990: 8 Definitive Method, 1990: 9 Multi-stage loading

Type of Sample Key: U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

Comments: Tested in Vertical Condition

UKAS Calibration - loads from 0.2 to 10kN

Remarks to Include: Sample disturbance, loss of moisture, variation form test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

UKAS TESTING
0998

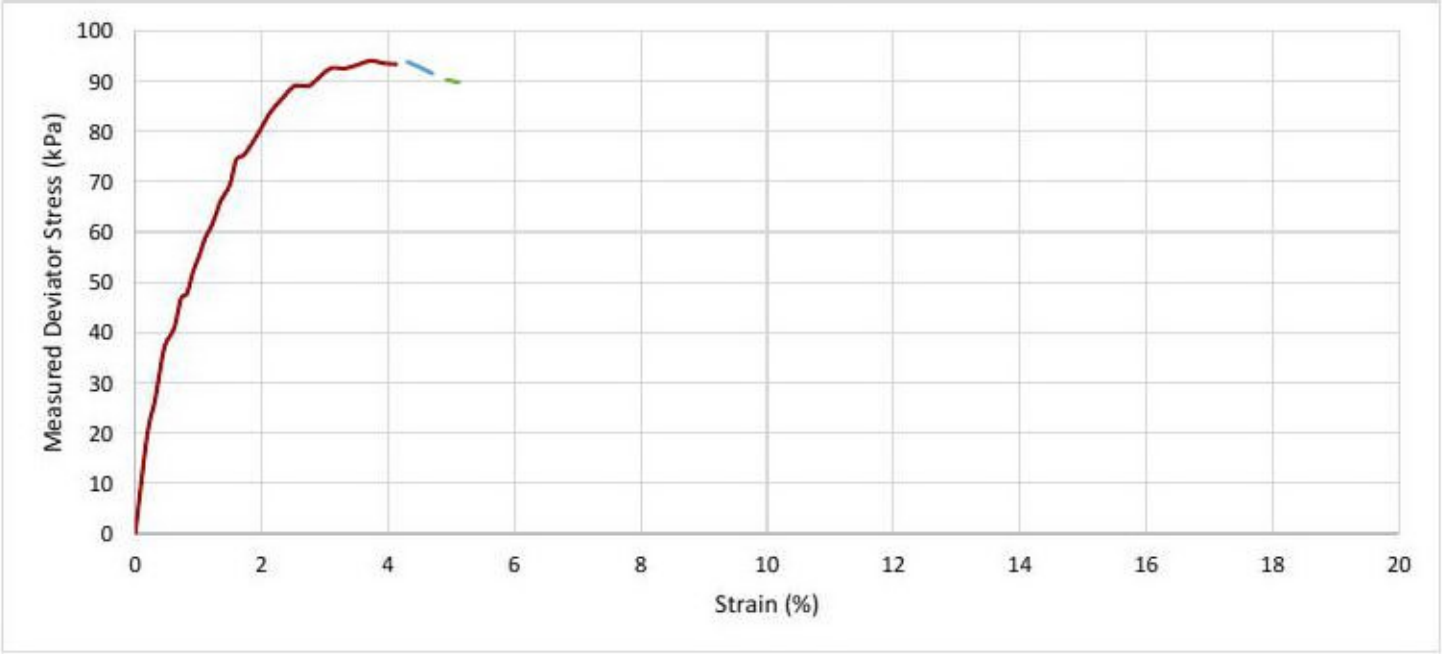
Contract	Clacton
Serial No.	40230_1

DETERMINATION OF UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Description	Remarks
BH2	1.00	U	1	Firm (medium strength) fissured yellowish brown CLAY with rare calcareous aggregations	Specimen sheared during 1st confining pressure

Initial Specimen	Height (mm)	Diameter (mm)	Weight (g)	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)
Depth of Top of Specimen (m) 1.02	199.2	102.2	3093	33.3	1.89	1.42

TEST INFORMATION — Rate of Strain 1.0 % per Min — Rubber Membrane Thickness 0.3 mm



Specimen at failure	Measured Cell Pressure, σ3 (kPa)	Strain at Failure (%)	Stress Corrections (kPa)		Corrected Max. Deviator Stress, (σ1-σ3)f (kPa)	Shear Stress Cu, ½(σ1-σ3)f (kPa)	Mohrs Circle Analysis	
			Rubber Membrane	Piston Friction			Cu (kPa)	PHI (degrees)
	22	3.7	0.3	/	94	47		
	45	4.3	0.4	1.7	96	48		
	56	4.9	0.4	2.7	91	46		

Method of Preparation:	BS 1377: Part 1: 1990
Method of Test:	BS 1377: Part 7: 1990: 8 Definitive Method, 1990: 9 Multi-stage loading
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Tested in Vertical Condition UKAS Calibration - loads from 0.2 to 10kN
Remarks to Include:	Sample disturbance, loss of moisture, variation form test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

0998

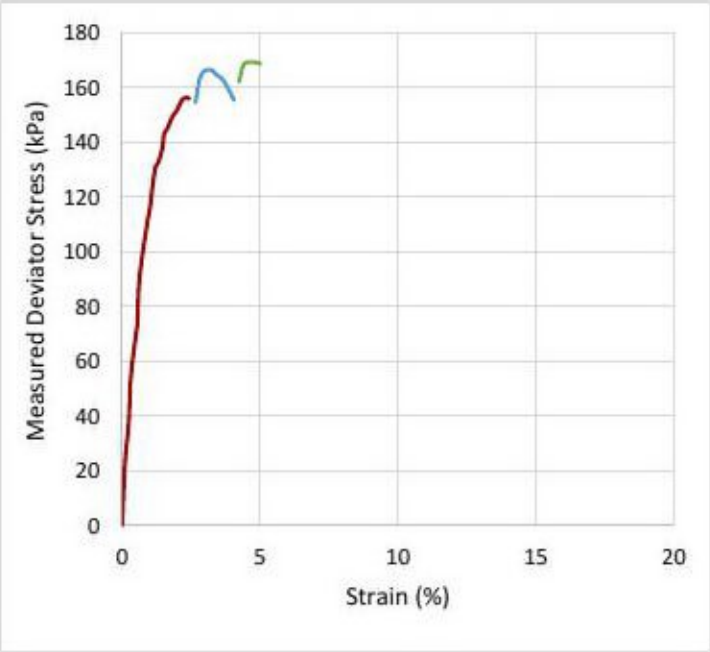
Contract	Clacton
Serial No.	40230_1

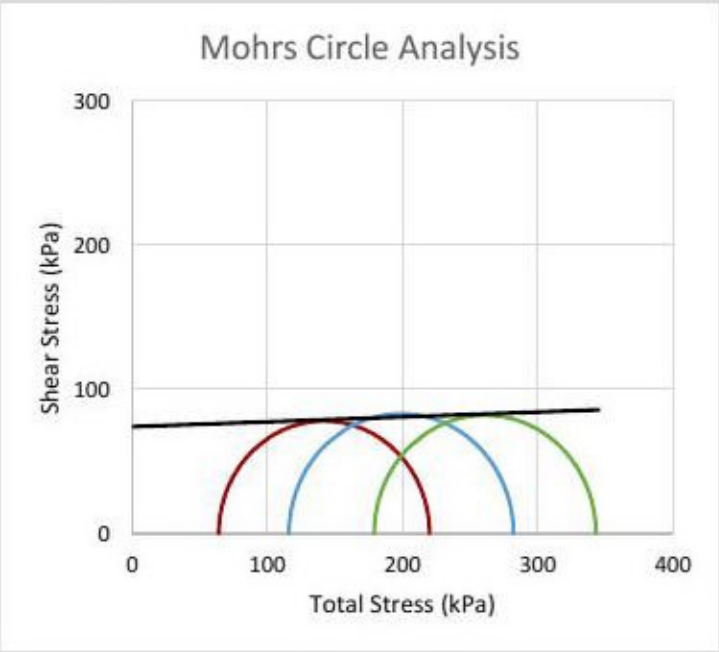
DETERMINATION OF UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Description	Remarks
BH2	3.00	U	2	Stiff (high strength) fissured yellowish brown CLAY with occasional grey mottling	

Initial Specimen	Height (mm)	Diameter (mm)	Weight (g)	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)
Depth of Top of Specimen (m) 3.04	199.4	103.1	3199	30.7	1.92	1.47

TEST INFORMATION — Rate of Strain 1.0 % per Min — Rubber Membrane Thickness 0.3 mm





Specimen at failure	Measured Cell Pressure, σ3 (kPa)	Strain at Failure (%)	Stress Corrections (kPa)		Corrected Max. Deviator Stress, (σ1-σ3)f (kPa)	Shear Stress Cu, ½(σ1-σ3)f (kPa)	Mohrs Circle Analysis	
			Rubber Membrane	Piston Friction			Cu (kPa)	PHI (degrees)
	64	2.2	0.2	/	156	78		
	116	3.2	0.3	1.7	165	83	74	1.9
	179	4.8	0.4	5.5	163	82		

Method of Preparation:	BS 1377: Part 1: 1990
Method of Test:	BS 1377: Part 7: 1990: 8 Definitive Method, 1990: 9 Multi-stage loading
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Tested in Vertical Condition UKAS Calibration - loads from 0.2 to 10kN
Remarks to Include:	Sample disturbance, loss of moisture, variation form test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

UKAS TESTING
0998

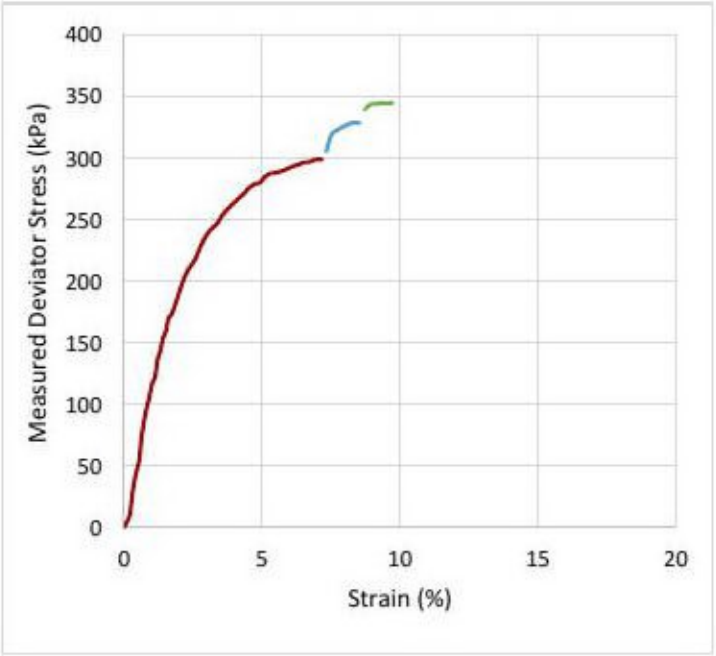
Contract	**Clacton**
Serial No.	**40230_1**

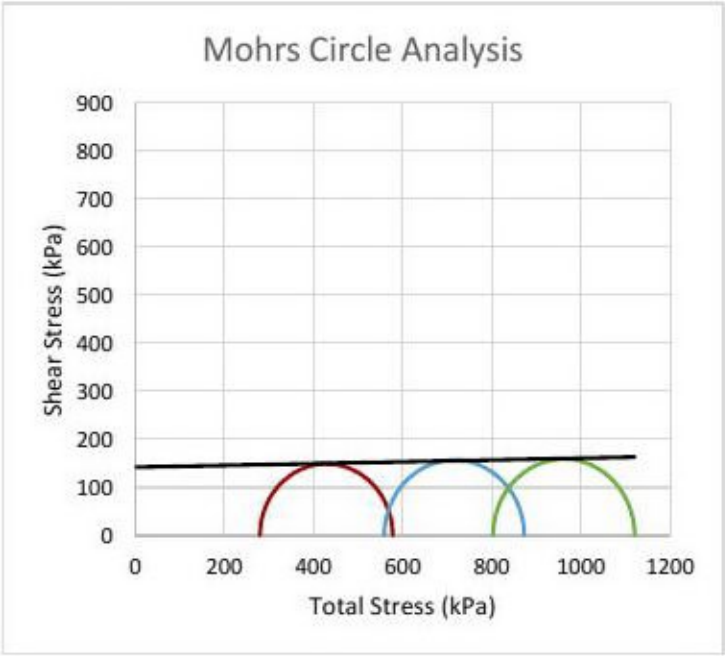
DETERMINATION OF UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

Borehole /Pit No.	Depth (m)	Type	Reference	Description	Remarks
BH2	14.00	U	6	Stiff (high strength) fissured dark greyish brown CLAY with rare dark grey mottling	

Initial Specimen	Height (mm)	Diameter (mm)	Weight (g)	Water Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)
Depth of Top of Specimen (m) 14.03	155.6	103.3	2532	30.1	1.94	1.49

TEST INFORMATION — Rate of Strain 1.0 % per Min — Rubber Membrane Thickness 0.3 mm





Specimen at failure	Measured Cell Pressure, σ3 (kPa)	Strain at Failure (%)	Stress Corrections (kPa)		Corrected Max. Deviator Stress, (σ1-σ3)f (kPa)	Shear Stress Cu, ½(σ1-σ3)f (kPa)	Mohrs Circle Analysis	
			Rubber Membrane	Piston Friction			Cu (kPa)	PHI (degrees)
	280	7.2	0.5	/	298	149		
	559	8.3	0.6	14.0	314	157	142	1.1
	803	9.7	0.6	27.3	317	159		

Method of Preparation:	BS 1377: Part 1: 1990
Method of Test:	BS 1377: Part 7: 1990: 8 Definitive Method, 1990: 9 Multi-stage loading
Type of Sample Key:	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter
Comments:	Tested in Vertical Condition UKAS Calibration - loads from 0.2 to 10kN
Remarks to Include:	Sample disturbance, loss of moisture, variation form test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

UKAS TESTING 0998

Contract	Clacton
Serial No.	40230_1

CALIFORNIA BEARING RATIO TEST

Borehole /Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
CBR1	0.50 - 1.00	B	-	Soft brown and light yellowish brown slightly gravelly slightly sandy silty CLAY with rare recently active roots. Gravel is fine to coarse chert and rare chalk	

Specimen Preparation

Condition	Remoulded
Details	Recompacted with specified standard effort using 2.5kg rammer

Material Retained on 20mm Sieve Removed		3.3	%
Initial Specimen Details:	Bulk Density	1.86	Mg/m³
	Dry Density	1.42	Mg/m³

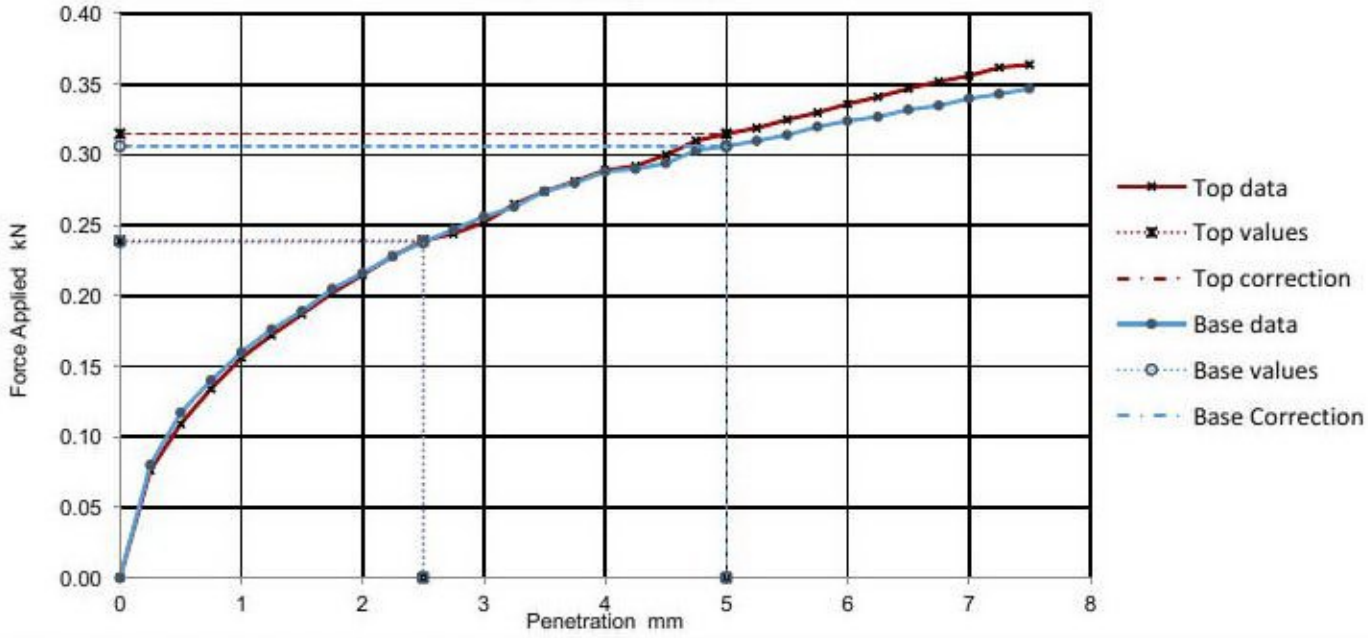
Soaking Details	Not Soaked	
Period of Soaking		days
Time to Surface		days
Amount of Swell Recorded		mm
Initial Water Content		%

Surcharge Applied	15	kg

Test Results

	Curve Correction	CBR Values (%) 2.5mm	5.0mm	Highest	Mean*	Water Content (%)
TOP	No	1.8	1.6	1.8	1.8	31.1
BASE	No	1.8	1.5	1.8		31.5

Force v Penetration Plots



Method of Preparation:	BS1377: Part1: 2016 & BS1377: Part 4: 1990: 7.2.4.4
Method of Test:	BS 1377: Part 4: 1990: 7
Type of Sample Key	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT= Split Spoon Sample, C = Core Cutter
Comments:	*Only reported if the results from each end of the sample are within ±10% of the mean value. Note:- CBR Results are water content dependent - an increase in water content will result in a decrease of CBR value.
Remarks to Include:	Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C.

TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD

DATE ISSUED: 09/03/2022

UKAS TESTING 0998

Contract	Clacton
Serial No.	40230_1

CALIFORNIA BEARING RATIO TEST

Borehole /Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks
CBR2	0.50 - 1.00	B	-	Stiff light yellowish brown slightly gravelly slightly sandy silty CLAY with frequent recently active roots. Gravel is fine to coarse chert and rare chalk	

Specimen Preparation

Condition	Remoulded
Details	Recompacted with specified standard effort using 2.5kg rammer

Material Retained on 20mm Sieve Removed		0.3	%
Initial Specimen Details:	Bulk Density	1.87	Mg/m³
	Dry Density	1.48	Mg/m³

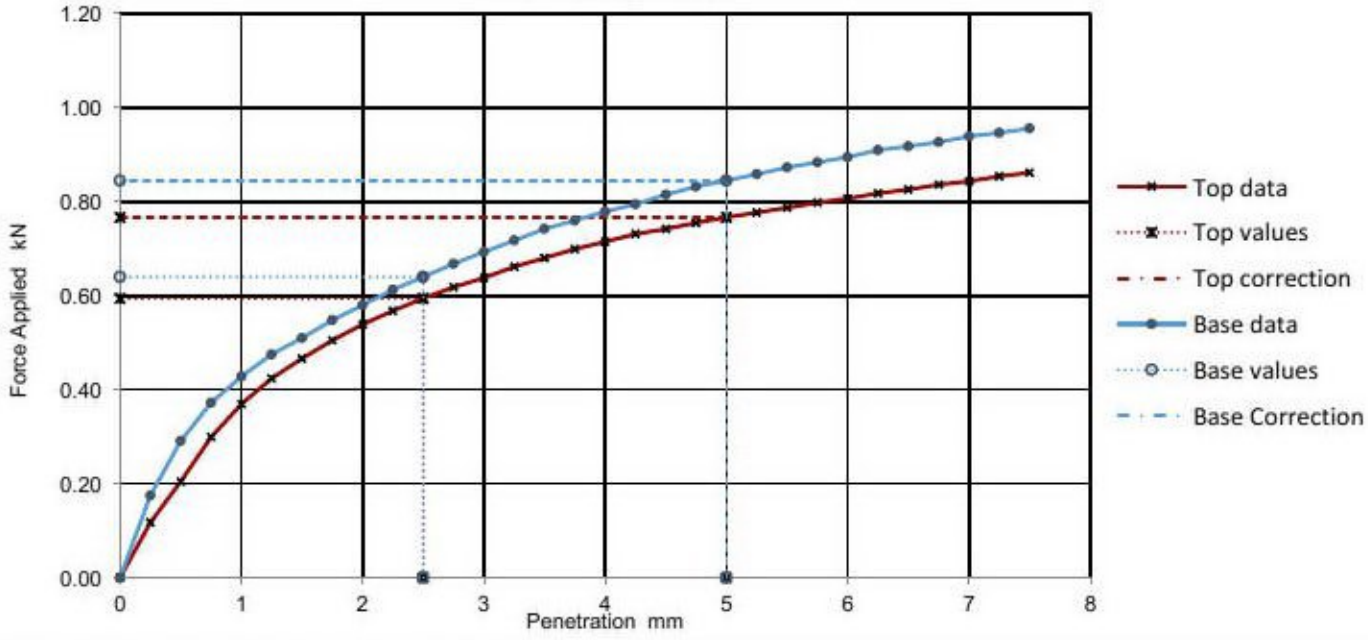
Soaking Details	Not Soaked	
Period of Soaking		days
Time to Surface		days
Amount of Swell Recorded		mm
Initial Water Content		%

Surcharge Applied	15	kg

Test Results

	Curve Correction	CBR Values (%) 2.5mm	5.0mm	Highest	Mean*	Water Content (%)
TOP	No	4.5	3.8	4.5	4.7	25.3
BASE	No	4.8	4.2	4.8		27.3

Force v Penetration Plots



Method of Preparation:	BS1377: Part1: 2016 & BS1377: Part 4: 1990: 7.2.4.4
Method of Test:	BS 1377: Part 4: 1990: 7
Type of Sample Key	U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT= Split Spoon Sample, C = Core Cutter
Comments:	*Only reported if the results from each end of the sample are within ±10% of the mean value. Note:- CBR Results are water content dependent - an increase in water content will result in a decrease of CBR value.
Remarks to Include:	Sample disturbance, loss of moisture, variation from test procedure, location and origin of test specimen within original sample, oven drying temperature if not 105-110°C.

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL

UKAS TESTING
2183

Final Report

[redacted]

Report No.:	22-06679-1
Initial Date of Issue:	28-Feb-2022
Client	Compass Geotechnical Limited
Client Address:	13 Willow Park, Upton Lane Stoke Golding Warwickshire CV13 6EU
Contact(s):	[redacted]
Project	Clacton
Quotation No.:	Q19-18078
Date Received:	23-Feb-2022
Order No.:	212970B
Date Instructed:	23-Feb-2022
No. of Samples:	5
Turnaround (Wkdays):	5
Results Due:	01-Mar-2022
Date Approved:	28-Feb-2022
Approved By:	[redacted]
Details:	Stuart Henderson, Technical Manager

Results - Soil

Project: Clacton

Client: Compass Geotechnical Limited				Chemtest Job No.:	22-06679	22-06679	22-06679	22-06679	22-06679
Quotation No.: Q21-12373				Chemtest Sample ID.:	1377497	1377498	1377500	1377501	1377502
				Client Sample ID.:	BS	BS	BS	BS	BS
				Sample Location:	BH1	BH1	BH2	BH2	BH2
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	1.0	3.0	2.0	3.45	15.0
				Date Sampled:	22-Feb-2022	22-Feb-2022	22-Feb-2022	22-Feb-2022	22-Feb-2022
				Time Sampled:	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	20	22	27	22	22
pH	M	2010		4.0	8.4	7.8	8.1	8.5	8.5
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.12	0.12	0.042	0.030	0.12

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix (v)
Laboratory Test Results – Contamination

eurofins | Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL

UKAS TESTING
2183

Final Report

[redacted]

Report No.:	22-06533-1
Initial Date of Issue:	28-Feb-2022
Client	Compass Geotechnical Limited
Client Address:	13 Willow Park, Upton Lane Stoke Golding Warwickshire CV13 6EU
Contact(s):	[redacted]
Project	Clacton
Quotation No.:	Q19-18078
Date Received:	22-Feb-2022
Order No.:	212970
Date Instructed:	22-Feb-2022
No. of Samples:	6
Turnaround (Wkdays):	5
Results Due:	28-Feb-2022
Date Approved:	28-Feb-2022
Approved By:	[redacted]
Details:	Stuart Henderson, Technical Manager

Results - Soil

Project: Clacton

Client: Compass Geotechnical Limited			Chemtest Job No.:	22-06533	22-06533	22-06533	22-06533	22-06533	22-06533
Soil Sample No.(s): 1375911-1375915			Chemtest Sample ID.:	1375911	1375911	1375912	1375913	1375914	1375915
			Client Sample ID:	BS	BS	BS	BS	BS	BS
			Sample Location:	BH1	BH2	TP1	TP2	TP3	TP4
			Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):	0.50	0.5	0.3	0.3	0.3	0.3
			Date Sampled:	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022
			Time Sampled:	0:00	0:00	0:00	0:00	0:00	0:00
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Moisture	N	2030	%	0.020	35	23	28	27	24	27
pH	M	2010		4.0	8.2	8.5	8.3	8.5	7.5	8.2
Arsenic	M	2450	mg/kg	1.0	11	5.0	6.8	7.4	4.5	7.5
Cadmium	M	2450	mg/kg	0.10	< 0.10	0.15	0.13	0.12	0.15	0.15
Copper	M	2450	mg/kg	0.50	61	11	14	11	7.6	12
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	67	13	15	13	9.4	16
Lead	M	2450	mg/kg	0.50	82	15	21	17	18	23
Selenium	M	2450	mg/kg	0.20	< 0.20	0.26	< 0.20	< 0.20	< 0.20	< 0.20
Zinc	M	2450	mg/kg	0.50	21	33	58	33	49	48
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
TPH >C5-C6	N	2670	mg/kg	1.0	< 1.0	< 1.0	1.4	< 1.0	< 1.0	< 1.0
TPH >C6-C8	N	2670	mg/kg	1.0	< 1.0	< 1.0	1.2	< 1.0	< 1.0	< 1.0
TPH >C8-C10	N	2670	mg/kg	1.0	< 1.0	< 1.0	8.1	< 1.0	< 1.0	< 1.0
TPH >C10-C12	N	2670	mg/kg	1.0	26	< 1.0	< 1.0	< 1.0	33	< 1.0
TPH >C12-C16	N	2670	mg/kg	1.0	64	< 1.0	< 1.0	< 1.0	49	< 1.0
TPH >C16-C21	N	2670	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total TPH >C5-C21	N	2670	mg/kg	10	90	< 10	27	< 10	82	< 10
Naphthalene	M	2700	mg/kg	0.10	0.73	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	0.18	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	0.17	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	0.16	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	1.2	0.22	0.47	< 0.10	0.43	< 0.10
Anthracene	M	2700	mg/kg	0.10	0.42	< 0.10	0.22	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	1.6	0.55	1.1	0.21	1.2	0.80
Pyrene	M	2700	mg/kg	0.10	2.1	0.58	1.2	0.34	1.2	0.89
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.1	0.20	0.62	< 0.10	< 0.10	0.31
Chrysene	M	2700	mg/kg	0.10	1.6	0.25	0.65	< 0.10	< 0.10	0.34
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.2	< 0.10	< 0.10	< 0.10	< 0.10	0.59
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.65	< 0.10	< 0.10	< 0.10	< 0.10	0.51
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.2	< 0.10	< 0.10	< 0.10	< 0.10	0.47
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 EPA PAH's	M	2700	mg/kg	2.0	13	2.7	5.4	< 2.0	3.0	3.8
Dichlorodifluoromethane	M	2760	µg/kg	1.0						< 1.0
Chloromethane	M	2760	µg/kg	1.0						< 1.0

Results - Soil

Project: Clacton

Client: Compass Geotechnical Limited			Chemtest Job No.:	22-06533	22-06533	22-06533	22-06533	22-06533	22-06533
Quotation No.: Q21-12278			Chemtest Sample ID.:	1376910	1376911	1376912	1376913	1376914	1376915
			Client Sample ID:	BS	BS	BS	BS	BS	BS
			Sample Location:	BH1	BH2	TP1	TP2	TP3	TP4
			Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):	1.50	1.5	0.3	0.5	1.3	0.5
			Date Sampled:	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022
			Time Sampled:	1:00	0:00	1:00	0:00	0:00	1:00
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Vinyl Chloride	U	2760	µg/kg	1.0					< 1.0
Bromomethane	U	2760	µg/kg	20					< 20
Chloroethane	U	2760	µg/kg	2.0					< 2.0
Trichlorofluoromethane	U	2760	µg/kg	1.0					< 1.0
1,1-Dichloroethene	U	2760	µg/kg	1.0					< 1.0
Trans-1,2-Dichloroethene	U	2760	µg/kg	1.0					< 1.0
1,1-Dichloroethane	U	2760	µg/kg	1.0					< 1.0
cis-1,2-Dichloroethene	U	2760	µg/kg	1.0					< 1.0
Bromochloromethane	U	2760	µg/kg	5.0					< 5.0
Trichloromethane	U	2760	µg/kg	1.0					< 1.0
1,1,1-Trichloroethane	U	2760	µg/kg	1.0					< 1.0
Tetrachloromethane	U	2760	µg/kg	1.0					< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0					< 1.0
Benzene	U	2760	µg/kg	1.0					< 1.0
1,2-Dichloroethane	U	2760	µg/kg	2.0					< 2.0
Trichloroethene	N	2760	µg/kg	1.0					< 1.0
1,2-Dichloropropane	U	2760	µg/kg	1.0					< 1.0
Dibromomethane	U	2760	µg/kg	1.0					< 1.0
Bromodichloromethane	U	2760	µg/kg	5.0					< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10					< 10
Toluene	U	2760	µg/kg	1.0					< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10					< 10
1,1,2-Trichloroethane	U	2760	µg/kg	10					< 10
Tetrachloroethene	U	2760	µg/kg	1.0					< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0					< 2.0
Dibromochloromethane	U	2760	µg/kg	10					< 10
1,2-Dibromoethane	U	2760	µg/kg	5.0					< 5.0
Chlorobenzene	U	2760	µg/kg	1.0					< 1.0
1,1,1,2-Tetrachloroethane	U	2760	µg/kg	2.0					< 2.0
Ethylbenzene	U	2760	µg/kg	1.0					< 1.0
m & p-Xylene	U	2760	µg/kg	1.0					< 1.0
o-Xylene	U	2760	µg/kg	1.0					< 1.0
Styrene	U	2760	µg/kg	1.0					< 1.0
Tribromomethane	U	2760	µg/kg	1.0					< 1.0
Isopropylbenzene	U	2760	µg/kg	1.0					< 1.0
Bromobenzene	U	2760	µg/kg	1.0					< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50					< 50

Results - Soil

Project: Clacton

Client: Compass Geotechnical Limited				**Chemtest Job No.:**	22-06533	22-06533	22-06533	22-06533	22-06533	22-06533
Quotation No.: Q18-15078				**Chemtest Sample ID.:**	1376910	1376911	1376912	1376913	1376914	1376915
				Client Sample ID:	ES	ES	ES	ES	ES	ES
				Sample Location:	BH1	BH2	TP1	TP2	TP3	TP4
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	0.5	0.3	0.3	0.3	0.3
				Date Sampled:	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022	17-Feb-2022
				Time Sampled:	0:00	0:00	0:00	0:00	0:00	0:00
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
N-Propylbenzene	U	2760	µg/kg	1.0						< 1.0
2-Chlorotoluene	U	2760	µg/kg	1.0						< 1.0
1,3,5-Trimethylbenzene	U	2760	µg/kg	1.0						< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0						< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0						< 1.0
1,2,4-Trimethylbenzene	U	2760	µg/kg	1.0						< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0						< 1.0
1,3-Dichlorobenzene	U	2760	µg/kg	1.0						< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0						< 1.0
1,4-Dichlorobenzene	U	2760	µg/kg	1.0						< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0						< 1.0
1,2-Dichlorobenzene	U	2760	µg/kg	1.0						< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50						< 50
1,2,4-Trichlorobenzene	U	2760	µg/kg	1.0						< 1.0
Hexachlorobutadiene	U	2760	µg/kg	1.0						< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0						< 2.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0						< 1.0

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description (Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron. Sulphate. Magnesium & Chromium	Boron: Sulphate: Magnesium: Chromium	Aqueous extraction / ICP-OES
2450	Acid Soluble Metals in Soils	Metals. including: Arsenic: Barium: Beryllium: Cadmium: Chromium: Cobalt: Copper: Lead: Manganese: Mercury: Molybdenum: Nickel: Selenium: Vanadium: Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1.5-diphenylcarbazide.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40): optional carbon banding. e.g. 3-band – GRO. DRO & LRO"TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene: Acenaphthylene: Anthracene: Benzo[a]Anthracene: Benzo[a]Pyrene: Benzo[b]Fluoranthene: Benzo[ghi]Perylene: Benzo[k]Fluoranthene: Chrysene: Dibenz[ah]Anthracene: Fluoranthene: Fluorene: Indeno[123cd]Pyrene: Naphthalene: Phenanthrene: Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds. including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)"please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample. as received. with mass spectrometric (MS) detection of volatile organic compounds.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix (vi)
ULS & SLS Calculations

Calculation of Preliminary Bearing Pressure - Strip Foundation on Clays

For undrained conditions using $R/A = (\pi + 2)Cu + q$

Input Parameters

Term	Symbol	Value	Units
Width of rising wall	d	0.3	m
Height of concrete foundation	h	0.3	m
Depth below ground level	D	1	m
Breadth of foundation	B	0.6	m
density of soil	$\Upsilon_{s;k}$	20	kN/m^3
density of concrete	$\Upsilon_{c;k}$	24	kN/m^3
density of brick and infill	$\Upsilon_{b;k}$	22	kN/m^3
Undrained shear strength	Cu	48	kPa
Assumed imposed vertical load		80	kN/mrun

Permanent characterisitic vertical load

Weight of rising wall		4.62	kN/mrun
Weight of foundation		4.32	kN/mrun
Weight of backfill		4.2	kN/mrun
Total characterisitic vertical load	V_k	93.14	kN/mrun

Design Approach 1

Undrained Conditions simplified for the case of a vertical load action at the centre of strip

Area of footing	A	0.6	m2/mrun

Combination 1 (A1, M1, R1)

Design Load (A1)	V_{d1}	125.74	kN/mrun
Design Strength (M1)	C_{ud1}	48	kPa
Soil Surcharge adj to footing	q_{d1}	20	kPa
Design Bearing Resistance (R1)	R_{d1}	160.09	kPa

Check if $V_{d1} \leq R_{d1}$ acceptable for Design Approach 1 Combination 1

Combination 2 (A2, M2, R1)

Design Load (A2)	V_{d2}	93.14	kN/mrun	
Design Strength (M2)	C_{ud2}	34.3	kPa	
Soil surcharge adj to footing	q_{d2}	20	kPa	
Design Bearing Resistance (R1)	R_{d2}	117.8	kPa	
Check if $V_{d2} \leq R_{d2}$		acceptable for Design Approach 1 Combination 2		
Critical Combination Check				
Combination 1	R_{d1}/V_{d1}	1.2732		
Combination 2	R_{d2}/V_{d2}	1.2645		Combination 2 is more critical

Settlements (SLS Limit State)

Limit to settlements by $V_k = R_k/3$	using unfactored values			
Vertical Load	V_k	93.14	kN/mrun	
Bearing Resistance	R_k	160.09	kN/mrun	
	R_k/V_k	1.7188		Less than 3 consider increasing foundation size or reducing load
To give V_k for $R_k/3$	V_k	53.363	kN/mrun	
Preliminary design bearing resistance		88.939	kPa	
Imposed wall loading		40.223	kN/mrun	

Preliminary Analysis for CFA Pile Foundation in Clay for Vertical Load Only

For undrained conditions

Input Parameters

Term	Symbol	Value	Units
Pile diameter	d	0.3	m
Pile Length	D	15	m
Thickness of Stratum 1	D1	14	m
Thickness of Stratum 2	D2	1	m
density of soil	$\Upsilon_{s;k}$	20	kN/m^3
density of concrete	$\Upsilon_{c;k}$	24	kN/m^3
Undrained shear strength Stratum 1	Cu	100	kPa
Undrained shear strength Stratum 2	Cu	150	kPa

Design Approach 1

To determine preliminary design value for imposed load for pile
The difference in the weight of the pile and the displaced overburden load is ignored in this preliminary analysis

Combination 1 (A1, M1, R1)

Design Load (A1)	V_{d1}	to be determined
Design Strength (M1)	Υ_{cu}	1

Design Resistance (R1)
Basic Pile Resistance Factors using analytical method

Pile Base	$9C_u$	9
Pile Shaft	αC_u	
For this case in Strata 1 and Strata 2,	α	0.5
Pile shaft for Strata 1 and Strata 2,	$0.5\ C_u$	
Shaft resistance for Strata 1 and Strata 2	R_k	$0.5C_uA_s$
Compressive Resistance	$R_{c;d}$	$R_{b;d} + R_{b;s}$
Partial Factors for CFA Pile	$\Upsilon_b = 1.1$	$\Upsilon s = 1.0$

Note: when deriving characteristic values for pile design from ground parameters, partial factors have to be corrected by a model factor.

Presumed Model Factor	1.4

Partial factors for pile resistance for CFA Piles

$\Upsilon_{b;d}$	1.54
$\Upsilon_{s;d}$	1.4

Term	Symbol	Value	Units
Base Resistance $(9/1.54)C_u A_b$	$R_{b;d}$	61.973	kN
Shaft Resistance $(0.5/1.4)\Sigma C_u A_s$	$R_{s;d}$	521.8	kN
Compressive Resistance $= R_{b;d}+R_{s;d}$	$R_{c;d}$	583.77	kN
Preliminary Pile Design Load for Combination 1		584	kN
Imposed loading factored for Design Approach 1		432	kN

Combination 2 (A2, M1 or M2, R4)

Design Load (A2) to be determined

Design Strength (M1) γ_{cu} 1

Design Resistance (R4)

Partial Factors for CFA piles (without specific verification of SLS)

γ_b 2.0

γ_s 1.6

Note: when deriving characteristic values for pile design from ground parameters, partial factors have to be corrected by a model factor.

Presumed Model Factor 1.4

Partial factors for pile resistance for CFA Piles

$\gamma_{b;d}$ 2.8

$\gamma_{s;d}$ 2.24

Base Resistance $(9/2.80)C_u A_b$	$R_{b;d}$	34.085	kN
Shaft Resistance $(0.5/2.24)\Sigma C_u A_s$	$R_{s;d}$	326.12	kN
Compressive Resistance $= R_{b;d}+R_{s;d}$	$R_{c;d}$	360.21	kN
Preliminary Pile Design Load for Combination 2		360	kN

Settlements (SLS Limit State)

Traditional pile analysis has been based broadly on verifying the overall factor of safety depending on pile testing proposals

Typically:
F of S - 2.5 - 3.0 for no pile tests
F of S - 2.0 - 2.5 for tests on 1% of working piles
F of S - 2.0 - 2.25 when preliminary pile testing is undertaken

SLS Check

As no specific consolidation or similar tests have been carried out a check on the limit to settlements will be restricted to using classical bearing capacity theory (unfactored values) as in the following to give and overall factor of safety of 2.5:

Term	Symbol	Value	Units
Base Resistance $9C_u A_b$	$R_{b;d}$	95.44	kN
Shaft Resistance $0.5\Sigma C_u A_s$	$R_{s;d}$	730.52	kN
Compressive Resistance $= R_{b;d}+R_{s;d}$	$R_{c;d}$	825.95	kN
Preliminary Pile Design Load = $R_{c;d}/2.5$		330	kN

Compass Geotechnical
Geotechnical, Geoenvironmental and Civil Engineering Consultants
13 Willow Park, Upton Lane, Stoke Golding, Warwickshire, CV13 6EU
[redacted]