



EARTH ENVIRONMENTAL
& GEOTECHNICAL

Ground Investigation Report

11 Queen Annes Drive

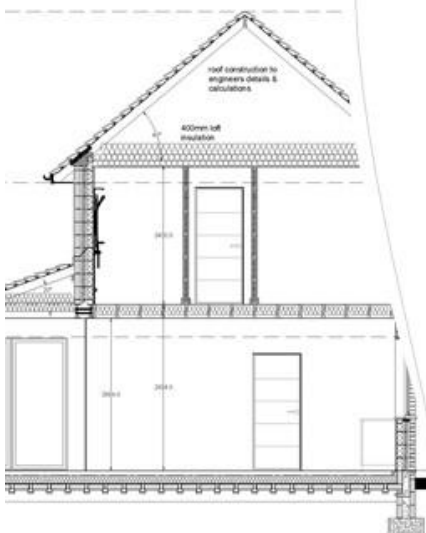
Bedhampton

Havant

For

Dot Architecture

December 2020



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GROUND INVESTIGATION REPORT

11 QUEEN ANNES DRIVE

BEDHAMPTON

HAMPSHIRE

Report Ref: B1575/20

December 2020

Prepared on Behalf of:

Dot Architecture

By:

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Date: 15th December 2020

Prepared for: Dot Architecture

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Definition of Version Code:

- D. Applied during initial drafting of the report before it has been reviewed.
- C. Applied after the report has been reviewed but before it has been approved by the Project Manager.
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1.0 INTRODUCTION

1.1 Background

Earth Environmental & Geotechnical (Southern) Ltd (EEGSL) was commissioned by Dot Architecture, acting on behalf of Claire and Ronnie Beavis (the Clients), to undertake a Ground Investigation for a residential development at a site in Bedhampton, Havant.

1.2 Terms of Reference

EEGSL was commissioned by the Client to undertake a site investigation in accordance with a proposal reference B1575, dated 8th November 2020.

The objectives of this investigation are as follows:

- *Assessment of ground conditions for design of foundations and infrastructure associated with proposed development.*

This report presents full factual records of the site work carried out, the ground conditions encountered in the exploratory holes, the in situ and laboratory test results. All information collected has been used to provide an interpretation of the ground conditions, with recommendations on geotechnical design.

1.3 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices or changes in legislation may require a reinterpretation of the report in whole or in part. EEGSL reserve the right to amend either conclusions or recommendations in light of any further information that may become available.

The report is provided for the sole use by the client and is confidential to them. Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes, particularly at intervening locations. Whilst every effort is made to ensure accuracy of data supplied, all opinions expressed as to the spatial distribution of strata between sampling locations is for guidance only and no responsibility is accepted as to its accuracy.

2.0 THE SITE

2.1 Site Location & Description

The site is located immediately east of No. 11 Queen Annes Drive in the Bedhampton area of Havant in Hampshire at National Grid Reference 470129 106767 and has a nearest postcode of PO9 3PG. The site location is shown in Figure 1 below.

Figure 1 – Aerial Photograph Showing Site Location



At the time of the investigation the site was a disused/derelict piece of land, as shown in the general site photograph below.

Figure 2 – General Site Photograph



2.3 Geology

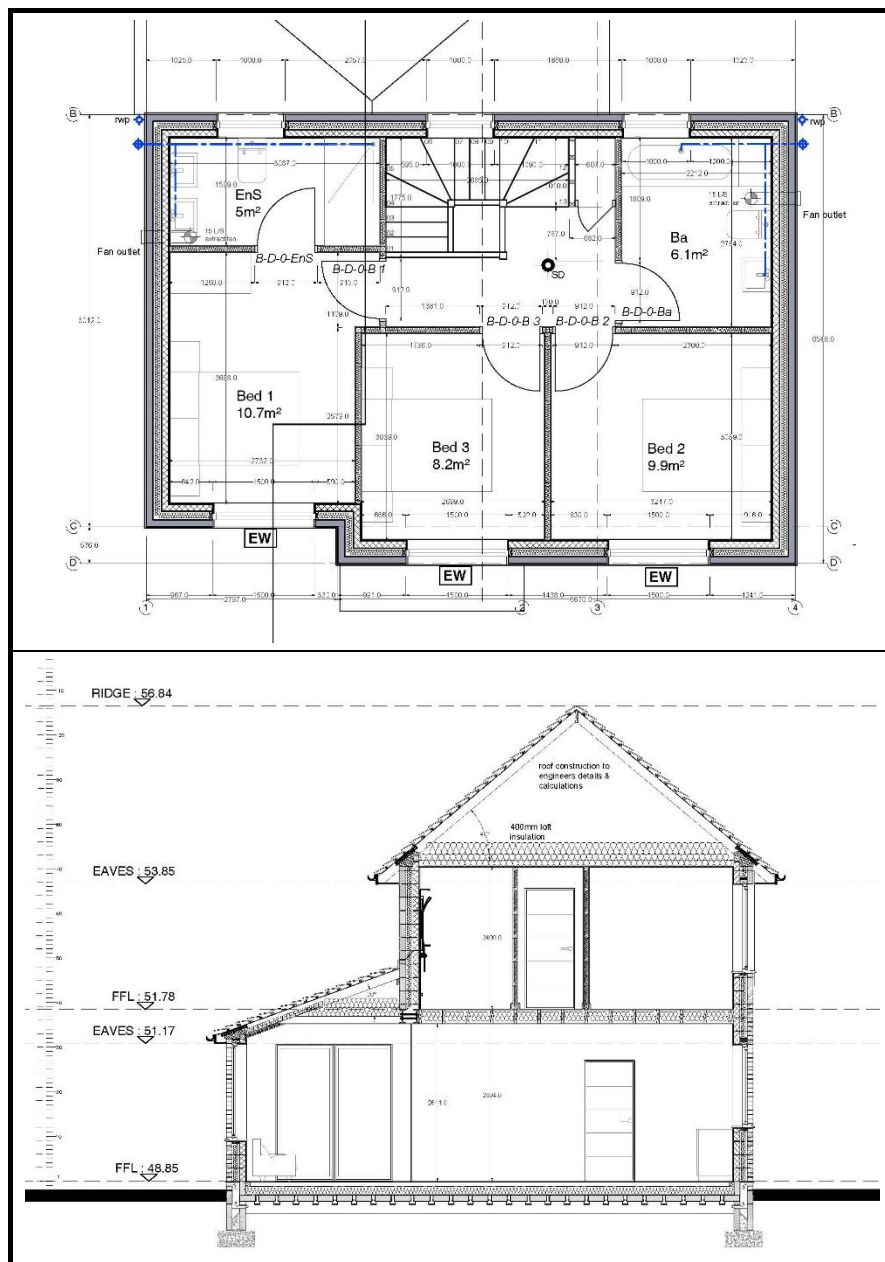
According to the British Geological Survey (BGS) the site is underlain by the London Clay Formation of Palaeogene age.

The London Clay Formation is described as comprising bioturbated or poorly laminated, blue grey or grey brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.

2.4 Proposed Development

It is proposed to construct a new residential dwelling on site. Development details are shown in Figure 3 below.

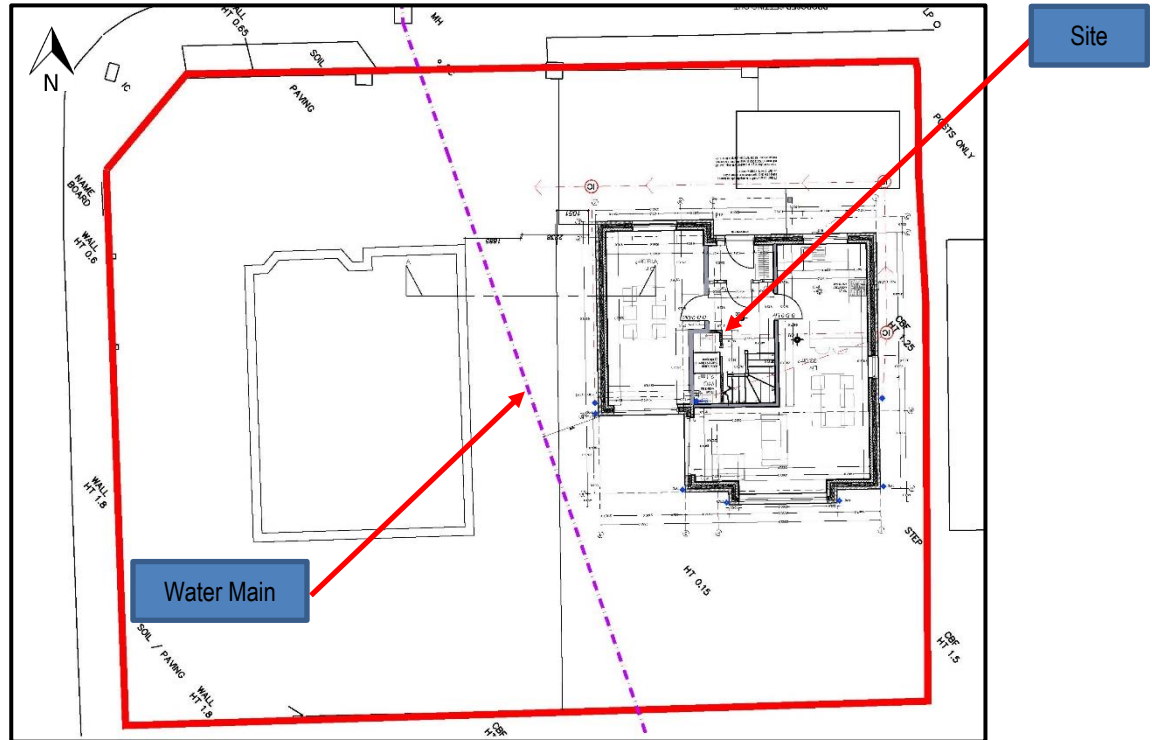
Figure 3 – Proposed Development Details



2.4 Utilities

According to information supplied by Dot Architecture there is a buried water main close to the site, the location of which is shown in Figure 4 below.

Figure 4 – Location of Buried Water Main



3.0 SITE INVESTIGATION

3.1 Exploratory Fieldwork

The fieldwork was carried out by EEGSL between 23rd and 25th November 2020 and comprised:

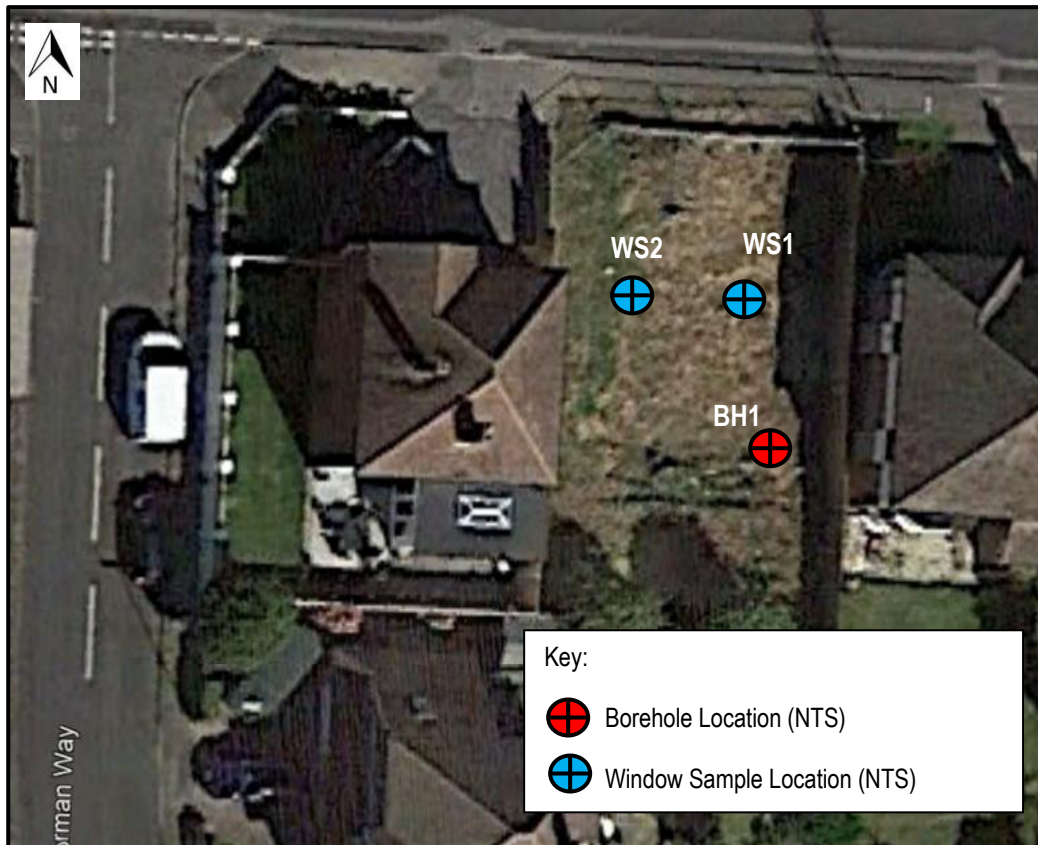
- A single 150mm diameter borehole (designated BH1) was sunk to a depth of 15.0m below existing ground level, using a light cable percussion boring rig. With this type of rig boreholes are advanced by the percussive action of drill tools suspended on a winch-driven steel cable. The tools generally include a clay-cutter for penetrating fine-grained soils, and a shell for use in coarse-grained, or “granular”, soils. Representative disturbed samples were recovered as boring proceeded. In addition, “undisturbed” 100mm diameter samples (U100’s) were recovered, as appropriate, using standard thick-walled, open-drive samplers, with a steel cutting shoe, dynamically driven by a sliding hammer. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Chiselling techniques were not required to penetrate the materials encountered. Details of groundwater conditions were noted, and are indicated on the borehole log. These observations relate only to the time of boring, and do not necessarily reflect possible seasonal fluctuations. They may have been affected by the installation of casing, or the addition of water to aid boring. The borehole was backfilled on completion with arisings. The borehole log is included in Appendix 1.
- Two window sample boreholes (designated WS1 and WS2) were sunk to depths of 3.0m below existing ground level. Window sampler boring is carried out with a small, track-mounted rig, which uses a chain-driven trip hammer to drive sampling tubes or penetrometers into the ground. These tools are coupled to the anvil of the hammer by solid drill rods. Sampling tubes comprise “windowless samplers”, which are plain sampler tubes in which a continuous disturbed sample is recovered within a semi-rigid plastic liner. In order to reduce friction within the borehole, sampling tubes of progressively smaller diameter are used as the borehole depth increases. Sampler diameters generally range from between approximately 90mm to 50mm. Standard Penetration Tests (SPTs) were undertaken in the boreholes in accordance with BS EN ISO 22476-3. Window Sample Logs and photographs are included in Appendix 1.

Each exploratory location was scanned using a Cable Avoidance Tool (CAT) in order to locate unrecorded underground services, and the exploratory locations were repositioned if necessary. On completion, all samples recovered from the site were taken to a specialist laboratory for testing.

All site investigation work was supervised full time by a representative of EEGSL. The logging of soils and rocks has been carried out in accordance with BS5930⁽²⁰¹⁵⁾ except where superseded by the soil and rock description methodology in BS EN14688-1⁽²⁰⁰²⁾, BS EN 14688-2⁽²⁰⁰⁴⁾ and BS EN 14689-1⁽²⁰⁰³⁾.

The exploratory hole locations were determined on site by EEGSL and are shown approximately on the Exploratory Hole Location Plan (Figure 5) overleaf.

Figure 5 - Exploratory Hole Location Plan



3.2 Laboratory Testing

A programme of laboratory testing was carried out on samples taken from the various strata to assist in classification and determine the engineering properties of the materials underlying the site. The testing was scheduled by EEGSL and carried out by GEO Site & Testing Services Ltd. The test procedures used were generally in accordance with the methods described in BS1377:1990. Details of the specific tests used in each case are given below:

Table 1 – Summary of Laboratory Geotechnical Tests Undertaken

TEST	STANDARD	No.
Moisture Content	BS1377:1990 Part 2, Clause 3.2	4
Liquid Limit, Plastic Limit, Plasticity Index	BS1377:1990 Part 2, Clause 4/5	4
Sulphate content of 2:1 soil:water extract	BS1377:1990 Part 3, Clause 5	5
pH value	BS1377:1990 Part 3, Clause 9	5

The results of the laboratory tests are included in Appendix 2.

4.0 GROUND CONDITIONS ENCOUNTERED

4.1 Soil Profile Encountered

The sequence of strata encountered beneath the site was as follows:

- **Made Ground** was encountered in all the exploratory holes, comprising:
 - Gravelly clay with chalk, brick, flint.
 - Silty clay with chalk and brick gravel (BH1 only).
- **London Clay** was encountered in all the exploratory holes except HP1 and HP2, comprising:
 - Brown becoming dark grey silty CLAY.
 - CLAY with flint gravel and cobbles.

The depths of the various materials encountered in each of the exploratory holes are summarised in Table 2 below.

Table 2 – Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m)				GROUNDWATER
	MADE GROUND		LONDON CLAY		
	Brown gravelly clay with chalk, brick and flint.	White gravelly silty clay with chalk and rare brick	Brown silty CLAY	Very clayey flint GRAVEL	
BH1	GL-1.00	1.00-1.65	1.65-15.00		Strike at 3.4m
WS1	GL-0.50		0.50-2.30	2.30-3.00	Dry
WS2	GL-0.50		0.50-1.95	1.95-3.00	Dry

4.2 Obstructions

Underground man-made obstructions were not encountered during the investigation. The window sample boreholes refused on very gravelly/cobbly clay horizons.

4.3 Groundwater

Groundwater was encountered in BH1 at 4.3m depth, rising to 1.9m depth after 20 minutes.

5.0 ENGINEERING PROPERTIES OF SOILS ENCOUNTERED

5.1 General

The following sections discuss the engineering properties of the strata encountered, based on results of laboratory testing and in situ testing.

Laboratory test results are summarised in Table 3 below.

Table 3 – Summary of Laboratory Test Results

Location	Depth (m)	CLASSIFICATION				CHEMICAL	
		Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	pH Value	Water Soluble Sulphate (mg/l)
BH1	0.30					7.11	40
BH1	1.20					7.26	40
BH1	1.60	19	58	18	40		
BH1	2.20					7.35	40
BH1	3.20	11		NP			
BH1	7.20	18	57	22	35		
BH1	9.20					7.89	50
BH1	10.20	23	58	22	36		
BH1	13.20					8.09	30

*NP = Non Plastic

5.2 London Clay

Atterberg Limit tests have given values of **liquid limit** in the range 57% to 58% and **plastic limit** values in the range 18% to 22%, resulting in values of **plasticity index** in the range 35% to 40%. These results suggest the samples tested are clay of high plasticity as shown on the Plasticity Chart included in Appendix 2. For design purposes, a value of plasticity index = 38% is recommended, based on the upper quartile value of results.

In accordance with NHBC Chapter 4.2 Building Near Trees⁽²⁰⁰³⁾ soils can be classified in terms of **volume change potential**, using the relationship:

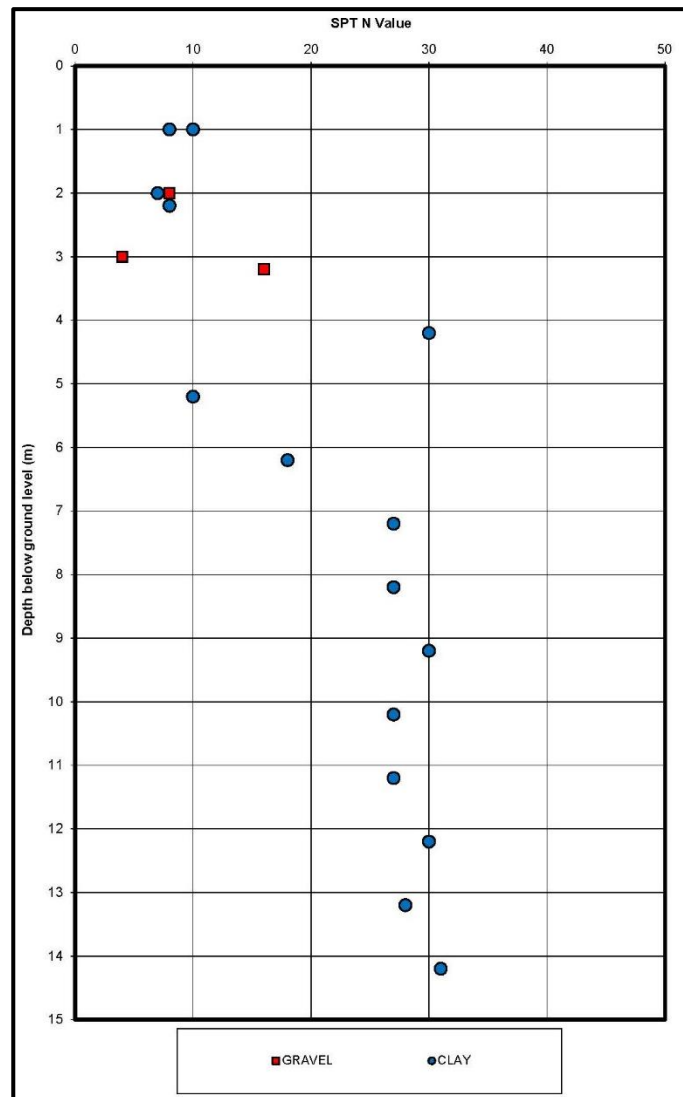
$$I_{p'} = I_p \times \frac{\% \text{ less than } 425\mu\text{m}}{100\%}$$

....where $I_{p'}$ = modified plasticity index, I_p = plasticity index.

Based on the laboratory test results, the above relationship and Table 1 of NHBC Chapter 4.2, the samples tested are shown to have **medium volume change potential**.

SPT N values range from 4 to 31 and show a gradual increase with depth as can be seen in the SPT v Depth Plot (Figure 6) overleaf. These results suggest the clay is generally soft to firm becoming firm to stiff with depth and the clayey gravel is loose to medium dense.

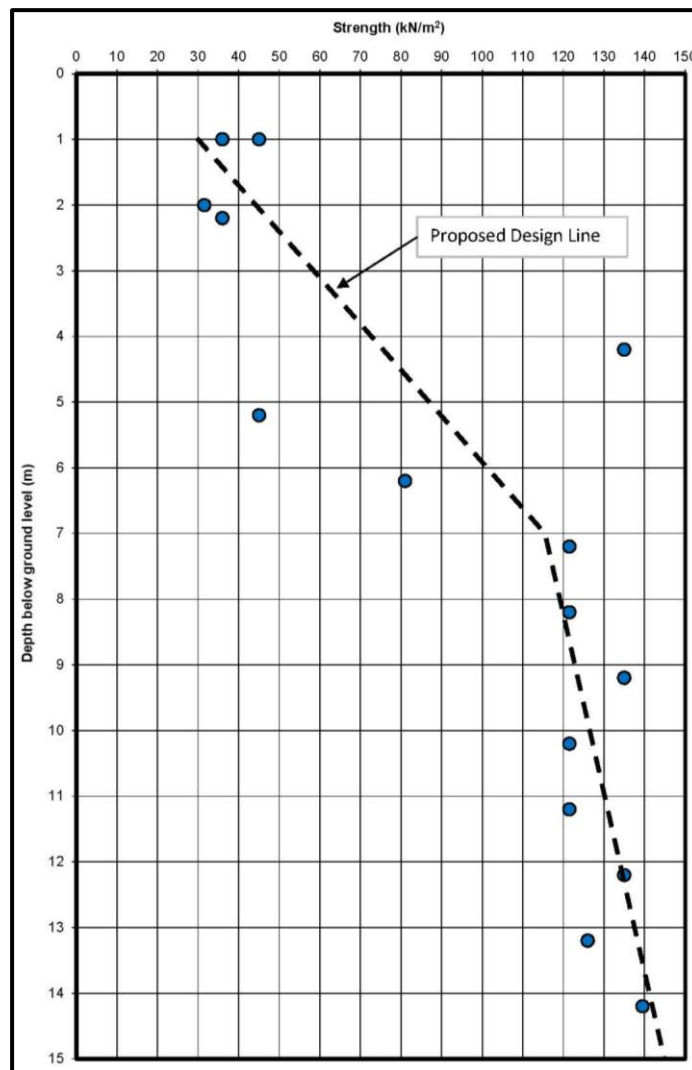
Figure 6 – SPT v Depth Plot



Shear strength may be estimated from a correlation by Stroud and Butler⁽¹⁹⁷⁵⁾: for a clay with a plasticity index of 38%, $c_u = 4.5 \times \text{SPT N value}$. A plot of derived shear strength against depth is shown in Figure 7 overleaf. From Figure 7 the following strength profile is recommended:

- $c_u = 30\text{kN/m}^2$ at 1m depth, increasing linearly to;
- $c_u = 115\text{kN/m}^2$ at 7m depth, increasing linearly to;
- $c_u = 145\text{kN/m}^2$ at 15m depth

Figure 7 – Strength v Depth Plot (London Clay)



Effective stress strength parameters may also be obtained from correlations with plasticity index. For a plasticity index of 38%:

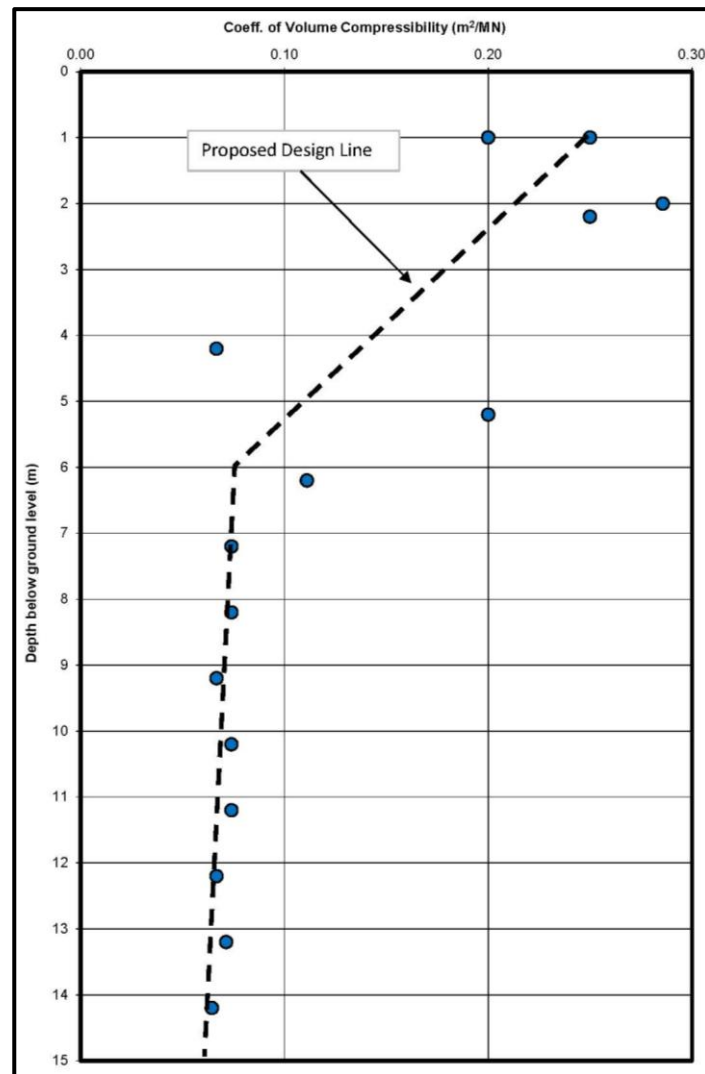
- BS8002⁽¹⁹⁹⁴⁾, Table 2 gives $\phi'_{crit} \approx 22^\circ$;
- Gibson⁽¹⁹⁵³⁾, gives $\phi_d = 24.7^\circ$.

Based on all the above, design values of $\phi' = 22^\circ$ and $c' = 0 \text{ kN/m}^2$ are recommended for the London Clay.

The **coefficient of volume compressibility**, m_v may also be estimated from a correlation by Stroud and Butler⁽¹⁹⁷⁵⁾: for a clay with a plasticity index of 38%, $m_v = 1 / (0.50 \times N \text{ value})$.

A plot of all derived m_v results against depth is shown on the m_v v Depth Plot (Figure 8) overleaf.

Figure 8 – Coefficient of Volume Compressibility v Depth Plot (London Clay)



From Figure 8 the following profile is recommended:

- $m_v = 0.25 \text{ m}^2/\text{MN}$ at 1m depth, decreasing linearly to;
- $m_v = 0.08 \text{ m}^2/\text{MN}$ at 6m depth, decreasing linearly to;
- $m_v = 0.07 \text{ m}^2/\text{MN}$ at 15m depth

Laboratory test have given values of **water soluble sulphate** in the range 30mg/l to 50mg/l, together with **pH values** in the range 7.11 to 8.09.

6.0 GEOTECHNICAL ASSESSMENT

6.1 Proposed Development

It is proposed to construct a single two storey dwelling on site. At the time of writing this report anticipated structural loadings were not known.

6.2 Ground Conditions Encountered

The exploratory holes have encountered Made Ground (up to 1.65m thickness) overlying soft to firm becoming firm to stiff clay with some bands of clayey gravel between 4m and 5m depth. Groundwater was encountered in BH1 at 4.3m depth.

6.3 Foundation Considerations

Based on the ground conditions encountered, conventional shallow depth strip/pad foundations could be suitable, subject to anticipated structural loadings and tolerance of structure to settlement.

If structural loadings and/or settlement are too high for the proposed development alternative foundation options such as piles, should be considered.

The above options are discussed in the following sections.

6.3.1 *Conventional Strip Foundations*

Made Ground is not suitable as a foundation stratum due to its inherent variability and risk of intolerable differential settlement. Therefore foundations should be taken down into the natural clay at a minimum depth of 1.0m below existing ground level. If any Made Ground, soft or particularly loose material is encountered at the base of the foundations excavation, this should be either excavated and replaced by suitable granular fill, or the foundation extended to suitable strata.

Table 4 overleaf summarises anticipated allowable bearing pressures for strip and pad foundations placed at different depths in natural clay. The bearing capacities are calculated based on Hansen's⁽¹⁹⁷⁸⁾ method and assuming a factor of safety against bearing capacity failure of 3. Groundwater is assumed to be at foundation level.

Table 4 – Summary of Allowable Bearing Pressures

Depth (m)	Stratum	Design Value (Figure 7)	Foundation Type	Foundation Size	Allowable Bearing Pressure
1.00	CLAY	$c_u=30\text{kN/m}^2$	Strip	0.4m	80kN/m ²
				0.9m	70kN/m ²
			Pad	1m x 1m	85kN/m ²
				2m x 2m	75kN/m ²
1.50	CLAY	$c_u=37\text{kN/m}^2$	Strip	0.4m	100kN/m ²
				0.9m	95kN/m ²
			Pad	1m x 1m	110kN/m ²
				2m x 2m	100kN/m ²
2.00	CLAY	$c_u=43\text{kN/m}^2$	Strip	0.4m	120kN/m ²
				0.9m	115kN/m ²
			Pad	1m x 1m	130kN/m ²
				2m x 2m	120kN/m ²
2.50	CLAY	$c_u=50\text{kN/m}^2$	Strip	0.4m	140kN/m ²
				0.9m	135kN/m ²
			Pad	1m x 1m	155kN/m ²
				2m x 2m	145kN/m ²

Table 15 below summarises anticipated settlements of strip/pad foundations. For the purposes of the calculations, the structural loading has been assumed as equal to the allowable bearing pressures above, to give a worse-case scenario.

Table 5 – Summary of Anticipated Settlements

Depth (m)	Stratum	Foundation Type	Foundation Size	Foundation Loading	Settlement (mm)		
					At Centre	At Corner	Average
1.00	CLAY	Strip	0.4m	80kN/m ²	-	-	5-10
			0.9m	70kN/m ²	-	-	10-15
		Pad	1m x 1m	85kN/m ²	20-25	<5	15-20
			2m x 2m	75kN/m ²	30-35	5-10	20-25
1.50	CLAY	Strip	0.4m	100kN/m ²	-	-	10-15
			0.9m	95kN/m ²	-	-	15-20
		Pad	1m x 1m	110kN/m ²	25-30	5-10	20-25
			2m x 2m	100kN/m ²	35-40	10-15	25-30
2.00	CLAY	Strip	0.4m	120kN/m ²	-	-	10-15
			0.9m	115kN/m ²	-	-	15-20
		Pad	1m x 1m	130kN/m ²	30-35	5-10	20-25
			2m x 2m	120kN/m ²	40-45	10-15	30-35
2.50	CLAY	Strip	0.4m	140kN/m ²	-	-	10-15
			0.9m	135kN/m ²	-	-	20-25
		Pad	1m x 1m	155kN/m ²	30-35	5-10	20-25
			2m x 2m	145kN/m ²	40-45	10-15	30-35

Settlements for other bearing pressures may be estimated on a pro-rata basis but bearing pressures should not exceed the allowable net bearing pressure based on ultimate bearing capacity.

If foundations are located within the zone of influence of trees, to avoid possible excessive settlement due to water removal by trees during dry periods or ground heave due to tree removal, the recommendations of the National House Building Council Practice Standard “Building Near Trees” should be closely followed. In this context soils should be considered as having MEDIUM volume change potential.

Floor slabs should be designed as suspended where located within the zone of influence of a tree OR Made Ground is greater than 600mm thickness. Ground bearing floor slabs can be used where placed in natural material or Made Ground excavated and replaced with suitable granular fill.

All foundation excavations should be inspected by a suitable qualified engineer to prove that the founding strata is suitable and uniform along the length of the foundation, and capable of taking the anticipated structural loadings.

If the allowable bearing pressures are below anticipated foundation loadings or the anticipated settlements too high, alternative foundation such as piles should be considered.

6.3.2 Piled Foundations

The proposed development may be founded on a system of ground beams spanning onto piles taken down into the stiff to very stiff London Clay, encountered at depths of below 5.0m below existing ground level.

A variety of pile types may be used, including bored and continuous flight auger (CFA) piles. Driven piles are unlikely to be suitable given the close proximity of the existing property and buried water service.

Because of the various advantages and limitations of each pile type, and the cost implications, advice should be sought from specialist piling contractors to determine the most suitable and cost-effective type. They should also be able to give recommended pile diameters and depths and likely pile capacities, with guaranteed performance. It is recommended a pile test be carried out to confirm pile capacities. In assessing the pile capacities, contractors should make an allowance for the effects of negative skin friction, particularly in the made ground and soft clays. The design strength profile in Figure 7 can be used for the purposes of pile design.

There may be differential settlement between piled structures and the surrounding ground level. Provision should, therefore, be made to make up ground levels at threshold positions. Alternatively, these materials should be removed and replaced in a controlled manner by suitable existing materials or imported engineered fill.

It is essential the advice of a specialist piling contractor is sought and that positive assurances are provided by the piling contractor that their proprietary system is capable of providing the required working loads in the ground conditions encountered.

Floor slabs should be designed as suspended if the piled solution is used.

6.4 Chemical Attack on Buried Concrete

Chemical tests (see Appendices) show low levels of water soluble sulphates and slightly alkaline conditions. Based on these conditions, it is recommended that for foundations the Design Sulphate Class for the site, as defined in BRE Special Digest 1⁽²⁰⁰⁵⁾, be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification be taken as AC-1s. The recommendations of BRE Special Digest 1 should be followed for concrete foundations and ground bearing floor slabs.

6.5 Suitability of Excavated Materials

Acceptability criteria and testing, and methods of compaction/placement will depend on the type of contract and specification used for the construction of the proposed development and it is recommended that earthworks specifications are reviewed by a suitably qualified engineer, once these have been prepared by the relevant parties.

Granular Made Ground and natural flint gravel may be suitable for re-use providing it is not contaminated and does not contain excessive amounts of clay and providing moisture contents are controlled during placement. The control of moisture contents will be important as the cohesive content of this stratum is likely to be sensitive to moisture content changes.

The soft near surface natural clay is unlikely to be suitable for re-use and should be used for landscaping purposes only, providing it is not contaminated. Stiff to very stiff natural clay could be suitable for re-use subject to further compliance testing.

6.6 Temporary Works

Formations will be susceptible to damage both by weather and trafficking, and should be protected immediately on exposure, particularly in areas where construction plant will access the site.

Excavations in the Made Ground are likely to be unstable and should be battered back to an angle of 1 in 2, or a system of close sheeting and shoring adopted to ensure stability, and in particular where personnel are required to enter excavations. Vertically sided excavation in clay should be stable in the short term.

All excavations should be adequately supported where personnel are required to enter.

Groundwater seepages are likely to be encountered in excavations and pumping of excavations from a suitable located sump should be adequate to keep excavations dry.

APPENDIX 1

EXPLORATORY HOLE LOGS

Percussion Drilling Log

Project Name: 11 Queen Anne's Drive		Client: Dot Architecture		Date: 23/11/2020	
Location: Havant		Contractor: LAS Drilling			
Project No. : B1575		Crew Name: LS		Drilling Equipment: Dando 2000	
Borehole Number BH1	Hole Type CP	Level	Logged By RL	Scale 1:50	Page Number Sheet 1 of 2

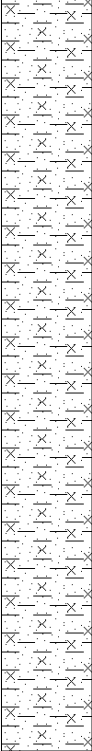
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D					MADE GROUND: Brown slightly gravelly clay. Gravel is angular to subangular fine to coarse of chalk, flint and red brick.	
		1.20	D		1.00			MADE GROUND: White slightly gravelly silty clay. Gravel is subangular to subrounded fine to coarse of chalk and rare angular red brick.	1
		1.20	SPT	N=8 (1,2/2,2,2,2)					
		1.60	D		1.65				
					2.00			Soft to firm brown slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to medium of flint.	2
		2.20	D					Firm becoming stiff brown slightly sandy slightly silty CLAY. Sand is fine.	
		2.20	SPT	N=9 (4,3/3,2,2,2)					
								very gravelly/clayey gravel at 3.0m-4.0m depth. Gravel is rounded to subangular fine to medium of flint.	3
		3.20	D						
		3.20	SPT	N=16 (4,6/6,4,3,3)				Gravel is becoming fine to coarse and occasional subrounded to rounded cobbles of flint at 4.0m	4
								becoming very gravelly at 5.0m depth, gravel is angular to subrounded fine to coarse of flint.	5
		4.20	D		5.50				
		4.20	SPT	N=30 (7,9/9,8,7,6)					
								Firm to stiff becoming stiff dark grey or brown mottled light grey and light brown very sandy silty CLAY.	6
		5.20	SPT	N=10 (2,2/2,2,3,3)				becoming multicoloured (reddish brown, dark red and grey) at 7.0m depth.	7
		5.20	D						
		6.20	D					becoming pinkish brown and gravelly at 8.0m depth.	8
		6.20	SPT	N=18 (3,3/4,4,4,6)					
		7.20	D						
		7.20	SPT	N=27 (3,4/5,7,7,8)					
		8.20	D						
		8.20	SPT	N=27 (4,4/6,6,7,8)					
		9.20	D						
		9.20	SPT	N=30 (5,5/7,7,8,8)					10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks Groundwater encountered at 3.4m depth, rising to 1.9m after 20mins.										 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Percussion Drilling Log

Project Name: 11 Queen Anne's Drive		Client: Dot Architecture		Date: 23/11/2020	
Location: Havant		Contractor: LAS Drilling			
Project No. : B1575		Crew Name: LS		Drilling Equipment: Dando 2000	
Borehole Number BH1	Hole Type CP	Level	Logged By RL	Scale 1:50	Page Number Sheet 2 of 2

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.20 10.20	D SPT	N=28 (4,6/6,7,7,8)				Firm to stiff becoming stiff dark grey or brown mottled light grey and light brown very sandy silty CLAY.	11
		11.20 11.20	D SPT	N=27 (4,5/5,7,7,8)					12
		12.20 12.20	D SPT	N=30 (5,5/7,7,7,9)					13
		13.20 13.20	D SPT	N=28 (4,6/6,7,7,8)					14
		14.20 14.20	D SPT	N=31 (5,7/7,7,8,9)					15
					15.00			End of Borehole at 15.000m	16
									17
									18
									19
									20

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks Groundwater encountered at 3.4m depth, rising to 1.9m after 20mins.										 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Window Sample Log

Project Name: 11 Queen Anne's Drive		Client: Dot Architecture		Date: 25/11/2020	
Location: Havant		Contractor: LAS Drilling			
Project No. : B1575		Crew Name: LS		Drilling Equipment: Dando Terrier 2002	
Borehole Number WS1	Hole Type WS	Level	Logged By RL	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50						MADE GROUND: Brown slightly gravelly silty clay with occasional angular cobbles of redbrick. Gravel is angular to subangular fine to coarse of flint and redbrick.	
		1.00	S	1,2/2,2,2,2 N=8	1.00			Soft to firm light brown slightly gravelly slightly sandy silty CLAY. Gravel is subrounded fine to medium of flint. Sand is fine.	1
								Soft to firm light brown with orange patches slightly sandy silty CLAY. Sand is fine.	
		2.00	S	2,1/1,2,2,2,1 N=8	2.00			Soft to firm brown and grey slightly gravelly CLAY. Gravel is angular fine to coarse of flint.	2
					2.30			Loose very clayey angular fine to coarse GRAVEL of flint with occasional cobbles of same.	
					3.00			REFUSAL on flint gravel/cobbles at 3.0m	3
								End of Borehole at 3.000m	
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks WS refused at 3.60m due to cobbles/coarse gravels of flint (driller's did not want to break through in case of rig becoming damaged). Liner recoveries: GL-1.0m = Inspection Pit, 1.0m-2.0m = 100%, 2.0m - 3.0m = 65%, 3.0m = 4.0m = 0%										 EARTH ENVIRONMENTAL & GEOTECHNICAL
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Window Sample Log

Project Name: 11 Queen Anne's Drive		Client: Dot Architecture		Date: 25/11/2020	
Location: Havant		Contractor: LAS Drilling			
Project No. : B1575		Crew Name: LS		Drilling Equipment: Dando Terrier 2002	
Borehole Number WS2	Hole Type WS	Level	Logged By RL	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50						MADE GROUND: Brown slightly gravelly silty clay. Gravel is subangular to angular fine to coarse of flint and chalk.	
		1.00	S	1,1,/2,2,2,2,3 N=10				Light brown slightly gravelly slightly sandy silty CLAY. Gravel is subrounded fine to medium of flint. Sand is fine.	1
		2.00	S	2,1/1,2,2,1,2 N=8	1.95			Loose brown very clayey angular fine to coarse GRAVEL of flint with occasional subangular cobbles of flint.	2
		3.00	S	1,1/1,1,1,1,1 N=4	3.00			REFUSAL at 3.0m on flint gravel/cobbles	3
								End of Borehole at 3.000m	4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

WS refused at 3.0m due to cobbles/coarse gravels of flint (driller's did not want to break through in case of rig becoming damaged).
Liner recoveries: GL - 1.0m = Inspection Pit, 1.0m - 2.0m = 100%, 2.0m - 3.0m = 50%





APPENDIX 2

LABORATORY TEST RESULTS



Contract Number: 51478

Client Ref: **B1575**

Report Date: **11-12-2020**

Client PO: **B1575**

Client **Earth Environmental & Geotechnical**
Suite G1 Kingsbury House
Kingsbury Square
Melksham, Wilts
SN12 6HL

Contract Title: **Queen Annes Drive Bedhampton**
For the attention of: **Simon Leat**

Date Received: **25-11-2020**

Date Completed: **11-12-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	4
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	4
Water Soluble Sulphate 2:1 extract BS 1377:1990 - Part 3 : 5.3 - @ Non Accredited Test	5
pH value of soil BS 1377:1990 - Part 3 : 9.5 - @ Non Accredited Test	5
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

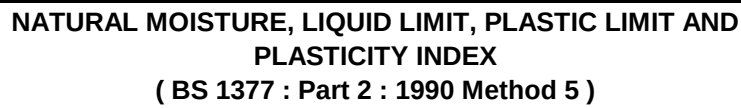
@ - denotes non accredited tests

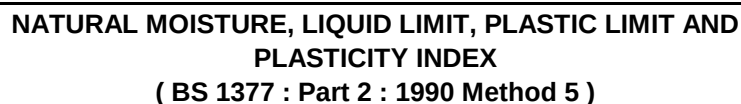
This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved Signatories:

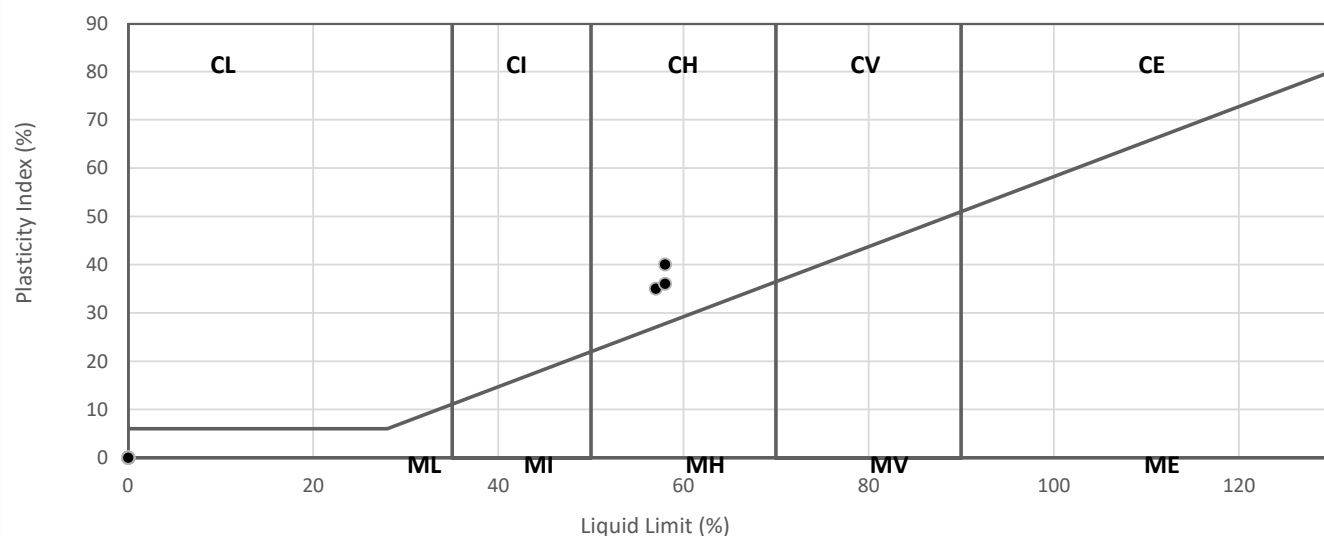
Emma Sharp (Office Manager/Director) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)

Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

[illegible]

[illegible]

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



Operators	Checked	11/12/2020	Wayne Honey (Administrative/Quality Assistant)
Daniel Bassett	Approved	11/12/2020	Paul Evans (Quality/Technical Manager)



Test Operator	Checked and Authorised by		Paul Evans	
Darren Bourne	Date	11/12/2020		

APPENDIX 3

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

Other than that expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2020 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth

Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

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