

GEOTECHNICAL SOIL SURVEY

Globe Estates (Southern) Ltd

44 and 46 Ferringham Lane



Soil Environment Services Ltd
May 2020

Our Ref: SES/GES/FL#1

Date: 15th May 2020

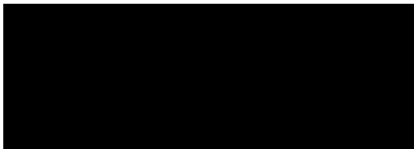
Client:

Globe Estates (Southern) Ltd
311 Goring Lane
Worthing West
Sussex
BN12 4NX

GEOTECHNICAL SOIL SURVEY

44 and 46 Ferringham Lane

A report prepared on behalf of *Soil Environment Services* by:



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Managing Director

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Soil Environment Services

Agricultural Land Classification, Contaminated Land
Risk Assessment, Mineral Extraction Soil Planning
Unit 8, Stocksfield Hall, Stocksfield, Northumberland, NE43 7TN



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1. SCOPE OF WORKS

Soil Environment Services Ltd was instructed to conduct a ground investigation at:

Land at 44 & 46 Ferringham Lane,
Ferring,
West Sussex,
BN12 5LU

(Drawing 1)

...to determine the ground conditions for proposed residential developments.

The planned works include soil survey and testing to provide a factual geotechnical assessment of soil conditions for the required ground-works and/or building construction in general accordance with EC7, BS5930 and BS1377.

The site investigation was carried out on the 22nd April 2020.

The planned scope of works detailed and specified within the agreed quotation comprised:

- 5 x Boreholes to a maximum depth of 5 m or as dictated by ground conditions
- 5 x Dynamic probing or SPT and/ or Shear vane reading
- pH and sulphate analysis
- Atterberg limits analysis (plastic index)
- 1 x Factual report in general accordance with EC7 and BS5930

Variation to the above scope of works may be needed and beneficial given the ground conditions encountered during the site investigation. This will be detailed in **Section 3.1 – Completed Works**.

The accuracy of the geotechnical report is restricted to the initial scope of works and then the completed works. Also, variation in soil strength and composition may subsequently be encountered across the site during site works operations and/or ground preparation.

2. SITE SETTING

The sites assessed for this investigation (Drawing 1) comprise a cleared plot south of 44 Ferringham Lane and bungalow and garden at 46 Ferringham Lane. Topographically the sites are relatively level and the surrounding land slopes down to the south.

Mature trees are present on and adjacent to the sites.

2.1 Surface conditions

The site at present comprises mainly level lawn at 46 and cleared soil surface south of 44.

2.2 BGS/Soil survey mapped Geology and drift

Superficial geology

1:50 000 scale superficial deposits description: River Terrace Deposits (undifferentiated) - Sand, Silt And Clay. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U).

Bedrock geology

1:50 000 scale bedrock geology description: New Pit Chalk Formation - Chalk. Sedimentary Bedrock formed approximately 90 to 94 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas.

2.3 Drainage and hydrogeology

Surface water flow could possibly find a route to the south. Flow to groundwater could be restricted due to the clayey soils encountered on site. Ground water was encountered during the survey at around 2-3 m depth.

3. GEOTECHNICAL SOIL SURVEY

3.1 Completed works

Site works

Boreholes were located as in Drawing 1 and drilled to 5 m bgl maximum with SPTs to 5.0 m bgl.

3.2 General strata descriptions (full borehole log/s in Appendix A)

Sandy/gravelly clay to around 3-4 m depth with chalk below and water at around 2-3 m depth. (See Appendix A).

3.3 In-situ testing

Shear Vane readings

Shear vane readings were not undertaken as part of this investigation.

Light Dynamic Probe (LDP)

SPTs were undertaken in all boreholes.

3.3.1 Ground bearing

The allowable bearing capacities are as detailed in Table 1.

Table 1. Ground bearing for a 0.4 m dia pile foundations (kN/m²)

Depth (m bgl)	BH1		BH2		BH3		BH4		BH5	
	SPT- N	Bearing *	SPT- N	Bearing *	SPT- N	Bearing *	SPT- N	Bearing *	SPT- N	Bearing *
1.0	5	115.15	6	76.77	6	115.15	5	89.56	6	127.95
2.0	7	166.33	3	179.12	7	166.33	4	63.97	8	204.71
3.0	10	326.26	16	530.98	11	281.48	2	377.44	14	377.44
4.0	25	594.95	56	754.88	18	435.02	50	703.70	30	607.74
5.0	50	742.09	R		29	511.78	R		48	716.50

* Method: Bowles after Meyerhof 1976 for 5 mm settlement

R = Refusal

Notes on bearing capacity calculations

The bearing value information constitutes an element of interpretation of the factual data as recorded on site. This requires choice of methods and formulae which are open to interpretation.

Soil Environment Services uses NovoSPT, a widely accepted software package, using typical formulae for these calculations. Appropriate formulae have been used given the soil type/s and data input into the software adjusted to site specific conditions.

Shear Failure safety factor	3 or 25 mm settlement
Soil type/s	CLAY/CHALK
Unit weight/s	18/15 kN/m ³
Groundwater depth	None
Shallow footing width	0.6 m
Preferred depth	0.9 m bgl
Pile diameter	0.4 m
Borehole diameter	65 mm
Overburden correction	Liao & Whitman 1986

A number of interpretations of the factual data may be selected within the software and results offered for comparison. This will typically be either shallow and deep foundation options and different formulae for each of these options.

NovoSPT is a computer program for interpretation of Standard Penetration Test (SPT/ DCPT) and correlating blow counts (N) to soil properties based on more than 270 formulas. Novo Tech Software Ltd. #4188 Hoskins Road, North Vancouver, British Columbia, Canada. Soil Environment Services accept no responsibility for errors within NovoSPT software.

3.4 Groundwater

Water was encountered at between 2 and 3 m depth.

4. LABORATORY TESTING

4.1 Chemical testing

Samples obtained at depth indicated no concern with regards to sulphates and pH (Appendix B) and it is therefore recommended in accordance with BRE Special Digest 1 (2005) that the onsite Design Sulphate Class is classified as DS-1. Subsequently all concrete specification should be of DS-1 ACEC AC-1s with respect to the chemical environment for concrete.

4.2 Mechanical testing

The soils are classified as having very low to medium plasticity and hence low to medium volume change potential (Appendix B). With reference to NHBC Chapter 4.2, Building near trees, the following applies with tree type and location:

Table 3. Foundation depth in relation to significant existing trees.

BH/ location	Depth (m)	Volume change potential	Tree type	Tree water demand	Potential distance from foundations (m)	Max tree height (m)	DH	Foundation depth (m)*
1	0.4-2.2	low	Leylandii	High	10	20	0.5	1.05
2	1.2-3.5	NS						
3	0.6-2.0	Med	Fir	Mod	10	20	0.5	0.9
4	0.3-2.0	Med	Leylandii	High	10	20	0.5	1.25
5	0.5-2.1	Low	Leylandii	High	5	20	0.25	1.70
5	0.5-2.1	Low	Oak	High	10	20	0.5	1.80

*-The foundation depths are based on the soil volume change potential noted in the borehole, the estimated distance between the nearest foundation and specific tree in relation to that borehole and the status of the trees in terms of removal, maximum growth allowed or limited height with respect to some hedge types. Hence, apart from soil volume change potential and tree type identification (although some estimation may occur during the winter) other factors may be subject to some variation if information is not supplied by the client or not obvious from site observations. It is expected that hedges will not exceed the legal max height. Soil volume change potential used is the greatest measured value when variations between each strata occur within a borehole location.

NS Not significant

The foundation depths will need to consider the proximity to trees. This is especially the case for No. 46 which may have high water demand trees on both sides of the property and within a significant distance of potential foundations.

5. SUMMARY AND CONCLUSIONS

5.1 General ground conditions

- The soils encountered comprised generally sandy clays to around 3 m depth with chalk to 5 m plus depth.
- Water was encountered at 2-3 m depth.
- Chemical testing indicates no concern with regards to sulphates and pH (Appendix B). Concrete specification should be of DS-1 ACEC AC-1s with respect to the chemical environment for concrete.
- Allowable bearing capacity is in general upwards of ~100 kN/m² at 1 m depth with the exception of BH4 which a soft horizon at around 2 m depth with ~64 kN/m².
- Foundations, particularly at No. 46, do need to consider the tree proximity and may need to extend to 1.8 m depth pending final tree locations and species.

Drawing 1

Borehole Locations

NOTES:



Borehole and SPT



Pit

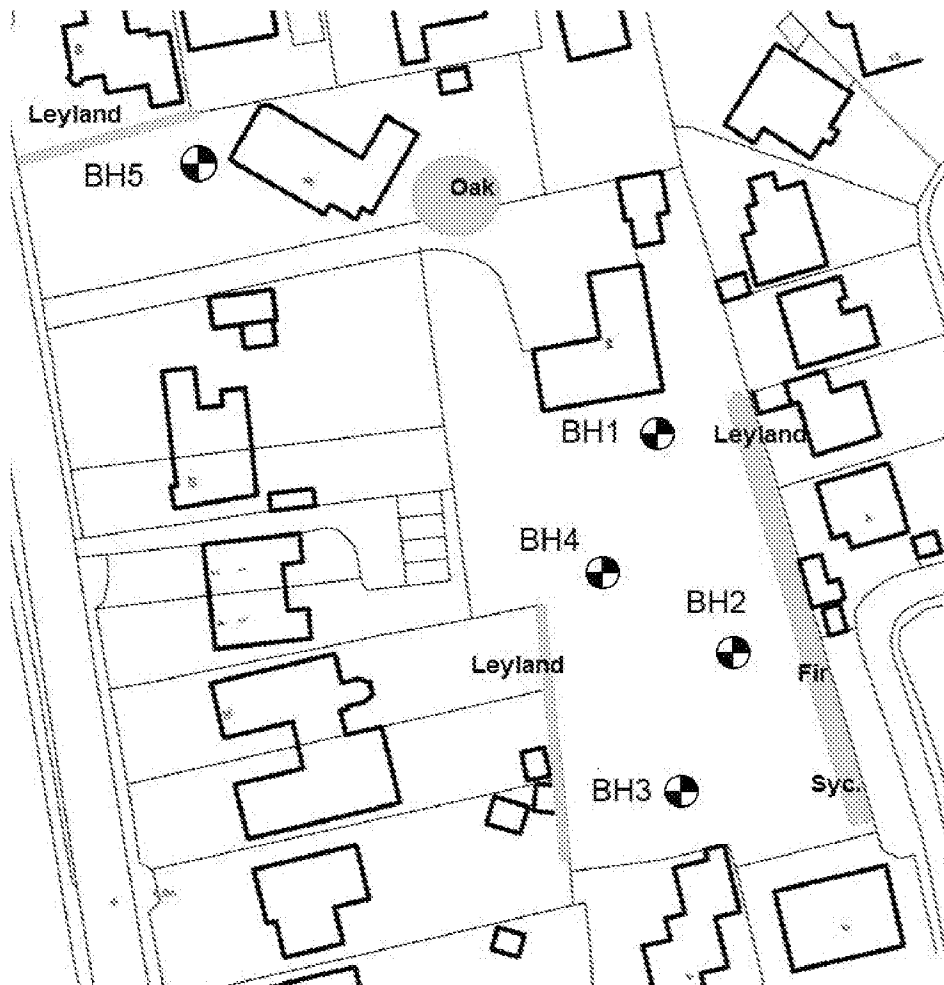
Soil Environment Services

Drawing Title: Borehole locations

Drawing No.: 1

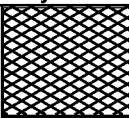
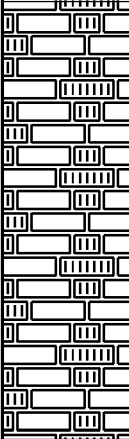
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Date: 29th April 2020



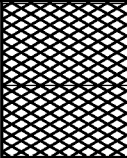
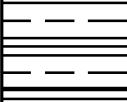
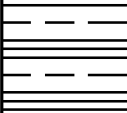
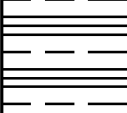
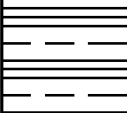
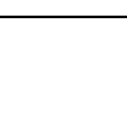
APPENDIX A

Engineer's Borehole Logs

Borehole/ Testpit Log		Excavation type and method:	Date
BH/Pit Ref.	BH 1	Borehole/Window Sampler	22/04/2020
Surface elevation Site ref: 0 m			
Depth (m BGL)	Symbol	Description	Notes
		MADE GROUND Dark brown firm distrubed silty clay with some gravel	Wet at 2.8 m bgl
1.0		Dark brown firm to stiff silty CLAY eith some fine chalk pieces and occasional med rounded gravel	
2.0		Very pale orange brown firm sandy CLAY with chalk pieces	
3.0		White/ off white friable CHALK with alternating bands of soft 'putty' CHALK	
4.0		Terminated on very hard CHALK at 4.5 m depth	

Borehole/ Testpit Log		Excavation type and method:	Date
BH/Pit Ref.	BH 2	Borehole/Window Sampler	22/04/2020

Surface elevation Site ref: 0 m

Depth (m BGL)	Symbol	Description	Notes
		MADE GROUND Orange brown firm disturbed silty clay	
		MADE GROUND Brown silty clay original topsoil	
1.0		Dark orange brown soft silty CLAY with occasional med/large flints	
		Very pale orange brown firm sandy CLAY with chalk pieces	
2.0			
			
3.0			
			
4.0		White/ off white friable CHALK with alternating bands of soft 'putty' CHALK	
			
			
			
			
			
			
		Borehole terminated at 5 m bgl	

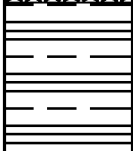
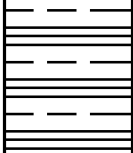
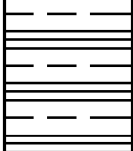
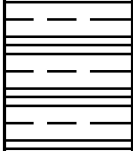
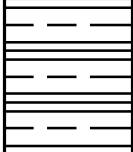
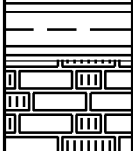
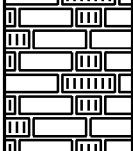
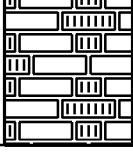
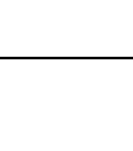
Borehole/ Testpit Log		Excavation type and method:	Date
BH/Pit Ref.	BH 3	Borehole/Window Sampler	22/04/2020

Surface elevation Site ref: 0 m

Depth (m BGL)	Symbol	Description	Notes
		MADE GROUND Orange brown firm distrubed silty clay MADE GROUND Brown silty clay orginal topsoil	Water at 2.1 m bgl
		Dark orange brown soft silty CLAY with occasional fine chalk pieces	
		Orange brown firm silt CLAY with chalk pieces	
		Hole collapse at 3 m bgl with CHALK derived from SPT probing	

Borehole/ Testpit Log		Excavation type and method:	Date
BH/Pit Ref.	BH 4	Borehole/Window Sampler	22/04/2020

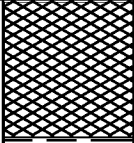
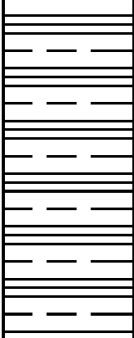
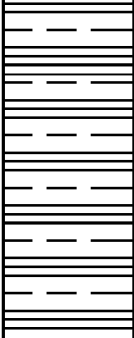
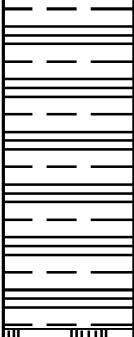
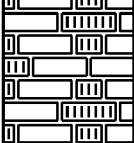
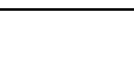
Surface elevation Site ref: 0 m

Depth (m BGL)	Symbol	Description	Notes
		MADE GROUND Orange brown firm distrubed silty clay with some med gravel	
		Dark orange brown soft silty CLAY with occasional fine chalk pieces	
1.0			
			
2.0			
		Pale orange brown/ grey soft sandy CLAY with chalk pieces	
			
3.0			
			
			
4.0		Off white friable/soft CHALK in 0.5 m alternating bands	
			

Borehole/ Testpit Log		Excavation type and method:	Date
BH/Pit Ref.	BH 5	Borehole/Window Sampler	22/04/2020

Surface elevation

Site ref: + ~ 1.0 m

Depth (m BGL)	Symbol	Description	Notes
		MADE GROUND Pale brown silty clay topsoil (dry)	
1.0		Dark orange brown firm silty CLAY with occasional fine chalk pieces	
2.0		Pale orange brown/ grey silty sandy CLAY with chalk pieces	
3.0			
4.0			
		Off white friable/soft CHALK in alternating bands	
		Hole terminated at 5 m bgl	

Water at 3.4 m bgl

APPENDIX B

Laboratory Results

NB BH 46/1 = BH5

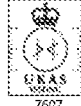
Chemtech Environmental Limited

SOILS

Lab number	85856-1	85856-2	85856-3	85856-4	85856-5	85856-6
Sample id	BN1	BN2	BN1	BN2	BN2	BN2
Depth (m)	0.40-2.20	2.20-2.80	2.80-5.00	0.40-1.20	1.20-3.50	3.50-5.00
Date sampled	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020
Test	Method	Units				
pH	CE004 ¹	units	8.4	8.4	8.3	8.3
Sulphate (2.1 water soluble)	CE001 ¹	mg/l SO ₄	20	<10	18	23

Lab number	85856-7	85856-8	85856-9	85856-10	85856-11	85856-12
Sample id	BN3	BN3	BN4	BN4	BN4	BN46/1
Depth (m)	0.40-2.00	2.00-3.30	0.30-1.00	2.00-3.00	2.30-5.00	0.50-2.50
Date sampled	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020	22/04/2020
Test	Method	Units				
pH	CE004 ¹	units	8.3	8.3	8.3	8.4
Sulphate (2.1 water soluble)	CE001 ¹	mg/l SO ₄	28	18	24	25

Lab number	93026-13		
Sample id	BN46/1		
Depth (m)	2.10-4.40		
Date sampled	22/04/2020		
Test	Method	Units	
pH	CE004 ¹	units	8.4
Sulphate (2.1 water soluble)	CE001 ¹	mg/l SO ₄	12

Summary of Classification Tests			Solmek 12-16 Yarm Road, Stockton on Tees, TS16 3NA	
Site name	Job number			
Ferringham Lane	85856			7607

Hole	Depth		Type	w %	Oven temp. oc	wa %	Pa %	Pr %	wL %	wP %	IP %	IL	Plasticity class	Preparation method
	Top m	Base m												
BH1	0.40	2.20	D	22	105	23	94	6	34-f	18	15	0.313	CL	Tested after >425µm removed by hand
BH1	2.20	2.80	D	19	105	23	83	17	30-f	17	13	0.462	CL	Tested after >425µm removed by hand
BH1	2.80	5.00	D	23	105	55	66	34	28-f	21	7	2.000	CL	Tested after >425µm removed by hand
BH2	0.60	1.20	D	26	105	30	87	13	43-f	21	22	0.408	CI	Tested after >425µm removed by hand
BH2	1.20	3.50	D	22	105	23	96	4	30-f	20	10	0.300	CL	Tested after >425µm removed by hand
BH2	3.50	5.00	D	21	105	25	83	17	27-f	18	9	0.778	CL	Tested after >425µm removed by hand
BH3	0.60	2.00	D	27	105	27	100	0	47-f	22	25	0.280	CI	Tested in natural condition
BH3	2.00	3.50	D	23	105	28	82	18	29-f	19	10	0.900	CL	Tested after washing to remove >425µm
BH4	0.30	2.00	D	24	105	24	100	0	43-f	23	20	0.050	CI	Tested in natural condition
BH4	2.00	3.50	D	20	105	20	100	0	26-f	17	9	0.333	CL	Tested in natural condition
BH4	3.50	5.00	D	22	105	31	71	29	28-f	19	9	1.333	CL	Tested after >425µm removed by hand
BH46/1	0.50	2.10	D	23	105	23	100	0	41-f	22	19	0.053	CI	Tested in natural condition
BH46/1	2.10	4.40	D	17	105	21	81	19	25-f	17	8	0.500	CL	Tested after washing to remove >425µm

All tests found in Solmek UKAS Schedule of Accreditation are tested to standard unless otherwise indicated

Key	Description	Category	BS Test Code
w	Moisture content		BS 1377:1990 Part 2 Clause 3.2
wa	Equivalent moisture content passing 425µm sieve		BS 1377:1990 Part 2 Clause 3.2
wL	Liquid limit	Single point	BS 1377:1990 Part 2 Clause 4.4
wL	Liquid limit	Four point	BS 1377:1990 Part 2 Clause 4.5
wP	Plastic limit		BS 1377:1990 Part 2 Clause 5.2
Pa	Percentage passing 425µm sieve		
Pv	Percentage retained 425µm sieve		
IP	Plasticity index		BS 1377:1990 Part 2 Clause 5.4
IL	Liquidity index		BS 1377:1990 Part 2 Clause 5.4
	Suffix indicating test is 'Not UKAS Accredited'	*	

Approved by	UBK
Approval date	01/05/2019 14:00
Date report generated	
Report Number	