

PROJECT REFERENCE: 17.9526

June 2017

GROUND INVESTIGATION REPORT

155 Middleton Road,

FOR

L Squared Properties Ltd

CONSTRUCTIVE EVALUATION
UNIT 15 & 16 FORD LANE BUSINESS PARK
FORD LANE
FORD
BN18 0UZ

Document Approval

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Date: 23/6/17

REPORT REVISED (response to significant changes in client requirements, methods of work etc).

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Unless specifically stated within the tender/quotation or unless identified within the introduction to this report it is confirmed that this report has been compiled wholly in accord with Constructive Evaluation Limited's terms of engagement. This report is provided for sole use by the Client and is confidential to them. No responsibility whatsoever for the contents of the report will be accepted to anyone other than the Client.

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This report is written in the context of an agreed scope of work between Constructive Evaluation Limited and the Client and should not be used in a different context. In light of additional information becoming available, improved practices and changes in legislation amendment or re-interpretation of the report in whole or part may be necessary after its original submission.

Professional Interpretation

The recommendations made and opinions expressed in the report are based on the conditions revealed by the site works together with an assessment of the data from the insitu and laboratory testing or in respect of the desktop reports. No responsibility can be accepted for conditions that have not been revealed by the research, site works and testing.

The Client is advised that the conditions observed on site by Constructive Evaluation Limited at the time of any site survey may be subject to change. Certain indicators of the presence of hazardous substances may have been latent at the time of the most recent site reconnaissance and they may subsequently have become evident. It is not possible to assess areas which are inaccessible or where access is not granted and CE accept no liability for risks subsequently identified therein.

The conceptual model, Risk assessment and sampling regime has been formulated in accordance with current UK guidance at time of production based upon the relevant information gained from Phase 1 and Phase 2 investigations. While the model and assessment offer opinions and interpretations of these guidelines, the comments made are for guidance only and no liability can be accepted for their accuracy. It is possible that aspects of desktop study may need to be altered to conform to the requirements of the statutory regulatory bodies.

Intrusive Field Operations

The data collected through direct operations in the production of this report has been so obtained, unless directly otherwise stated, in accordance with current UK guidance, law or accepted industry practice, including but not limited to: BS.5930: 1990 Code of Practice for Site Investigations (Amendment 3: 2015), & BS.10175: 2011 + A1: 2013 Investigations into Potentially Contaminated Sites. Exact exploratory locations will depend upon access conditions, site use and plant capability, CE do not accept liability for issues arising from material identified between or outside of the area of exploratory locations.

Laboratory Testing

Unless stated otherwise within the text, all geotechnical and material laboratory tests have been performed in accordance with the relevant British Standard Documents. Laboratory testing for contaminated land assessment is completed under the UKAS / MCERTS accreditation schemes, unless identified as otherwise in the report.

Human Health Risk Assessment Criteria

The Environment Agency has recently undertaken revision of the Soil Guideline Values (SGVs) which are partially complete. Where standards are available using the "new" approach, these have been utilised for correlative purposes. Where standards have not yet been revised, guidance following the "old" approach has been utilised. Please note that upon release of the remaining guidelines, the standards contained within this report may be subject to change. In addition, the second edition of the LQM CIEH guidance has now been released and will be utilised in favour of previously published guideline values.

Third Parties

The findings and opinions conveyed in this report are based on information obtained from a variety of sources, including that from previous Site investigations and chemical testing laboratories. Constructive Evaluation Limited has assumed that such information is correct. Constructive Evaluation Limited cannot and does not guarantee the authenticity or reliability of the information it has relied upon and can accept no responsibility for inaccuracies with the data supplied by other parties.

The accuracy of the historical map extracts supplied can not be guaranteed and it should be noted that different conditions may have existed between mapping sheet editions. Therefore, there can be no certainty that all areas of contamination have been identified during the Phase 1 investigation.

Definitions

Reference to the word "contamination" in this report does not relate to the statutory definition of contaminated land under 1990 Environmental Protection Act unless otherwise stated. The definition used in this report is: "Land that contains substances that, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets" (NATO CCMS, 1985).

1.0 INTRODUCTION

Constructive Evaluation (CE) Limited were instructed by Luke Davies of L Square Properties Ltd (the Client) (EQ11830, 16th May 2017) to carry out a Ground Investigation at a site known as 155 Middleton Road, Middleton-on-Sea, Bognor Regis, West Sussex, PO22 6DF.

It is understood that a two storey residential property is planned to be constructed within the rear of the existing residential garden associated with the Post office and Post Master's accommodation.

The purpose of this investigation is to ascertain the ground conditions and determine suitable geotechnical parameters to allow the design of temporary and permanent works for the proposed construction.

The investigation incorporated the construction of three window sample boreholes to a maximum depth of 6.00mbgl (metres below ground level) supplemented by the completion of three heavy dynamic probe tests, which achieved a maximum depth of 6.00mbgl also. In addition to this three soakage test were conducted within three machine excavated trial pits. The following report describes the work undertaken, the ground conditions identified and provides recommendations for the construction work.

2.0 SITE LAYOUT

The site is situated in the centre of Middleton-on-Sea situated on a National Grid Reference of SU972003. Access to the site is gained from the south off of Middleton Road via the tarmac driveway on the east of the property, which leads to the rear garden. Additionally there is pedestrian access to the rear of the property gained by a pathway along the west of the existing house.

The existing property is a timber framed two-storey construction, with a pitched tiled roof. The building is currently unused, however its previous use as a post office/ village store can still be seen as well as the attached living quarters assumed to be for the Post Master.

Towards the south of the property is a tarmac driveway with dual access to Middleton Road this is surrounded by well-maintained flower borders. The rear garden, in the north of the site, is currently unkempt grassed lawn. The rear garden has a pathway running along the east and northern perimeter of the site providing access to the properties behind the site.

The site is situated within a rural village, to the north of the site are residential properties and gardens and to the west is a small block of flats with associated parking. To the east of the site is a hardware store, with additionally sales space in the external north of the site.

3.0 PHYSICAL SETTING

3.1 Geology

The relevant 1:50,000 British Geological Survey data indicates the site to be situated over River Terrace Deposits, which is directly underlain by bedrock geology of the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation.

River Terrace Deposits (undifferentiated) – Sand and gravel, locally with lenses of silt, clay or peat. Typically within this area, these soils are formed by ‘Brickearth’ deposits which are formed by wind blown loess and are therefore dominated by silts and clays.

Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formations (undifferentiated) – Composed of hard to very hard nodular chalks and hardgrounds (which resist scratching by finger-nail) with interbedded soft to medium hard chalks (some grainy) and marls; some griotte chalks.

4.0 FIELDWORKS

The following intrusive works were carried out on the 2nd June 2017 supervised by an Engineering Geologist from CE. The SI was undertaken in accordance with the scope of works agreed with our Client and in relation to statutory guidance including BS5930: 1999 Code of Practice for Site Investigations (Amendment 3: 2015) and BS10175: 2011+A1: 2013 Investigation of Potentially Contaminated Sites: Code of Practice.

- Prior to any excavations taking place a Cable Avoidance Tool (CAT) was used to check for the position of any underlying electrical services. In addition, starter pits were excavated to 1.00 meters below ground level (mbgl) to clear test locations prior to any further drilling commencing.
- Two light weight window sample boreholes were completed (WS1-WS2), to a maximum depth of 3.10mbgl (refusal) using lightweight window sampling apparatus. Upon completion each borehole was logged and representative samples recovered.
- Dynamic Probe Testing was conducted immediately prior to and adjacent to window sample boreholes, using a Geotool Heavy Dynamic Probe to a maximum depth of 3.10mbgl (refusal).
- Three machine excavated trial pits were conducted to a depth of 1.00-2.00mbgl, via a JCB 3CX wheeled excavator.
- Three BRE365 soakage test were conducted within the excavated trial pits and the test where undertaken for a maximum of 5 hours.
- Each exploratory borehole was backfilled with arisings compacted and reinstated at the surface in accordance with existing ground conditions.

The site layout plan indicating the position of the test location is provided in Appendix A, with photographs taken during the investigation in Appendix C.

5.0 GROUND CONDITIONS

5.1 Soils

The following strata conditions were encountered during the intrusive works:

Made Ground/Top Soil – The initial surface covering was found to be covered by grass lawn or other vegetation and described as orange brown slightly clayey silty fine to medium grained sand. Within WS1, WS2 and WS3 there was also noted to be anthropogenic material such as fragments of glass, brick and plastic. This was proven to a maximum depth of 0.60mbgl in WS1.

Silty Clay/ Clayey Silt – The underlying natural soil is considered to be representative of Brickearth (now classified as River Terrace Deposit) and is described as soft orange brown mottled pale grey silty Clay/ clayey Silt. The deposit has pockets of yellowish brown silty fine to medium grained sand and gravels of chalk notable at lower levels within the strata. This material is encountered to the maximum drilled depth of 5.80mbgl within WS3; however the base depth is variable and is encountered at a depth of up to 1.50mbgl.

Chalk – Beneath the latter stratum is material recovered as greyish white structureless Chalk which would be considered to be representative of CIRIA grade Dm; this soil is generally described as a slightly gravelly to gravelly silt, locally improving to grade Dc at the base of WS1 at 5.20-6.00mbgl.

The percussive nature of the sampling apparatus tends to destroy the structure of intact Chalk and therefore the description of the Chalk stratum is likely to be something of an underestimate of the insitu condition of the material.

Please refer to the stratigraphic logs contained within Appendix B for a more detailed description.

5.2 Groundwater

The site investigation work was all undertaken in dry conditions. Groundwater strikes were recorded during the intrusive works within all three boreholes at 3.00mbgl this gradually rose to 1.50 – 1.60mbgl.

The three trial pits that were all mechanically excavated did not encounter any groundwater, however TP2 had a seepage of water at 1.80mbgl, this is assumed to be sourced from the nearby TP1 that was already undergoing an infiltration test.

6.0 GEOTECHNICAL TESTING

6.1 Geotechnical Testing

6.1.1 Sulphate and pH Analysis

Six samples were submitted for determination of pH and Water Soluble Sulphate concentration. Water soluble sulphate concentrations within the Made Ground and natural soils were found to range from <10mg/l to 110mg/l, with pH levels ranging from 8.0 to 8.4. Full laboratory test results can be found in Appendix D.

6.1.2 Atterberg Limits and Natural Moisture Content

In total, five disturbed samples of the underlying soils were submitted for determination of their Natural Moisture Content (NMC) and Plasticity Index (PI). The samples tested for NMC were selected from depths between 0.80m and 3.70mbgl. Results ranged between 13% and 24%.

The results indicate Liquid Limits between 20% and 39% and Plastic Limits between 17% and 19%. One sample from WS1 2.8-3.7mbgl is recorded as non-plastic. Once the portion retained on the 425µm had been taken into account (0-3%), the Modified PI results lie between 13% and 20%.

Based upon these results the soils have of low to moderate Plasticity. In accordance with the NHBC guidance (chapter 4.2 'Building Near Trees') these soils have Low shrinkage potential.

6.1.3 Saturated Moisture Content

Two recovered intact clasts of the recovered chalk soils ranging from 4.00-5.00mbgl were submitted to determine chalk density by means of Saturation Moisture Content (SMC) analysis. The results indicate bulk density of 2.05Mg/m³ within both samples, and SMC values of 22-23%; indicative of medium density Chalk.

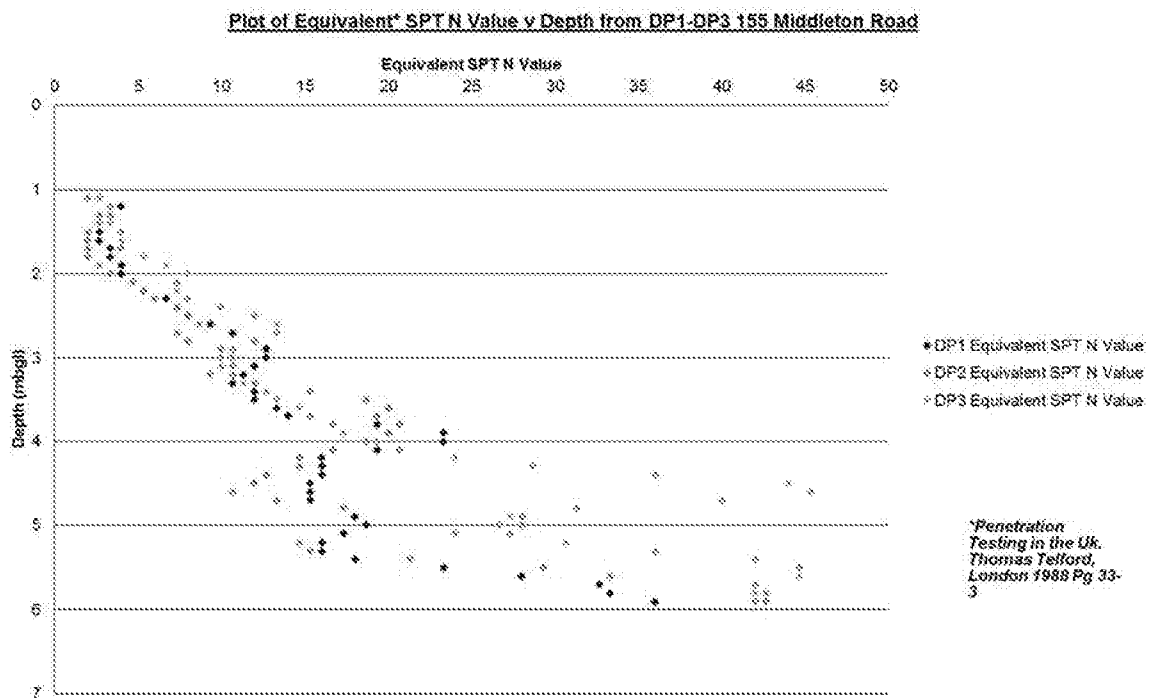
6.2 Insitu Testing

6.2.1 Heavy Dynamic Probing

Heavyweight probing (DPH) was carried out adjacent to and prior to the drilling of the window sample holes (WS1-WS3) using a Geotool heavy weight probe to determine the insitu strength characteristics of the underlying soils. This form of probing is completed using a 50kg drop hammer weight measuring blow count per 100mm (N100) increments to the specified depth, or until 'refusal' (50+ blows per 100mm).

Depth (m)	WS1/DP1		WS2/DP2		WS3/DP3		Soil Density / Consistency
	N100 value range	Depth	N100 value range	Depth	N100 value range	Depth	
Made Ground	1-2	0.00-0.50	1-2	0.00-0.40	2	0.00-0.30	N/A
River Terrace Deposit	1-7	0.50-3.70	1-12	0.40-4.80	3-26	0.30-5.80	Soft to firm
Chalk (Dm)	7-14	3.70-5.20	5-27	4.80-6.00	19-23	5.80-6.00	Soft, becoming stiff
Chalk (Dc)	7-20	5.20-6.00	-	-	-	-	Loose to medium dense

A plot of the equivalent SPT N-value against depth as derived from the Dynamic Probe testing is shown below.



6.2.2 Infiltration Testing

Infiltration testing was completed in the form of BRE 365 soakage tests. These were completed within the square machine excavated trial pits, via fast infilling of water and measuring the decreasing water level over time. Results are summarized in the table below:

Borehole	Material	Coefficient of Permeability k (m/s)	Drainage*
TP1	Clayey silty Sand over slightly silty Clay	2.74×10^{-6}	Poor
TP2	Clayey silty Sand over slightly silty Clay	1.09×10^{-6}	Poor
TP3	Clayey silty Sand over slightly silty Clay	2.53×10^{-6}	Poor

*With reference to Casagrande and Fadum (1940)

Results indicate soils would be considered to have poor drainage characteristics.

7.0 DISCUSSION OF GROUND CONDITIONS

7.1 Soil Engineering Properties

It is understood that the current proposal for the site is to construct a new two storey residential property, with private garden within the existing garden. Exact loadings are not known at the time of writing.

Stratigraphic records indicate that the entire site is overlain initially by Made Ground soils to a maximum depth of 0.60mbgl. These are generally formed by a clayey sand deposit with instances of brick and plastic rubble.

The upper most natural soils are described as firm consistency and locally firm to stiff consistency brown mottled pale grey silty clay / clayey silt. This material is noted to become sandier with occasional chalk and flint gravels and pockets of sand becoming more prevalent with depth. This soil is considered to be representative of a Brickearth Deposit and was encountered to depths ranging from 1.50-5.80mbgl.

The large disparity in the depth to the base of this stratum between exploratory positions is considered to be an effect of the nature of the weathering profile at the upper surface of the underlying Chalk which is typically undulose.

Insitu testing indicates a slightly lower soil consistency / strength than the logging engineer's description, suggesting a soft or soft to firm consistency. Laboratory testing for Atterberg limits, has indicated that this stratum is of low to intermediate plasticity and would be considered to be of medium shrinkage potential in accordance with NHBC guidance.

The underlying Chalk was recovered in a structureless condition described as a slightly gravelly Silt initially, with this material noted to the base of WS2 and WS3. An approximate CIRIA grade of Dm is assigned to this soil, albeit that the percussive sampling technique may have given rise to an underestimation of the insitu condition of this Stratum.

At location WS1 the chalk is subsequently described, below 5.20mbgl, as a gravelly / cobbly soil with a sandy silt grade matrix. This soil is assigned an approximate CIRIA grade of Dc.

Insitu testing indicates Equivalent SPT N-values of N~10-20 in the upper regions of the chalk stratum, which are considered consistent with structureless chalk in a Dm condition. The improvement observed in the Equivalent SPT N-values below 4.50-5.50mbgl would be considered a possible indication of structured chalk at depth.

Groundwater was encountered at a depth of ~3.00mbgl in each borehole location, with water levels noted to rise to 1.60-1.80mbgl, it is noted that the trial pits remained dry. On this basis it is considered that groundwater is to an extent confined by the surface cohesive soils, whilst the preferentially more permeable material below 3.00mbgl allows penetration of the groundwater from the underlying chalk.

7.2 Shallow Foundations

It is expected that the preferred foundation form for the new development will be spread type footings sited within the silty Clay soils of the shallow Brickearth Deposits.

The Made Ground soils encountered across the site would not be considered suitable as a bearing stratum; owing to the mode of their emplacement and variable condition Made Ground soils are prone to unacceptable total and differential settlements, including situations where the load intensity is low.

On the basis of the medium shrinkage potential classification of the soils, a minimum foundation depth of 0.90mbgl would be required by NHBC guidance. The effects of the high demand Hawthorn tree at the northeast corner of the site should be considered in the calculations of the final foundation depths, on the basis of NHBC guidance, Chapter 4.2 'Building Near Trees'; with foundation depths of 1.40-1.50mbgl anticipated to be necessary in the vicinity of this tree. The zones of tree root influence of all vegetation should be considered including the silver birch and plane trees which are noted on neighbouring sites.

At a depth of 1.00-1.50mbgl a safe bearing pressure of 75kN/m² is considered achievable on the basis of the logging description and insitu testing results. This assessment also accounts for the increased potential for differential total settlement which might be expected due to the variable thickness and composition of the Brickearth soils. To further mitigate against adverse effects of differential settlement it would be advised to structurally reinforce the new foundations.

Foundations of ~1.50m deep may also encounter chalk soils where these are present at a shallower depth. Where this occurs, it would be recommended that the foundation excavation is inspected by the structural engineer to ensure that suitable structural reinforcement is included to span the differing soil types.

7.3 Deep Foundations

Should the above bearing pressure prove to be insufficient it may be necessary to consider the use of a deep piled foundation, as the deepening of foundation excavations would likely be impracticable due to the potential for groundwater ingress. Should a piled foundation prove to be necessary, additional ground investigation would be recommended to provide suitable design parameters, however the information obtained to date should be shown to a specialist piling contractor who will be able to advise on the most suitable piling technique and pile lengths.

7.4 Floor Slabs

The floor slab design will depend on the final foundation designs and is dependent on the underlying materials, including bearing capacity and the presence of any cohesive or Made Ground Soils.

On the basis of the medium shrinkage potential soils encountered on site, a fully suspended floor slab is recommended in order to satisfy NHBC requirements. Advice on the suitable construction of such a floor should be sought from the NHBC guidance.

7.5 Excavations and Groundwater

It is likely that excavations of less than 1.20mbgl will require support to their faces due to the variable nature of Made Ground. Should excavations be taken below this depth, adequate support should be provided in order to satisfy statutory safety regulations.

Groundwater has been identified up to 1.60mbgl during site works.

Therefore any excavation made below groundwater levels on site is expected to be subject to the inflow of groundwater which is expected to result in the further instability of excavation faces, particularly where granular soils are encountered. It is recommended that provision is made in the specification of ground works for dewatering, with consideration to the possibility of the pooling of surface water within open excavations.

If groundwater is identified within any of the excavations during the construction phase then it should be dealt with appropriately and removed using good engineering practices.

The design of any temporary retaining structures to support excavation faces should be made assuming the following moderately conservative parameters:

Material	Effective angle of friction (ϕ°)	Effective Cohesion, c' (kPa)	Bulk Density (kN/m ³)
Made Ground	24	0	16
Silty Clay	24-25	0	17
Chalk (Dm)	28-30	0	18

7.6 Aggressive Chemical Environment to Concrete

Sulphate concentrations within the Made Ground and Natural soils were found to range from <10mg/l to 110mg/l and pH levels were noted to range from 8.0 to 8.4 suggesting that a design class of DS-1 and a sub class of AC-1 should be adopted for buried concrete structures within these soils, (Reference made to current BRE SD1 Guidelines) based on the soils tested.

APPENDICES

Appendix A – Site Plan

Appendix B – Stratigraphic Logs

Appendix C – Photographs

Appendix D – Laboratory Certificates



APPENDIX A

Site Plan





Note

1. Do not scale from this drawing, use figured dimensions only
2. All dimensions must be checked onsite prior to commencement of works
3. Where applicable this drawing is to be read in conjunction with other consultants drawing.
4. This drawing is the copyright of constructive evaluation Ltd.

**Site: 155 Middleton Road,
Middleton-on-Sea**

Job Number: 17.9526

Date: 4th June 2017

Drawing: Site Location

Drawn: LC



constructiveevaluation
site investigation • building pathology

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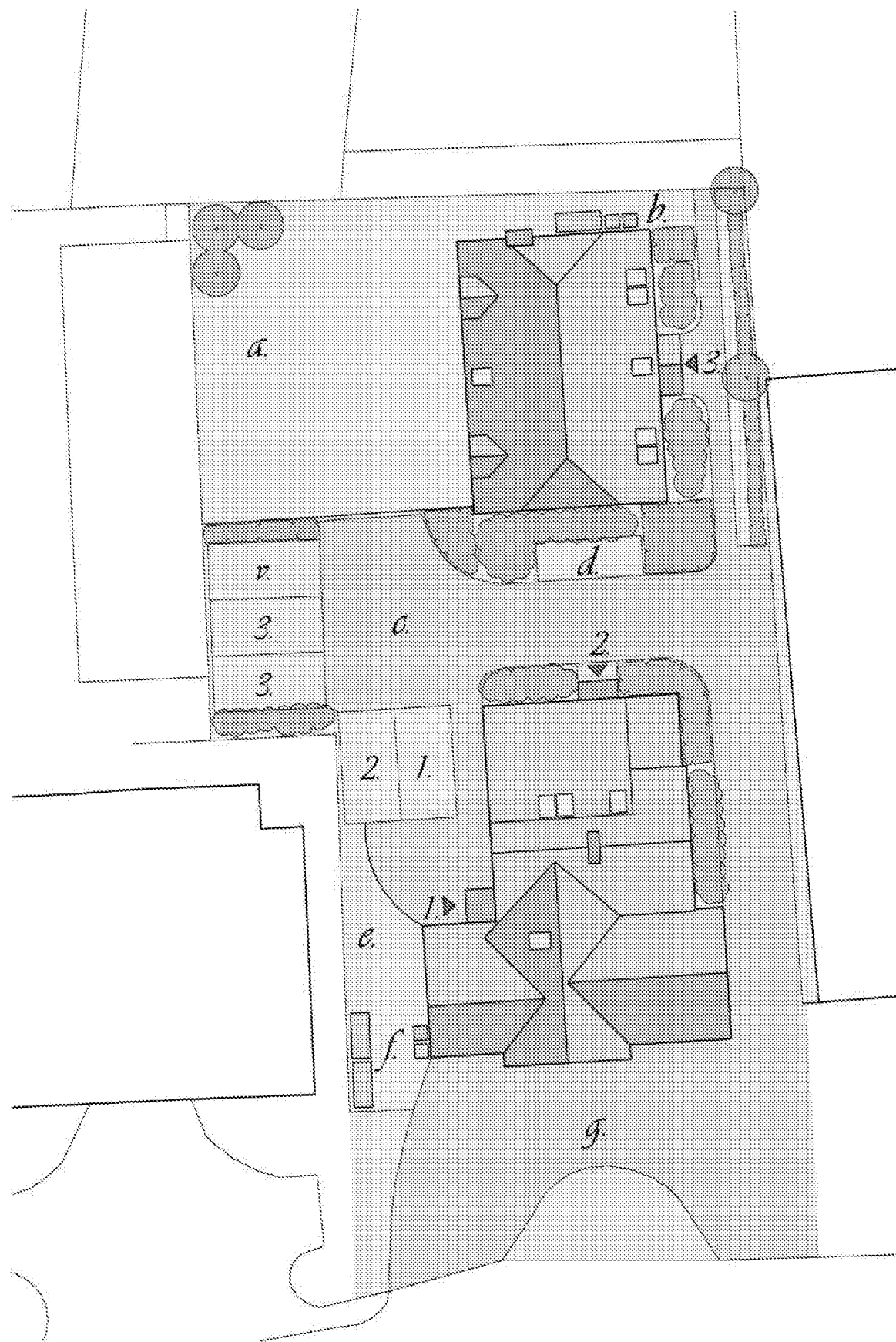
Email: Info@theconstructivegroup.com



-  *proposed detached chalet bungalow*
-  *internal and external alterations to existing post office and post master's accommodation to form retail unit and 2 No flats*

proposed block plan

1:500@A3



- a. garden to proposed chalet bungalow (154m² - 11.5 m deep)*
- b. bike store and bins to chalet bungalow*
- c. parking and turning*
- d. bin compound (retail)*
- e. communal garden for flats (40m²) and patios (10m²)*
- f. bike store and bins to flats*
- g. existing parking and turning area for retail unaffected*

proposed site plan

1:250@A3

APPENDIX B

Stratigraphic Logs





Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Project Name: Middleton Road

Project No.
17.9526

Co-ords:

Hole Type
WS

Location: Middleton-on-Sea

Level:

Scale
1:50

Client: L Squared Properties Ltd

Dates: 02/06/2017

Logged By
LC

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.50			Grass over Made Ground: orange brown/ brown slightly clayey silty fine to medium Sand. occasional brick and plastic fragments,	1
		0.60	D					Firm orange brown mottled pale grey silty Clay/ clayey Silt.	
		1.20 - 1.50	D		2.80			Firm and locally firm to stiff orange brown mottled pale grey slightly gravelly silty Clay/ clayey Silt. Gravels are fine to coarse sized angular to sub-rounded chalk. <i>The stratum becomes dark brown with decreasing depth.</i>	2
		1.50 - 2.00	D						
		2.00 - 2.80	D						
		2.80 - 3.70	D						
		3.70 - 4.00	D		3.70			Structureless CHALK composed of firm greyish white slightly gravelly Silt. Gravels are subrounded fine to coarse of weak low density greyish white chalk. rare fine to coarse gravel sized flints (Dm).	3
		4.00 - 5.00	D						
		5.20 - 5.60	D		5.20			Structureless CHALK composed of off white silty sandy gravel with cobbles. Sand is fine to coarse grained. Gravels and cobbles are of weak low density white chalk. occasional fine to coarse angular to subrounded flint gravels (Dc).	4
		5.50 - 6.00	D						
					6.00			End of Borehole at 6.000m	5

Remarks



 constructiveevaluation site investigation • building pathology				Borehole Log			Borehole No. WS2 Sheet 1 of 1	
Project Name: Middleton Road				Project No. 17.9526		Co-ords:		Hole Type WS
Location: Middleton-on-Sea				Level:		Scale 1:50		
Client: L Squared Properties Ltd				Dates: 02/06/2017		Logged By LC		

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 	0.40	D		0.40			Grass over Made Ground: dark brown to black slightly clayey silty fine to medium Sand. occasional brick and glass fragments.	1
		0.80	D					Firm orange brown mottled pale grey silty Clay/ clayey Silt.	
		1.00 - 1.30	D						
		1.30 - 1.60	D						
		1.60 - 2.00	D						
		2.00 - 2.50	D		2.00			Orange/ yellow brown slightly clayey silty fine to medium Sand, with occasional pockets of silty clay.	2
		2.50 - 3.00	D						
		3.00 - 3.50	D						3
		3.50 - 4.00	D						
		4.00 - 4.50	D					Occasional fine to medium angular to sub-rounded chalk gravels.	4
				4.80			Structureless CHALK composed of firm greyish white slightly gravelly Silt. Gravels are subrounded fine to coarse of weak low density greyish white chalk. rare fine to coarse gravel sized flints (Dm).	5	
				6.00			End of Borehole at 6.000m	6	
								7	
								8	
								9	
								10	

Remarks	
---------	---



Borehole Log

Borehole No.

WS3

Sheet 1 of 1

Project Name: Middleton Road

Project No.
17.9526

Co-ords:

Hole Type
WS

Location: Middleton-on-Sea

Level:

Scale
1:50

Client: L Squared Properties Ltd

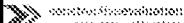
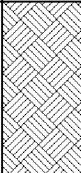
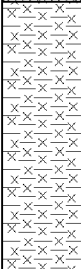
Dates: 02/06/2017

Logged By
LC

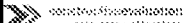
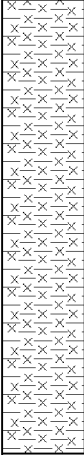
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			Grass over Made Ground: dark brown to black slightly clayey silty fine to medium Sand. occasional brick and glass fragments.	
								Firm orange brown mottled pale grey silty Clay/ clayey Silt.	
		1.00 - 1.30	D						1
		1.30 - 1.60	D						
		1.60 - 2.00	D						
		2.00 - 2.50	D		1.80				2
		2.50 - 3.00	D						
		3.00 - 4.00	D						3
		4.00 - 4.50	D						4
		4.50 - 5.50	D						5
		5.50 - 6.00	D						
					5.80				
					6.00			Structureless CHALK composed of firm greyish white slightly gravelly Silt. Gravels are subrounded fine to coarse of weak low density greyish white chalk. rare fine to coarse gravel sized flints (Dm). End of Borehole at 6.000m	6
									7
									8
									9
									10

Remarks



				Trial Pit Log			Trialpit No TP3 Sheet 1 of 1	
Project Name: Middleton Road				Project No. 17.9526		Co-ords: - Level:		Date 02/06/2017
Location: Middleton-on-Sea				Dimensions (m):		1.75 		Scale 1:25
Client: L Squared Properties Ltd				Depth 1.60		0.6 		Logged LC
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	D		0.60			Grass over orange brown/ brown slightly clayey silty fine to medium Sand. Frequent rootlets.	1 2 3 4 5
							Firm pale grey mottled orange brown silty Clay/ clayey Silt.	
							Structureless CHALK composed of firm greyish white slightly gravelly Silt. Gravels are subrounded fine to coarse of weak low density greyish white chalk. rare fine to coarse gravel sized flints (Dm).	
	1.55	D		1.50 1.60			End of pit at 1.60 m	
Remarks:								
Stability:								



				Trial Pit Log			Trialpit No TP2 Sheet 1 of 1	
Project Name: Middleton Road				Project No. 17.9526		Co-ords: - Level:		Date 02/06/2017
Location: Middleton-on-Sea				Dimensions (m):		1.8 		Scale 1:25
Client: L Squared Properties Ltd				Depth 2.00		0.6 		Logged LC
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	D		0.50			Grass over dark brown slightly clayey silty fine to medium Sand. occasional large roots and frequent rootlets.	
	1.00 1.10	D D					Firm pale grey mottled orange brown silty Clay/ clayey Silt. <i>The stratum clay content increase with depth.</i>	
				2.00			End of pit at 2.00 m	
Remarks:								
Stability:								



Probe Log

Borehole No.

DP1

Sheet 1 of 2

Project Name: Middleton Road

Project No.
17.9526

Co-ords: -

Hole Type
DP

Location: Middleton-on-Sea

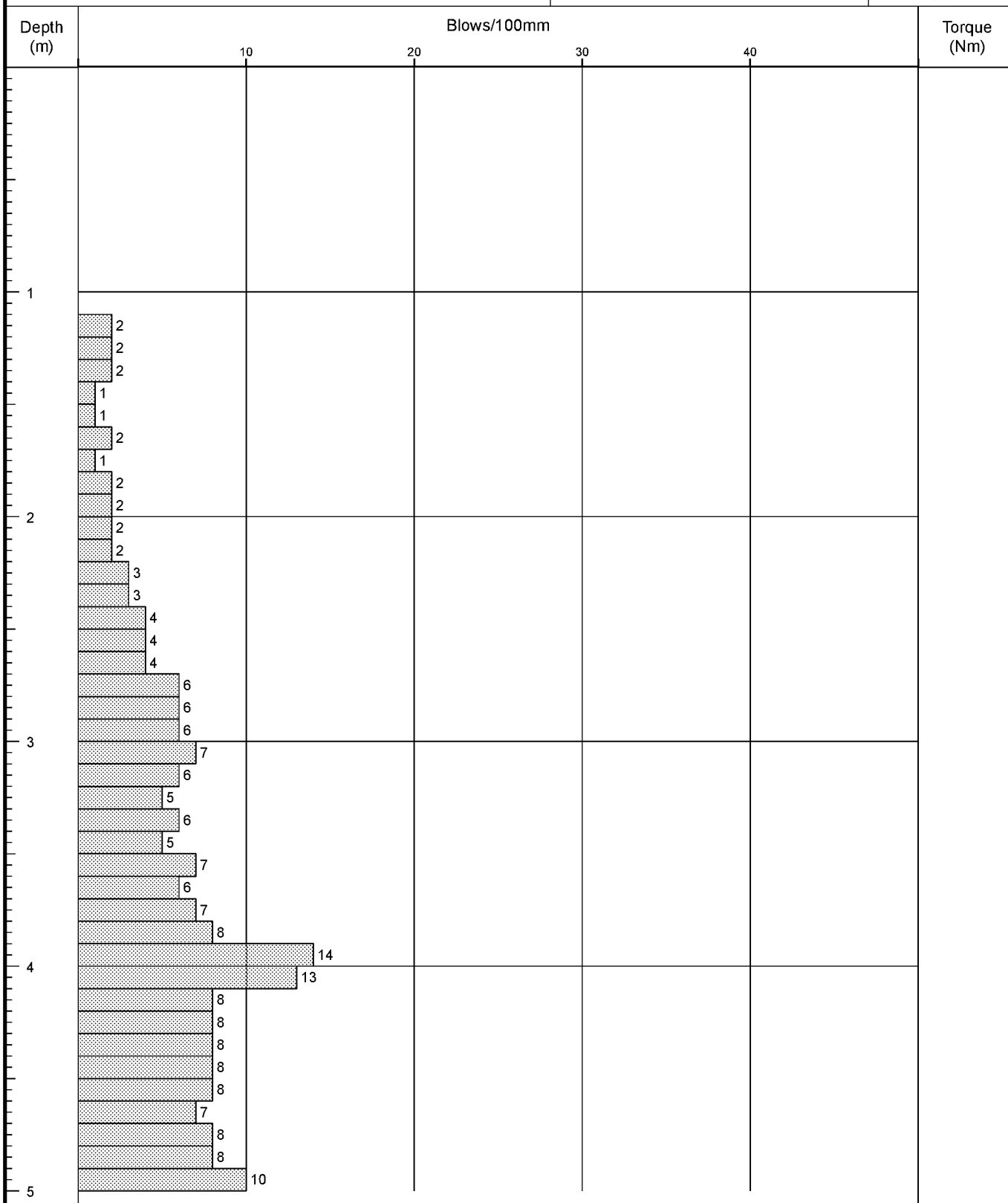
Level:

Scale
1:25

Client: L Squared Properties Ltd

Dates: 02/06/2017 - 02/06/2017

Logged By
LC



Remarks

Fall Height 100

Cone Base Diameter 45

Hammer Wt 50

Final Depth 6.00

Probe Type DPH

Log Scale 1:25



Probe Log

Borehole No.

DP1

Sheet 2 of 2

Project Name: Middleton Road

Project No.
17.9526

Co-ords: -

Hole Type
DP

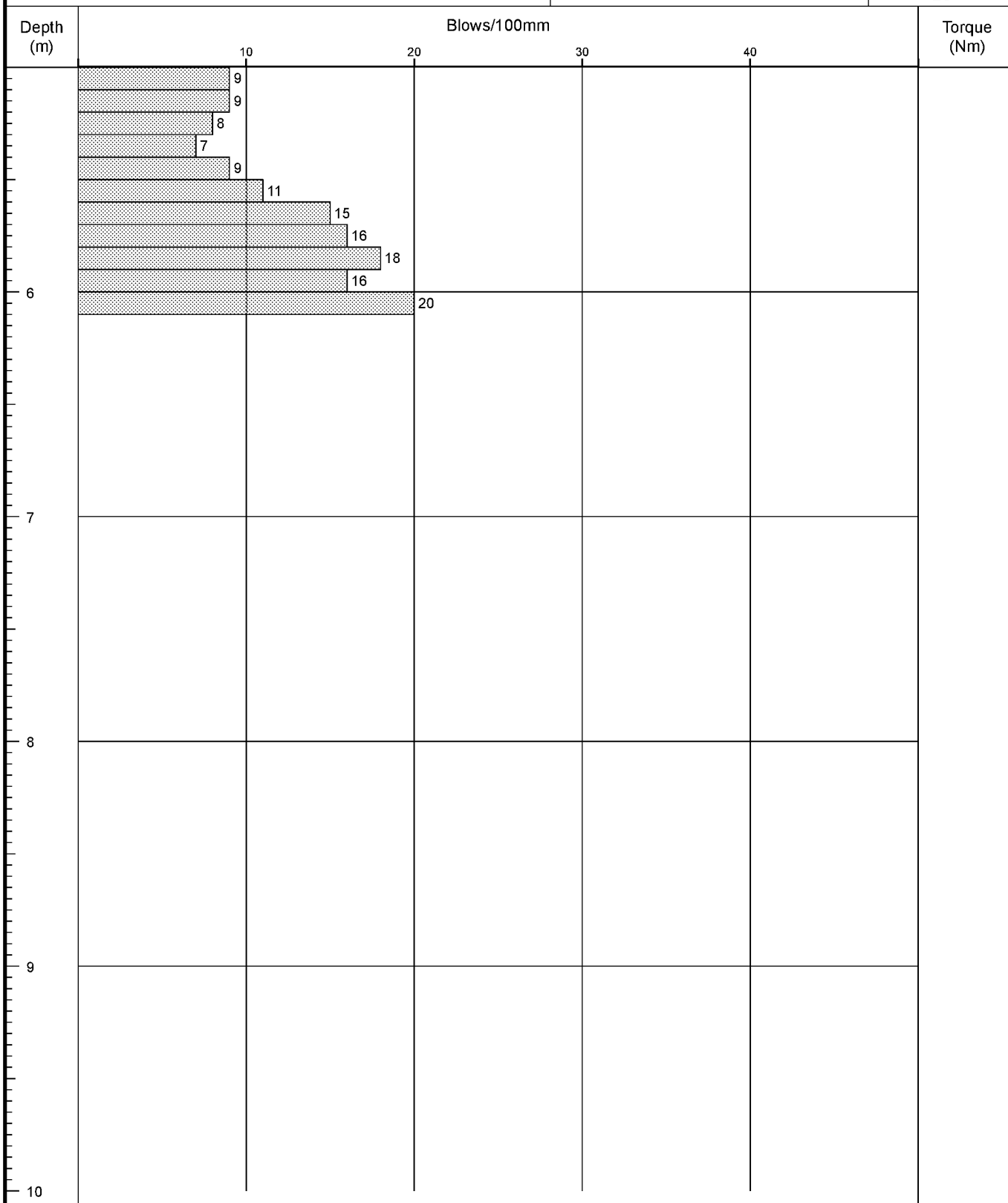
Location: Middleton-on-Sea

Level:

Scale
1:25

Client: L Squared Properties Ltd

Dates: 02/06/2017 - 02/06/2017

Logged By
LC


Remarks

Fall Height 100

Cone Base Diameter 45

Hammer Wt 50

Final Depth 6.00

Probe Type DPH

Log Scale 1:25



Probe Log

Borehole No.

DP2

Sheet 1 of 2

Project Name: Middleton Road

Project No.
17.9526

Co-ords: -

Hole Type
DP

Location: Middleton-on-Sea

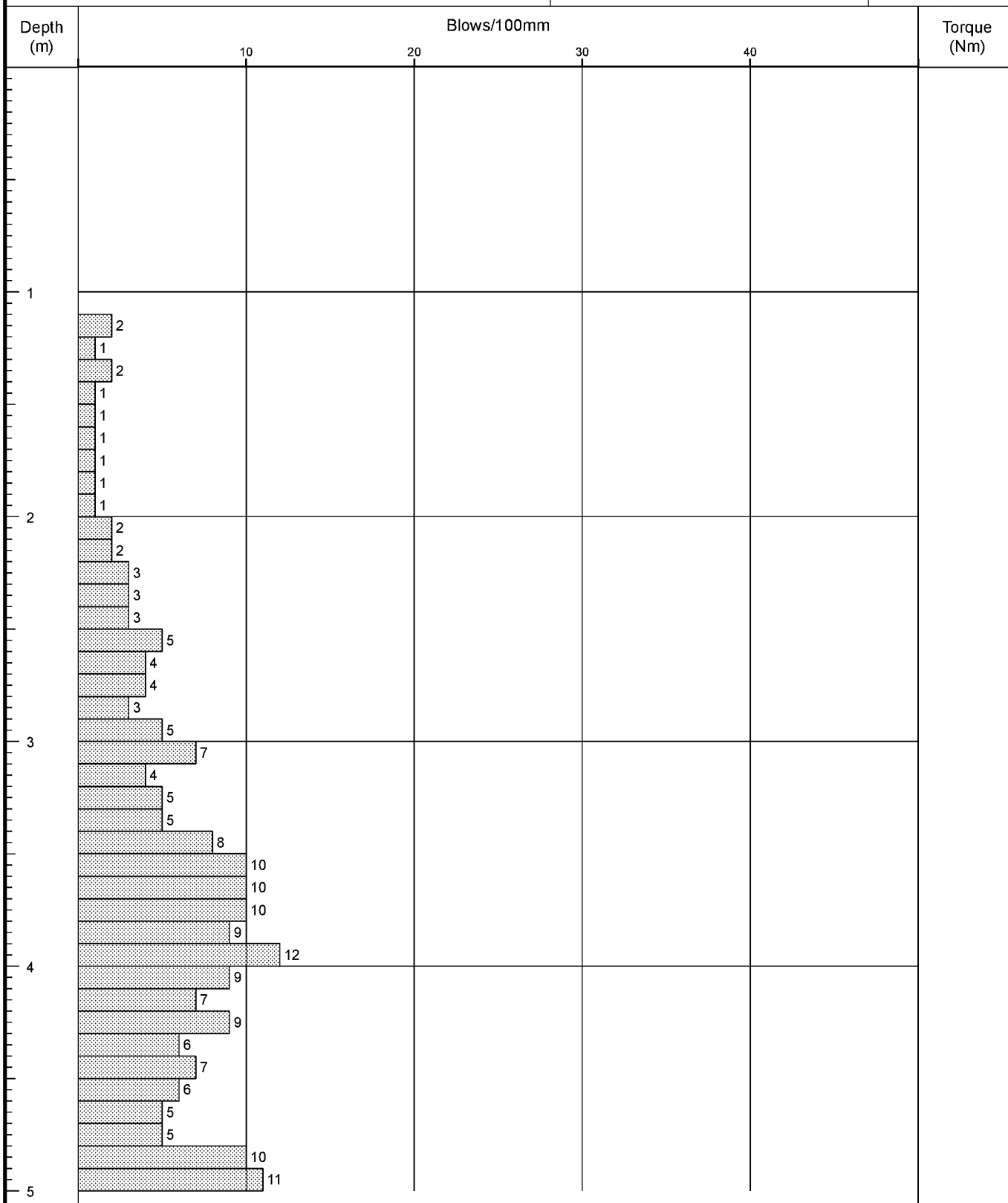
Level:

Scale
1:25

Client: L Squared Properties Ltd

Dates: 02/06/2017 - 02/06/2017

Logged By
LC



Remarks

Fall Height 100

Cone Base Diameter 45

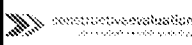
Hammer Wt 50

Final Depth 6.00

Probe Type DPH

Log Scale 1:25



		Probe Log		Borehole No. DP2	
Project Name: Middleton Road		Project No. 17.9526		Co-ords: -	
Location: Middleton-on-Sea		Level:		Hole Type DP	
Client: L Squared Properties Ltd		Dates: 02/06/2017 - 02/06/2017		Scale 1:25	
Client: L Squared Properties Ltd		Dates: 02/06/2017 - 02/06/2017		Logged By LC	
Depth (m)	Blows/100mm				Torque (Nm)
5	10	20	30	40	
6	10	20	30	40	
7	10	20	30	40	
8	10	20	30	40	
9	10	20	30	40	
10	10	20	30	40	
Remarks		Fall Height 100	Cone Base Diameter 45		
		Hammer Wt 50	Final Depth 6.00		
		Probe Type DPH	Log Scale 1:25		

Probe Log

Borehole No.

DP3

Sheet 1 of 2

Project Name: Middleton Road

Project No.
17.9526

Co-ords: -

Hole Type
DP

Location: Middleton-on-Sea

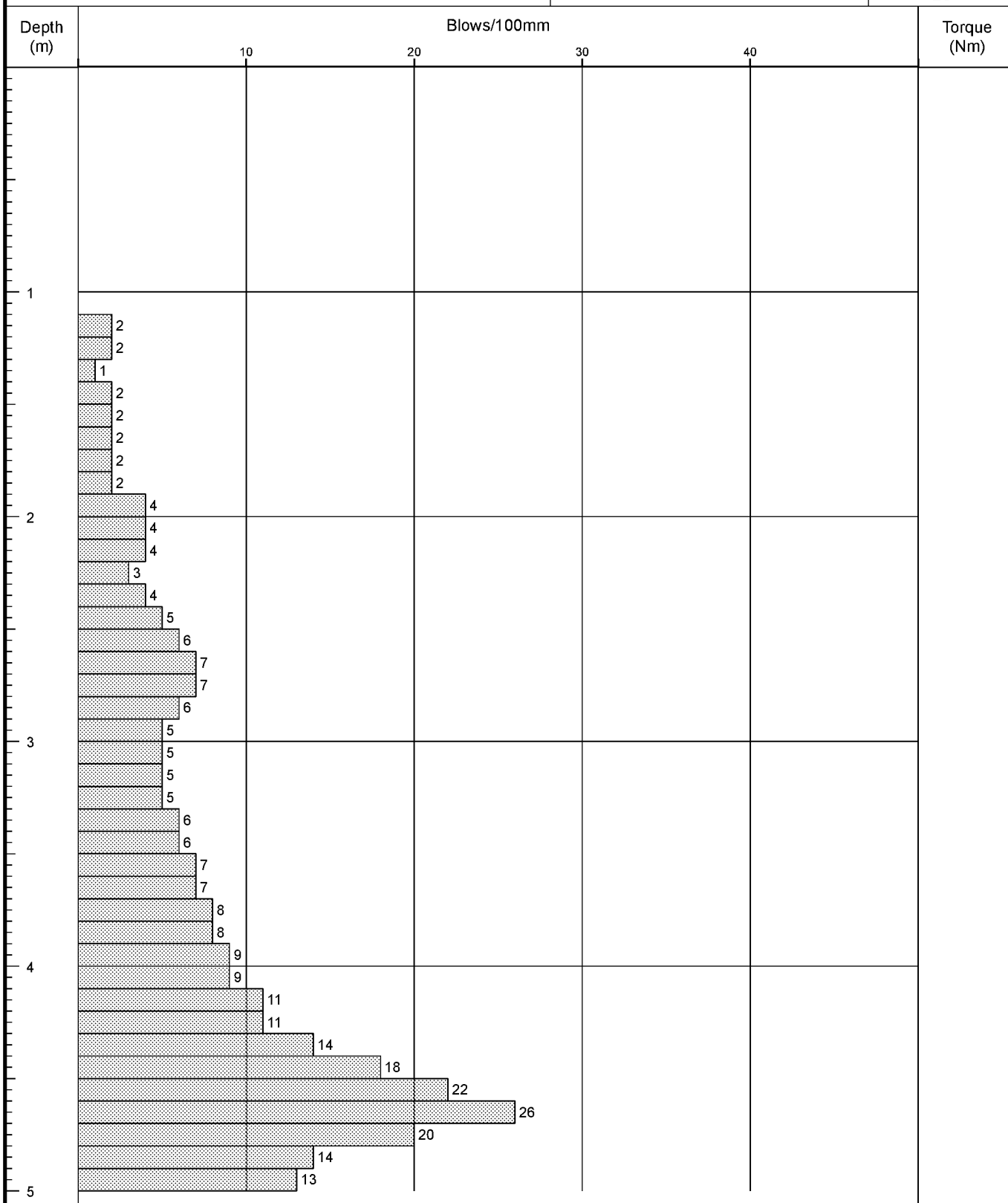
Level:

Scale
1:25

Client: L Squared Properties Ltd

Dates: 02/06/2017 - 02/06/2017

Logged By
LC



Remarks

Fall Height 100

Cone Base Diameter 45

Hammer Wt 50

Final Depth 6.00

Probe Type DPH

Log Scale 1:25



Probe Log

Borehole No.

DP3

Sheet 2 of 2

Project Name: Middleton Road

Project No.
17.9526

Co-ords: -

Hole Type
DP

Location: Middleton-on-Sea

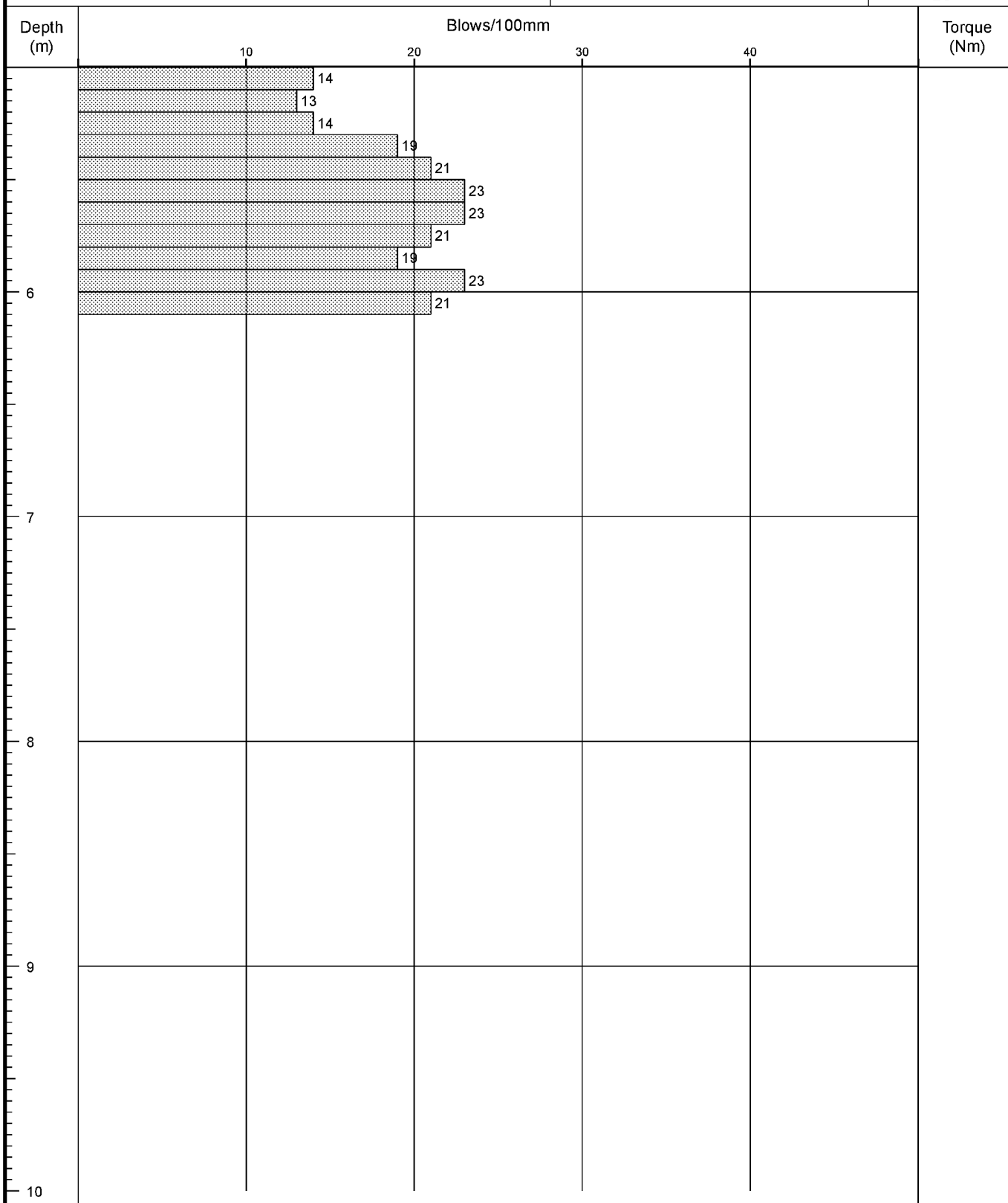
Level:

Scale
1:25

Client: L Squared Properties Ltd

Dates: 02/06/2017 - 02/06/2017

Logged By
LC



Remarks

Fall Height 100

Cone Base Diameter 45

Hammer Wt 50

Final Depth 6.00

Probe Type DPH

Log Scale 1:25



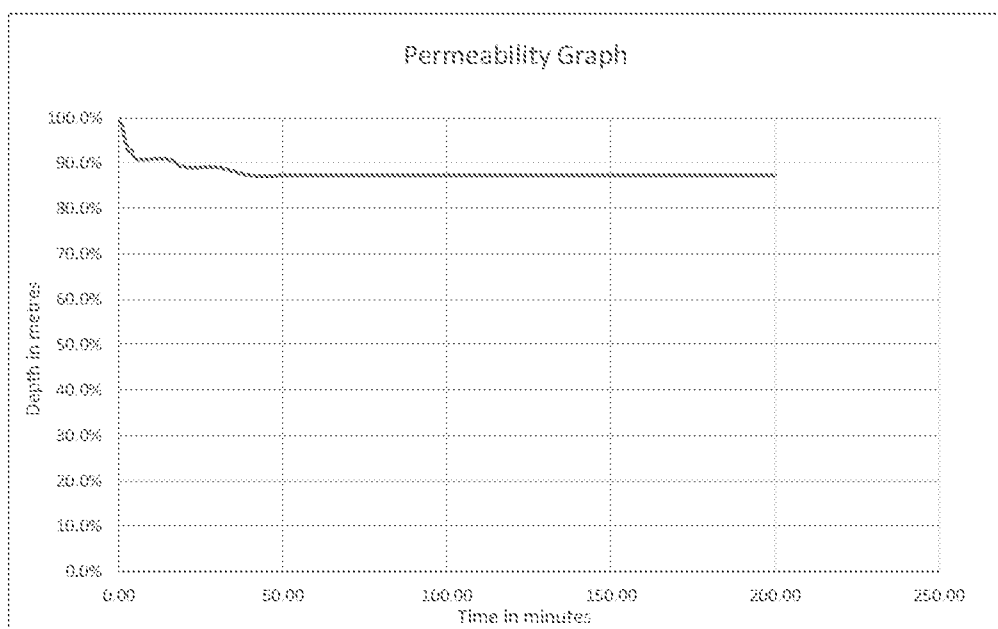
constructiveevaluation
critical discussions & building practices

Trial Hole: TP3

Test 1

Fit Size		Time in mins	
Length	1.75		75%
Width	0.60		25%
Depth	2.00		

not valid



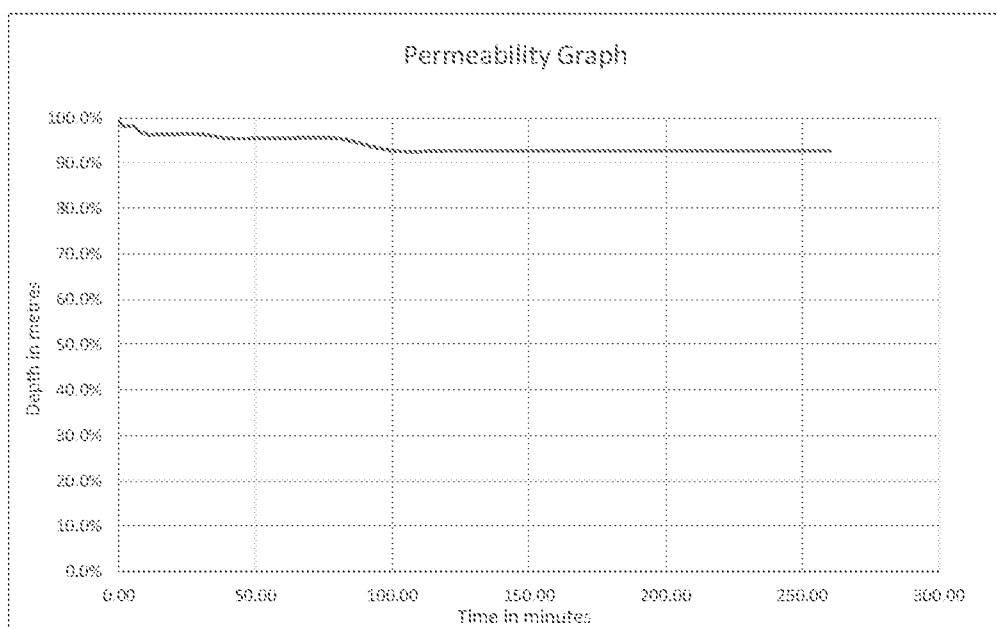
constructiveevaluation
site investigations building pathology

Trial Hole: TP2

Test 1

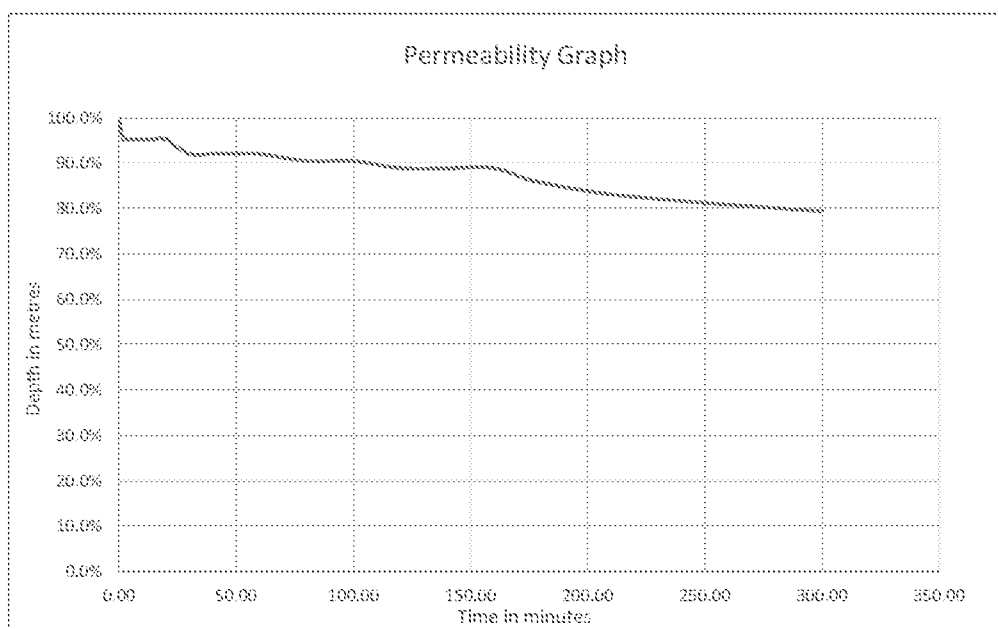
Fit Size		Time in mins	
Length	1.80		75%
Width	0.60		25%
Depth	2.00		

not valid



constructiveevaluation
critical evaluation's building technology

Test 1



APPENDIX C

Photographs



Investigation Photographs

Project Ref:17.9526

Site Name: Middleton Road

1.



2.



- 1) Looking north west within the site.
- 2) Looking north east within the site.
- 3) Looking south west within the site.
- 4) Looking south east within the site.

3.



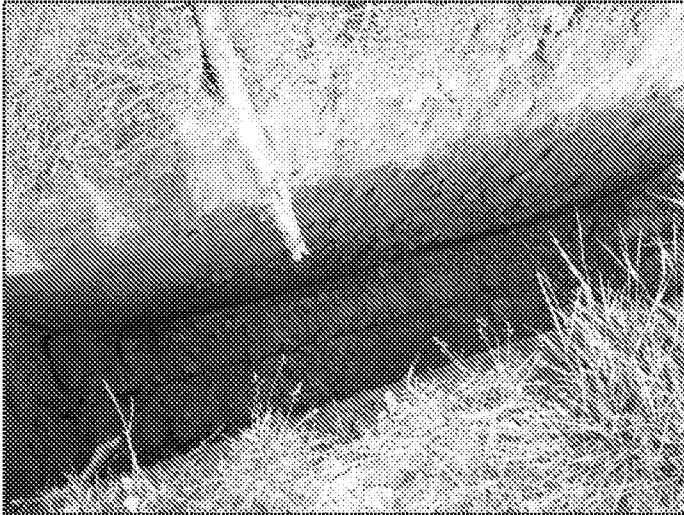
4.



Investigation Photographs

Project Ref: 17.9526
Site Name: Middleton Road

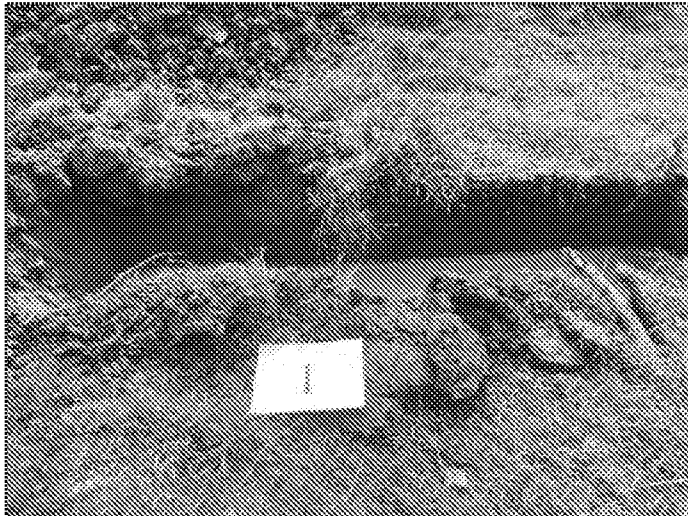
5.



6.



7.



8.



- 5) TP1 1.00mbgl
- 6) TP2 2.00mbgl
- 7) TP1 beginning of the soakage test.
- 8) WS1 1.00-2.00mbgl.

Investigation Photographs

Project Ref: 17.9526
Site Name: Middleton Road

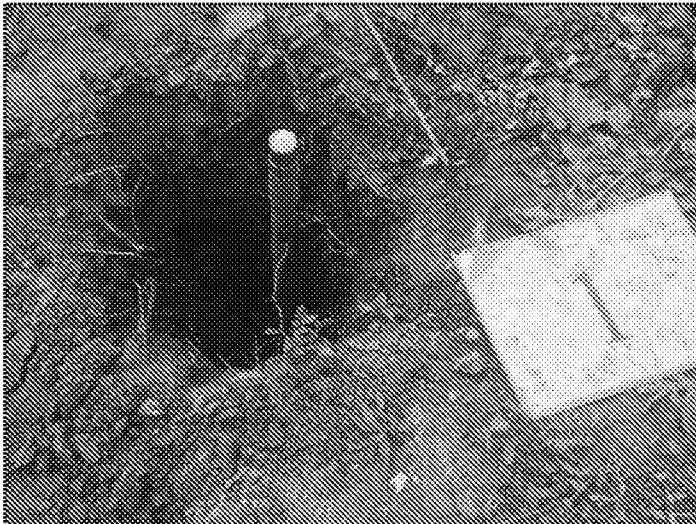
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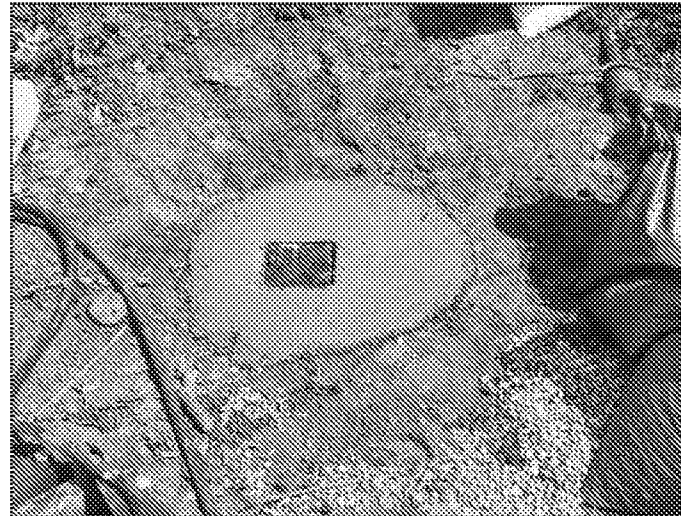
10.



11.



12.



- 9) WS1 2.00-4.00mbgl
- 10) WS1 4.00-6.00mbgl.
- 11) WS1 trial hole.
- 12) WS1 monitoring install cover.

Investigation Photographs

Project Ref:17.9526

Site Name: Middleton Road

13.



14.



15.



16.



13) WS2 1.00-2.00mbgl

14) WS2 2.00-4.00mbgl.

15) WS3 1.00-2.00mbgl.

16) WS3 2.00-4.00mbgl.



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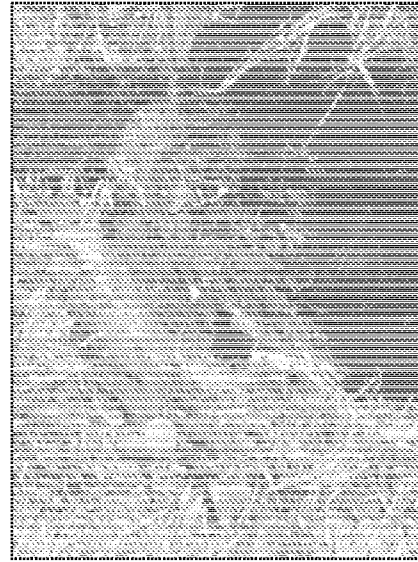
Investigation Photographs

Project Ref: 17.9526
Site Name: Middleton Road

17.



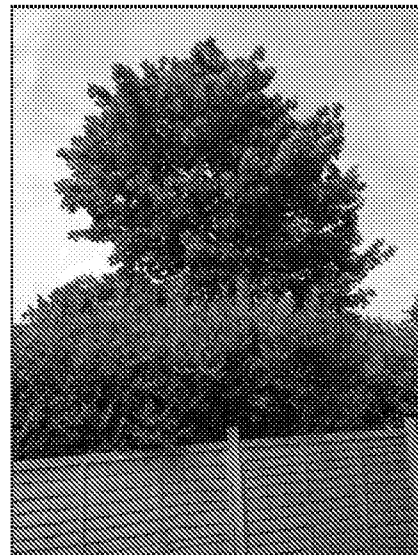
18.



19.



20.



- 17) WS3 4.00-6.00mbgl
- 18) WS3 hand dug pit.
- 19) WS3 excavation
- 20) Tree located north off of the site.

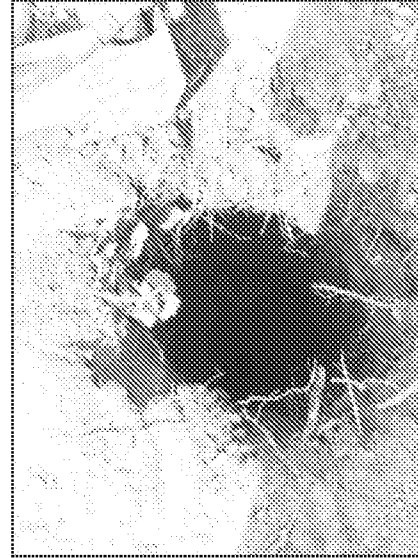
Investigation Photographs

Project Ref: 17.9526
Site Name: Middleton Road

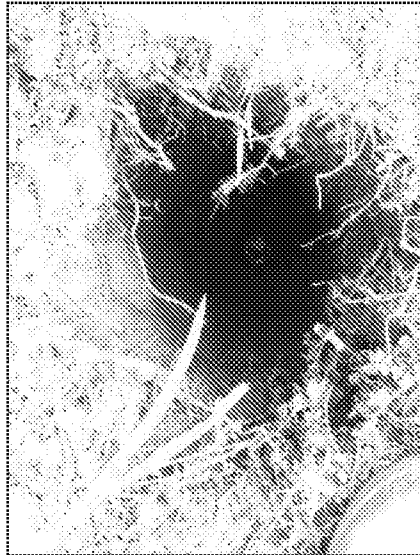
21.



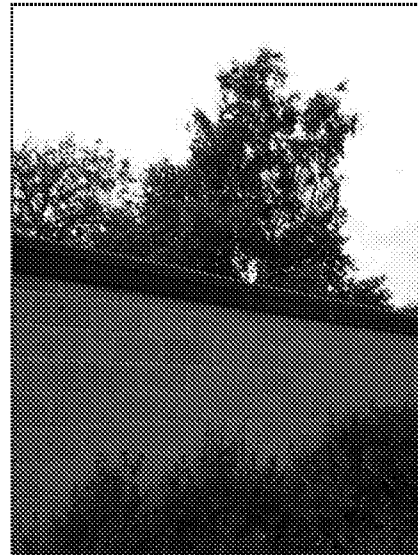
22.



23.



24.



- 21) Tree located north east of the site.
- 22) WS3
- 23) WS2
- 24) Tree located west of the site.

APPENDIX D

Laboratory Certificates





Lydia Coote
Constructive Evaluation Ltd
Unit 15 & 16
Ford Lane Business
Ford Lane
Ford
Arundel
BN18 0UZ

QTS Environmental Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN



QTS Environmental Report No: 17-59876

Site Reference: 155 Middleton Road

Project / Job Ref: 17.9526

Order No: 17.9526/LC

Sample Receipt Date: 07/06/2017

Sample Scheduled Date: 07/06/2017

Report Issue Number: 1

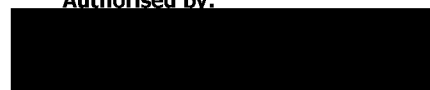
Reporting Date: 13/06/2017

Authorised by:



Kevin Old
Associate Director of Laboratory

Authorised by:



Russell Jarvis
Associate Director of Client Services

QTSE is the trading name of DETS Ltd, company registration number 03705645



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN



Soil Analysis Certificate						
QTS Environmental Report No: 17-59876	Date Sampled	02/06/17	02/06/17	02/06/17	02/06/17	02/06/17
Constructive Evaluation Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: 155 Middleton Road	TP / BH No	TP2	TP3	WS1	WS2	WS3
Project / Job Ref: 17.9526	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: 17.9526/LC	Depth (m)	1.10	1.55	5.50 - 6.00	2.50 - 3.00	2.00 - 2.50
Reporting Date: 13/06/2017	QTSE Sample No	272549	272550	272551	272552	272553

Determinand	Unit	RL	Accreditation	(n)				
pH	pH Units	N/a	MCERTS	8.0	8.3	8.3	8.3	8.4
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	35	110	22	13	11
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.03	0.11	0.02	0.01	0.01

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C

Analysis carried out on the dried sample is corrected for the stone content

Subcontracted analysis ⁽⁵⁾

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



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN



Soil Analysis Certificate						
QTS Environmental Report No: 17-59876	Date Sampled	02/06/17				
Constructive Evaluation Ltd	Time Sampled	None Supplied				
Site Reference: 155 Middleton Road	TP / BH No	WS3				
Project / Job Ref: 17.9526	Additional Refs	None Supplied				
Order No: 17.9526/LC	Depth (m)	4.00 - 4.50				
Reporting Date: 13/06/2017	QTSE Sample No	272554				

Determinand	Unit	RL	Accreditation				
pH	pH Units	N/a	MCERTS	8.4			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C
Analysis carried out on the dried sample is corrected for the stone content
Subcontracted analysis ⁽⁵⁾



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN



Soil Analysis Certificate - Sample Descriptions

QTS Environmental Report No: 17-59876

Constructive Evaluation Ltd

Site Reference: 155 Middleton Road

Project / Job Ref: 17.9526

Order No: 17.9526/LC

Reporting Date: 13/06/2017

QTSE Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
272549	TP2	None Supplied	1.10	16.8	White clay
272550	TP3	None Supplied	1.55	13.6	Green sandy clay
272551	WS1	None Supplied	5.50 - 6.00	18.1	White chalk
272552	WS2	None Supplied	2.50 - 3.00	13.2	Brown sandy clay with stones
272553	WS3	None Supplied	2.00 - 2.50	11.2	Green sandy clay
272554	WS3	None Supplied	4.00 - 4.50	13	Brown clayey sand

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

Insufficient Sample ^{1/5}

Unsuitable Sample ^{4/5}



QTS Environmental Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN



Soil Analysis Certificate - Methodology & Miscellaneous Information

QTS Environmental Report No: 17-59876

Constructive Evaluation Ltd

Site Reference: 155 Middleton Road

Project / Job Ref: 17.9526

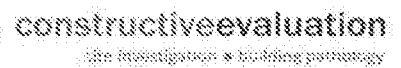
Order No: 17.9526/LC

Reporting Date: 13/06/2017

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 dphenylcarbazine followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

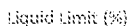
D Dried
AR As Received

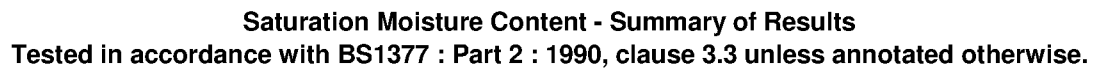
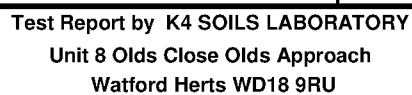
SUMMARY OF RESULTS



Client

Retained portion =
chalk grains



[illegible]

Checked and Approved

Initials J.P

Date: 15/06/2017