Southern Testing
Environmental & Geotechnical

Site Investigation Report

Desk Studies | Risk Assessments | Site Investigations | Geotechnical | Contamination Investigations | Remediation Design and Validation

Site: 16 Provost Road, NW3 4ST

Client: Mr S Kirkwood

Report Date: July 2014

Project Reference: J11866

Southern Testing
Keeble House, Stuart Way
East Grinstead, West Sussex RH19 4QA

t 01342 333100 f 01342 410321
e info@southerntesting.co.uk
w southerntesting.co.uk

SUMMARY

The site comprises an existing detached property at No 16 Provost Road, London, NW3 4ST located to the west of Chalk Farm. It is proposed to construct a single level basement structure beneath the front area of the property currently used for off street parking.

Geological records indicate the site to be underlain by London Clay.

The soils encountered comprised made ground, overlying weathered London Clay.

To date, standing water levels of 4.69 and 5.19m BGL, have been measured within the monitoring well installed in BH1A.

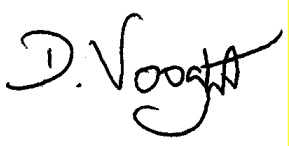
Precautions for BRE Class DS-3 sulphate are recommended for subsurface concrete with an ACEC classification of AC-2s.

NHBC High Volume Change Potential precautions will apply for the weathered London Clay soils.

The development includes a basement structure which is to be constructed using a form of conventional underpinning methods. Parameters for retaining wall design are given.

The design of the new basement foundation system should take account the nature of the existing/adjacent foundations and their condition.

J N Race MSc CGeol
(Countersigned)



D Vooght MSc
(Signed)

For and on behalf of Southern Testing Laboratories Limited

STL: J11866
29 July 2014

TABLE OF CONTENTS

A INTRODUCTION 1

1 AUTHORITY 1
2 LOCATION 1
3 PROPOSED CONSTRUCTION 1
4 OBJECT 1
5 SCOPE 1

B THE SITE 2

6 GEOLOGY 2
7 HYDROLOGY AND HYDROGEOLOGY 2
8 RADON RISK 3
9 BOMB MAP 3
10 SITE LOCATION 3
11 GENERAL DESCRIPTION 3

C SITE INVESTIGATION 4

11 METHOD 4
12 SOILS AS FOUND 4
13 GROUNDWATER OBSERVATIONS 5
14 GROUNDWATER MONITORING 5

D FIELD TESTING AND SAMPLING 6

E GEOTECHNICAL LABORATORY TESTS 6

F DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS 6

15 SOIL CLASSIFICATION AND PROPERTIES 6
16 SWELLING AND SHRINKAGE 6
17 GROUNDWATER LEVELS 8
18 SULPHATES AND ACIDITY 9
19 BEARING CAPACITY 9
20 HEAVE 9
21 BASEMENT CONSTRUCTION 10
22 EXCAVATIONS AND TRENCHING 10

APPENDIX A Site Plan and Exploratory Hole Logs
APPENDIX B Field Sampling and in-situ Test Methods
APPENDIX C Geotechnical Laboratory Test Methods & Results
APPENDIX D Bomb Map
APPENDIX E PDISP Output for heave displacements

A INTRODUCTION

1 Authority

Our authority for carrying out this work was given in a returned STL Project Order Form dated 5th June 2014 from Michael Johnson the Architect acting on behalf of the client Mr S Kirkwood.

2 Location

The subject site comprises an existing detached property, No 16 Provost Road, London, NW3 4ST. The approximate National Grid Reference of the site is TQ 278 844.

3 Proposed Construction

In terms of the proposed construction, we understand that it is proposed to construct a single level basement structure (approximately 3m deep) beneath the front area of the property which is currently used for off street parking.

We understand that that the basement structure will comprise "300 RC walls with a basement slab and roof to form a concrete box".

According to the Engineer's proposed construction strategy the basement will be formed using a form of conventional underpinning methods with the walls being excavated and concreted in 1000mm wide panels using a hit and miss construction technique. The use of temporary propping methods will be used to support the new walls until an adequate amount of perpendicular walls and are in place to ensure stability of the walls. In the long-term the concrete roof and floor slab will ensure permanent propping of the walls.

4 Object

The object of the investigation was to assess ground and groundwater conditions, foundation bearing and other soil parameters relevant to the proposed development.

5 Scope

This report presents our, exploratory hole logs and test results and our interpretation of these data.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

Contamination issues are not considered in this report.

The findings and opinions conveyed via this Site Investigation Report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Limited believes is reliable. Nevertheless, Southern Testing Laboratories Limited cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The site investigation was conducted and this report has been prepared for the sole internal use and reliance of Mr S Kirkwood and the appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorization of Southern Testing Laboratories Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

B THE SITE

6 Geology

The British Geological Survey Map at 1:50,000 indicates that the site geology consists of London Clay.

London Clay

London Clay is a well-known stiff (high strength) blue-grey, fissured clay, which weathers to a brown colour near the surface. It contains thin layers of nodular calcareous mudstone - "claystone" - from place to place, and crystals of water clear calcium sulphate (selenite) are common.

7 Hydrology and Hydrogeology

Data from the Environment Agency and other information relating to controlled waters is summarised below. The groundwater vulnerability assessment is based on the current data on the EA website.

Data		
Aquifer Designation	Superficial Deposits	There are no superficial deposits mapped.
	Bedrock	Unproductive Strata (London Clay) - deposits with low permeability that have negligible significance for water supply or river base flow.
Source Protection Zones		The site is not located within a Source Protection Zone.
Surface Water Features		The nearest surface water features are the Hampstead Heath Pond Chain some 1.5km to the north. The site lies outside of the catchment area to the ponds. The Regents Canal is located approximately 0.8km to the south.

Data	
Watercourses, well (used/disused) or potential spring lines	The site is not located near any water courses.
Fluvial Flood Risk	On the basis of the information given on the EA website (June 2014) the site is not located within an area at risk of flooding from fluvial sources.
Surface Water Flood Risk	The "Risk of Flooding from Surface Water" mapping on the Environment Agency website shows the site to be within an area of very low risk. Very low means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%).

8 Radon Risk

With reference to BRE guidance, no radon protection is required on this site.

9 Bomb Map

The published bomb map for the area, taken from the London County Council Bomb Damage Maps (1939-1945), shows that the site, along with the properties on Provost Road did not suffer any bomb damage during WWII (refer Figure 2-Appendix D).

10 Site Location

The subject site comprises an existing detached property, No 16 Provost Road, NW3 4ST. It is located on the south side of Provost Road and approximately 260m west of Chalk Farm LUL Station.

11 General Description

The site/subject property at No 16 Provost Road, comprises a four storey (including lower ground floor and roof accommodation) detached residential building.

An inspection of historical maps freely available on the internet was carried out. The map dated 1871-1873 shows the subject building along, with the other detached properties on Provost Road. The earlier map dated 1850-51 was of such a scale that other than the general road lines within the area, no buildings were shown.

The existing building is of masonry brick construction (with outer rendered surface) and comprises a detached 4-storey property with a lower ground floor and stairs leading up to the upper ground floor. A relatively narrow light well (approximately 1600mm deep) and a paved area for off street parking are situated to the front of the property.

The adjacent detached properties all have lower ground floors and are of similar age and construction to that of the subject building.

Regionally ground levels comprise estimated falls of about 2° degrees to the southeast with local falls to the east down Provost Road of approximately 2°.

Existing vegetation within the front area of the site consists of borders containing a variety of shrubs together with potted olive trees. Vegetation within the neighbouring gardens includes rose plants and Camellia within the front garden of No 17 and Hawthorn trees within the adjacent front garden of No 15 Provost Road. An inspection of Google maps (dated 2012) indicates that a tree was once present on the front boundary of the site with No 17 Provost Road. We understand that the tree was a type of Prunus and was removed approximately 3-4 months prior to this investigation.

C SITE INVESTIGATION

11 Method

The strategy adopted for the intrusive investigation comprised the following:

- 1 No window sample hole was carried out to a depth of 6m (BH1A).
- A groundwater monitoring well was installed in BH1A for groundwater monitoring purposes.
- A series of 2 No test pits were hand excavated to establish foundation conditions to the subject property, the retaining wall of the front lightwell and also the boundary wall (TP's 1 & 2).

The exploratory borehole and trial pit locations are shown in Figure 1 in Appendix A.

The fieldwork was carried out on the 25th June 2014, at which time the weather was warm and dry.

12 Soils as Found

The soils encountered during the investigation (BH1A) are described in detail in the attached exploratory hole log (Appendix A).

A brief summary of the soils encountered is also given below.

Depth to Base (m BGL)	Soil Type	Description
0.8 (BH1A)	MADE GROUND*	Dark grey brown silty SAND with occasional brick fragments and rootlets. **Paving slabs over weak concrete over strong concrete to 450mm+ (BH1). Unable to break through concrete with hand held hydraulic breaker and therefore the borehole*

Depth to Base (m BGL)	Soil Type	Description
		was relocated to adjacent flower bed (BH1A)
6.0+	WEATHERED LONDON CLAY	Firm to stiff turning stiff to very stiff, high strength, pale brown mottled grey CLAY with occasional selenite crystals and sandy patches and claystone nodules. Rootlets to 1.5m

A series of hand excavated pits were carried out to establish the front foundations of the subject property and the adjacent boundary wall. Cross sections showing our findings are given in Appendix A.

13 Groundwater Observations

A summary of the water level observations during site works on the 25th June 2014 is given below.

Test Location	Water Strikes/Observations
BH1A	Dry on completion to 6.0mBGL
TP1	Dry to base of hole (0.8mBGL) on completion
TP2	Dry to base of hole (0.85mBGL) on completion

14 Groundwater Monitoring

Following the initial fieldworks the site was re-visited on two separate occasions, to monitor the well installed in BH1A. The results of these measurements are given below.

Date of Reading	Standing Water Level (mBGL)
30/6/2014	5.19
25/7/2014	4.69

D FIELD TESTING AND SAMPLING

The following in-situ tests and sampling methods were employed. Descriptions are given in Appendix B.

- Disturbed Samples
- Hand Penetrometer Tests

E GEOTECHNICAL LABORATORY TESTS

The following tests were carried out on selected samples. Test method references and results are given in Appendix C.

- Moisture Content
- Atterberg Limit Tests
- Soluble Sulphate and pH

F DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS

15 Soil Classification and Properties

Soil Type	Depth	Compressibility	VCP	Permeability	Frost Susceptible	CBR	Remarks
Made Ground	GL to 0.8m	N/A	N/A	Low but seepages from more permeable horizons are anticipated	Yes	N/A	Not suitable for foundations
Weathered London Clay	6.0m+	Medium	High	Very low/impermeable, but seepages from fissures can occur	No	Poor	

16 Swelling and Shrinkage

The results of the Atterberg Limit Tests on selected samples of the Weathered London Clay soils indicate that NHBC High Volume Change Potential precautions are applicable.

It is noted that within the upper 1.5m root traces were encountered in test location BH1A. It is understood that some 3-4 months prior to the investigation a tree was removed from a location adjacent to this test hole. The tree was reported to be a type of Prunus. Given this information the presence of soil desiccation was investigated.

16.1.1 (Soil Desiccation)

Various methods are available in the appraisal of soil desiccation. We have listed below the methods used in our assessment of desiccation:-

- Water content/Atterberg limit
- Shear Strength using hand penetrometer methods

16.1.2 Water Content/Atterberg Limit Test

Information from the Atterberg Limit test can sometimes be used to give an indication of desiccation that is present at the time of the investigation. It should be noted that they are only crude guides and therefore any conclusions drawn should be used in conjunction with other available data. The criterion used in our estimate of desiccation are as follows:

(i) The soils within the upper weathered zone will generally be at plastic limit + 2 to 4% where unaffected by trees.

(ii) The soils at depth below the very highly weathered zone are generally close to their plastic limit.

(iii) Where clays are desiccated by trees, they will be at significantly lower water contents than those given in (i) and (ii).

(iv) If soils are at a moisture content of less than 0.5 x liquid limit, they can be considered desiccated. Experience shows that rigid application of this criterion results in an overestimate of the depth of desiccation. As a consequence, this criterion has not been considered further.

(v) If soils are below a moisture content of 0.4 x liquid limit, then significant desiccation could be present and, depending on foundation loading, is likely to give rise to heave on removal of trees and structural damage.

Figure MC1 (Appendix C) shows a plot of moisture content versus depth for the test location. Figure MC2 (Appendix C) has been plotted with respect to the above criterion.

Referring to figures MC2, and using the aforementioned criterion, desiccation is indicated to a depth of approximately 1.9m.

16.1.3 Shear Strength

Pugh et al [1] used shear strength in their of method evaluating desiccation depths of London Clay as they considered it offered a rapid, low cost method.

[1] "A rapid and reliable on-site method of assessing desiccation in clay soils"
by R S Pugh, P G Parnell, and R D Parkes, Proc. Instn Civ. Engrs. Geotech. Engng. 1995, 113 pp. 25-30.

The method basically consists of the use of simple hand penetrometer measurements of shear strength. By comparing the test results with that of a range of typical values for London Clay soils in a non-desiccated state an assessment of soil desiccation can be made. The results of the hand penetrometer measurements are given in Figure HP1 (Appendix C).

Referring to Figure HP1 soil desiccation to a depth of about 1.6/1.7m is indicated.

16.1.4 Summary on Desiccation

On the basis of the above moisture content/plasticity tests and hand penetrometer tests soil desiccation is indicated within test location BH1A to about 1.9m.

In terms of the proposed construction, and given the depth of the proposed basement (assuming a founding depth in the region of 3.0m bgl), no specific precautions are considered necessary with respect to further foundation deepening. Where shallower foundations are required, then NHBC High Volume Change precautions would be applicable.

17 Groundwater Levels

It should be noted that ground water levels vary considerably from season to season and year to year, often rising close to the ground surface in wet or winter weather, and falling in periods of drought. Long term monitoring is required to assess the ground water regime and this was not possible during the course of this site investigation.

While siteworks were in progress, no groundwater entries were noted within the made ground or underlying Weathered London Clay.

The two groundwater monitoring visits to date have measured standing water levels of 4.69 and 5.19m BGL within the monitoring well installed in BH1A. On the basis of these measurements to date, groundwater ingress is not expected to be a significant problem in terms of dewatering issues etc during construction. Allowances for some dewatering, however, should be made from perched sources e.g. within the made ground, in the form of intermittent pumping from strategically placed collector sumps.

For the longer term condition, seepage entries from fissure flow within the clays and any perched water from within the overlying made ground should be allowed for in the design of the basement area e.g. provision of waterproofing measures, and also for hydrostatic uplift of the basement floor slab.

Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1 x 10^{-9} m/s and 1x 10^{-14} m/s, with an even lower vertical permeability. Accordingly, the groundwater flow rate is anticipated to be extremely low to negligible.

Any groundwater flows that take place will likely follow the local/regional topography which in this instance comprises regional falls to the south east of around 2°with similar local falls to the east down Provost Road. Given the very slight falls in the local/regional topography, hence negligible hydraulic gradient, and the very low/impermeable nature of the underlying clay materials, there is negligible risk of the proposed basement walls causing a "damming effect" or mounding of water on the upstream faces.

On the basis of the observations/comments, it is concluded that the proposed development will not result in any specific issues relating to the hydrogeology and hydrology of the site.

In terms of the potential cumulative effects on the groundwater environment in the local area, i.e. should other future basements be granted beneath adjacent properties, the combination of the overall regional and local topographic falls of the area (hence negligible hydraulic gradients) and the very low/impermeable nature of the underlying London Clay, suggests that any resulting increases in groundwater levels within the area (locally or regionally) will be negligible.

18 Sulphates and Acidity

The measured pH of the made ground ranged between 7.8 and 10.1, indicating alkaline conditions. The measured pH of the natural Weathered London Clay soils ranged between 6.9 and 7.7 and therefore they are also slightly alkaline in reaction.

Within the made ground materials, soluble sulphate levels of 150 and 270mg/l were measured in the samples tested. Within the underlying natural Weathered London Clay soils soluble sulphate of between 490 and 2131mg/l were measured.

On the basis of the above measurements, we would recommend that BRE Class DS-3 precautions are adopted for subsurface concrete together with an ACEC Class of AC-2s.

19 Bearing Capacity

Where it is necessary to construct spread foundations or bases to retaining walls as part of the proposed works, all foundations should clearly penetrate any made ground and be formed on the underlying natural High Strength Clay materials. For foundations formed on these materials, an allowable bearing capacity of 125kPa may be adopted.

20 Heave

Due to stress relief following the removal of the existing soils to form the basement structure, both immediate (undrained) and long term (drained) heave displacements can be expected to occur in the underlying London Clay.

The immediate (undrained) heave displacements will more or less occur as excavation of the basement takes place and before the construction of basement elements e.g. slabs etc. Accordingly, only the long term (drained) heave displacements will need to be catered for in design, to overcome the problem of uplift pressures forming. This is normally overcome by installing appropriate void forming materials beneath the basement elements.

For the analysis of heave movements, the following stiffness parameters after Burland and Kalra (1986)[2] are suggested for the London Clay:

$$\text{Undrained Young's Modulus } (E_u) = (10+5.2z)\ (MN/m^2)$$

$$\text{Undrained Poisson Ratio } (\nu_u) = 0.5$$

[2] Burland J.B. and Kalra J.C. (1986) Queen Elizabeth Conference Centre: geotechnical aspects, Proc. Inst. Civ. Engnrs, Part 1,80,1479-1503

Drained Young's Modulus (E_d) = (7.5+3.9z) (MN/m^2)

Drained Poisson Ratio (ν_d) =0.2

Where z (m) is taken from the surface of the London Clay

Assuming a basement/excavation formation depth of about 3.0m beneath the existing front paved area, an analysis of heave displacements has been carried out using PDisp and the above parameters (Appendix E). Figure U1 relates to the immediate (undrained-end of construction stage) heave displacements and Figure V1 to the total long term (drained) heave displacements (which includes the end of construction displacements). The maximum undrained heave displacement, i.e. end of construction stage, occurs beneath the approximate central point of the proposed basement structure and is 6mm. The total long term drained heave movement (which includes the initial undrained heave movement) occurs at the same point and is 10mm.

21 Basement Construction

Based on the findings of the borehole BH1A and the soil types encountered, the following soil parameters are suggested for design of retaining walls:

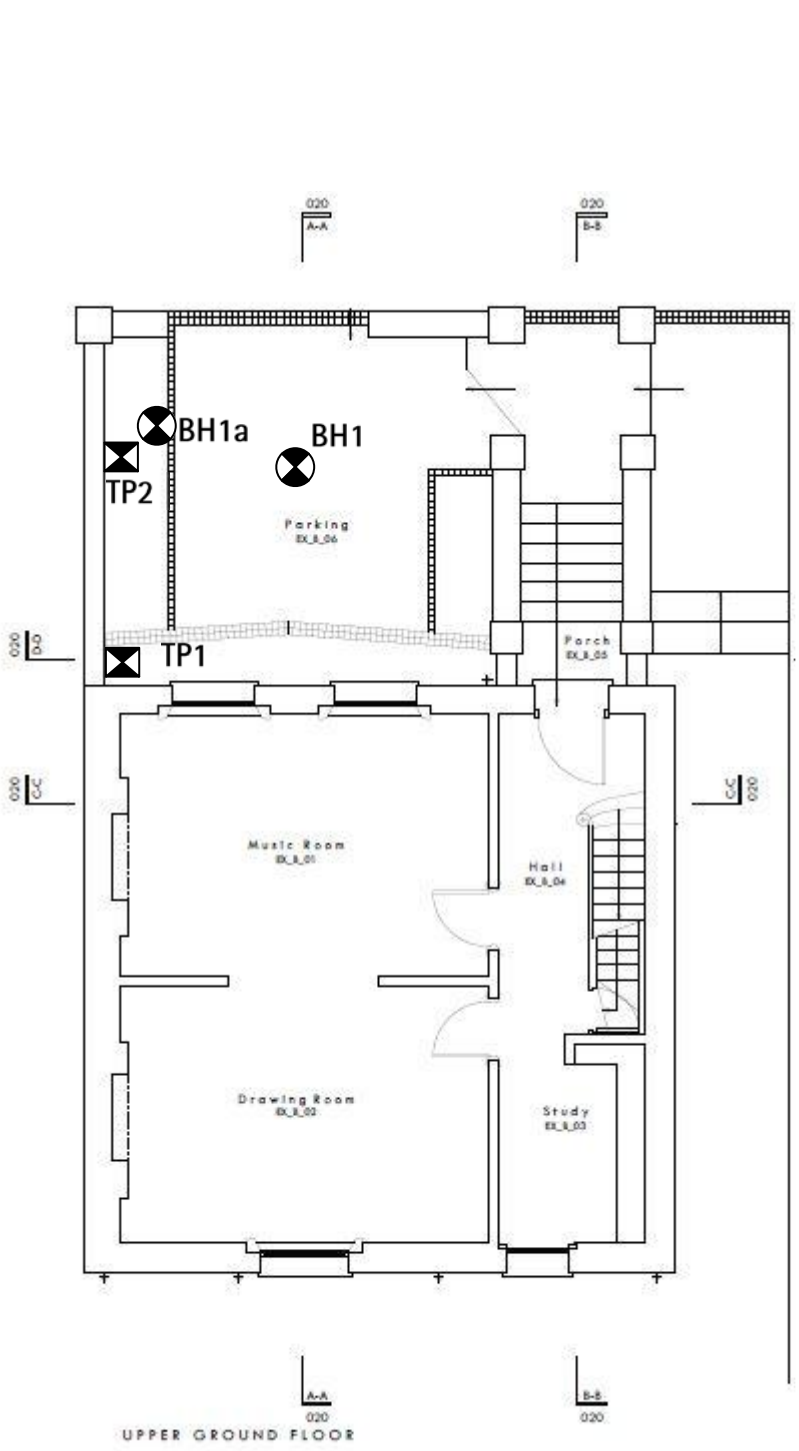
Soil Type	Bulk density γ_b (kN/m^3)	Undrained Shear Strength (Temporary Condition)	Long Term Drained Condition	
			c' (kN/m^2)	φ^o
Made Ground	19	N/A	0	30
Weathered London Clay	20	Cu=50kPa@1m depth (surface of London Clay) increasing linearly with depth to 150kPa @6.0m depth	0	25

22 Excavations and Trenching

Statutory lateral earth support will be required in all excavations where men must work. Instability of the sides of any excavations carried out must be expected. Accordingly, measures should be taken at all times to ensure that excavations are adequately supported. Given the presence of the existing adjacent foundations, close attention in design of temporary and permanent propping is required at all times to prevent settlement or excessive lateral yielding of the excavation/foundations.

APPENDIX A

Site Plans and Exploratory Hole Logs and Photographs



NB: Positions of Boreholes and/or Trial Pits are only indicative unless dimensioned

Site: 16 Provost Road, London NW1	STL: J11866	Fig No: 1
Date: 26 June 2014		

Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

ST Consult

Southern Testing | ST Consult
Environmental & Geotechnical

Tel: 01342 333100

Project No.	Hole Type	Borehole No
J11866	WLS	**BH1** Sheet 1 of 1

Project Name: 16 Provost Road (London NW3)

Dates: 25/06/2014

Location: London NW3

NGR: 527800E - 184400N

Client: Sam Kirkwood

Level: -

Logged By: SM

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.04		0.04	Concrete Paving Slab
						0.11		0.15	Weak CONCRETE
						0.30		0.45	Strong CONCRETE (unable to penetrate with breaker)
									End of Borehole at 0.45 m

1.0
2.0
3.0
4.0
5.0

Type | Results

Borehole Details

Casing Depth (m bgl)	Hole Depth (m bgl)	Casing Diameter (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Hole terminated at 0.45 on concrete. Hole moved next to TP2 see BH1a log.

Southern Testing | ST Consult
Environmental & Geotechnical

Tel: 01342 333100

Project No.	Hole Type	Borehole No
J11866	WLS	**BH1A** Sheet 1 of 1

Project Name: 16 Provost Road (London NW3)

Dates: 25/06/2014

Location: London NW3

NGR: 527800E - 184400N

Client: Sam Kirkwood

Level: -

Logged By: SM

Well	Water Strikes	Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
		Depth (m)	Type	Results					
						0.80			MADE GROUND composed of dark grey brown, silty, SAND, with occasional brick fragments roots and rootlets.
								0.80	
		1.00		UCS = 150					Firm to stiff, high strength to very high strength, fissured, pale brown mottled grey, CLAY, with occasional roots and rootlets.
		1.00	D						0.80m - 1.50m: Fine rootlets present until 1.5m
		1.25		UCS = 260					
		1.50		UCS = 350					
		1.50	D						
		1.75		UCS = 190					
		2.00		UCS = 210					
		2.00	D						
		2.25		UCS = 200					
		2.50		UCS = 240					
		2.50	D						
		2.75		UCS = 250					
		3.00		UCS = 250					
		3.00	D						3.00m - 6.00m: Occasional to frequent selenite crystals
		3.25		UCS = 210					
		3.50		UCS = 250		5.20			
		3.50	D						
		3.75		UCS = 270					
		4.00		UCS = 260					
		4.00	D						4.00m - 6.00m: Clay becoming thinly laminated, with occasional sandy patches and claystone nodules.
		4.25		UCS = 300					
		4.50		UCS = 220					
		4.50	D						
		4.75		UCS = 320					
		5.00		UCS = 260					
		5.00	D						
		5.25		UCS = 320					
		5.50		UCS = 400					
		5.50	D						
		5.75		UCS = 450					
		6.00		UCS = 450				6.00	
		6.00	D						End of Borehole at 6.00 m

	Type	Results

Borehole Details

Casing Depth m bgl	Hole Depth m bgl	Casing Diameter mm

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Hole dry on completion.

Southern Testing | ST Consult
Environmental & Geotechnical

Tel: 01342 333100

Project No.	Machine Type	Trialpit No
J11866	**Hand Dug**	**TP1** Sheet 1 of 1

Project Name: 16 Provost Road (London NW3)

NGR: 527800E - 184400N

Level: -

Date: 25/06/2014

Location: London NW3

Dimensions: 0.60m

Depth 0.80m

0.50m

Client: Sam Kirkwood

Logged By SM

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.14		0.14	CONCRETE
0.20	D			0.11		0.25	MADE GROUND composed of grey brown, silty, fine to coarse, SAND, with occasional brick and concrete fragments.
0.50		UCS = 100		0.55			Firm, medium strength, pale brown, CLAY.
0.80	D					0.80	Trial Pit Complete at 0.80 m

Remarks:

Pit Stability:

Groundwater: Hole dry on completion.

PPT = Perth Penetration Test 'N' Value , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer, HV= Hand Vane Result (kPa)

Southern Testing | ST Consult
Environmental & Geotechnical

Tel: 01342 333100

Project No.	Machine Type	Trialpit No
J11866	**Hand Dug**	**TP2** Sheet 1 of 1

Project Name: 16 Provost Road (London NW3)

NGR: 527800E - 184400N

Level: -

Date: 25/06/2014

Location: London NW3

Dimensions: 0.50m

Depth 0.85m

0.30m

Client: Sam Kirkwood

Logged By SM

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.85			MADE GROUND composed of dark grey brown, silty, SAND, with frequent roots, rootlets and occasional brick fragments
0.50	D						
						0.85	Trial Pit Complete at 0.85 m

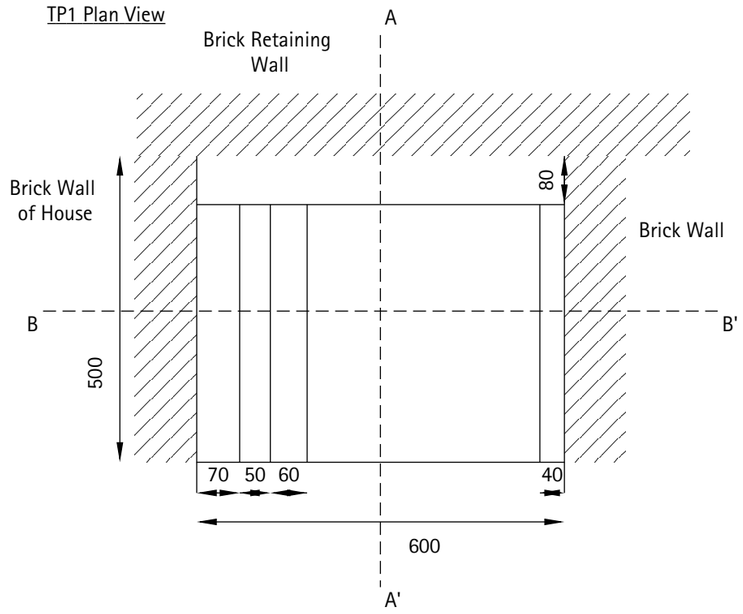
Remarks:

Pit Stability:

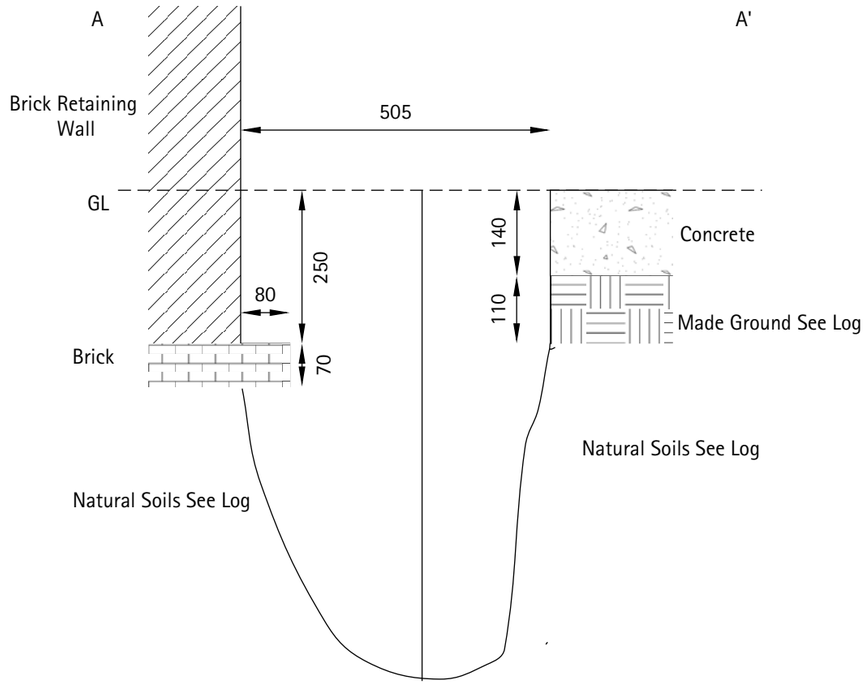
Groundwater: Hole dry on completion.

PPT = Perth Penetration Test 'N' Value , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer, HV= Hand Vane Result (kPa)

TP1 Plan View

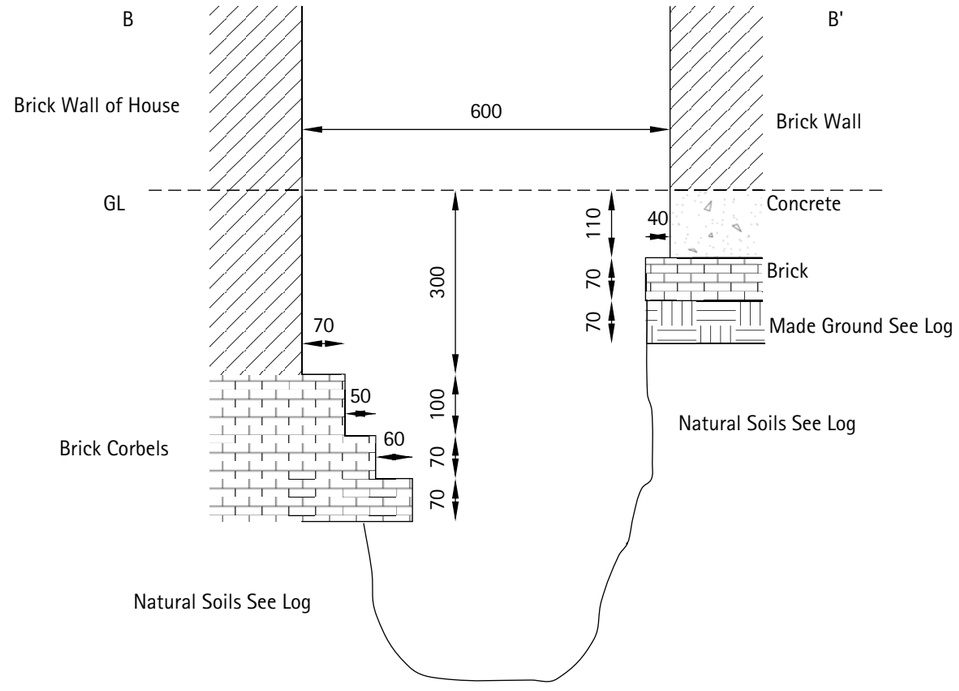


TP1 Section A to A'



Total Depth: 0.8m

TP1 Section B to B'



Total Depth: 0.8m

Notes

1. Base Drawing supplied by others. Trial Pit, Borehole and Window Sample Locations added by Southern Testing.

2. Positions of Trial Holes are only indicative unless dimensioned.

3. All units in mm unless specified otherwise.

Southern Testing
Environmental & Geotechnical

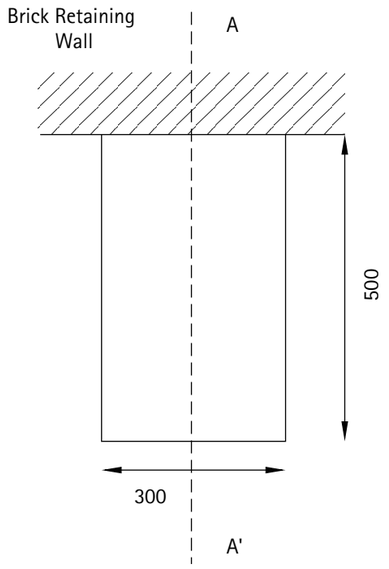
Keeble House, Stuart Way, East Grinstead, West Sussex. RH19 4QA

Tel: 01342 333100 Fax: 01342 410321

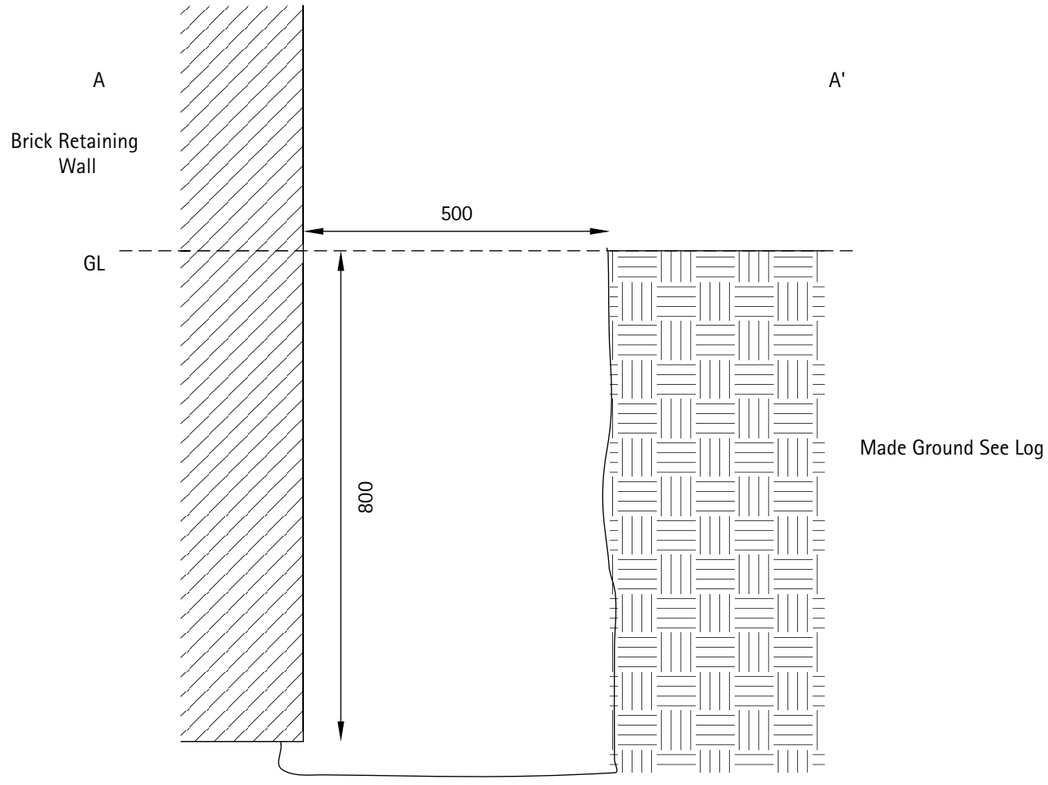
www.southerntesting.co.uk

Client: Sam Kirkwood	
Job Title: J11866 -16 Provost Road	
Description: Trial Pit Sections	
Drawing No: TP1	
Scale: 1:100	Paper Size: A3
Drawn by: SM	Checked by: DV
Date: 26/06/2014	

TP2 Plan View



TP2 Section A to A'



Total Depth: 0.85m

Notes

1. Base Drawing supplied by others. Trial Pit, Borehole and Window Sample Locations added by Southern Testing.

2. Positions of Trial Holes are only indicative unless dimensioned.

3. All units in mm unless specified otherwise.

Southern Testing
Environmental & Geotechnical
Keeble House, Stuart Way, East Grinstead, West Sussex. RH19 4QA
Tel: 01342 333100 Fax: 01342 410321
www.southerntesting.co.uk

Client: Sam Kirkwood

Job Title: J11866- 16 Provost Road

Description: Trial Pit Sections

Drawing No: TP2

Scale: 1:100	Paper Size: A3
Drawn by: SM	Checked by: DV

Date: 26/06/2014

Photo showing TP1.

Brick Corbels on left hand section of TP1.

Brick foundation on right hand side of TP1.

Brick foundation in central section of TP1.

	
Photo showing TP2	Photo to show height difference between TP1 and TP2

APPENDIX B

Field Sampling and in-situ Test Methods & Results

Field Sampling and in-situ Test Methods

Disturbed Samples

Disturbed samples were taken from the trial holes intervals and stored in sealed glass jars and polythene bags, as appropriate.

Hand Penetrometer Test

The hand penetrometer consists of a spring loaded and calibrated plunger which is forced into the soil. A reading of unconfined compression strength (equal to twice cohesion) is given on a calibrated scale. In common with other hand methods of strength assessment (eg. the shear vane) it does not give an accurate indication of bearing capacity in stiff or fissured soils, because of the small test area. The figures are used for strength classification according to the table below

.

Hand Penetrometer Value (kPa)	Undrained Shear Strength cu (kPa)	Undrained Shear Strength of Clays
Less than 20	Less than 10	Extremely Low
20 to 40	10 to 20	Very Low
40 to 80	20 to 40	Low
80 to 150	40 to 75	Medium
150 to 300	75 to 150	High
300 to 600	150 to 300	Very High
More than 600	More than 300	Extremely High

APPENDIX C

Geotechnical Laboratory Test Methods & Results

Southern Testing | ST Consult

Atterberg and Moisture Content Summary

To BS1377-2:1990(2003) cl.3.2, 3.3, 4.2, 4.3

AGS

Project Name	*16 Provost Road (London NW3)*			Project Number	*J11866*
Client	*Sam Kirkwod*	PE	*DV*	Date Issued	*02-Jul-14*

Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi-fication	Passing 425 micron %
BH1A	1.00	D	*Stiff high strength yellow brown mottled orange yellow speckled black CLAY with occasional fine flint gravel.*		*28*	*57*	*20*	*37*	*CH*	*95*
BH1A	1.50	D			*24*					
BH1A	2.00	D	*Firm medium strength light brown CLAY.*		*37*	*88*	*27*	*61*	*CV*	*100*
BH1A	2.50	D			*33*					
BH1A	3.00	D	*Firm high strength light brown CLAY.*		*35*	*78*	*27*	*51*	*CV*	*100*
BH1A	3.50	D			*34*					
BH1A	4.00	D	*Very stiff very high strenght light brown CLAY.*		*35*	*79*	*31*	*48*	*CV*	*100*
BH1A	4.50	D			*33*					
BH1A	5.00	D			*34*					
BH1A	5.50	D			*31*					

Southern Testing | ST Consult

Atterberg and Moisture Content Summary

To BS1377-2:1990(2003) cl.3.2, 3.3, 4.2, 4.3

AGS

Project Name	*16 Provost Road (London NW3)*					Project Number		*J11866*	
Client	*Sam Kirkwod*			PE	*DV*	Date Issued		*02-Jul-14*	

Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi-fication	Passing 425 micron %
BH1A	6.00	D			*31*					

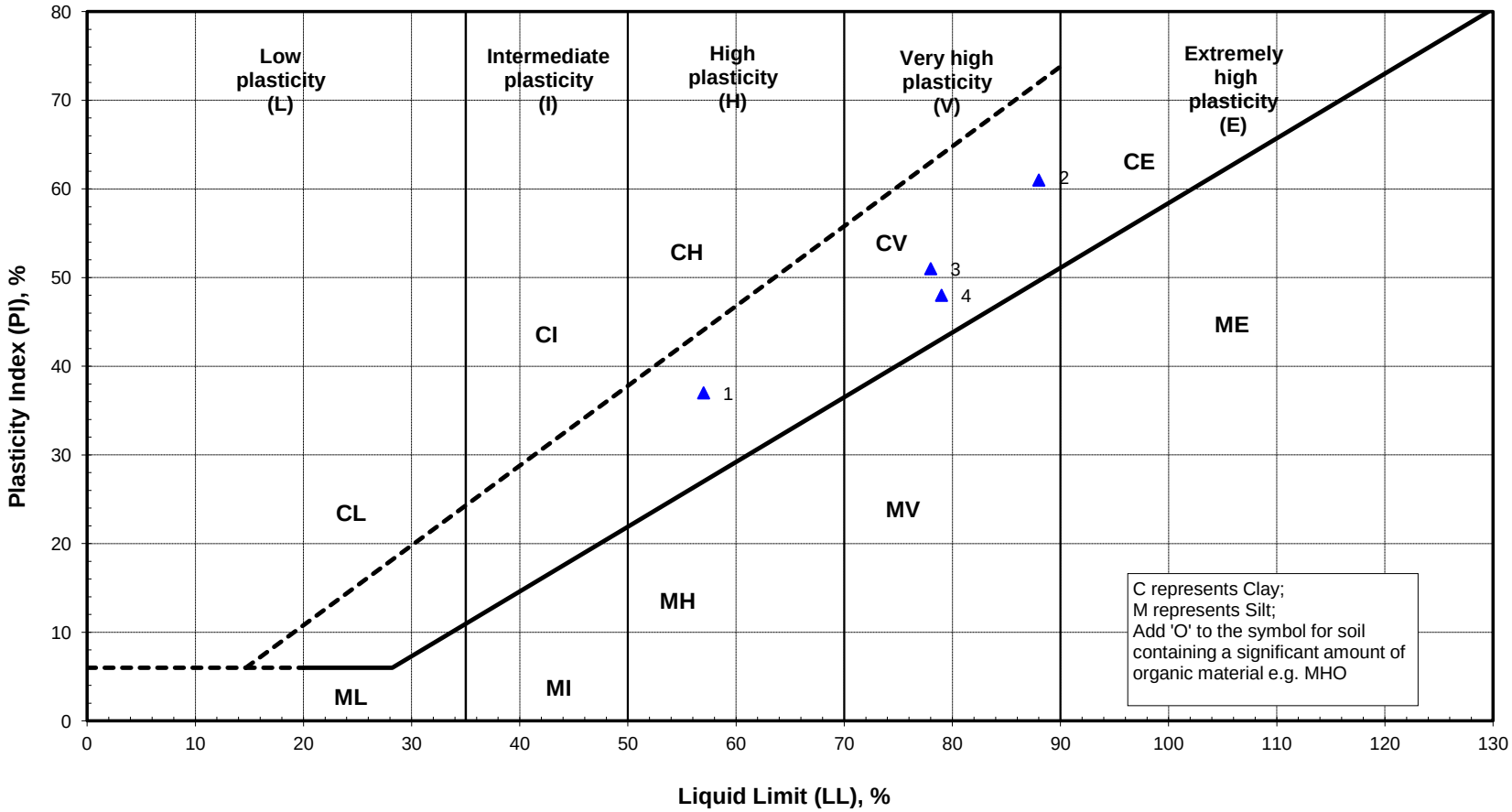
Jun 13

Plasticity Chart for Atterberg Limit Tests

Project Name	*16 Provost Road (London NW3)*			**Project Number**	*J11866*
Client Name	*Sam Kirkwod*	**PE**	*DV*	**Date Issued**	*02-Jul-14*

Key

No.	TH No.	Depth
1	BH1A	1.00
2	BH1A	2.00
3	BH1A	3.00
4	BH1A	4.00



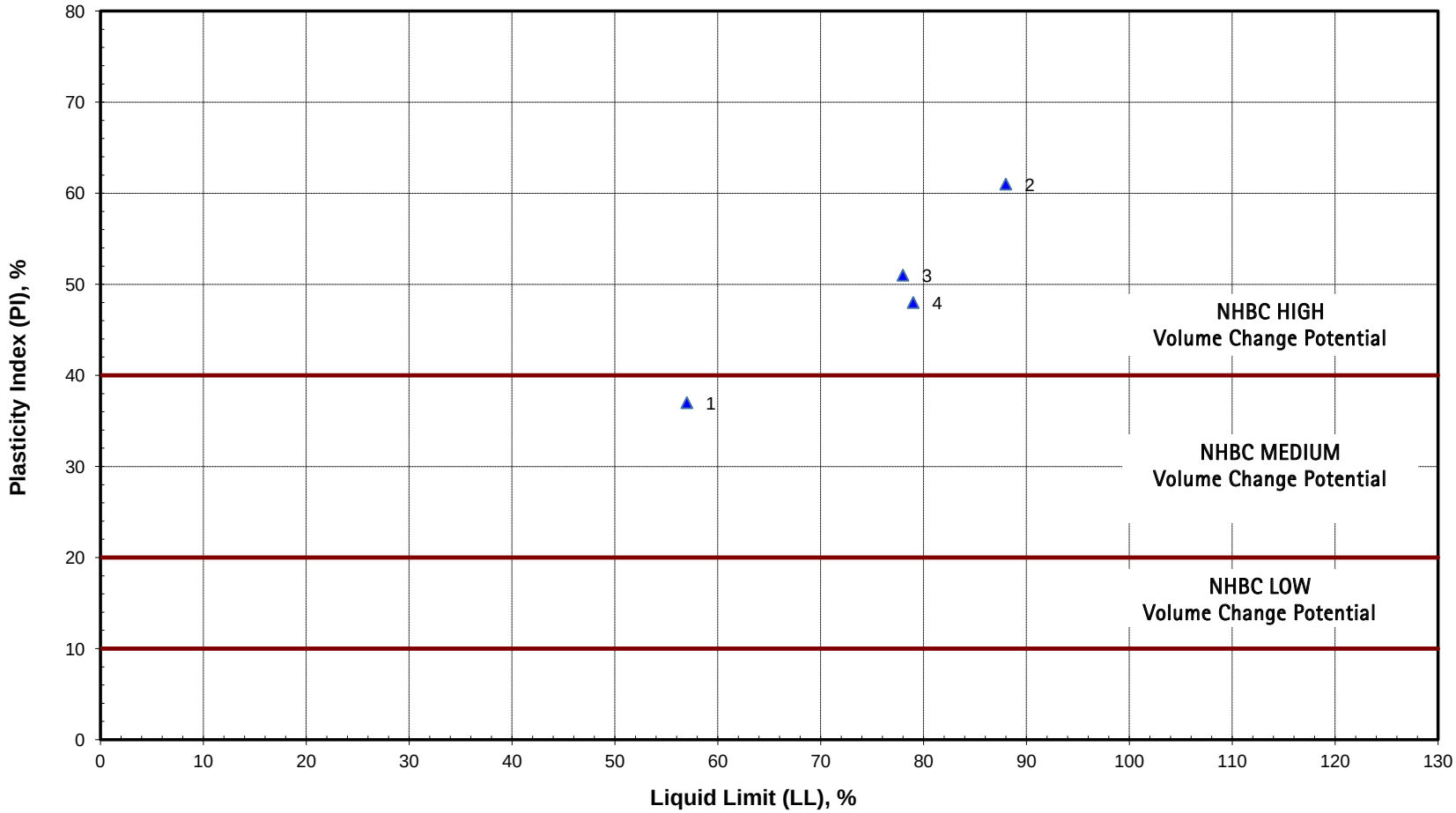
Liquid Limit		**Plastic Limit**		**Plasticity Index**	
Maximum Value	88	Maximum Value	31	Maximum Value	61
Minimum Value	57	Minimum Value	20	Minimum Value	37
Average Value	76	Average Value	26	Average Value	49

NHBC Classification for Volume Change Potential

Project Name	*16 Provost Road (London NW3)*			**Project Number**	*J11866*
Client Name	*Sam Kirkwod*	**PE**	*DV*	**Date Issued**	*02-Jul-14*

Key

No.	TH No.	Depth
1	BH1A	1.00
2	BH1A	2.00
3	BH1A	3.00
4	BH1A	4.00



Liquid Limit		**Plastic Limit**		**Plasticity Index**	
Maximum Value	88	Maximum Value	31	Maximum Value	61
Minimum Value	57	Minimum Value	20	Minimum Value	37
Average Value	76	Average Value	26	Average Value	49

Southern Testing | ST Consult

CHEMICAL & ELECTROCHEMICAL TESTING SUMMARY

To BS1377-3:1990(2003) cl 5.6 & 9.5

AGS

Project Name	16 Provost Road (London NW3)						Project Number		J11866	
Client	Sam Kirkwod				PE	*DV*	Date Issued		*02-Jul-14*	
TH No.	Depth m	Sample Type	Visual Description	Comments	Passing 2mm %	pH Value	Soil Sulphate 2:1 Water Extract		Groundwater Sulphate	
							g/l SO_3	BRE mg/l SO_4	g/l SO_3	BRE mg/l SO_4
BH1A	2.00	D	Firm medium strength light brown CLAY.		100.0	6.9	0.41	490		
BH1A	3.00	D	Firm high strength light brown CLAY.		100.0	7.7	1.78	2131		

Scientific Analysis Laboratories is a
limited company registered in England and
Wales (No 2514788) whose address is at
Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

3 Crittall Drive
Springwood Industrial
Estate
Braintree
Essex
CM7 2RT
Tel : 01376 560120
Fax : 01376 552923

Report Number: 405143-1

Date of Report: 09-Jul-2014

Customer: Southern Testing Laboratories
Keeble House
Stuart Way
East Grinstead
West Sussex
RH19 4QA

Customer Contact: Mr David Vooght

Customer Job Reference: J11866
Customer Purchase Order: J11866_2
Customer Site Reference: 16 Provost Road (London NW3)
Date Job Received at SAL: 30-Jun-2014
Date Analysis Started: 02-Jul-2014
Date Analysis Completed: 09-Jul-2014

The results reported relate to samples received in the laboratory
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with QP22

UKAS TESTING
1650

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

Report checked
and authorised by :
Miss Claire Brown
Customer Service Manager

Issued by :
Miss Claire Brown
Customer Service Manager

SAL Reference: 405143
Project Site: 16 Provost Road (London NW3)
Customer Reference: J11866

Soil Analysed as Soil
Miscellaneous

				SAL Reference	405143 001	405143 002
				Customer Sample Reference	TP1 @ 0.20m	TP2 @ 0.50m
				Date Sampled	25-JUN-2014	25-JUN-2014
				Type	Topsoil	Topsoil
Determinand	**Method**	**Test Sample**	**LOD**	**Units**		
pH	T7	A40			**10.1**	**7.8**
(Water Soluble) SO4-- expressed as SO4	T242	A40	0.01	g/l	**0.27**	**0.15**
Moisture	T277	AR	0.1	%	**13**	**12**
Moisture @ 105 C	T162	AR	0.1	%	**15**	**15**
Retained on 2mm	T2	A40	0.1	%	<0.1	<0.1

Index to symbols used in 405143-1

Value	Description
A40	Assisted dried < 40C
AR	As Received
M	Analysis is MCERTS accredited
N	Analysis is not UKAS accredited

Notes

Retained on 2mm is removed before analysis

Method Index

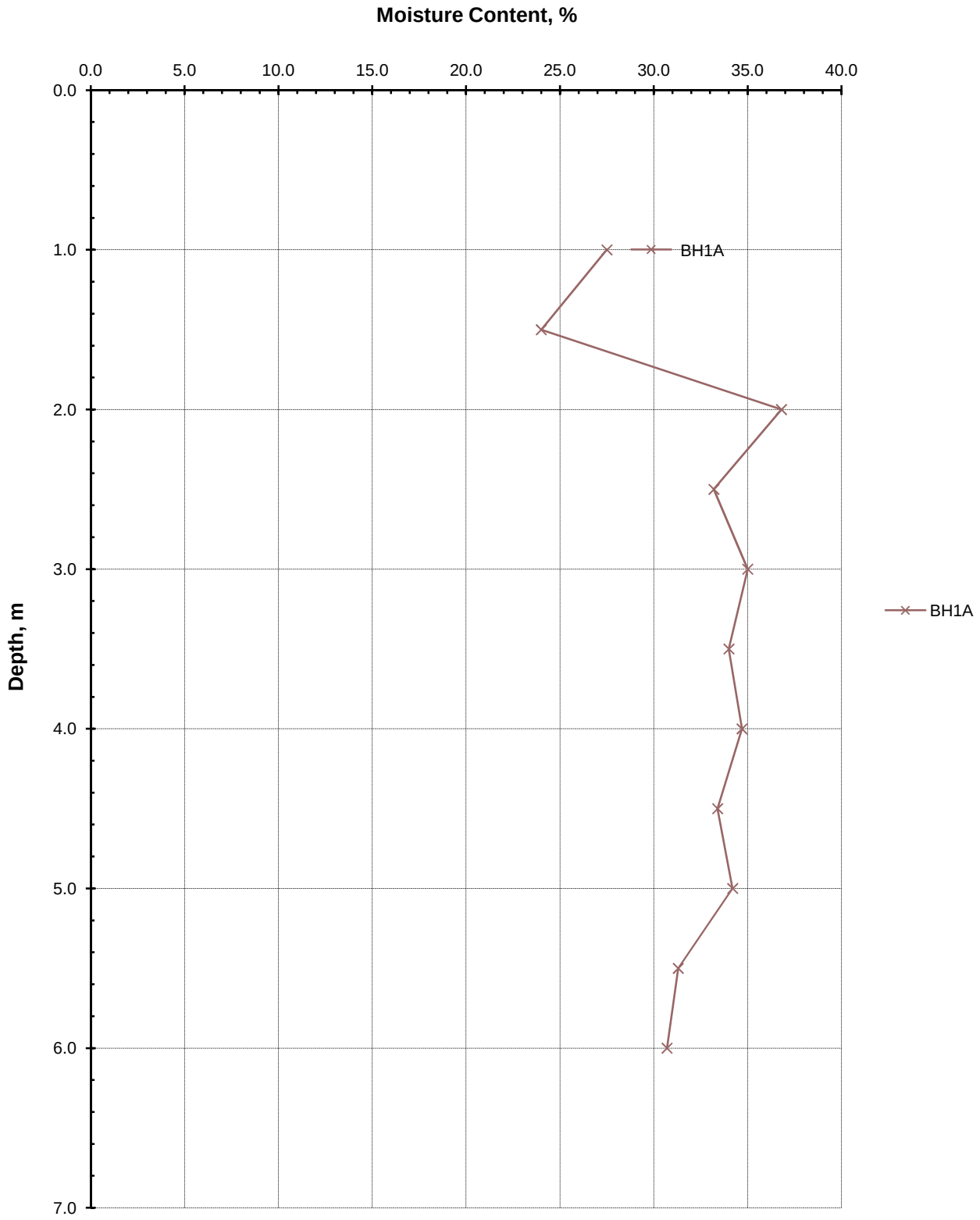
Value	Description
T242	2:1 Extraction/ICP/OES (TRL 447 T1)
T2	Grav
T277	Grav (1 Dec) (40 C)
T162	Grav (1 Dec) (105 C)
T7	Probe

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
pH	T7	A40			M	001-002
(Water Soluble) SO4-- expressed as SO4	T242	A40	0.01	g/l	M	001-002
Moisture	T277	AR	0.1	%	N	001-002
Moisture @ 105 C	T162	AR	0.1	%	N	001-002
Retained on 2mm	T2	A40	0.1	%	N	001-002

Moisture Content *vs* Depth

In Accordance with BS 1377 : Part 2 : 1990 : Clause 3



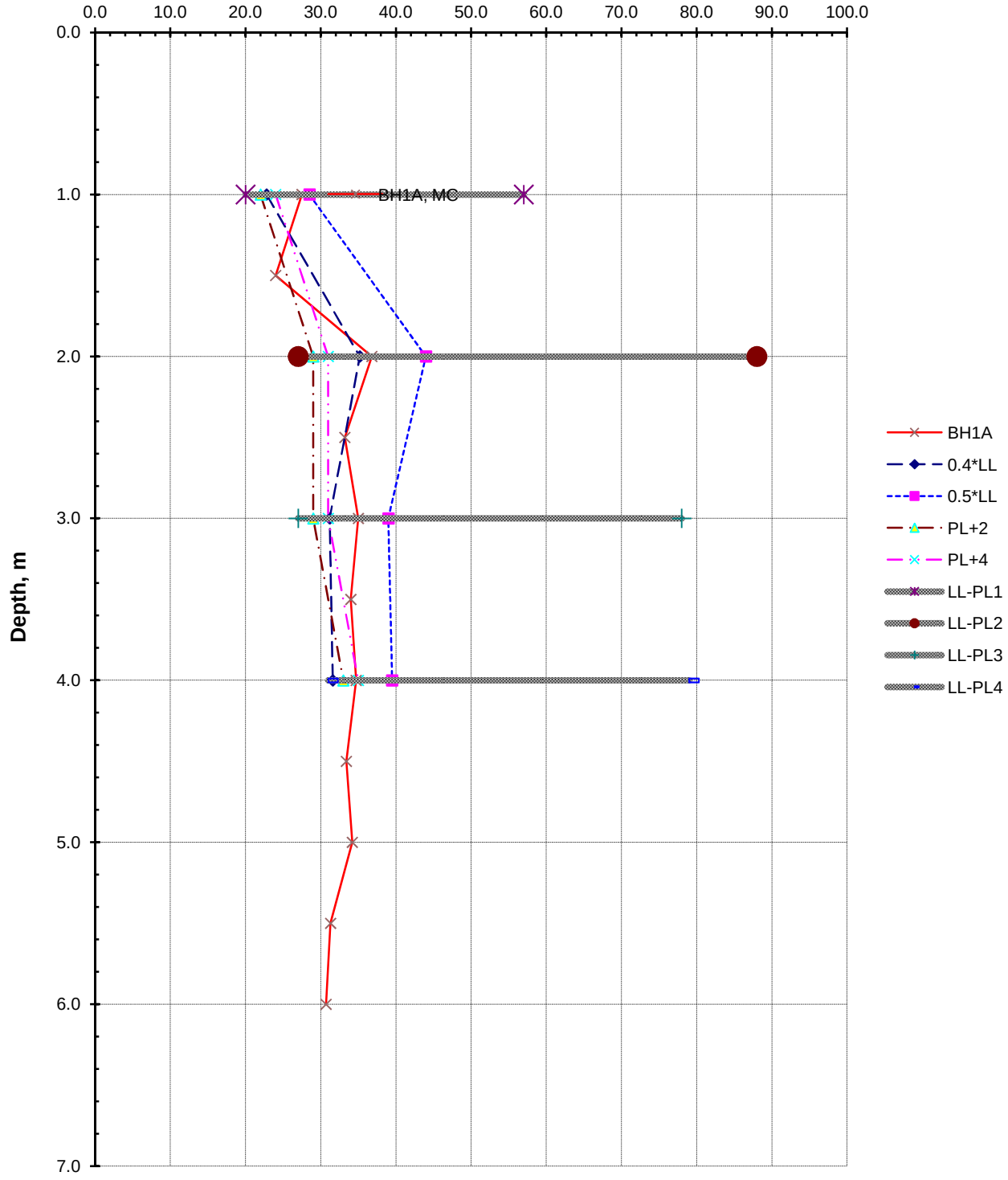
Note:

Client:	**Sam Kirkwod**	**Site:**	**16 Provost Road, London NW3**		
Job No:	J11866	**Date:**	30/06/2014	**Figure:**	MC1

Moisture Content and Atterberg Limit Tests *vs* Depth

In Accordance with BS 1377 : Part 2 : 1990 : Clause 3

Moisture Content, %

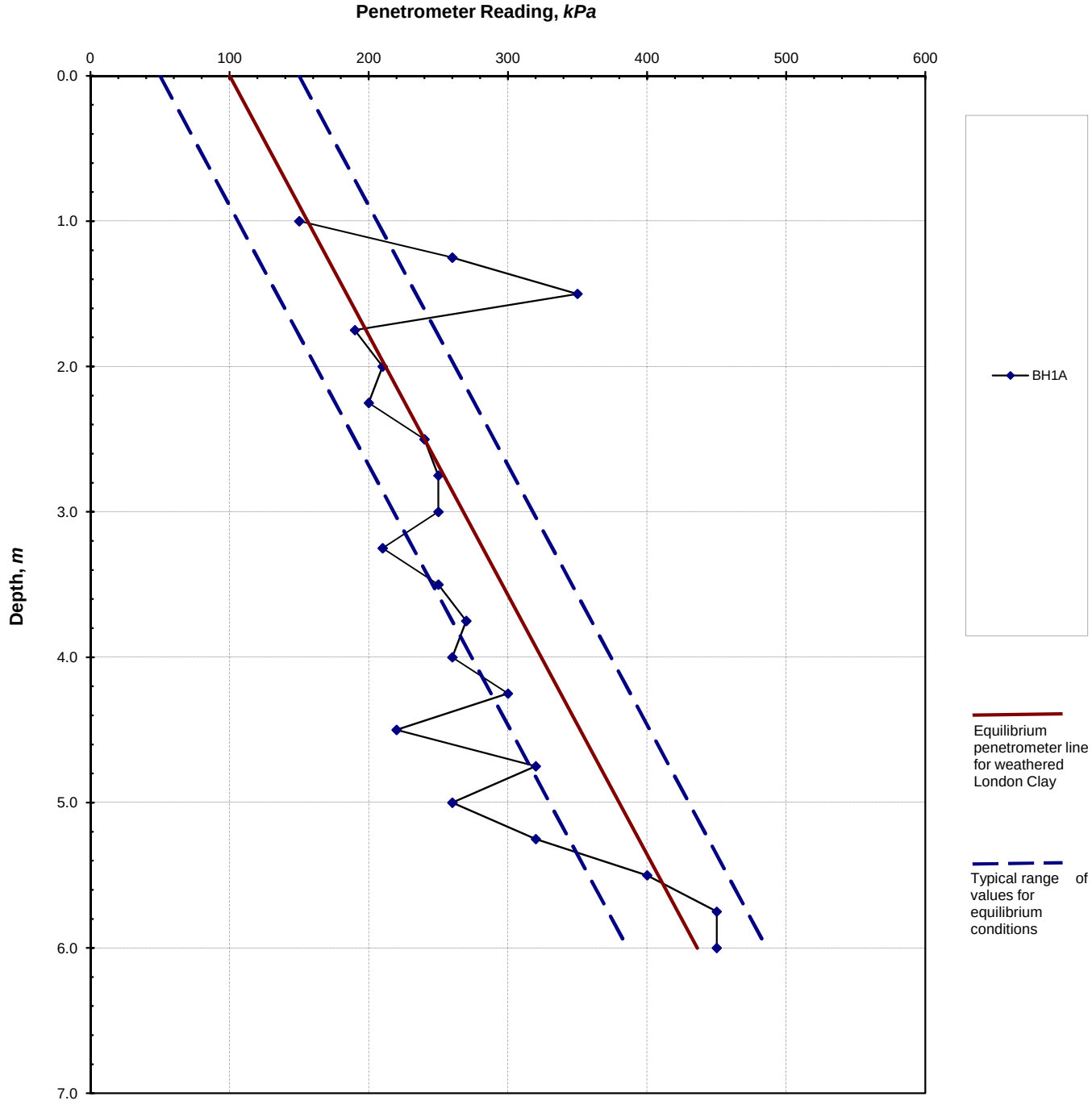


Note:

Client:	**Sam Kirkwod**	**Site:**	**16 Provost Road, London NW3**		
Job No:	J11866	**Date:**	02/07/2014	**Figure:**	MC2

Pocket Penetrometer Reading *vs* Depth

Test Hole Nos: BH1A



** Reference made to "A rapid and reliable on-site method of assessing desiccation in clay soils", by R S Pugh, P G Parnell, and R D Parkes, Proc. Instn Civ. Engrs. Geotech. Engng. 1995, 113 pp. 25-30*

Client:	**Mr Kirkwood**	**Job No:**	J11866		
Site:	**16 Provost Road, London NW3**	**Date:**	28/07/2014	**Fig.**	**HP1**

APPENDIX D

Bomb Map

Colour Key References
(for guidance only)

Black
Total destruction

Purple
Damaged beyond repair

Dark Red
Seriously damaged; doubtful if repairable

Light Red
Seriously damaged, but repairable at cost

Orange
General blast damage – not structural

Yellow
Blast damage, minor in nature

Light Blue
Clearance areas

Light Green
Clearance areas

V1 flying bomb

V2 long range rocket

Site: 16 Provost Road, London Nw3	STL: J11866	Fig No: 2
Date: 29 July 2014	Bomb Map	

Southern Testing

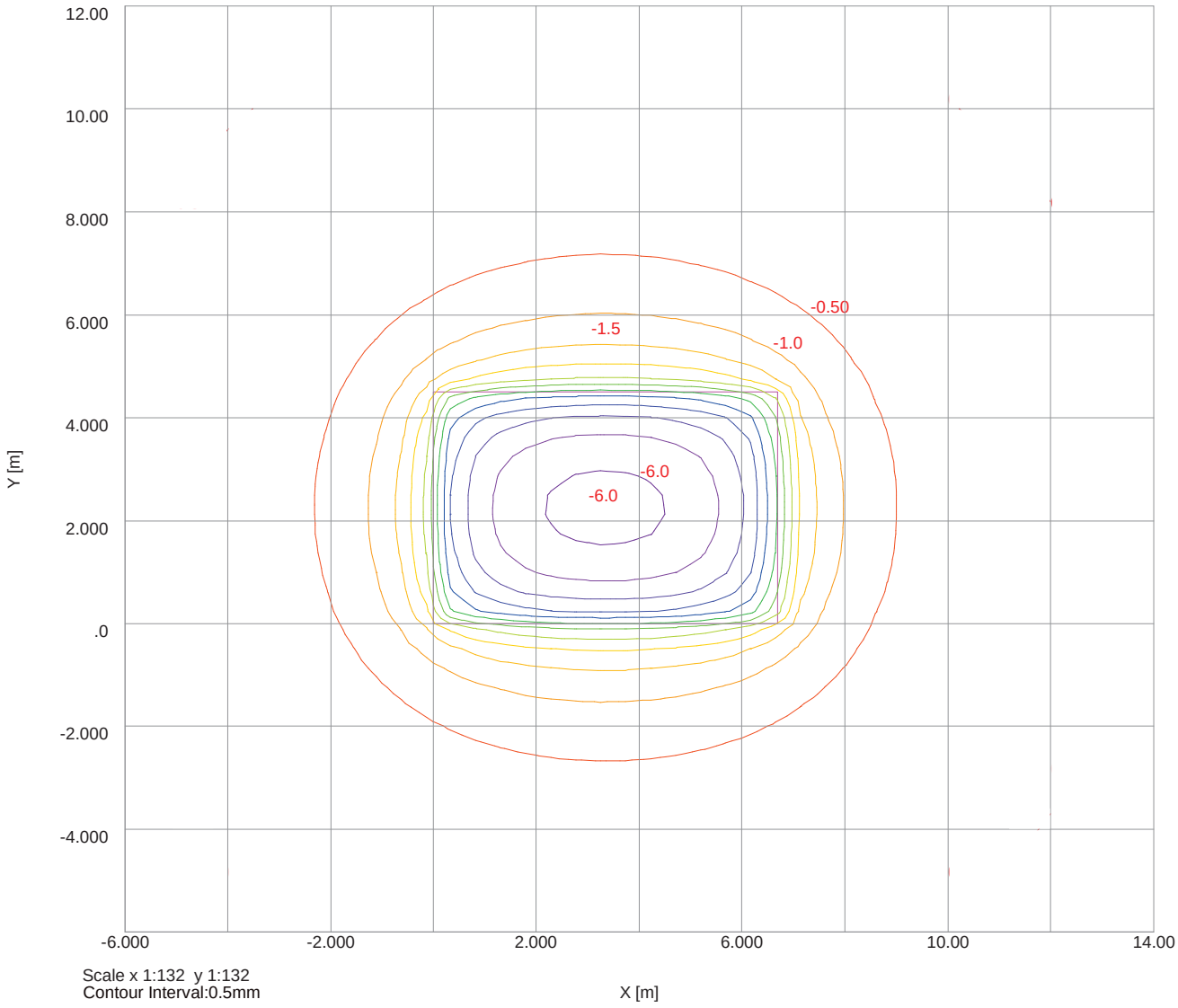
Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

ST Consult

APPENDIX E

PDISP Output for heave displacements

Settlement Contours : Grid 1 at -3.000m



Settlement Contours : Grid 1 at -3.000m