THE STUDIO HOUSE

1 HAMPSTEAD HILL GARDENS, LONDON NW3 2PH

BASEMENT IMPACT ASSESSMENT

FOR

CARMI KORINE

December 2017

Our Ref: HLEI50381/002R

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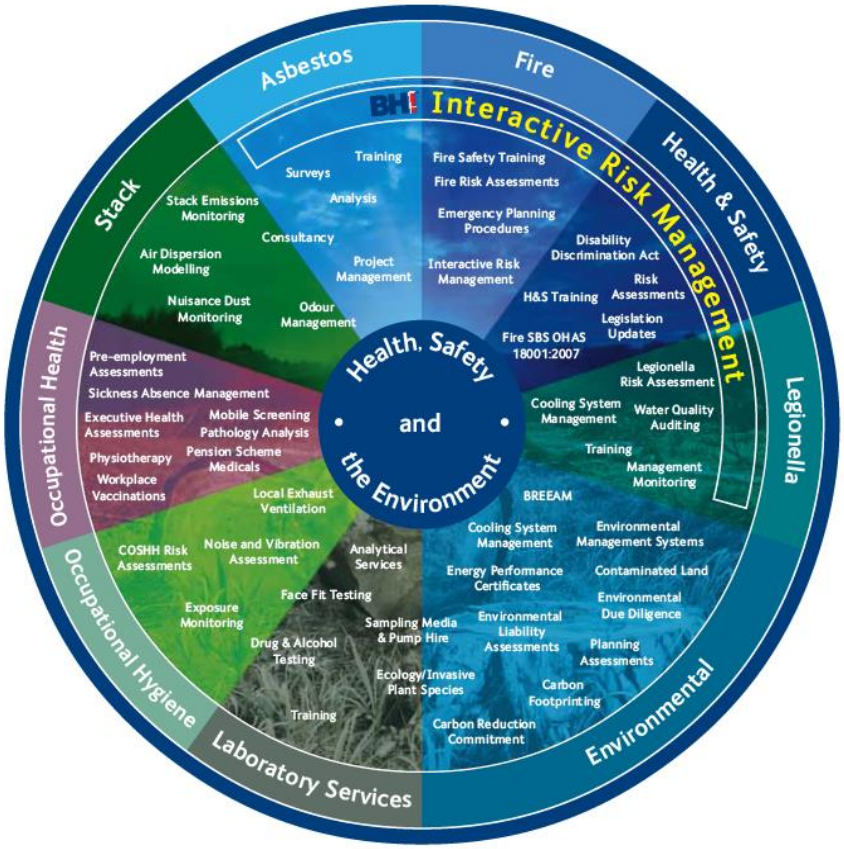

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EXECUTIVE SUMMARY

RPS Health, Safety & Environment (RPS) was commissioned by Carmi Korine to undertake a Geotechnical Site Investigation and subsequent Basement Impact Assessment (BIA) at The Studio House, 1 Hampstead Hill Gardens, London NW3 2PH. The report has been commissioned prior to the proposed development of a single-storey basement beneath the property which is four storeys high.

A Geotechnical Site Investigation, comprising one cable percussion borehole and the installation of a groundwater monitoring well, was undertaken to determine the general ground conditions beneath the site; to enable the assessment of the potential impact of the basement construction to nearby structures and to provide geotechnical parameters for the design of the basement. A hand excavated trial pit was also undertaken adjacent to the southern party wall of the property to determine details of existing foundations.

Topsoil was present from the ground surface at the location of the borehole, underlain by London Clay Formation.

It is understood the proposed basement is to be approximately 4.00m deep. It is proposed to construct a single storey of basement using traditional underpinning methods, whereby excavation takes place in short lengths, which are then infilled with concrete "pins" in order to carry load to competent strata beneath the level of the proposed basement floor slab.

From the available information it is considered that the risk to land stability from this basement excavation and construction is considered to be ***Moderate.***

An assessment of settlement of the ground adjacent to the foundations of the adjoining building was made, based on Figure 2.11 of CIRIA document C580. The assessment indicated that settlement would be in the order of 8mm. As a consequence, of this ground movement, damage to the adjacent building is anticipated to be moderate, in accordance with Table 2.5 of the same document. Cracking in brickwork will likely require patching by a mason. Repointing of external brickwork and/or replacement of small sections of brickwork may also be required (this assumes that the method of basement construction is undertaken in a way to ensure that adequate support is applied to the ground at all times until the basement is completed).

The calculated settlement and associated anticipated damage is based on the assumption that the basement will be excavated along the full face of the existing wall of the building. In reality, this does not occur. However, the basement excavation should take in small sections, or "bays". These will then be infilled with concrete "pins" in order to carry load to competent strata beneath the level of the proposed basement floor slab, thereby minimising the risk of movement and associated cracking. The method of underpinning and basement excavation chosen should seek to restrict movement in the overlying and adjacent structure and thereby minimise potential damage.

A condition survey of the adjacent structure should be completed prior to the proposed excavation works and agreed by all parties. The building should be monitored during and after construction of the basement and a final condition survey undertaken upon completion of the works.

The excavation method chosen should also seek to restrict movement of the adjacent public highway (Hampstead Hill Gardens).

Ground settlement in the vicinity of the Network Rail tunnel, located approximately 15m to the south at is closest point, is anticipated to be negligible. However, Network Rail may require modelling to confirm that the works will not cause instability to their land and structures.

1 INTRODUCTION

1.1 Preamble

RPS Health, Safety & Environment (RPS) was commissioned by Carmi Korine to undertake a Geotechnical Site Investigation and subsequent Basement Impact Assessment (BIA) at The Studio House, 1 Hampstead Hill Gardens, London NW3 2PH.

The report has been commissioned prior to the proposed development of a single-storey basement beneath a two storey apartment, located at 1 Hampstead Hill Gardens, London NW3 2PH. The BIA has been requested to determine the impact of the proposed development on neighbouring structures. Pre-application planning advice provided by the London Borough of Camden (reference 2016/5853/PRE, dated 20th January 2017) recommends that the impact of the proposed basement on neighbouring structures is considered in accordance with document *CPG4: Camden Planning Guidance – Basements and Lightwells.*

1.2 Objectives

The principal objectives of this assessment were as follows:

- Assess the impact of basement construction on neighbouring structures; and
- To determine the engineering properties of the underlying soils and to provide geotechnical parameters to assist preliminary foundation, floor slabs and retaining wall and basement design.

1.3 Legislation and Guidance

This report has been produced in general accordance with:

- *National Planning Policy Framework (2012);*
- *British Standard requirements for the 'protection of below ground structures against water from the ground - Code of Practice' (ref. BS8102: 2009);*
- *British Standard requirements for the 'Investigation of potentially contaminated sites - Code of practice' (ref. BS10175:2011);*
- British Standard requirements for the *'Code of practice for ground investigations' (ref. BS5930:2015)*;
- Camden Planning Guidance, London Borough of Camden, CPG4 Basements and Lightwells (2013);
- CIRIA Report C580, Construction Industry Research and Information Association, Embedded retaining walls – guidance for economic design (2003); and

- CIRIA Report 143, Construction Industry Research and Information Association, The Standard Penetration Test (SPT): Methods and use (1995).

The guidance offered within CPG4: Camden Planning Guidance – Basements and Lightwells has been used as a basis for undertaking the BIA. This document recommends that a BIA comprises the following stages:

- Stage 1 – Screening;
- Stage 2 – Scoping;
- Stage 3 – Site investigation and study;
- Stage 4 – Impact assessment; and
- Stage 5 – Review and decision making.

Details of the limitations of this type of assessment are described in Appendix A.

2 SITE BACKGROUND

2.1 Site Location & Description

The site is located in the London Borough of Camden at National Grid Reference 526950, 185503. A site location plan is provided as Figure 1. The development area currently comprises a two storey apartment at the northern end, which is part of a four storey, six-apartment masonry conversion. A garden and a residential garage are present to the northwest of the apartment building. A site plan, indicating the position of the borehole drilled on site, is presented as Figure 2.

2.2 Proposed Development

It is proposed to construct a single-storey basement beneath the northern portion of the existing two storey apartment, which will extend beneath the existing conservatory on the northern side and beyond the eastern outer wall to form a light well. Proposed ground floor and basement plans for the development are provided as Figure 3 and Appendix E.

2.3 Geology and Hydrogeology

Based on the British Geological Survey (BGS) mapping (1:50,000-scale) and the Environment Agency Groundwater Vulnerability mapping (1:100,000-scale), the stratigraphic sequence and the aquifer classifications beneath the site are as follows:

Table 1 – Stratigraphic Sequence and Aquifer Classification

Strata	Description & approximate thickness	Aquifer Classification
London Clay Formation	Clay and silt. Likely to be of significant thickness beneath the site.	Unproductive Stratum

Made Ground may be present across the site as a result of past construction and demolition activities. No historic site investigation reports have been identified and reviewed to verify this.

EA mapping indicates that the site overlies an Unproductive Stratum, relating to the London Clay Formation. These formations have a low permeability and have negligible significance for water supply or base flow.

According to EA data, the site is not located in a designated groundwater Source Protection Zone (SPZ).

Information provided by the EA indicates that there are no records of any active licensed potable groundwater abstractions within 1km of the site.

The chemical quality of groundwater beneath the site has not been classified under the EA local River Basin Management Plan.

2.4 Hydrology

The site is located within an EA designated Flood Zone 1, whereby the annual risk from flooding from rivers is less than 1 in 1,000. The potential risk from fluvial flooding on site is considered to be negligible.

The nearest surface water body to the site is the Hampstead No.1 Lake, located approximately 425m to the northwest. This is not classified under an EA local River Basin Management Plan. No water bodies classified under an EA local River Basin Management Plan are indicated to be present within 1km of the site.

3 SCREENING (STAGE 1)

The first stage of the BIA is the identification of any matters of concern which should be investigated. This considers three aspects which are:

- Subterranean Groundwater Flow;
- Land Stability; and
- Surface Flow and Flooding.

Flowcharts have been developed for this evaluation and these flowcharts comprise a series of questions. If the response to any question is yes or unknown, the evaluation should advance to Stage 2 of the assessment.

Table 2 - Groundwater Flow Screening

	Question	Response	Comment/Source
1a	Is the site located directly above an aquifer?	No	BGS and EA mapping
1b	Will the proposed basement extend beneath the water table surface	No	BGS and EA mapping
2	Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	No	Site Inspection and OS Mapping
3	Will the proposed basement development result in a change in the proportion of hard surfaced /paved areas?	No	Construction drawings provided by the client
4	As part of the site drainage, will more surface water (rainfall & runoff etc) than at present be discharged to the ground (via soakaway and/or SUDS)?	No	BGS and EA mapping – impermeable ground conditions unsuitable for SUDS
5	Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond or spring line	No	Site Inspection and OS Mapping

Table 3 - Slope Stability Screening

	Question	Response	Comment/Source
1	Does the existing site include slopes, natural or manmade greater than 7^{o}?	No	Site Inspection and OS Mapping
2	Will the proposed re-profiling of landscaping at site change slopes at the boundary to more than 7^{o}?	No	Construction drawings provided by the client
3	Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7^{o}?	No	Site Inspection and OS Mapping
4	Is the site within a wider hillside setting in which the general slope is greater than 7^{o}?	No	Site Inspection and OS Mapping
5	Is the London Clay Formation the shallowest strata at the site?	Yes	BGS Geology of Britain viewer

	Question	Response	Comment/Source
6	Will any trees be felled as part of the proposed development and/or any other works proposed within any tree protection zone where trees are to be retained?	No	Site Inspection and OS Mapping
7	Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	No	No evidence of cracking in local structures
8	Is the site within 100m of a watercourse or a potential spring line?	No	OS mapping
9	Is the site within an area of previously worked ground?	No	BGS mapping
10	Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	No	BGS and EA mapping
11	Is the site within 5m of a highway or pedestrian right of way?	Yes	Site inspection
12	Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	Construction drawings provided by the client
13	Is the site over (or within the exclusion zone of) any tunnels?	Unknown	Basement located approximately 15m from Network Rail tunnel at its closest point.

Table 4 - Surface Flow and Flooding Screening

	Question	Response	Comment/Source
1	As part of the proposed site drainage, will surface water flows be materially changed from the existing route?	No	Proposed basement construction beneath existing building cover.
2	Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	Proposed basement construction beneath existing building cover.
3	Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?	No	Basement to be constructed within impermeable London Clay Formation
4	Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	Basement will be constructed so as not to impact quality of surface water
5	Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment (SFRA) or is it at risk from flooding (such as: because the proposed basement is below the static water level of nearby surface water features)	No	EA Flood map for planning, EA Long term flood risk information, Camden Surface Water Management Plan and SFRA

As the responses to some of the questions include Yes and Unknown it will be necessary for the BIA to proceed to the next Stage.

4 SCOPING (STAGE 2)

4.1 Groundwater Flow

No issues were identified.

4.2 Slope Stability

The following issues were identified:

- Is the London Clay Formation the shallowest strata at the site?

ACTION: An assessment will be required to determine if heave due to unloading of the London Clay Formation will affect the proposed development and/or neighbouring properties.

- Is the site within 5m of a highway or pedestrian right of way?

ACTION: An assessment will be required to determine if the basement has an adverse effect on the stability of the highway and footpath.

- Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?

ACTION: An assessment will be required on the stability of temporary works during excavation of the basement on the stability of foundations to the adjacent building.

- Is the site over (or within the exclusion zone of) any tunnels?

ACTION: Consultation with Networks Rail is required. An assessment will likely be required on the likelihood of ground movement during basement construction to adversely affect the nearby rail tunnel (located approximately 15m to the south of the basement at its nearest point.

4.3 Surface Flow & Flooding

No issues were identified.

5 INTRUSIVE SITE INVESTIGATION (STAGE 3)

5.1 Objectives

The objective of the site investigation was to determine the general ground conditions beneath the site to enable the assessment of the potential impact of the basement construction to nearby structures as well as to provide geotechnical parameters for the basement's design.

5.2 Description of Works

The site investigation was carried out on the 21st July 2017 and comprised the following:

- One cable percussion borehole (BH1) to a depth of approximately 10.00m below ground level (bgl);
- Installation of a groundwater monitoring well in the borehole; and
- Excavation of a hand dug foundation inspection pit adjacent to the southern party wall within the apartment.

The borehole was positioned adjacent to the northern edge of the proposed basement. Its location is presented on Figure 2.

A return visit for groundwater monitoring was carried out on 4th August 2017.

5.3 Laboratory Testing

5.3.1 Geotechnical Laboratory Testing

Samples of the London Clay Formation were submitted to a UKAS accredited geotechnical testing laboratory and analysed for soil classification, total and effective stress parameters, consolidation characteristics, pH and water soluble sulphate content.

6 SITE INVESTIGATION FINDINGS (STAGE 3)

6.1 Ground Conditions

6.1.1 Geology

The strata encountered during the intrusive investigation are summarised in the table below and described in the following section.

Table 5 – Encountered Strata

Strata	Depth to Top of Strata m bgl (m AOD)	Thickness (m)
Topsoil	GL (77.25)	0.40
London Clay Formation	0.40 (76.85)	Not proven to a depth of 10.00m bgl (67.25)

Topsoil was present from the ground surface, underlain by London Clay Formation.

General descriptions of the strata encountered during the intrusive investigations are summarised below. Reference should be made to the borehole log within Appendix B of this report for full descriptions of ground conditions underlying the site.

London Clay Formation

The London Clay Formation was encountered beneath a limited thickness of topsoil at a depth of approximately 0.40m bgl (76.85m AOD). The London Clay Formation was encountered as orange brown and grey mottled slightly silty clay to a depth of approximately 5.90m bgl (71.35m AOD), at which point the stratum comprised dark brown-grey very closely fissured clay to the base of the borehole.

Atterberg Limit testing was undertaken on four soil samples collected from the London Clay Formation at depths ranging from approximately 1.50m to 9.00m bgl (68.25m to 75.75m AOD). This testing was undertaken to determine values for Liquid Limit (LL), Plastic Limit (PL) and Plasticity Index (PI). The results for LL were 71% to 78%. The results for PL were 30% to 32%. The results for PI were 41% to 46%. This is indicative of a very high plasticity clay. Modified plasticity index values indicate that these samples have a high volume change potential. The natural moisture contents of these samples ranged from 34% to 37%.

Four SPT results obtained from within the London Clay Formation at depths ranging from approximately 1.00m bgl to 8.00m bgl (69.25m to 76.25m AOD) gave results ranging from N = 11 to N = 19. SPT results increased with depth. The SPT results correspond approximately to undrained

shear strength values ranging from 50kN/m^2 to 86kN/m^2, which is indicative of a medium, ranging to a high strength cohesive material.

Two quick undrained triaxial compression tests undertaken on samples collected from the London Clay Formation at depths of approximately 6.50m and 9.50m bgl (67.75m and 70.75m AOD) gave results of 77kN/m^2 and 168kN/m^2. This is indicative of a high strength material. The results of triaxial tests were higher than those derived from SPT's. The natural moisture contents of the samples were 29%. Bulk density was 1.89Mg/m^3 and 1.91Mg/m^3. Dry density was 1.46Mg/m^3 and 1.48Mg/m^3.

One consolidated Undrained Triaxial test was undertaken on a sample collected from the London Clay Formation at a depth of approximately 2.00m bgl (75.25m AOD), giving a result of 11.2kN/m^2 for effective cohesion. The natural moisture content of this sample was 29%.

One oedometer consolidation test was undertaken on a sample collected from the London Clay Formation at a depth of approximately 4.00m bgl (73.25m AOD). Between a pressure range of 100kN/m^2 to 200kN/m^2, a coefficient of compression (m_v) value of 0.187m^2/MN was obtained. This is indicative of a medium compressibility material.

6.2 Groundwater

Groundwater was not encountered during intrusive works. Groundwater was encountered at approximately 1.97m bgl (75.28m AOD) during a subsequent monitoring visit to site on 4th August 2017. It is considered that this is representative of perched water within sandy horizons or claystone bands in the London Clay Formation.

7 GEOTECHNICAL ANALYSIS (STAGE 3)

7.1 Introduction

It is proposed to construct a single-storey of basement beneath the existing two storey apartment. Proposed ground floor and basement plans for the development are provided as Figure 3.

No preliminary structural loads for the proposed development have been received. Therefore, the preliminary recommendations below will need to be reviewed in light of subsequent detailed design.

7.2 Preliminary Geotechnical Risk Register

The table below summarises the potential geotechnical hazards associated with the development. The table provides an assessment of whether the site is likely to be affected by the hazard and the possible consequences and engineering considerations.

Table 6 – Geotechnical Risk Register

Hazard Description	Is hazard likely to be present / affect the site? (H / M / L / NA?)	Comments / possible engineering requirements where hazard present
Sudden lateral / vertical changes in ground conditions	L	The ground conditions encountered within the borehole comprised a limited thickness of topsoil overlying the London Clay Formation. The main variations in ground conditions (if present) are likely to be associated with the depth of weathering within the London Clay Formation It is understood that the proposed building foundations and basement slab will bear upon the London Clay Formation at a depth of approximately 4.00m bgl.
Highly compressible / low bearing capacity soils, (including peat and soft clay)	L	It is understood that the proposed building foundations and basement slab will bear upon the London Clay Formation. Laboratory analysis indicates that this stratum is of medium compressibility and is considered to be a suitable bearing layer to support the foundations and basement slab of the proposed development.
Ground dissolution features / natural cavities	L	Ground conditions beneath the site are not consistent with this feature.
Shrinking and swelling clays	M/H	Heave within the clay is possible due to the removal of overburden as part of the basement excavation. Analysis using SigmaW software indicates that up to 21mm of heave may be expected as a result of the overburden removal. This is likely to have substantially completed during the construction stage, prior to casting the basement slab. However, it would be prudent to allow for heave protection, such as clay board, beneath the slab to mitigate against any residual pressure remaining following its construction.

Hazard Description	Is hazard likely to be present / affect the site? (H / M / L / NA?)	Comments / possible engineering requirements where hazard present
Slope stability/retaining wall issues	L	Whilst no significant slopes are present on site, any temporary or permanent slopes created as part of the development, including retaining structures, should be subject to appropriate geotechnical design based on site-specific site investigation information.
High groundwater table (including waterlogged ground)	L/M	Groundwater was encountered at approximately 1.97m bgl (75.28m AOD) during a subsequent monitoring visit to site. It is considered that this is representative of perched water within sandy horizons or claystone bands in the London Clay Formation. Groundwater control measures, such as pumping from a localised sump may therefore be necessary during the basement excavation.
Filled and Made Ground (including embankments)	L	Made Ground was not encountered during intrusive works. A limited thickness of topsoil (0.40m) was encountered, directly overlying the London Clay Formation.
Obstructions (including foundations, services, basements, tunnels and adjacent sub-structures)	M	The proposed basement is to be constructed beneath an existing building. Any relic foundations or services encountered during excavation will likely require removal using hand held tools. This should be taken into account and programmed for.
Underground mining	L	The ground conditions encountered are not consistent with this hazard.
Concrete classification	M	Testing indicates that a Design Sulphate Class of DS-3 and an Aggressive Chemical Environment for Concrete (ACEC) Classification of AC3 would be appropriate for buried concrete structures beneath the site.
Seismic Activity	L	The Eurocode 8 seismic hazard zoning maps for the UK (Musson and Sargeant, 2007) indicate that horizontal Peak Ground Acceleration (PGA) values with 10% probability of being exceeded in 50 years (475 year return period) are between 0.00g and 0.02g, which is considered very low.

7.3 Existing Foundations

An inspection pit was excavated adjacent to the internal party wall of the apartment in order to expose detail of existing foundations beneath the building. Details of exposed foundations are summarised in the table below:

Table 7 – Details of Existing Foundations

Trial Pit ID	Location	Foundation Construction	Step Out from Wall of Structure (m)	Depth of Underside of Foundation (m below existing floor level)	Notes
TP1	Adjacent to southern party wall of apartment	Stepped brick	0.08	0.42	Founded on the London Clay Formation.

The exposed foundation beneath the building appeared to comprise a shallow stepped concrete strip footing, bearing upon the London Clay Formation. The hand pit record is presented within Appendix B of this report.

7.4 Foundation Solutions

7.4.1 Underpinning

It is understood that it is proposed to construct a single storey of basement using traditional basement and underpinning methods, whereby existing stepped shallow foundations (which appear to bear within the London Clay Formation below the level of the existing ground floor) are deepened by excavating beneath and infilling with concrete “pins” in order to carry load to competent strata beneath the level of the proposed basement floor slab. The sequence of excavation and underpinning of existing foundations should be agreed with the contractor undertaking the works to avoid undermining the structure above.

Based on site investigation data, the London Clay Formation present at the proposed foundation bearing level (at approximately 4.00m bgl), is likely to provide a suitable bearing stratum for foundations, providing the bearing layer is at least medium strength. Based on SPT data allowable bearing pressures of up to 100kN/m^2 are likely to be achievable. However, this assumes that the stratum is at least medium strength cohesive material at formation level. The formation should be inspected by the site engineer. If soft deposits are encountered, the founding depth must be taken deeper, into competent material.

A limited degree of differential movement should be anticipated and allowed for when undertaking the structural design of the foundations.

The excavation of up to approximately 4.00m of soil from ground level relieves the soil at foundation level of approximately 80kN/m². The proposed building loads are considered unlikely to exceed this and are therefore unlikely to cause instability with respect to bearing capacity or settlement.

7.5 Basement

It is understood the proposed basement is to be approximately 4.00m deep. The method of wall construction for the basement is likely to be by excavating beneath existing foundations and creating concrete ‘pins’ in sequence. A wall within the basement is required to support the northern outside wall to the building above.

The following soil profile is considered appropriate for the calculation of earth pressures and design of the basement wall:

Table 8 – Soil Profile from Ground Level

Stratum	Depth m bgl (m AOD)	Bulk Density (kN/m^3)	Cu(kN/m^2)	Φ(º)	C' (kN/m^2)	Φ'(º)
London Clay Formation	Existing ground level to a maximum proven depth of 10.00 (67.25 to 77.25)	20	50 at ground level, increasing linearly to 85 at 10.00m bgl	0**	0*	11**

* Conservative assumption.
** Moderately conservative value, based on *in situ* and/or laboratory testing.

It should be noted that the actual coefficient of earth pressure used for design should reflect the form of construction employed and any temporary works required.

7.6 Floor Slabs

Based on exploratory holes completed on site, the basement floor slab formation layer (at a depth of approximately 4.00m bgl) will comprise the London Clay Formation. On this basis, it is considered that a ground bearing floor slab will be suitable for the proposed development.

Dependant on the rate of the excavation to expose the basement floor formation level, some heave in the London Clay Formation may be experienced. The depth of excavation in to the London Clay Formation is approximately 4.00m bgl. The removal of this soil would result in an unloading of approximately 80kPa at the underside level of the basement and induce heaving. Analysis using SigmaW software indicates that up to 21mm of heave may be expected as a result of the overburden removal. It is considered likely that much of this heave will have dissipated prior to the construction of the basement floor slab.

It would be prudent to allow for heave protection, such as clay board, beneath the floor slab to mitigate against any residual pressure and longer term movements remaining following construction of the basement.

7.7 Chemical Attack on Buried Concrete

Three samples from the London Clay Formation were tested for pH and for sulphate content. The results are presented below:

Table 9 – Results of pH and sulphate testing

Sample m bgl (m AOD)	Stratum	pH	Sulphate (mg/kg)	Design Sulphate Class	ACEC Class
0.50 (76.75)	London Clay Formation	7.8	80	DS1	AC1
2.50 (74.75)	London Clay Formation	7.5	2600	DS3	AC3
4.50 (72.75)	London Clay Formation	7.6	2000	DS3	AC3

The data was used to assess appropriate concrete classification for buried concrete in accordance with BRE Special Digest 1, based on the following assumptions:

- Brownfield ground conditions;
- Mobile groundwater conditions; and
- For a dataset of one to four samples, the characteristic value for soluble sulphate has been taken as the highest of the results, while the characteristic value for pH is taken as the lowest of pH results. The characteristic values for the London Clay Formation are taken as 2,600mg/l for soluble sulphate and 7.65 for pH value.

Based on the above, it is considered that a Design Sulphate Class of DS-3 and an Aggressive Chemical Environment for Concrete (ACEC) Classification of AC3 would be appropriate for all buried concrete structures.

7.8 Temporary Works and Excavation

The proposed basement is to be constructed beneath part of an existing building. Any relic foundations or services encountered during excavation will likely require removal using hand held tools. This should be taken into account and programmed for.

Groundwater was encountered at approximately 1.97m bgl (75.28m AOD) during a subsequent monitoring visit to site. It is considered that this is representative of perched water within sandy horizons or claystone bands in the London Clay Formation. Groundwater control measures, such as pumping from a localised sump may therefore be necessary during the basement excavation.

If perched groundwater is encountered during excavation, degradation of the formation may occur. The formation should therefore be adequately protected from seepages and protected from adverse weather conditions, if exposed at any time. If the formation layer becomes wet resulting in softening of the surface materials, then excavation may have to be taken deeper in order to find a suitable bearing layer. Suitable shoring measures may be required for any excavations greater than 1.20m bgl, required for services. All temporary excavations should be undertaken in accordance with CIRIA Report 97 – Trenching Practice.

Groundwater levels are likely to vary seasonally. Additional groundwater monitoring is recommended prior to construction.

8 IMPACT ASSESSMENT (STAGE 4)

8.1 Shrinking & Swelling Clays

Testing of the London Clay Formation shows that it has a plasticity index of up to 46% and would be classified as a clay with a high volume change potential. There are no trees of significant height within their zone of influence around the basement that could result in seasonal shrink/swell as a result of water extraction by the tree roots. No high or intermediate water demand trees should be planted within the vicinity of the basement.

8.2 Heave of Underlying Soils

Some heave in the London Clay Formation may be experienced as a result of the proposed excavation works. The depth of basement in to the London Clay Formation is approximately 4.00m, which would result in an unloading of up to 80kPa at the underside level of the basement. Analysis using SigmaW software along sections “AA” and “CC” (see Appendix E) indicates that up to 21mm of heave may be expected as a result of the overburden removal. It is likely that much of this heave pressure will have dissipated prior to the construction of the basement floor slab. However, it may be prudent to allow for heave protection beneath the slab to mitigate against any residual pressure remaining following its construction.

Foundation bearing pressures have not been provided at the time of this assessment. However, it is considered likely that they will be large enough to resist any uplift pressure due to the unloading of the London Clay Formation beneath. If loads are to be significantly smaller than the estimated 70kN/m^2 of uplift pressure, it may be prudent to allow for heave protection beneath the foundations.

8.3 Adjacent Pedestrian Right of Way & Utilities

The eastern wall of the basement will be adjacent to the pedestrian pathway of Hampstead Hill Gardens. The method of basement construction must be undertaken in a way to ensure that adequate support is applied to the ground beneath the pathway at all times until completion of the basement.

8.4 Adjacent Property

The excavation and construction of the basement has the potential to cause some movement in the ground around the excavation void. The extent of movement will be dependent on the rigidity of temporary support applied to the face of the basement excavation. The southern wall of the basement is to be positioned close to the party wall of the adjacent apartment, which is also part of 1 Hampstead Hill Gardens.

An assessment of settlement of the ground adjacent to the foundations of the adjoining building was made, based on Figure 2.11 of CIRIA document C580. The assessment indicated that settlement would be in the order of 8mm. As a consequence, of this ground movement, damage to the adjacent building is anticipated to be moderate, in accordance with Table 2.5 of the same document (and provided as Appendix D).

Cracking in brickwork will likely require patching by a mason. Repointing of external brickwork and/or replacement of small sections of brickwork may also be required (this assumes that the method of basement construction is undertaken in a way to ensure that adequate support is applied to the ground at all times until the basement is completed).

The calculated settlement and associated anticipated damage is based on the assumption that the basement will be excavated along the full face of the existing wall of the building. In reality, this does not occur. However, the basement excavation should take in small sections, or “bays”. These will then be infilled with concrete “pins” in order to carry load to competent strata beneath the level of the proposed basement floor slab, thereby minimising the risk of movement and associated cracking. The method of underpinning and basement excavation chosen should seek to restrict movement in the overlying and adjacent structure and thereby minimise potential damage.

A condition survey of the adjacent structure should be completed prior to the proposed excavation works and agreed by all parties. The building should be monitored during and after construction of the basement and a final condition survey undertaken upon completion of the works.

Ground settlement in the vicinity of the Network Rail tunnel, located approximately 15m to the south at is closest point, is anticipated to be negligible. However, Network Rail may require modelling to confirm that the works will not cause instability to their land and structures.

9 CONCLUSIONS AND RECOMMENDATIONS

From the available information it is considered that the risk to land stability from this basement excavation and construction is considered to be **Moderate.**

An assessment of settlement of the ground adjacent to the foundations of the adjoining building was made, based on Figure 2.11 of CIRIA document C580. The assessment indicated that settlement would be in the order of 8mm. As a consequence, of this ground movement, damage to the adjacent building is anticipated to be moderate, in accordance with Table 2.5 of the same document. Cracking in brickwork will likely require patching by a mason. Repointing of external brickwork and/or replacement of small sections of brickwork may also be required (this assumes that the method of basement construction is undertaken in a way to ensure that adequate support is applied to the ground at all times until the basement is completed).

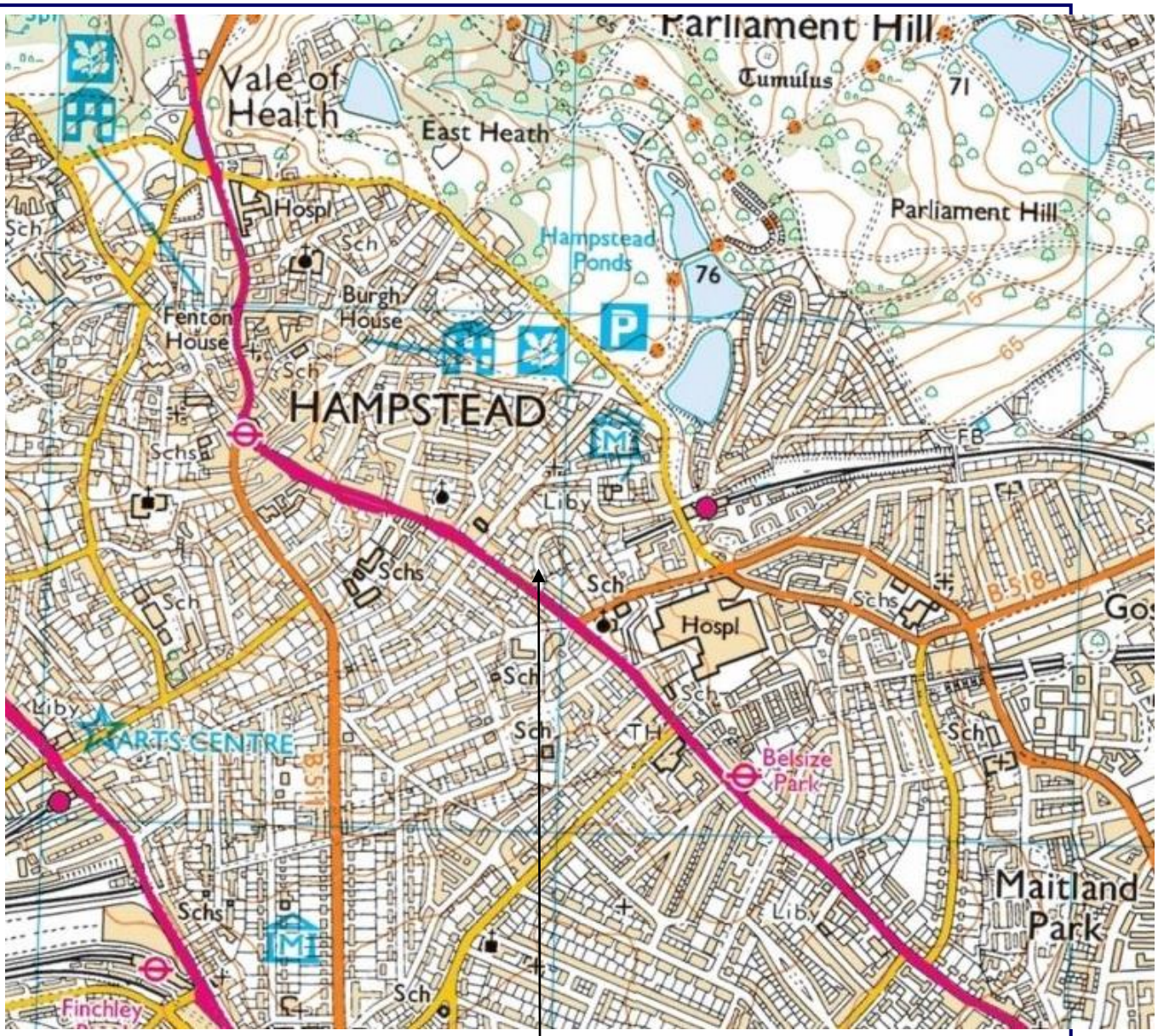
The calculated settlement and associated anticipated damage is based on the assumption that the basement will be excavated along the full face of the existing wall of the building. In reality, this does not occur. However, the basement excavation should take in small sections, or “bays”. These will then be infilled with concrete “pins” in order to carry load to competent strata beneath the level of the proposed basement floor slab, thereby minimising the risk of movement and associated cracking. The method of underpinning and basement excavation chosen should seek to restrict movement in the overlying and adjacent structure and thereby minimise potential damage.

A condition survey of the adjacent structure should be completed prior to the proposed excavation works and agreed by all parties. The building should be monitored during and after construction of the basement and a final condition survey undertaken upon completion of the works.

The excavation method chosen should also seek to restrict movement of the adjacent public highway (Hampstead Hill Gardens).

Ground settlement in the vicinity of the Network Rail tunnel, located approximately 15m to the south at is closest point, is anticipated to be negligible. However, Network Rail may require modelling to confirm that the works will not cause instability to their land and structures.

FIGURES



Site Location

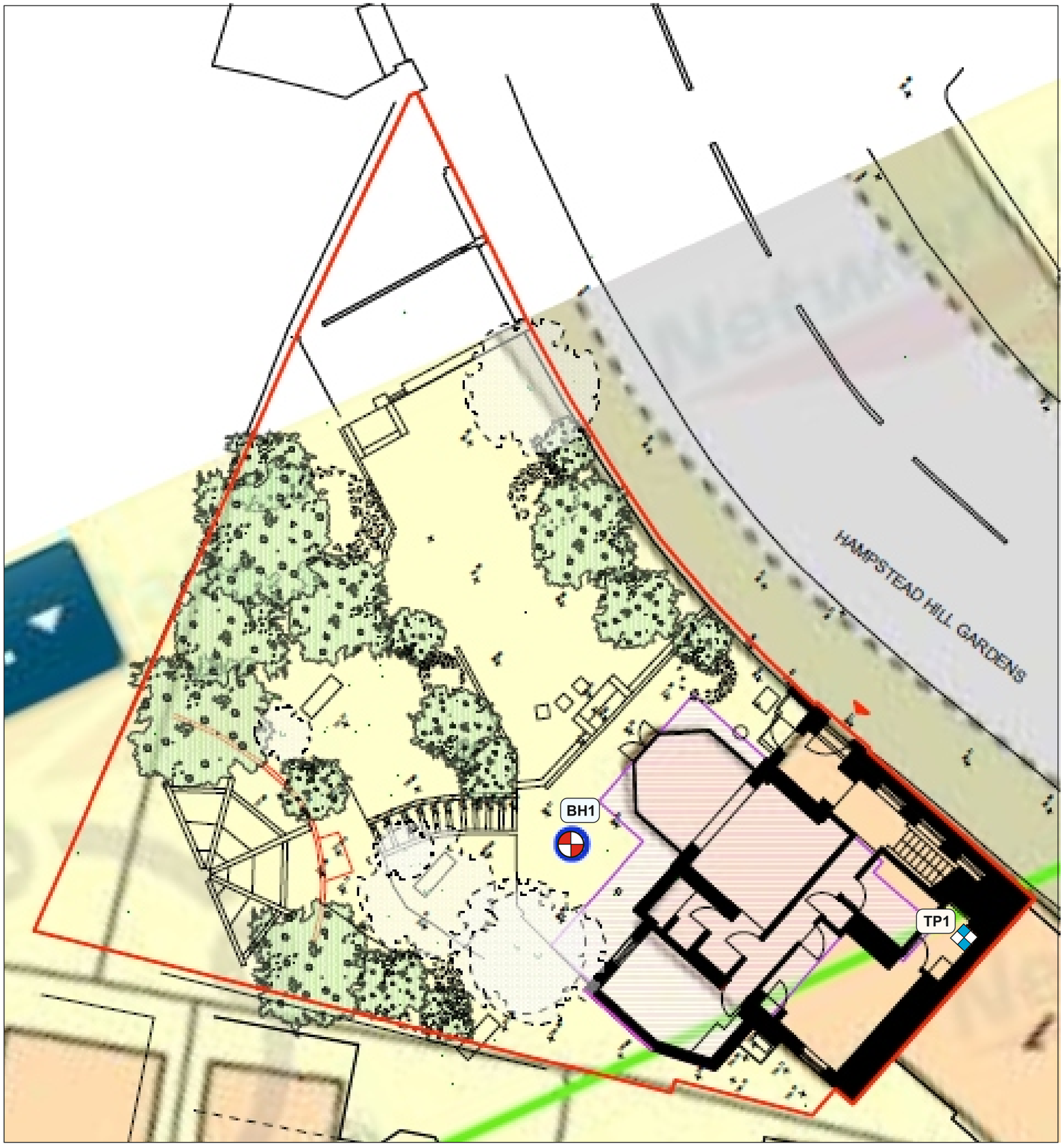
Figure 1: Site Location Plan

Map Date: Current

Scale: Not to scale

RPS
35 New Bridge Street
London
EC4V 6BW

☎ 020-7280-3240
www.rpsgroup.com



N

Legend

- Cable Percussive Borehole
- Hand Dug Foundation Pit
- Site Boundary

RPS
35 New Bridge Street,
London EC4V 6BW
T 020 7280 3240
F 020 7283 9248
W www.rpsgroup.com

Client: MR CARMI KORINE

Project: HAMPSTEAD HILL GARDENS

Title: EXPLORATORY HOLE LOCATION PLAN

Job Ref:	Scale:	Date:
HLEI50381	NTS	Aug 2017

Figure Number: 2 Rev: 1

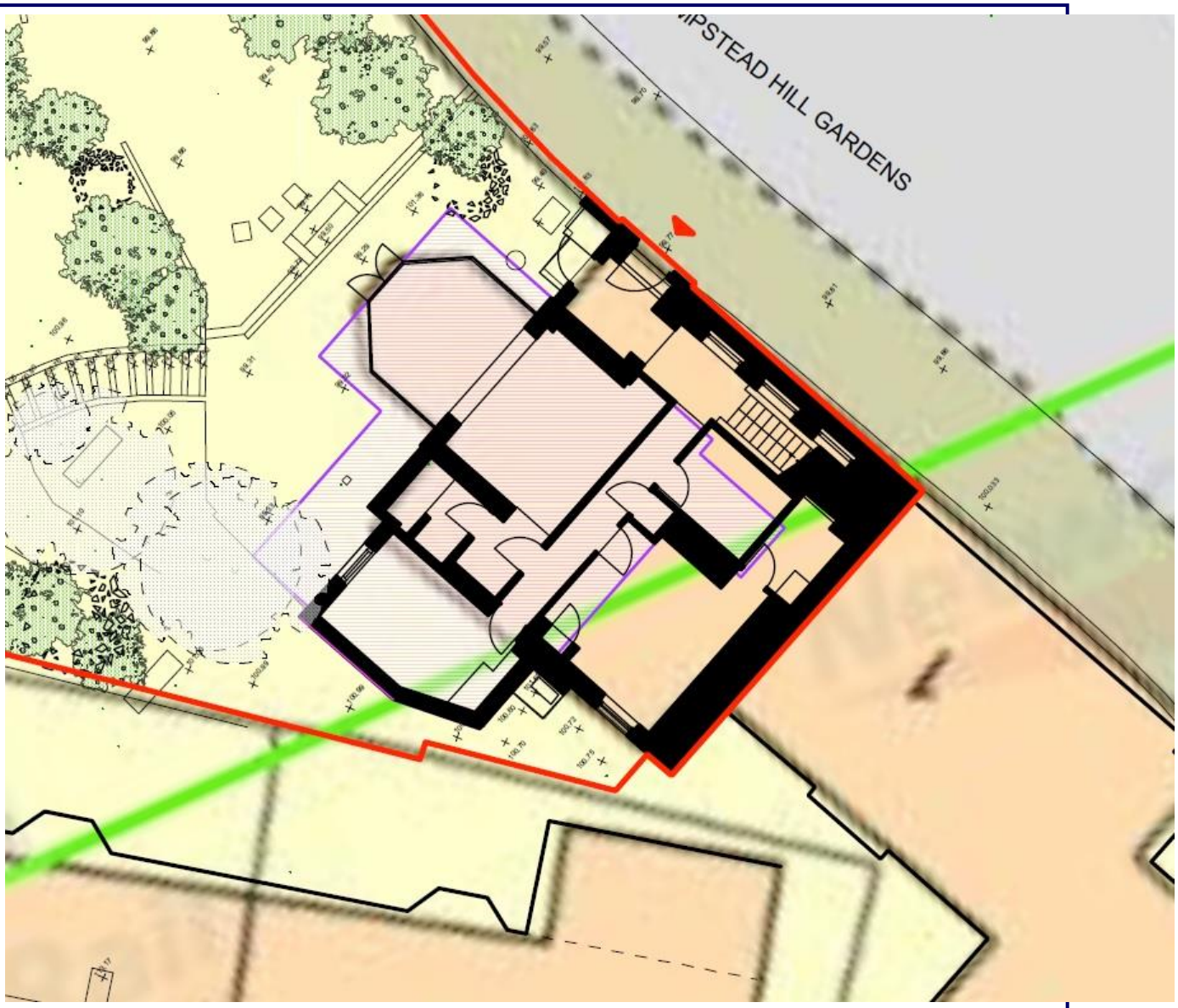


Figure 3: Proposed Development Plan

Scale: Not to scale

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APPENDIX A

General Notes

RPS HEALTH, SAFETY & ENVIRONMENT

Phase 2 – Site Investigations

General Notes

1. The assessments made in this report are based on the ground conditions as revealed by intrusive investigations, together with the results of any field or laboratory testing undertaken

2. There may be special conditions appertaining to the site which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.

3. Where any data supplied by the Client or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by RPS Companies for inaccuracies within the data supplied by other parties.

4. Whilst the report may express an opinion on possible ground conditions between or beyond borehole location, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy thereof.

5. Comments on groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. Groundwater conditions may vary due to seasonal or other effects.

6. This report is prepared and written in the context of the agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a re-interpretation of the report in whole or part after its original submission.

7. The copyright in the written materials shall remain the property of the RPS Company but with a royalty-free perpetual licence to the client deemed to be granted on payment in full to the RPS Company by the client of the outstanding amounts.

8. The report is provided for sole use by the Client and is confidential to them and their professional advisors. No responsibility whatsoever for the contents of the report will be accepted to any person other than the Client.

9. These terms apply in addition to the RPS Group "Standard Terms of Business" (or in addition to another written contract which may be in place instead thereof) unless specifically agreed in writing. (In the event of a conflict between these terms and the said Standard Terms of Business the said Standard Terms of Business shall prevail). In the absence of such a written contract the Standard Terms of Business will apply.

APPENDIX B

Borehole Log

BOREHOLE LOG

Borehole No. **BH1**

Sheet 1 of 3

Project Name:	Hampstead Hill Gardens	Co-ordinates:		Date(s): 21/07/2017		Final Depth:
Project No:	HLEI50381	Easting:	526939	Drilling Method:	Pipe Diameter: 50mm	10.00m
Location:	Hampstead	Northing:	185506	Cable Percussive Drill Rig	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Mr Carmi Korine	Ground Level (mAOD):	77.25	Logged By: LF		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.40)	77.25		Brown slightly gravelly silty fine SAND. Gravel is angular to subrounded fine to medium of flint. Rare wood fragments (10x12mm) (TOPSOIL)	
		0.50	D		0.40		76.85		Firm brown mottled orangish brown and grey occasionally slightly silty CLAY. (LONDON CLAY FORMATION)	
		1.00	SPT(S)	N=11 (1,1/2,3,3,3)						1
		1.45 1.50	SPTLS D			(2.10)				2
		2.45 2.50	U D	Blows=42	2.50		74.75		Firm brown mottled orangish brown silty CLAY with occasional selenite crystals (3x1.5mm). (LONDON CLAY FORMATION)	
		3.00	SPT(S)	N=14 (1,1/3,3,4,4)						3
		3.45 3.50	SPTLS D			(3.40)				
		4.00	U	Blows=40						4
		4.50	D							
W		5.00	SPT(S)	N=16 (2,3/4,4,4,4)					Continued on next sheet	5

Remarks:
Hand dug inspection pit from ground level to 1.20m bgl. Cable percussion drilling from 1.20 to 10.00m bgl. No groundwater encountered.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)

AGS

BOREHOLE LOG

Borehole No. **BH1**

Sheet 2 of 3

Project Name:	Hampstead Hill Gardens	Co-ordinates:		Date(s): 21/07/2017		Final Depth:
Project No:	HLEI50381	Easting:	526939	Drilling Method:	Pipe Diameter: 50mm	10.00m
Location:	Hampstead	Northing:	185506	Cable Percussive Drill Rig	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Mr Carmi Korine	Ground Level (mAOD):	77.25	Logged By: LF		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		5.45	SPTLS							
		5.90	D		5.90		71.35		Stiff dark brownish grey fissured CLAY. Fissures are very closely to closely spaced randomly orientated, incipient. (LONDON CLAY FORMATION)	6
		6.95	U	Blows=45						
		7.00	D						*At 7.00m bgl: 1no. angular coarse gravel of pyritised mudstone.*	7
		8.00	SPT(S)	N=19 (3,4/4,4,5,6)		(4.10)				8
		8.45	SPTLS							
		9.00	D							9
		9.45 - 9.50	U	Blows=45						
		10.00	D						Continued on next sheet	10

Remarks:
Hand dug inspection pit from ground level to 1.20m bgl. Cable percussion drilling from 1.20 to 10.00m bgl. No groundwater encountered.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)

BOREHOLE LOG

Borehole No. **BH1**

Sheet 3 of 3

Project Name:	Hampstead Hill Gardens	Co-ordinates:		Date(s): 21/07/2017		Final Depth:
Project No:	HLEI50381	Easting:	526939	Drilling Method:	Pipe Diameter: 50mm	10.00m
Location:	Hampstead	Northing:	185506	Cable Percussive Drill Rig	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Mr Carmi Korine	Ground Level (mAOD):	77.25	Logged By: LF		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
									Terminated at design depth. End of Borehole at 10.00m	11 12 13 14 15

Remarks:
Hand dug inspection pit from ground level to 1.20m bgl. Cable percussion drilling from 1.20 to 10.00m bgl. No groundwater encountered.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)

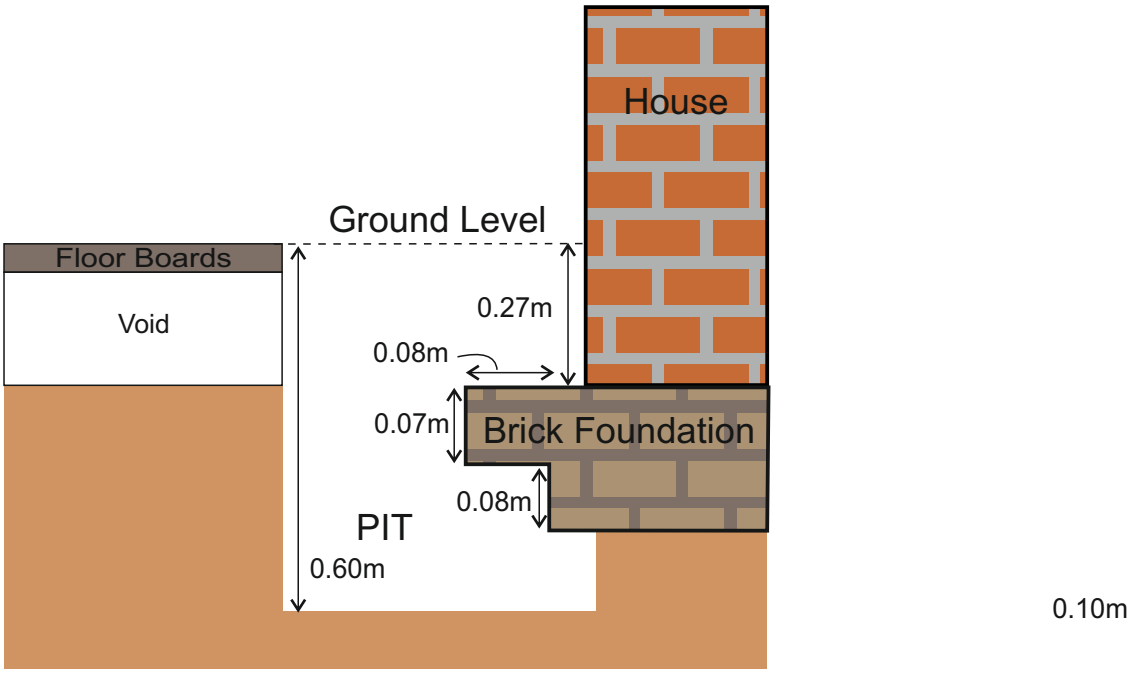
RPS Health, Safety & Environment
35 New Bridge Street
EC4V 6BW
Tel: 0207 280 3240

HAND PIT LOG

Hand Pit No.
TP1

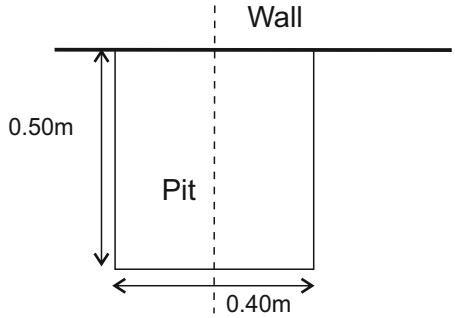
NOT TO SCALE

Project Name: Hampstead Hill Gardens	Project No. HLEI50381	Date:21/07/2017	Logged by: LF
Client: Mr Carmi Korine	Location: Hampstead	Method: Hand Dug	Checked by: RP



Line of section

Pit Dimensions:



Line of section

Soil Profile:

Depth(m bgl):	Description of Strata
0.0 - 0.05	Floor boards
0.05 - 0.27	Void
0.27 - 0.55	Reddish brown slightly clayey sandy angular to subrounded fine to coarse GRAVEL of concrete, flint and brick. Sand is fine to coarse. (MADE GROUND)
0.55 - 0.60	Brown slightly sandy slightly silty CLAY. Sand is fine. (LONDON CLAY FORMATION)

Photograph:

APPENDIX C

Geotechnical Laboratory Certificates

LABORATORY REPORT

4043

Contract Number: PSL17/3576

Report Date: 02 August 2017

Client's Reference: HLEI50381

Client Name: RPS Health, Safety and Environment
14 Cornhill
London
EC3V 3ND

For the attention of: Rob Philip

Contract Title: Hampstead Hill Gardens

Date Received: 25/7/2017
Date Commenced: 25/7/2017
Date Completed: 2/8/2017

Notes: Opinions and Interpretations are outside the UKAS Accreditation

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

L Knight (Senior Technician)
S Eyre (Senior Technician)
A Fry (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH1		D	1.50		Brown CLAY.
BH1		D	3.50		Brown CLAY.
BH1		U	4.00	4.45	Brown CLAY.
BH1		D	5.90		Brown CLAY.
BH1		U	6.50	6.95	Stiff brown CLAY.
BH1		D	9.00		Brown CLAY.
BH1		U	9.50	9.95	Very stiff brown CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Hampstead Hill Gardens

Contract No:
PSL17/3576
Client Ref:
HLEI 50381

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH1		D	1.50		37			78	32	46	100	Very high plasticity CV.
BH1		D	3.50		34			71	30	41	100	Very high plasticity CV.
BH1		D	5.90		35			75	31	44	100	Very high plasticity CV.
BH1		D	9.00		34			72	30	42	100	Very high plasticity CV.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

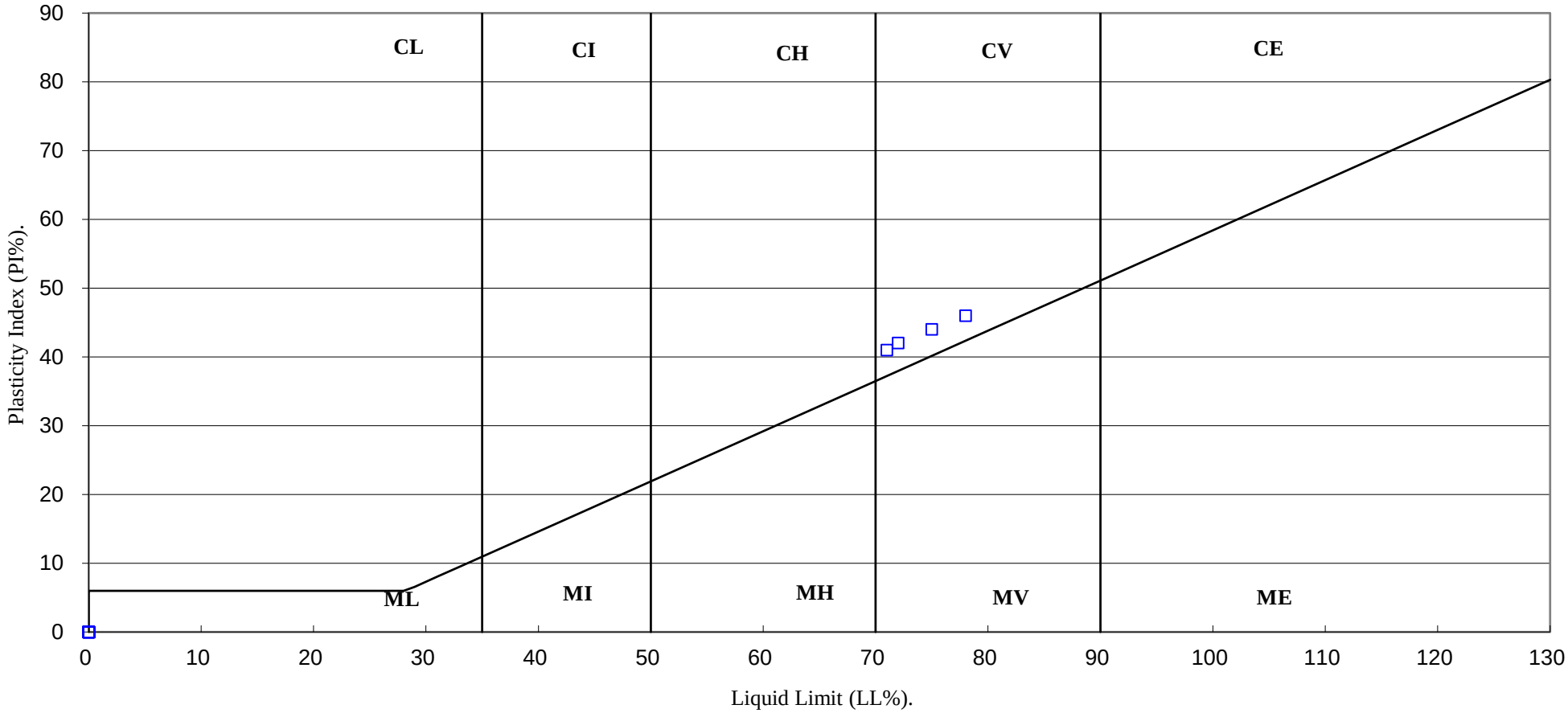
PSL Professional Soils Laboratory

Hampstead Hill Gardens

Contract No:
PSL17/3576
Client Ref:
HLEI 50381

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



UKAS TESTING 4043	PSL Professional Soils Laboratory	**Hampstead Hill Gardens**	**Contract No:**
			PSL17/3576
			Client Ref:
			HLEI 50381

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

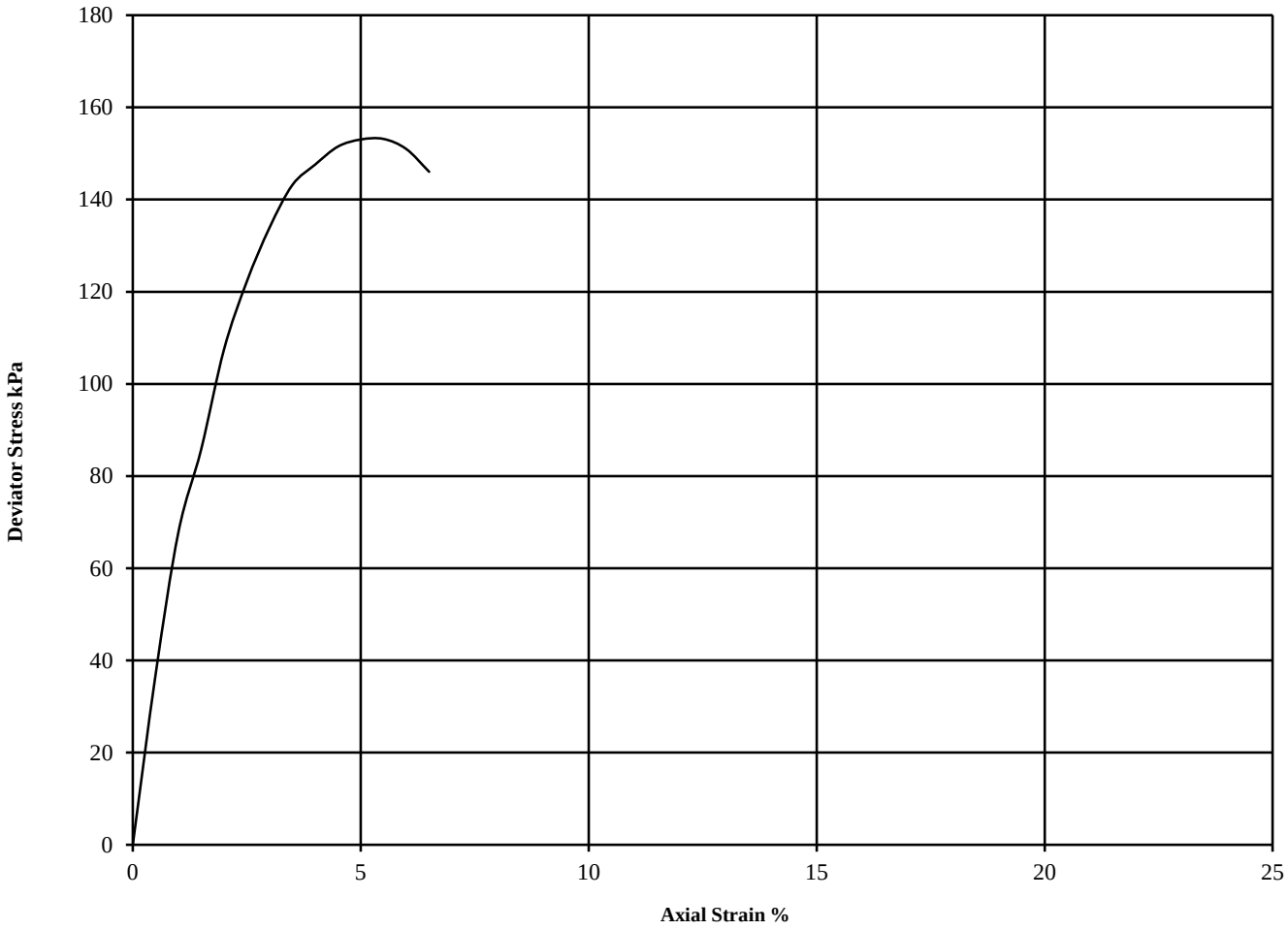
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH1** **Top Depth (m):** **6.50**

Sample Number: **Base Depth (m):** **6.95**

Sample Type **B**



Diameter (mm):		104.0	Height (mm):		208.0	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Disturbed Sample Remoulded with 2.5kg effort Rate of strain = 1 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.36
1	29	1.89	1.46	130	153	77	5.5	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Hampstead Hill Gardens

Contract No: **PSL17/3576**

Client Ref: **HLEI 50381**

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

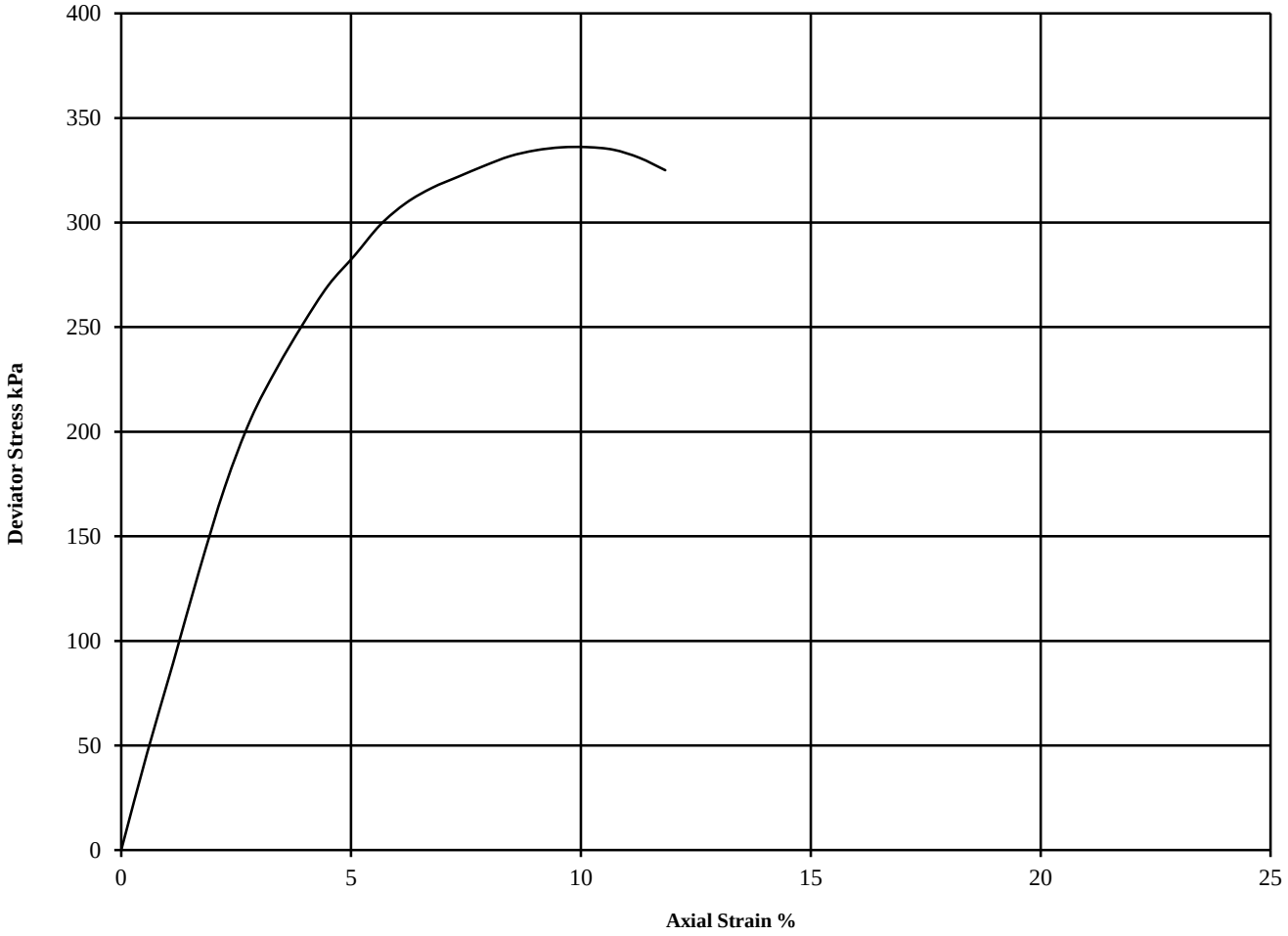
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: **BH1** **Top Depth (m):** **9.50**

Sample Number: **Base Depth (m):** **9.95**

Sample Type **B**



Diameter (mm):		102.0	Height (mm):		181.0	Test:	UU Single Stage		Remarks:
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa) θ_3	Corr. Max. Deviator Stress (kPa) $(\theta_1-\theta_3)_f$	Shear Strength Cu (kPa) $^1/_2(\theta_1-\theta_3)_f$	Failure Strain (%)	Mode of Failure	Disturbed Sample Remoulded with 2.5kg effort Rate of strain = 1 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.35
1	29	1.91	1.48	190	336	168	10.1	Brittle	See summary of soil descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

Hampstead Hill Gardens

Contract No: **PSL17/3576**

Client Ref: **HLEI 50381**

ONE DIMENSIONAL CONSOLIDATION TEST

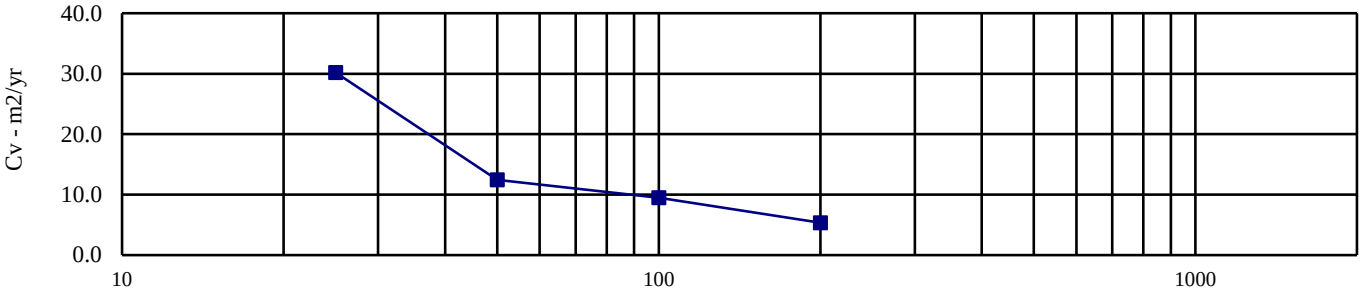
BS 1377: Part 5: 1990: Clause 3

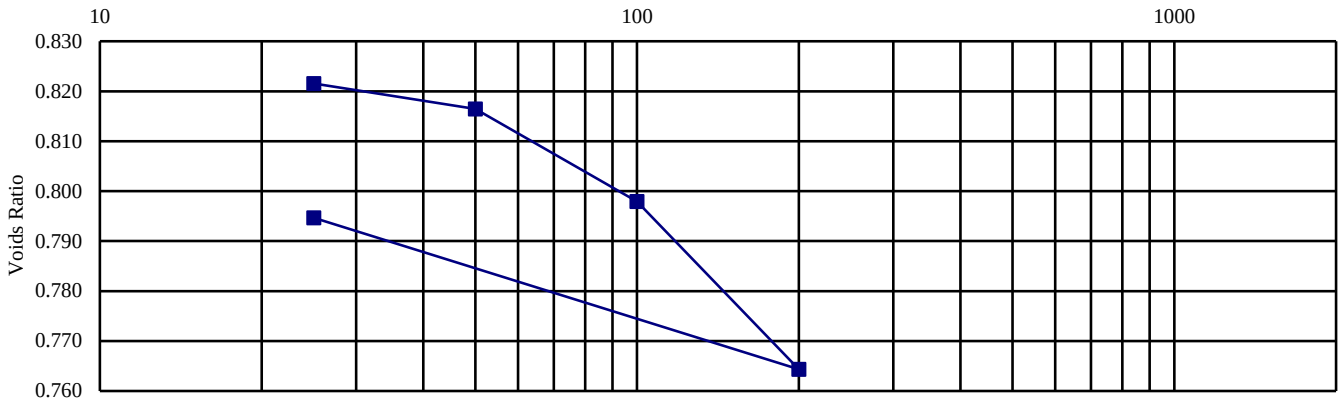
Hole Number: **Top Depth (m):** **4.00**

Sample Number: **Base Depth (m) :** **4.45**

Sample Type: **U**

Initial Conditions		Pressure Range kPa		Mv m2/MN	Cv m2/yr	Specimen location within tube:	Top
Moisture Content (%):	31						
Bulk Density (Mg/m3):	1.90	0	25	0.132	30.195	Method used to	
Dry Density (Mg/m3):	1.45	25	50	0.112	12.456	determine CV:	T90
Voids Ratio:	0.828	50	100	0.204	9.491	Nominal temperature	
Degree of saturation:	99.2	100	200	0.187	5.357	during test ' C:	20
Height (mm):	20.064	200	25	0.098	-	Remarks:	
Diameter (mm)	75.088					see summary	
Particle Density (Mg/m3): Assumed	2.65						



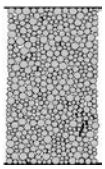


UKAS TESTING 4043	PSL Professional Soils Laboratory	**Hampstead Hill Gardens**	**Contract No: PSL17/3576** **Client Ref: HLEI 50381**

Effective Stress Triaxial Compression

Consolidated Undrained

Summary Report

Sample Details				
 *sketch showing specimen location in original sample*	Depth			2.00-2.45m
	Description			Brown CLAY.
	Type			Undisturbed, vertical orientation.
	Initial Length	L_0	(mm)	210.0
	Initial Diameter	D_0	(mm)	102.5
	Initial Weight	W_0	(gr)	3434.0
	Initial Bulk Density	ρ_0	(Mg/m3)	1.98
	Particle Density	ρ_s	(Mg/m3)	2.65

Initial Conditions			Stage 1	2	3	4
Initial Cell Pressure	σ_{3i}	(kPa)	319	340	381	
Initial Back Pressure	U_{bi}	(kPa)	299	300	302	
Membrane Thickness	m_b	(mm)	0.400			
Displacement Input	L_{IP}	(mm)	CH 2			
Load Input	N_{IP}	(N)	CH 1			
Pore Water Pressure Input	u_{pwp}	(kPa)	CH 3			
Sample Volume	V	(cm3)	CH 2			
Initial Moisture	$\omega_i\%$	(%)	29			
Initial Dry Density	ρ_{di}	(Mg/m3)	1.54			
Initial Voids Ratio	e_i	.	0.720			
Initial Degree of Saturation	S_i	(%)	100			
B Value	B	.	0.96			

Final Conditions						
Final Moisture	$\omega_f\%$	(%)	29			
Final Dry Density	ρ_{df}	(Mg/m3)	1.59			
Final Voids Ratio	e_f	.	0.664			
Final Degree of Saturation	S_f	(%)	100.0			
			Stage 1	2	3	4
Failure Criteria		.	Max. Dev. Stress	Max. Dev. Stress	Max. Dev. Stress	
Strain At Failure	$\varepsilon\%$	(%)	1.90	3.77	5.60	
Stress At Failure	$(\sigma_1-\sigma_3)$	(kPa)	46.8	80.3	107.5	
Minor Stress At Failure	σ_3'	(kPa)	6.0	17.0	37.0	
Major Stress At Failure	σ_1'	(kPa)	52.8	97.3	144.5	
Principal Stress At Failure	σ_1'/σ_3'		8.794	5.723	3.905	

Notes

Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH1 2.00-2.45m U
		Test Date	28/07/2017
Site Reference		Borehole	BH1
Jobfile	Hampstead Hill Gardens	Sample	2.00-2.45m U
Client	RPS	Depth	2.00-2.45m

Operator	Checked	Approved

Database: .\SQLEXPRESS \ sys1 03FEB2014 final

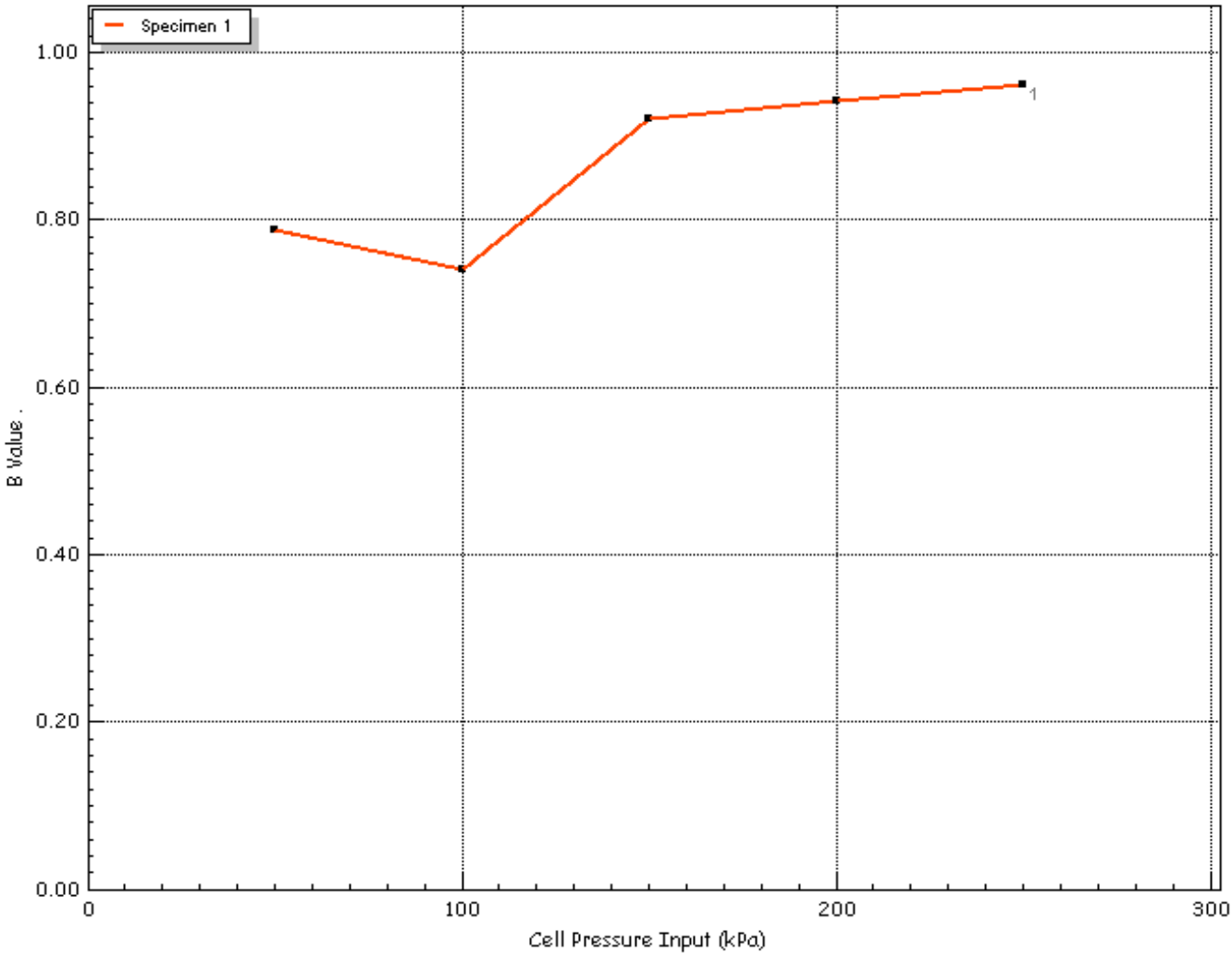
Professional Soils Laboratory

Effective Stress Triaxial Compression

Consolidated Undrained

Saturation Plots

			1
Saturation Method			Stepped
Cell Pressure Input	σ	(kPa)	250
Pore Water Pressure Input	u pwp	(kPa)	238
B Value	B	.	0.96



Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH1 2.00-2.45m U
Database: .\SQLEXPRESS \ sys1 03FEB2014 final		Test Date	28/07/2017
Site Reference		Borehole	BH1
Jobfile	Hampstead Hill Gardens	Sample	2.00-2.45m U
Client	RPS	Depth	2.00-2.45m
Operator	Checked	Approved	

Effective Stress Triaxial Compression

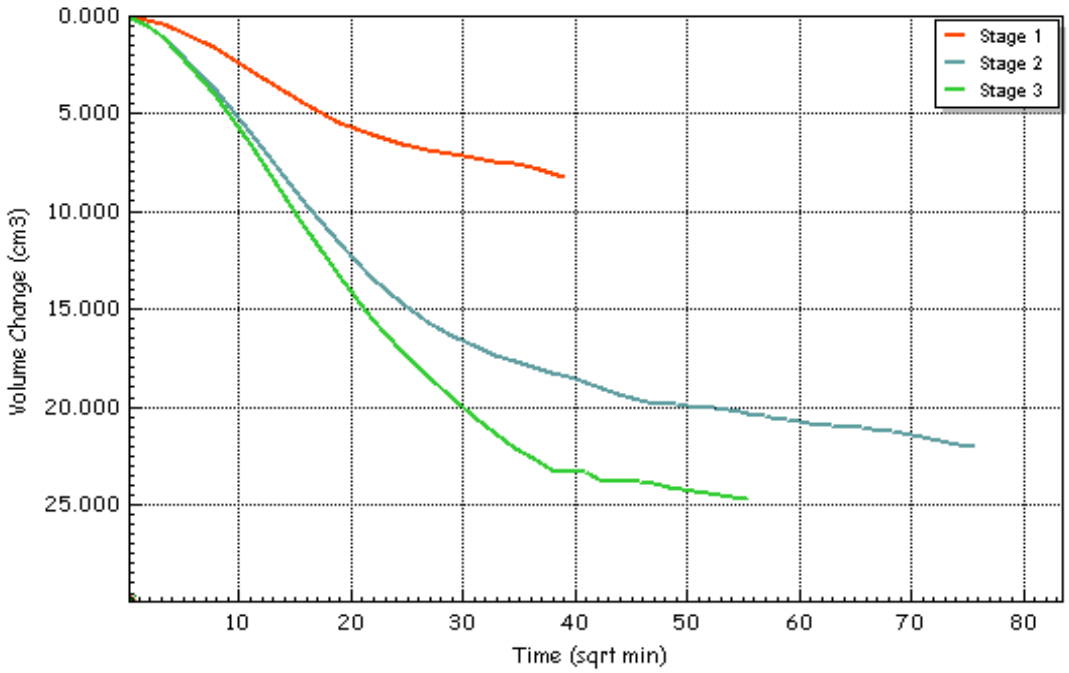
Consolidated Undrained

Consolidation Plots

Initial Conditions			Stage 1	2	3
Initial Cell Pressure	σ_3	(kPa)	320	340	380
Initial Back Pressure	u_{bi}	(kPa)	300	300	300
Pore Water Pressure Input	u_{pwp}	(kPa)	301	326	349
Drainage Method			Radial+One End		

Final Conditions			Stage 1	2	3
PWP Dissipation %	U%	(%)	100.00	100.00	97.96
Volumetric Strain	ε_v%	(%)	0.48	1.75	3.17
Corrected Length	L_C	(mm)	209.7	204.1	194.2
Corrected Area	A_C	82.25	82.25	83.04	84.88
Corrected Volume	V_C	(cm3)	1724.592	1702.570	1677.866
T100 Time to Failure	t_{100}	(min)	624.58	1093.46	1140.93
Consolidation	c_v	(m2/year)	0.347	0.198	0.190
Compressibility	m_v	(m2/MN)	1.585	0.672	0.661
Test Time	t_F	(h:m:s)	18:44:14	32:48:13	34:13:40
Estimated Strain to Failure	ε%	(%)	5.0	5.0	5.0
Shear Machine Speed	d_r	(mm/min)	0.00932	0.00518	0.00473

Notes



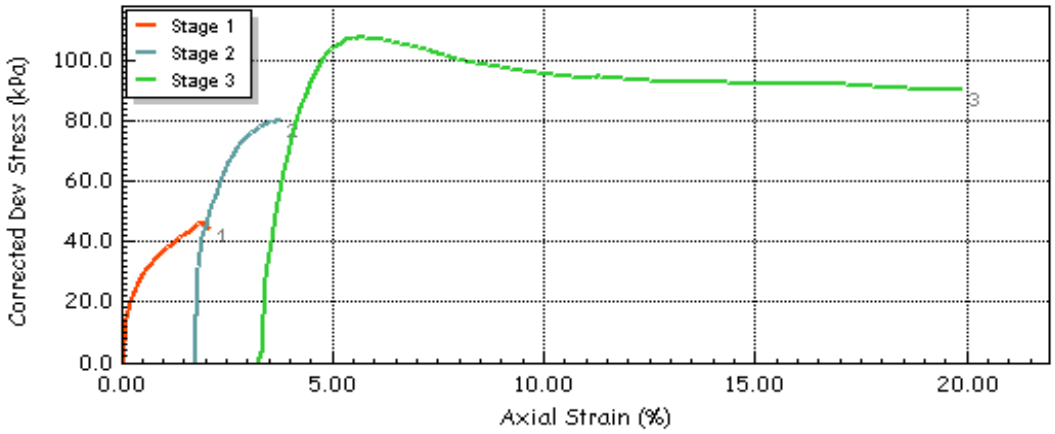
Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH1 2.00-2.45m U
Database: .\SQLEXPRESS \ sys1 03FEB2014 final		Test Date	28/07/2017
Site Reference		Borehole	BH1
Jobfile	Hampstead Hill Gardens	Sample	2.00-2.45m U
Client	RPS	Depth	2.00-2.45m
Operator	Checked	Approved	

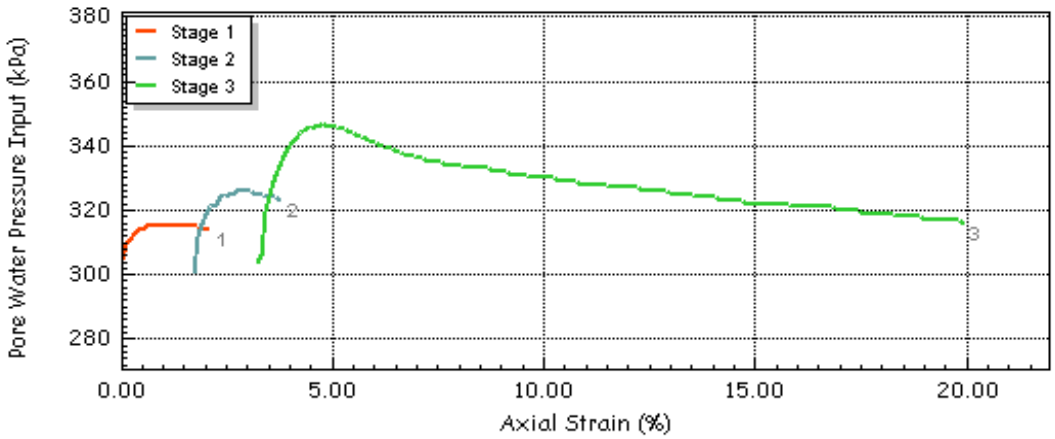
Professional Soils Laboratory

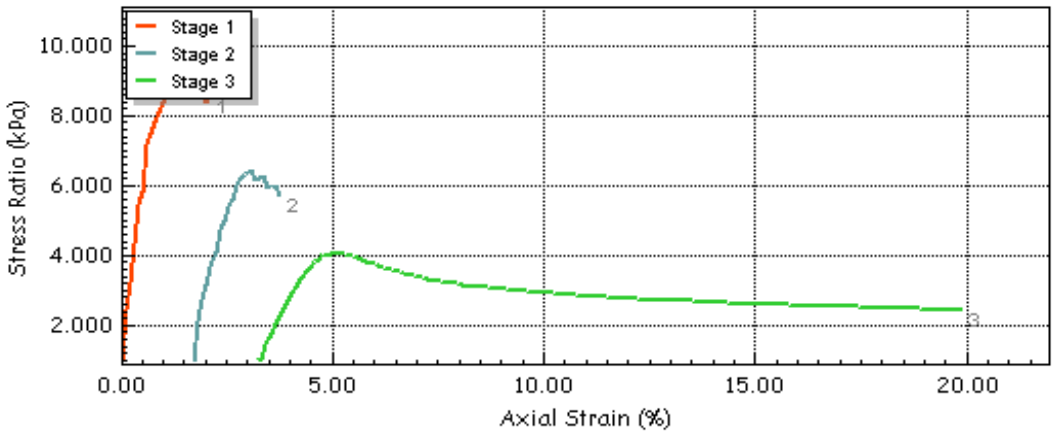
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots







Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH1 2.00-2.45m U
Database: .\SQLEXPRESS \ sys1 03FEB2014 final		Test Date	28/07/2017
Site Reference		Borehole	BH1
Jobfile	Hampstead Hill Gardens	Sample	2.00-2.45m U
Client	RPS	Depth	2.00-2.45m
Operator	Checked	Approved	

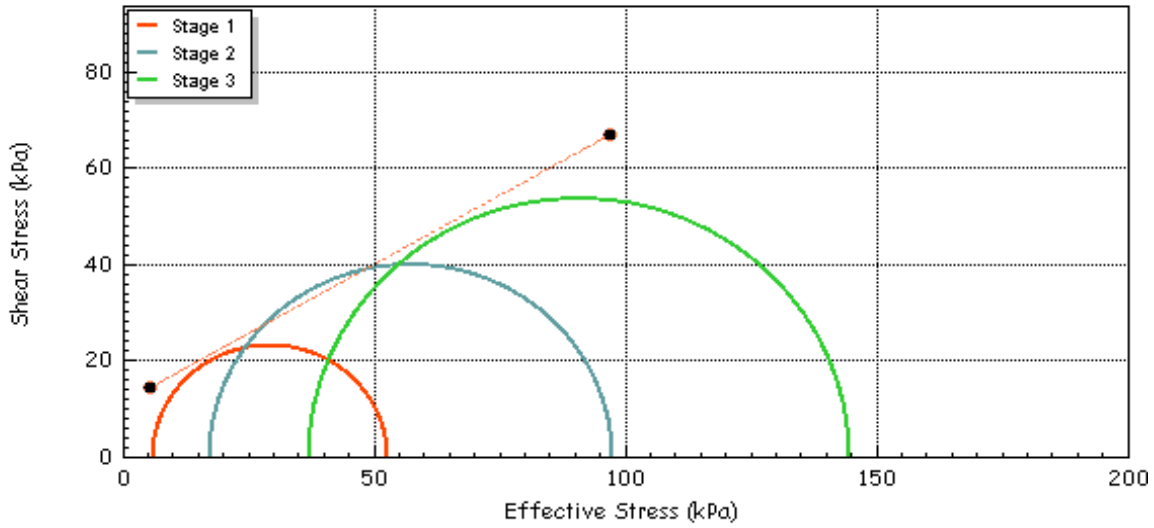
Professional Soils Laboratory

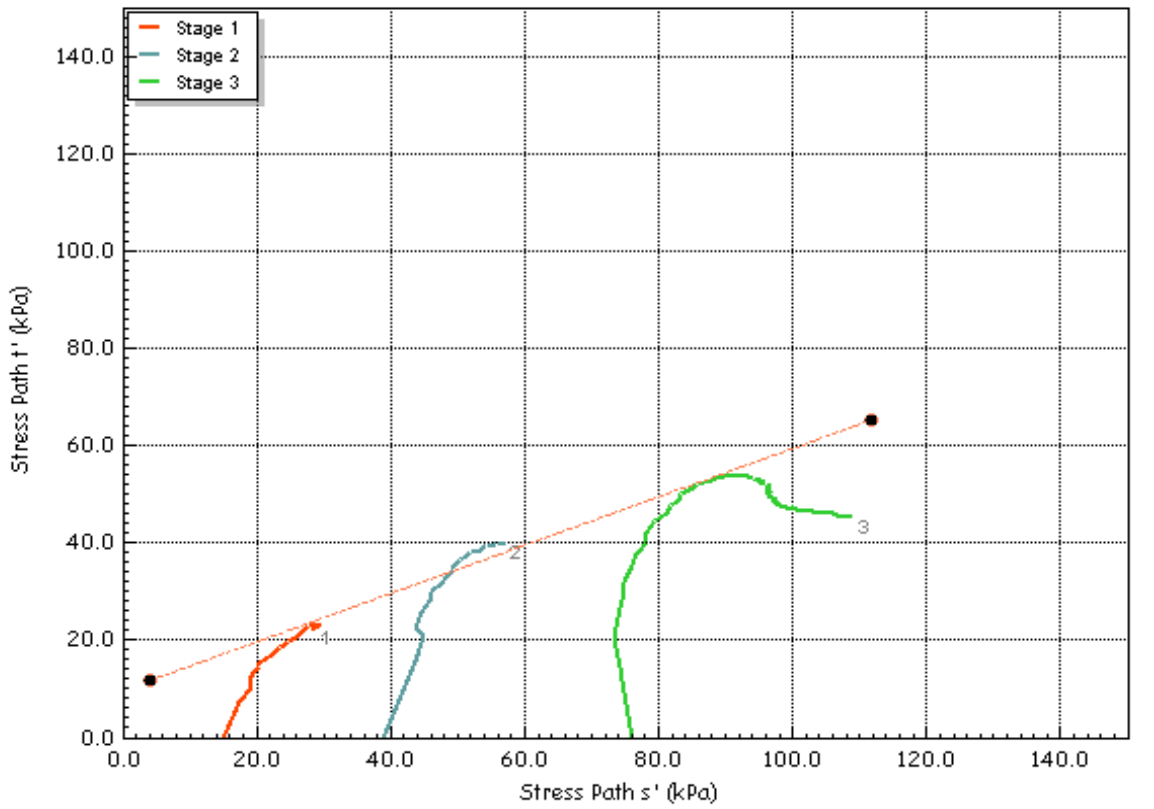
Effective Stress Triaxial Compression

Consolidated Undrained

Shear Stage Plots

Effective	c'	(kPa)	11.18	Effective Cohesion	c'	(kPa)	11.18
Effective Friction	ϕ'	(deg)	30.0	Effective Friction	ϕ'	(deg)	30.0





Test Method	BS1377-8 : 1990 : Clause 7	Test Name	BH1 2.00-2.45m U
Database: .\SQLEXPRESS \ sys1 03FEB2014 final		Test Date	28/07/2017
Site Reference		Borehole	BH1
Jobfile	Hampstead Hill Gardens	Sample	2.00-2.45m U
Client	RPS	Depth	2.00-2.45m
Operator	Checked	Approved	

Certificate of Analysis

Certificate Number 17-06581

01-Aug-17

Client Professional Soils Laboratory Ltd
5/7 Hexthorpe Road
Hexthorpe
DN4 0AR

Our Reference 17-06581

Client Reference PSL17/3576

Order No (not supplied)

Contract Title Hampstead Hill Gardens

Description 3 Soil samples.

Date Received Friday, July 28, 2017

Date Started Friday, July 28, 2017

Date Completed Tuesday, August 1, 2017

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 10725 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 17-06581
Client Ref PSL17/3576
Contract Title Hampstead Hill Gardens

			Lab No	1210822	1210823	1210824
			Sample ID	BH1	BH1	BH1
			Depth	0.50	2.50	4.50
			Other ID			
			Sample Type	D	D	D
			Sampling Date	21-Jul-17	21-Jul-17	21-Jul-17
			Sampling Time	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**			
Inorganics						
pH	DETSC 2008#			7.8	7.5	7.6
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	80	2600	2000

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-06581
Client Ref PSL17/3576
Contract Hampstead Hill Gardens

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1210822	BH1 0.50 SOIL	21-07-17	PG		
1210823	BH1 2.50 SOIL	21-07-17	PG		
1210824	BH1 4.50 SOIL	21-07-17	PG		

Key: P-Plastic G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX D

Classification of Visible Damage to Walls (Boscardin and Cording, 1989)

RPS

Table 2.5 *Classification of visible damage to walls (after Burland* et al, *1977, Boscardin and Cording, 1989; and Burland, 2001)*

Category of damage	Description of typical damage (ease of repair is underlined)	Approximate crack width (mm)	Limiting tensile strain ε_{lim} (per cent)
0 Negligible	Hairline cracks of less than about 0.1 mm are classed as negligible.	< 0.1	0.0–0.05
1 Very slight	Fine cracks that can easily be treated during normal decoration. Perhaps isolated slight fracture in building. Cracks in external brickwork visible on inspection.	< 1	0.05–0.075
2 Slight	Cracks easily filled. Redecoration probably required. Several slight fractures showing inside of building. Cracks are visible externally and some repointing may be required externally to ensure weathertightness. Doors and windows may stick slightly.	< 5	0.075–0.15
3 Moderate	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weathertightness often impaired.	5–15 or a number of cracks > 3	0.15–0.3
4 Severe	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Windows and frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted.	15–25 but also depends on number of cracks	> 0.3
5 Very severe	This requires a major repair involving partial or complete rebuilding. Beams lose bearings, walls lean badly and require shoring. Windows broken with distortion. Danger of instability.	usually > 25 but depends on number of cracks.	

Notes

1. In assessing the degree of damage, account must be taken of its location in the building or structure.
2. Crack width is only one aspect of damage and should not be used on its own as a direct measure of it.

APPENDIX E

Proposed development cross-sections

SECTION AA @ 1:100

SECTION BB @ 1:100

GENERAL NOTES:

1: DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2: ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3: ALL LEVELS ARE SHOWN IN METRES ABOVE ORDNANCE DATUM (AOD) UNLESS NOTED OTHERWISE.
4: ALL DIMENSIONS SHALL BE VERIFIED ON SITE BEFORE PROCEEDING WITH THE WORK.
5: ALL BOUNDARY LINES MUST BE CHECKED BY NICK LEITH-SMITH.
6: NICK LEITH-SMITH SHALL BE NOTIFIED IMMEDIATELY IN WRITING OF ANY DISCREPANCIES.
7: ALL INFORMATION REMAINS THE PROPERTY OF NICK LEITH-SMITH AND MAY NOT BE USED FOR ANY PURPOSE WHATSOEVER, OR REPRODUCED THROUGH ANY MEDIUM WITHOUT THE WRITTEN PERMISSION OF NICK LEITH-SMITH.
8: ALL COPYRIGHTS RETAINED BY NICK LEITH-SMITH.
9: SUBJECT TO SURVEY AND ALL NECESSARY STATUTORY AND LEGAL CONSENTS.
10: REFER TO PROJECT ORGANISATION SHEETS FOR DRAWING KEYS, NOTES AND ABBREVIATIONS.

0 0.5 1 mt

PRELIMINARY

Rev	Date	By	Revisions

Nick Leith-Smith Architecture + Design

Unit W123 Vox Studios
1-45 Durham Street Vauxhall
London SE11 5JH

Job Title:

Studio House

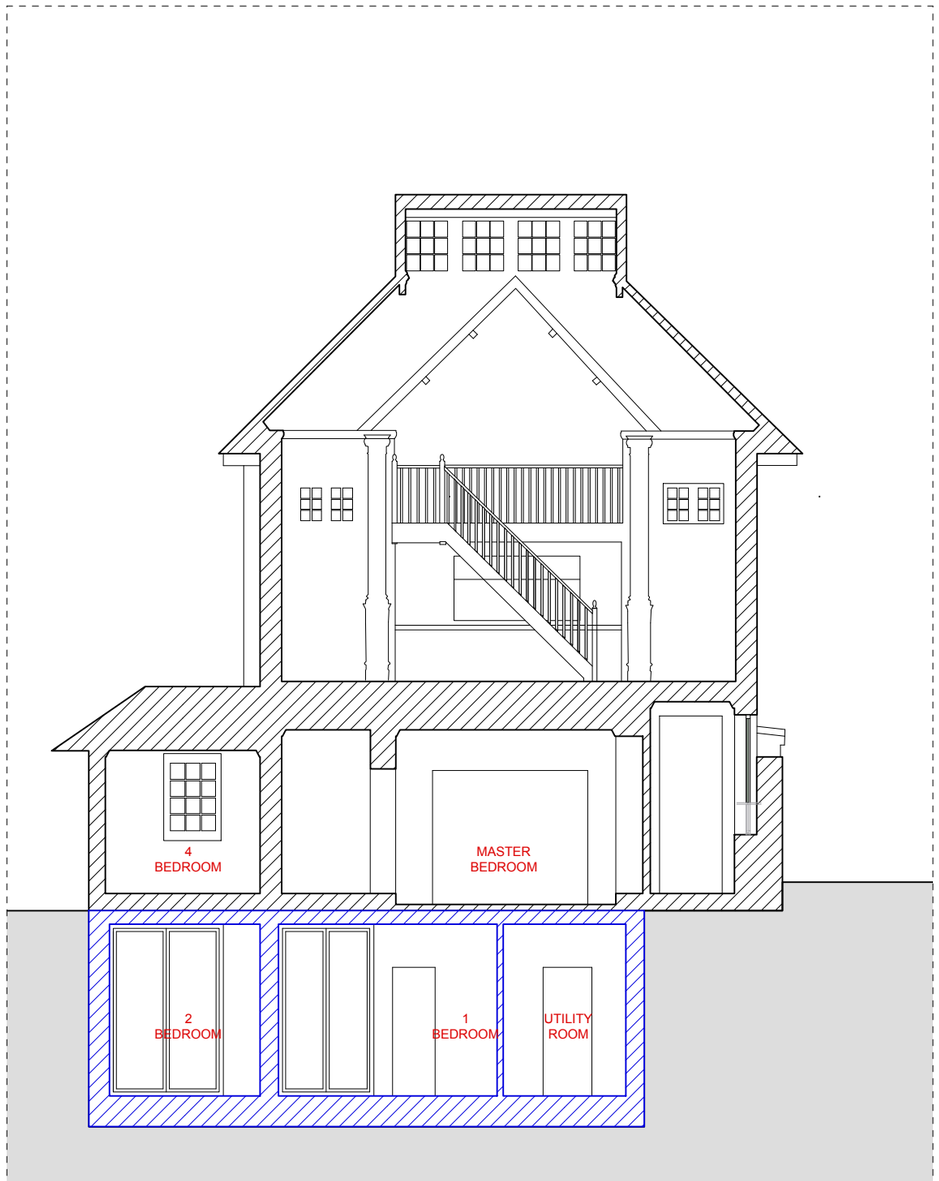
Hampstead Hill Gardens

London NW3

Drawing Title:

Proposed Section AA and Section BB

Scale: 1:100	A3	**Date: 29.09.16**
Drawn: BB		**Checked: KF**
Drawing No: 525 / A / 1.2000		**Rev:**



SECTION CC @ 1:100

GENERAL NOTES:

1: DO NOT SCALE DRAWINGS. DIMENSIONS GOVERN.
2: ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3: ALL LEVELS ARE SHOWN IN METRES ABOVE ORDNANCE DATUM (AOD) UNLESS NOTED OTHERWISE.
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0 0.5 1 mt

PRELIMINARY

Rev	Date	By	Revisions

Nick Leith-Smith Architecture + Design

Unit W123 Vox Studios
1-45 Durham Street Vauxhall
London SE11 5JH

Job Title:

Studio House

Hampstead Hill Gardens

London NW3

Drawing Title:

Proposed
Section CC

Scale: 1:100	A3	**Date: 25.08.16**
Drawn: BB		**Checked: KF**
Drawing No: 525 / A / 1.2001		**Rev:**