Site Analytical Services Ltd.

Ref: 14/22463
November 2014

Basement Impact Assessment

At

147 Kentish Town Road, London, NW1 8PB

For

Ringley Limited

First issued: August 2014

Revised: November 2014

CONTENTS

1.0 INTRODUCTION

1.1 Project Objectives

The purpose of this assessment is to consider the effects of a proposed basement construction on the local groundwater regime at the residential property at 147 Kentish Town Road, London, NW1. For this assessment a representative of SAS Limited visited the property on 21st August 2014.

The recommendations and comments given in this report are based on the information contained from the sources cited and may include information provided by the client and other parties, including anecdotal information. It must be noted that there may be special conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

1.2 Planning Policy Context

Camden Planning Guidance for Basements and Lightwells has recently been revised (CPG4, September 2013) and requires proposed developments to mitigate against the effects of ground and surface water flooding and to include drainage systems that do not impact neighbouring property of the site or the water environment by way of changing the groundwater regime.

Camden Guidance CPG4 sets out 5 Stages:

1. Screening
2. Scoping
3. Site Investigation
4. Impact Assessment
5. Review and decision making

This report is intended to address the scoping process set out in CPG4 and the Camden Geological, Hydrogeological and Hydrological Study (CGHHS). It will review existing site investigation data and provide a preliminary assessment of the issues identified by the Site Analytical Services Limited screening process.

This report also provides an impact assessment (4) of the geo-environmental impacts on adjacent structures and the surrounding area based on available site investigation data.

As part of this guidance a subterranean (groundwater) flow, slope stability and surface water and flooding screening chart is provided (CPG 4, Figures 1, 2 and 3 respectively). The completed charts in relation to this development are provided as Table 1, to this report.

1.3 Qualifications

The report has been prepared by Mr Andrew Smith, a Fellow of the Geological Society (FGS) and Member of the Chartered Institute of Water and Environmental Management (MCIWEM) in co-ordination with Mr Mike Davenport, a Chartered Structural Engineer (CEng).

2.0 SITE DETAILS

(National Grid Reference: TQ 289 844)

2.1 Site Location

The site is situated on the corner of Castle Road and the A400 Kentish Town Road in North London at approximate postcode NW1 8PD. The site is currently occupied by a former public house, together with rear courtyard.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain by the London Clay Formation.

2.3 Previous Reports

The results from a Phase 1 Preliminary Risk Assessment and Phase 2 Intrusive Investigation are presented under separate cover in Site Analytical Services Limited reports (Project No's. 14/22463-1 and 13/20593 respectively). The findings from these reports are described in this basement impact assessment.

2.4 Site Layout and History

The site was attended on 21st August 2014 for the purposes of conducting the site walkover.

The site comprises of a large three storey former public house building. The front of the property exits directly onto Kentish Town Road, whereas the rear of the property is a small level concreted area that exits onto Castle Road. There is no significant vegetation surrounding the site and the area is largely dominated by hardcover and buildings. Additionally, there is no significant slope in the area and the site is essentially flat.

The property has been the location of a public house since circa 1651; it was demolished and rebuilt in 1848 and went through a series of owners and name changes. In 2011 the property was closed and has remained vacant ever since.

From the site walkover there were no obvious potentially contaminating activities on the site.

2.5 Proposed Development

Proposals for the site include the reinstatement of the public house façade and extension and alteration to the property to accommodate B1/A2 use at basement and ground floor levels and 8 residential units at first, second and third floor levels (C3 Use).

The maximum depth of the proposed basement is expected to be approximately 2.80m below existing ground level.

2.6 Results of Basement Impact Assessment Screening

A screening process has been undertaken for the site in accordance with CPG4 and the results are summarised in Table 1 below:

Table 1: Summary of screening results

Item	Description	Response	Comment
Sub-terranean (Ground water Flow)	1a. Is the site located directly above an aquifer.	No	The Bedrock geology underlying the site (London Clay Formation) is classified as Unproductive Strata; drift deposits or rock layers with low permeability that have negligible significance for water supply or river base flow. Superficial Head (or slope) deposits were encountered below the Made Ground, but are not believed to be water bearing due to the cohesive element of the deposits and the lack of water seepages during drilling.
	1b. Will the proposed basement extend beneath the water table surface.	No	The maximum depth of the proposed basement floor level of 2.8m below ground level will be above the current water level of approximately 8.91m below ground level as recorded in Borehole A.
	2. Is the site within 100m of a watercourse, well (used / disused) or potential spring line.	Yes - refer to Section 4.2 for scoping	The nearest surface water feature is listed as Regents Canal located 354m south of the site. However, According to publications regarding Lost Rivers of London (Barton, 1992) and (Talling, 2011), the site is within 100m of the River Fleet.
	3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas.	No	The amount of hardstanding on-site is not expected to change.
	4. As part of site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS).	No	Existing drainage paths are to be utilised where possible. Whether soakaways/SUDS are used on the proposed development is to be confirmed (beyond the scope of this report). An appropriately qualified engineer should be engaged to ensure mandatory requirements are met.
	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	There are no surface water features within one kilometre of the site.

Slope Stability	1. Does the existing site include slopes, natural or man-made greater than 1 in 8.	No	The site is essentially flat.
	2. Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 1 in 8.	No	Remodelling of the site elevations is not proposed.
	3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 1 in 8.	No	The surrounding area is essentially flat
	4. Is the site within a wider hillside setting in which the general slope is greater than 1 in 8.	No	There is a general slope in the wider hillside setting from north to south down towards the Thames Basin, but this is less than 1 in 8.
	5. Is the London Clay the shallowest strata at the site.	No	The site is underlain by Made Ground overlying the London Clay Formation; the London Clay is the shallowest natural strata below the site.
	6. Will any trees be felled as part of the development and/or are any works proposed within any tree protection zones where trees are to be retained.	No	It is understood that no trees are to be felled as part of the development.
	7. Is there a history of seasonal shink-swell subsidence in the local area and/or evidence of such effects at the site	Yes - refer to Section 5.2 for scoping	The site lies above the London Clay Formation that is well know to have a high tendency to shrink and swell.
	8. Is the site within 100m of a watercourse or a potential spring line	Yes - refer to Section 4.2 for scoping	The nearest surface water feature is listed as Regents Canal located 344m south of the site. However, according to the Lost Rivers of London the site is within 100m of the River Fleet
	9. Is the site within an area of previously worked ground.	Yes - refer to Section 5.5 for scoping	Made Ground has been encountered at the site.

	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	The Bedrock geology underlying the site (London Clay Formation) is classified as Unproductive Strata; drift deposits or rock layers with low permeability that have negligible significance for water supply or river base flow.
	11. Is the site within 50m of the Hampstead Heath ponds.	No	The site is not located near Hampstead Heath.
	12. Is the site within 5m of a highway or pedestrian right of way.	Yes - refer to Section 5.6 for scoping	The site lies adjacent to the A400 Kentish Town Road and Castle Road.
	13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.	Yes - refer to Section 5.7 for scoping	The development will increase the depths of foundation at the site, although the foundation depths of adjacent properties are not known.
	14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines.	Yes - refer to Section 5.8 for scoping	The site lies adjacent to the Northern Line which runs along Kentish Town Road
Surface Water and Flooding	1. As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route.	No	The amount of hardstanding on-site is not changing therefore surface water will not be impacted by the development.
	2. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas.	No	The amount of hardstanding on-site is not expected to increase.

	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	As no changes are occurring above the ground, surface water will not be impacted by the development.
	4. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses.	No	As no changes are occurring above the ground, surface water will not be impacted by the development.
	5. Is the site in an area known to be at risk from surface water flooding.	No	According to the Envirocheck Report obtained as part of the desk study for the site (Site Analytical Services Report Reference 14/22463) the site is not in an area at risk from flooding.

The Screening Exercise has indentified the following potential issues which will be carried forward to the Scoping Phase

Subterranean (Groundwater) Flow

- Is the site within 100m of a watercourse, well (used / disused) or potential spring line.

Slope Stability

- Is there a history of seasonal shink-swell subsidence in the local area and/or evidence of such effects at the site.
- Is the site within 100m of a watercourse or a potential spring line.
- Is the site within an area of previously worked ground.
- Is the site within 5m of a highway or pedestrian right of way.
- Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties.

3.0 EXISTING SITE INVESTIGATION DATA

3.1 Records of site investigations

Ground conditions at the site were investigated by Site Analytical Services Limited in May 2013 (SAS Report Reference 13/20593 – included as Appendix D in this report) and again in August 2014 as part of this basement impact assessment (Borehole record provided in Appendix A of this report). The ground conditions revealed by the investigation are summarised in the following table.

Strata	Depth to top of strata, mbgl	Description
Made Ground	0.00	Surface layer of concrete underlain by very soft silty clay with ashes and brick rubble
Superficial Head	1.30 to 1.90	Dense very sandy silty fine to coarse very clayey flint gravel
London Clay Formation	0.40 to 2.70	Stiff and then very stiff silty clay with occasional partings of silty fine sand, scattered gypsum crystals

Groundwater was not encountered during the drilling of the borehole and the material remained essentially dry throughout.

Groundwater was subsequently recorded at a depth of depth of 8.91m below ground level in the monitoring standpipe installed in Borehole A after a period of approximately one to two weeks.

4.0 SUBTERRANEAN (GROUNDWATER FLOW) - SCOPING ASSESSMENT

4.1 Introduction

This section addresses outstanding issues raised by the screening process regarding the presence of an ancient watercourse within 100m of the site.

4.2 Springs, Wells and Watercourses

The nearest surface water feature is recorded as a Regents Canal located 354m south of the site. There are no fluvial or tidal floodplains located within 1km of the site.

With reference to 'The Lost Rivers of London' (Barton, 1992) and 'London's Lost River's (Talling, 2011), the site lies within 100m of the River Fleet which passes under Kentish Town and flows onwards to King's Cross. The river then flows down Farringdon Road and Farringdon Street and joins the River Thames beneath Blackfriars Bridge.

The River Fleet is now completely enclosed and flows through underground conduits for its entire length.

Given the predominantly clayey and low permeability nature of the near-surface soils, it is expected that there is very limited surface water infiltration potential and groundwater flow rates in the vicinity of the property will be very low. The historic development of the area for housing will have further limited surface water infiltration.

As a result it is considered that the proposed development will have minimal impact on any nearby watercourses.

5.0 SCOPING ASSESSMENT - SLOPE AND GROUND STABILITY

5.1 Introduction

This section addresses outstanding issues raised by the screening process regarding land stability (see Table 1).

5.2 Shrinking / Swelling Clays

Atterberg Limit tests were conducted on four samples taken from the near surface cohesive soils encountered in Boreholes 1 and 2. The samples fall into Classes CH and CV according to the British Soil Classification System. These are fine grained silty clay soils of high and very high plasticity and as such generally have a low permeability and a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2, April 2003, “Building near Trees".

Foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards and it is considered that this document is relevant in this situation.

5.3 Heave of underlying soils

The main phase of uplift or heave from the cohesive soils will come immediately following the excavation of the basement when the greatest elastic rebound of the soil (caused by the loss of the overburden pressure) will occur. Heave can be reduced by proceeding with the excavation in stages and observing and recording any movement that occurs over a set period of time. It may therefore be advantageous to delay the construction until an adequate proportion of the uplift has occurred. Once this monitoring period has elapsed and a suitably qualified engineer is confident that the majority of uplift has occurred, basement construction can commence. These processes and other ways of dealing with ground movements are described at length in BS8004 (British Standard Code of Practice for Foundations).

In addition, it is understood that a suspended concrete slab will be constructed at basement level and therefore heave is unlikely to be an issue at the site.

5.4 Compressible/Collapsible Ground

The natural ground stability hazards dataset supplied by the BGS gives the hazard rating for collapsible ground as ‘very low’ and compressible ground at the site is listed as ‘no hazard’.

5.5 Made Ground

In the exploratory holes undertaken at the site, Made Ground was found to extend down to depths of up to 1.90m below ground level and generally comprised of a surface layer of concrete underlain by very soft silty clay with ashes and brick rubble.

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any Made Ground and either into, or onto suitable underlying natural strata of adequate bearing characteristics.

The bearing capacity of the Made Ground should therefore be assumed to be less than 50kN/m^2 because of the likelihood of extreme variability within the material.

Contamination testing of the Made Ground is likely to be required during any second phase of ground investigation.

5.6 Location of public highway

The proposed basement is not to be extended below Kentish Town Road or Castle Road and therefore it is suggested that the impact on these access roads is likely to be minimal.

There is nothing unusual in the proposed development that would give rise to any concerns with regard to the stability of public highways.

5.7 Structural Stability of Adjacent Properties

The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures.

The proposed development may also result in differential foundation depths between the site and adjacent property and as such it is recommended that the Party Wall Act will be used and considered during the design phase. For basement developments in densely built urban areas, the Party Wall Act (1996) will usually apply because neighbouring houses would typically lie within a defined space around the proposed building works. Specifically, the Party Wall Act applies to any excavation that is within 3m of a neighbouring structure; or that would extend deeper than that structure's foundation; or which is within 6m of the neighbouring structure and which also lies within a zone defined by a 45° line from the foundation of that structure. The Party Wall process should be followed and adhered to during this development.

5.8 Tunnels

The site lies adjacent to the Northern Line which runs along Kentish Town Road. Transport for London must be contacted prior to any structural design work to approve and make comments on the scheme.

A full statutory services search was outside the scope of this report but must be completed prior to design.

6.0 CONCLUSIONS

1. Proposals for the site include the reinstatement of the public house façade and extension and alteration to the property to accommodate B1/A2 use at basement and ground floor levels and 8 residential units at first, second and third floor levels (C3 Use).

2. With reference to 'The Lost Rivers of London' (Barton, 1992) and 'London's Lost River's (Talling, 2011), the site lies within 100m of the River Fleet. Given the predominantly clayey and low permeability nature of the near-surface soils, it is expected that there is very limited surface water infiltration potential and groundwater flow rates in the vicinity of the property will be very low.

3. Foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting.

4. The proposed basement is not to be extended below Kentish Town Road or Castle Road and therefore it is suggested that the impact on these access roads is likely to be minimal.

5. The excavation and construction of the basement at the site has the potential to cause some movements in the surrounding ground. However, it is understood that ground movements and/or instability will be managed through the proper design and construction of mitigation measures.

6. The site lies adjacent to the Northern Line which runs along Kentish Town Road. Transport for London must be contacted prior to any structural design work to approve and make comments on the scheme.

p.p. SITE ANALYTICAL SERVICES LIMITED

A P Smith BSc (Hons) FGS
Senior Geologist

7.0 REFERENCES

1. CIRIA Special Publication 69, 1989. The engineering implications of rising groundwater levels in the deep aquifer beneath London

2. Environment Agency, 2006. Groundwater levels in the Chalk-Basal Sands Aquifer in the London Basin

3. Site Analytical Services Report. Phase One Risk Assessment at 8 Lindfield Gardens. Reference 20316. March 2013.

4. Site Analytical Services Report. Report on Ground Investigation at 8 Lindfield Gardens. Reference 19316-1. March 2013.

5. Tomlinson, M J, 2001. “Foundation Design and Construction”, Seventh Edition, Prentice Hall (ISBN 0-13-031180-4).

6. British Standards Institution, 2007. Code of Practice for Site Investigations, BS5930, BSI, London

7. British Standards Institution, 1986. Code of practice for foundations, BS 8004, BSI, London.

8. British Standards Institution, 2009. Code of Practice for Protection of Below Ground Structures Against Water from the Ground. BS 8102, BSI, London

9. CIRIA, 2000. Sustainable Urban Drainage Systems: Design Manual for England and Wales. CIRIA C522, Construction Industry Research and Information Association, London

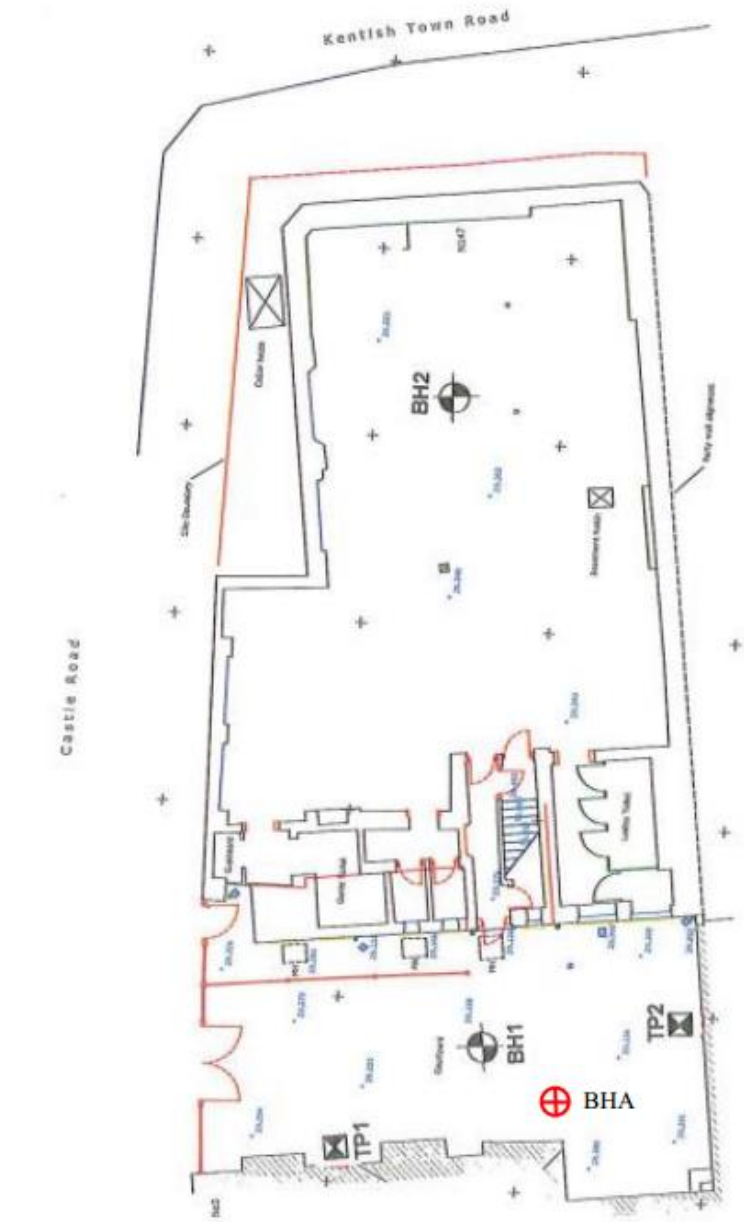
10. Camden Planning Guidance, 2011. CPG 4; Basements and lightwells. London Borough of Camden

11. Environment Agency Status Report 2010. Management of the London Basin Chalk Aquifer. Environment Agency

12. NHBC Standards, Chapter 4.1, "Land Quality - managing ground conditions", September 1999.

13. NHBC Standards, Chapter 4.2, "Building near Trees", April 2010.

Appendix A – Site Plan



Boreholes drilled in May 2013 investigation

Trial Pits excavated in May 2013 investigation

Borehole drilled in August 2014 investigation

Appendix B – Log of Borehole A (Drilled in August 2014 Investigation)

Site Analytical Services Ltd.

Site: 147 KENTISH TOWN ROAD, LONDON, NW1 8PB			Borehole Number: BHA
Boring Method: CONTINUOUS FLIGHT AUGER	Casing Diameter: 100mm cased to 0.00m	Ground Level (mOD):	Client: RINGLEY LIMITED	Job Number: 1422463
	Location: TQ 289 844	Dates: 08/08/2014	Engineer:	Sheet: 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.12	MADE GROUND : Concrete surface		
						(0.18)			
						0.30	MADE GROUND : Black ashes with crushed concrete and clinker		
0.25	D1								
0.50	D2						MADE GROUND : Very soft black silty clay with ashes and brick rubble		
0.75	D3								
1.00	D4					(1.40)			
1.50	D5								
						1.70	Dense brown very sandy silty sub angular fine to coarse very clayey flint GRAVEL.		
2.00	D6					(1.00)			
2.50	D7								
						2.70	Stiff becoming very stiff brown and mottled orange brown beined blue grey silty CLAY with occasional partings of light brown silty fine sand and occasional small gypsum crystals		
3.00	D8								
3.50	D9								
4.00	D10								
4.50	D11								
5.00	D12					(4.80)			
6.00	D13								
7.00	D14								
						7.50	Very stiff dark grey brown fissured silty clay with occasional partings of light brown silty fine sand and scattered small gypsum crystals		
8.00	D15								
9.00	D16					(2.50)			
10.00	D17			08/08/2014:DRY		10.00			

Remarks
D = Disturbed Sample
Groundwater was not encountered during drilling

Scale (approx): 1:50
Logged By: APS
Figure No.: 1422463.BHA

Appendix C – Monitoring Data from Borehole A

Date	Borehole	Water Level (m.bgl)	Depth to Base of Well (m.bgl)
12th August 2014	1	9.97	10.15
18th August 2014	1	8.91	10.15

Appendix D – Copy of Original Ground Investigation Report (Submitted in May 2013)

Ref: 13/20593
May 2013

Report on a Ground Investigation

At

147 Kentish Town Road, London, NW1 8PD

For

Ringley Limited

1.0 INTRODUCTION

At the request of RWA London, acting on behalf of Ringley Limited, a ground investigation was carried out in connection with a proposed development at the above site.

The information was required for the design and construction of foundations and infrastructure for the proposed development which includes demolishing the existing building but retaining and reusing the existing basement and constructing a five-storey mixed commercial and student building above. A study to assess whether any remediation was required for the protection of the end-user from the presence of potential contamination within the soils encountered was outside the scope of the present investigation.

The recommendations and comments given in this report are based on the ground conditions encountered in the exploratory holes made during the investigation and the results of the tests made in the field and the laboratory. It must be noted that there may be special conditions prevailing at the site remote from the exploratory hole locations which have not been disclosed by the investigation and which have not been taken into account in the report. No liability can be accepted for any such conditions.

This report does not constitute a full environmental audit of either the site or its immediate environs.

2.0 THE SITE AND LOCAL GEOLOGY

(National Grid Reference: TQ 289 844)

2.1 Site Description

The site is situated on the corner of Castle Road and the A400 Kentish Town Road in North London at approximate postcode NW1 8PD. The site is currently occupied by a former public house together with rear courtyard.

2.2 Geology

The 1:50000 Geological Survey of Great Britain (England and Wales) covering the area (Sheet 256, 'North London', Solid and Drift Edition) indicates the site to be underlain by the London Clay Formation.

3.0 SCOPE OF WORK

3.1 General

The scope of the investigation was agreed with the Consulting Engineer and comprised:

- The drilling of two continuous flight auger boreholes to a depth of 15.0m below ground level (Boreholes 1 and 2).
- The excavation by hand of four trial pits, two to a depth of up to 1.50m below ground level (Trial Pits 1 and 2) and two to a depth of up to 1.50m below basement level (Trial Pits 3 and 4) to confirm near surface soil conditions, expose the existing foundations.
- Sampling and in-situ testing as appropriate to the ground conditions encountered in the boreholes and trial pits.
- Laboratory testing to determine the engineering properties of the soils encountered in the exploratory holes.
- Interpretative reporting on foundation options for the proposed building works and infrastructure.
- A study into the possibility of the presence of toxic substances in the soil, together with any remediation required was outside the scope of the present investigation.

3.2 Ground Conditions

The locations of the exploratory holes are shown on the sketch site plans, Figures 1 and 1a. The depths listed for the boreholes and Trial Pits 1 and 2 are correlative to street level whilst the depths for Trial Pits 3 and 4 correlate to basement / cellar level.

The exploratory holes revealed ground conditions that were generally consistent with the geological records and known history of the area and comprised up to 1.90m thickness of made ground locally resting on materials typical of Superficial Head Deposits followed by the London Clay Formation at depth.

For detailed information on the ground conditions encountered in the exploratory holes, reference should be made to the exploratory hole records presented in Appendix A.

The made ground extended down to respective depths of 1.90m and 1.30m below ground level in Boreholes 1 and 2, 0.40m and 0.42m below basement level in Trial Pits 3 and 4 and to the full depths of investigation of up to 1.50m below ground level in Trial Pits 1 and 2. The material generally consisted of a surface cover of concrete overlying a mixture of very soft silty clay with ashes, brick fragments and clinker.

Superficial Head deposits were encountered below the made ground in Boreholes 1 and 2 and comprised of dense very clayey silty sand with varying proportions of flint gravel. These materials extended down to a depth of 2.40m below ground level in both boreholes

Below the Superficial Head deposits in Boreholes 1 and 2 and below the made ground in Trial Pits 1 and 2, the material comprised of stiff becoming very stiff mottled silty clay with some becoming occasional pockets and partings of silty fine sand and occasional small gypsum crystals. These deposits are typical of weathered London Clay and extended down to respective depths of 7.00m and 6.90m below ground level in Boreholes 1 and 2 and to the full depths of investigation of 1.50m below basement level in Trial Pit 3 and 0.85m below basement level in Trial Pit 4.

The weathered clay was underlain by more competent London Clay comprising of very stiff fissured silty clay with occasional partings of silty fine sand and scattered small gypsum crystals. These deposits extended down to the full depths of investigation of 15.0m below ground level in Boreholes 1 and 2.

3.3 Groundwater

Groundwater was not encountered during drilling or excavation of the exploratory holes and the material remained essentially dry throughout.

It must be noted that the speed of excavation and boring is such that there may well be insufficient time for light seepages of groundwater to enter the boreholes and trial pits and hence be detected, particularly within more cohesive soils of low permeability.

Isolated pockets of groundwater may be present perched within any less permeable material found at shallower depth on other parts of the site especially within any Made Ground.

It should be noted that the comments on groundwater conditions are based on observations made at the time of the investigation (April 2013) and that changes in the groundwater level could occur due to seasonal effects and also changes in drainage conditions.

3.4 Existing Foundations

Trial Pits 1 to 4 inclusive were excavated adjacent to existing structures in order to expose the foundations and founding stratum. Sketches of the foundations exposed in the trial pits and other pertinent details are presented on Figures 2 to 5 inclusive.

4.0 IN-SITU AND LABORATORY TESTS

4.1 In-Situ Mackintosh Probe and Shear Vane Tests

In made ground and the essentially granular soils encountered near to the surface in the boreholes, Mackintosh Probe tests were made at regular depth increments in order to assess the density or undrained shear strength of the materials. The results indicate that the made ground is of a soft consistency and the natural granular soils are in a dense state of compaction, all results being based on the generally accepted correlation as follows:

Mackintosh N75 X 0.38 = SPT 'N' Value

or

Mackintosh N300 X 0.1 = SPT 'N' Value

In the essentially cohesive soils encountered at depth in the boreholes, in-situ shear vane tests were made in order to assess the undrained shear strength of the materials. The result indicated that the cohesive soils at depth are of a stiff becoming very stiff consistency with increasing depth below ground level.

The results of the in-situ tests are shown on the appropriate exploratory hole records contained in Appendix A.

4.2 Classification Tests

Atterberg Limit tests were conducted on four samples taken from the near surface cohesive soils encountered in Boreholes 1 and 2. The samples fall into Classes CH and CV according to the British Soil Classification System.

These are fine grained silty clay soils of high and very high plasticity and as such generally have a low permeability and a high susceptibility to shrinkage and swelling movements with changes in moisture content, as defined by the NHBC Standards, Chapter 4.2. The results indicated Plasticity Index values between 44% and 51%, with all of the samples being above the upper 40% boundary between soils assessed as being of medium swelling and shrinkage potential and those assessed as being of high swelling and shrinkage potential.

The test results are given in Table 1, contained in Appendix B.

4.3 Sulphate and pH Analyses

The results of the sulphate and pH analyses made on four natural soil samples selected to be close to anticipated foundation level and to give a range of depth are presented on in the i2 Analytical Test Results contained in Appendix B. The results show the natural soil samples to have water soluble sulphate contents of up to 3.10g/litre associated with slightly alkaline pH values.

5.0 FOUNDATION DESIGN

5.1 General

It is proposed to demolish the existing building on the site, but retain and reuse the existing basement and construct a five storey mixed commercial and student building above. Anticipated foundation loads for the proposed new building are expected to be moderate and of the order of 150kN/m^2 and ground slab loadings are expected to be of the order of 10-15kN/m^2.

5.2 Site Preparation Works

The CDM Co-ordinator should be informed of the site conditions and risk assessment undertaken to comply with the Construction Design Management (CDM) regulations. Site personnel are to be made aware of the site conditions in particular the presence of services and any man-made structures below the site. A full statutory service search is recommended prior to any ground works. Given the close proximity of the site to the Northern Line as indicated by RWA London, LUL approval is likely to be required for any piling works.

5.3 Conventional Spread Foundations

A result of the inherent variability of uncontrolled fill, (Made Ground) is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should therefore, be taken through any Made Ground and either into, or onto a suitable underlying natural strata of adequate bearing characteristics.

Based on the ground and groundwater conditions encountered in the boreholes and trial pits, it should be possible to support the proposed new development on conventional spread or basement raft foundations taken down below the made ground and any weak superficial soils and placed in stiff becoming very stiff sandy silty clay encountered at depths of approximately 2.50m below ground level in the boreholes.

Such foundations placed within natural soils could be designed to an allowable net bearing pressure of the order of 250kN/m^2 at 2.50m depth in order to allow for a factor of safety of about three against general shear failure.

The actual allowable bearing pressure applicable would depend on the form of foundation used, its geometry and depth in accordance with classical analytical methods, details of which can be obtained from “Foundation Design and Construction”, Seventh Edition, 2001 by M J Tomlinson (see references) or similar texts.

Any soft or loose pockets encountered within otherwise competent formations should be removed and replaced with well compacted granular fill.

In addition, foundations may need to be taken deeper should they be within the zones of influence of both existing or recently felled trees and any proposed tree planting. The depth of foundation required to avoid the zone likely to be affected by the root systems of trees is shown in the recommendations given in NHBC Standards, Chapter 4.2, April 2003, “Building near Trees" and it is considered that this document is relevant in this situation.

5.4 Piled Foundations

In the event that the use of conventional spread foundations proves either impracticable or uneconomical due to the size and depth of foundation required, a piled foundation will be required. In these ground conditions, it is considered that some form of bored and in-situ cast concrete piled foundation with reinforced concrete ground beams should prove satisfactory.

The construction of a piled foundation is a specialist activity and the advice of a reputable contractor, familiar with the type of soil and groundwater conditions encountered at this site should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile chosen and method of installation adopted.

To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

Driven piles could also be used and would develop much higher working loads approximately 2.5 to 3 times higher than bored piles of a similar diameter at the same depth. However, the close proximity of adjacent buildings will in all probability preclude their use due to noise and vibration.

5.5 Retaining Walls

The results of the investigation indicated that made ground extends to a depth of 1.90m below ground level overlying Superficial Head deposits and the London Clay Formation below. The groundwater level below the site is unknown.

Retaining walls should generally be designed as self-supporting cantilevered retaining walls. The excavations for a basement must not affect the integrity of adjacent structures and therefore will need to be supported. Two forms of support could be considered, these being temporary works i.e. sheet piling which could be removed after the earth retaining walls have been constructed or as permanent works incorporated into the final design.

To facilitate support of the excavation, consideration could be given to a contiguous, secant or a sheet piled wall. Generally, cantilevered piled walls have an open face to embedded ratio of about one to two, i.e. a supported face three metres in height would require a penetration into the ground of about six metres below the base of the excavation. Should the piled retaining wall be purely an unsupported cantilever, then it is likely that quite deep section sheet piles or large diameter bored piles would be required.

The section of the sheet or the diameter of the piles could be reduced by installing a braced waling to the wall. Piles placed as part of the permanent works would be propped by the roof to the basement and would not be acting purely as a cantilevered support in the long term.

To reduce the likelihood of loss of ground if a sheet piled wall was adopted when removing the sheets, it is considered that the sheet piles should be incorporated into the final wall design. Assuming that the earth retaining wall will be propped, i.e. have its base slab and first floor slab cast in place soon after excavation, it is unlikely that full if any earth pressures will act on the wall while it is not propped. The greatest force acting on the wall, in the short term, is likely to be from the hydrostatic head should water percolate and be retained to the rear of the earth retaining structure.

The design parameters for each element of soil recorded in the relevant exploratory holes are provided in Table A below. The depth of pile penetration can be calculated once structural details of the proposed basement are known.

Founding Material	Depth to top (m)	Description	Critical Angle of Shearing Resistance (°) (Φ'_{crit})[1]	Coefficient active pressure (Ka)	Coefficient passive resistance (Kp)
Superficial Head (granular)	1.30 to 1.90	Dense very sandy very clayey GRAVEL	32	0.31	3.26
London Clay	9.50	Stiff becoming very stiff silty CLAY	21	0.47	2.12

Table A. Summary of design parameters for proposed basement foundation

Notes:

1. Calculated using guidance from BS8002

2. As the depth and structural details of the proposed basement are unknown these values should be used as guidance only

The main phase of uplift or heave from the cohesive soils will come immediately following the excavation of the basement when the greatest elastic rebound of the soil (caused by the loss of the overburden pressure) will occur. Heave can be reduced by proceeding with the excavation in stages and observing and recording any movement that occurs over a set period of time. It may therefore be advantageous to delay the construction until an adequate proportion of the uplift has occurred. Once this monitoring period has elapsed and a suitably qualified engineer is confident that the majority of uplift has occurred, basement construction can commence.

These processes and other ways of dealing with ground movements are described at length in BS8004 (British Standard Code of Practice for Foundations).

5.6 Basement Floor Slab

Due to the thickness of made ground in places, the presence of soils assessed to be of high swelling and shrinkage potential below and the possibility of deep ground disturbance from the removal of the existing buildings and infrastructure, it is recommended that ground slabs should be fully suspended.

5.7 Excavations

Shallow excavations for foundations and services are likely to require nominal side support in the short term and groundwater is unlikely to be encountered in significant quantities once any accumulated surface water has been removed. Deeper and longer excavations below approximately 1.5m below existing ground level will require close side support and some seepages of groundwater could be encountered.

No particular difficulties are envisaged in removing any water by conventional internal pumping methods from open sumps.

Normal safety precautions should be taken if excavations are to be entered.

5.8 Chemical Attack on Buried Concrete

The results of the chemical analyses show the natural soil samples to have water soluble sulphate contents of up to 3.10g/litre associated with slightly alkaline pH values.

In these conditions, it is considered that deterioration of buried concrete due to sulphate or acid attack is likely to occur. The final design of buried concrete according to Tables C1 and C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-4.

In addition, segregations of gypsum were noted within the London Clay and scattered small gypsum crystals were also noted at depth. Consequently, it is considered that any buried concrete at depth may be attacked by such sulphates in solution and that it would be prudent to design any such deep buried concrete in accordance with full Class DS-4 conditions.

p.p. SITE ANALYTICAL SERVICES LIMITED

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Senior Geologist

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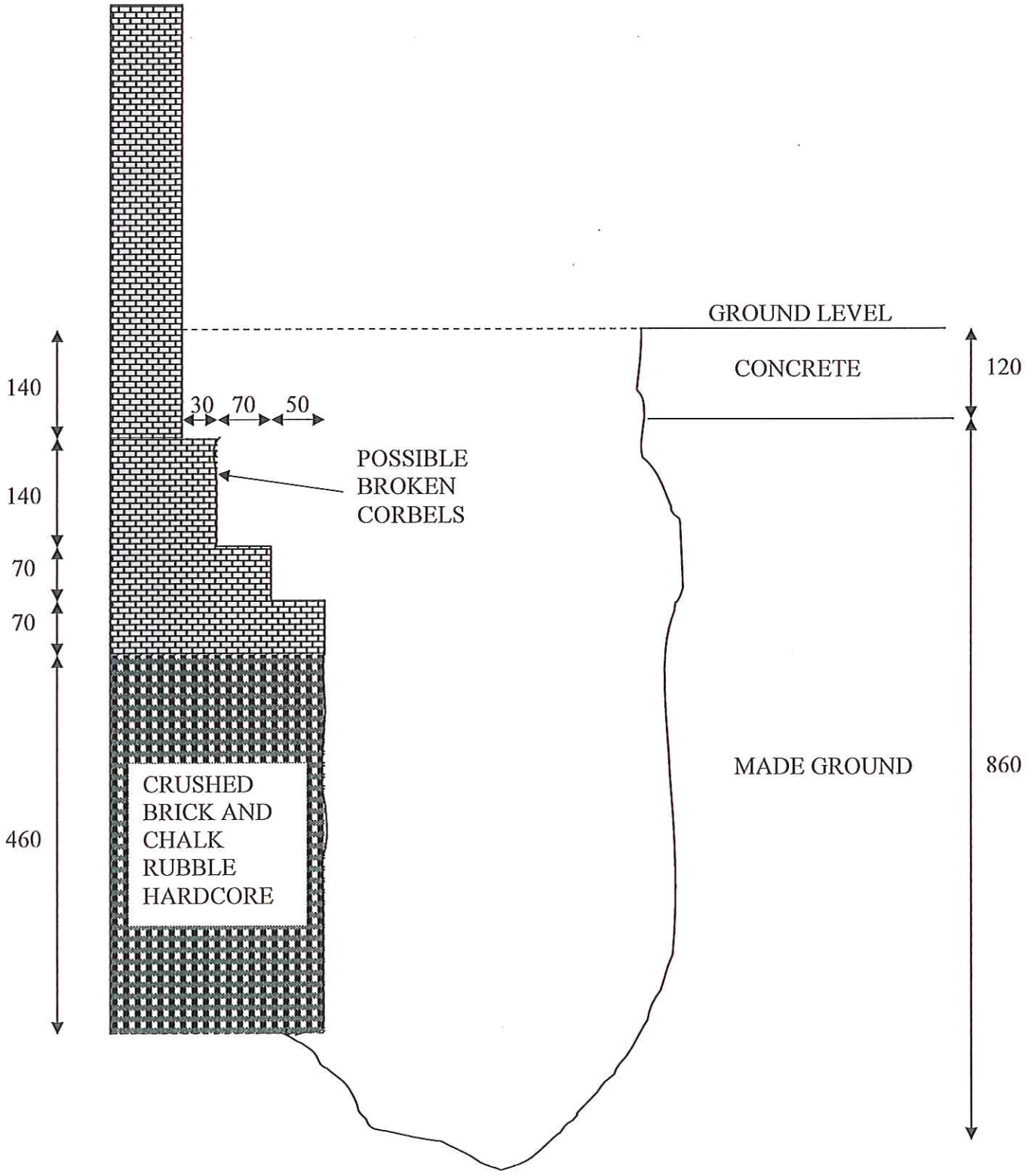
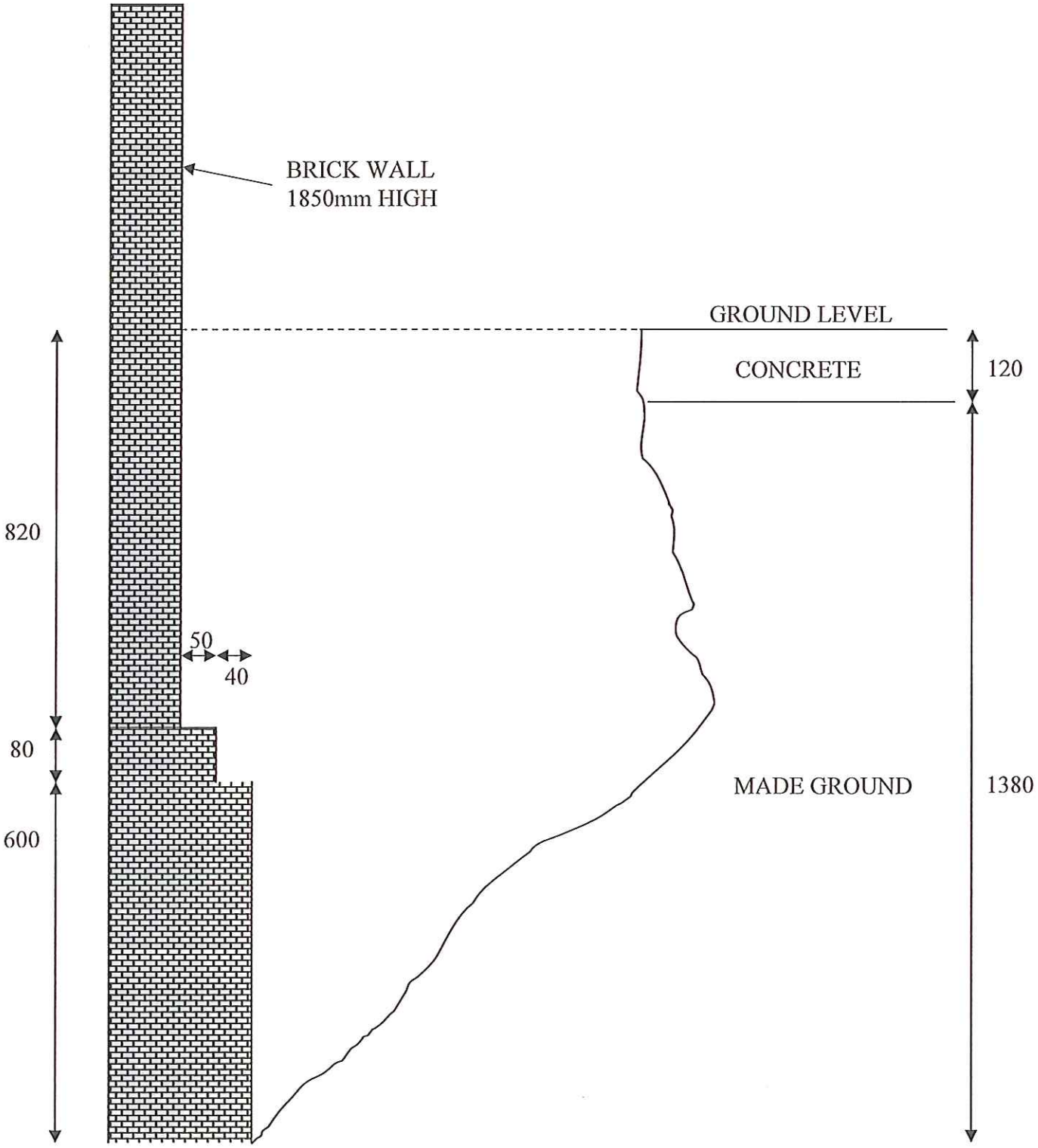
Site Analytical Services Ltd.				REF: 13/20593
LOCATION:	147 Kentish Town Road, London, NW1 8PD			FIG: 2
TITLE:	Trial Pit 1	DATE:	April 2013	SCALE: NTS



END OF TRIAL PIT 1 AT 980mm DEPTH

DIMENSIONS IN mm

Site Analytical Services Ltd.				REF: 13/20593
LOCATION:	147 Kentish Town Road, London, NW1 8PD			FIG: 3
TITLE:	Trial Pit 2	DATE:	April 2013	SCALE: NTS

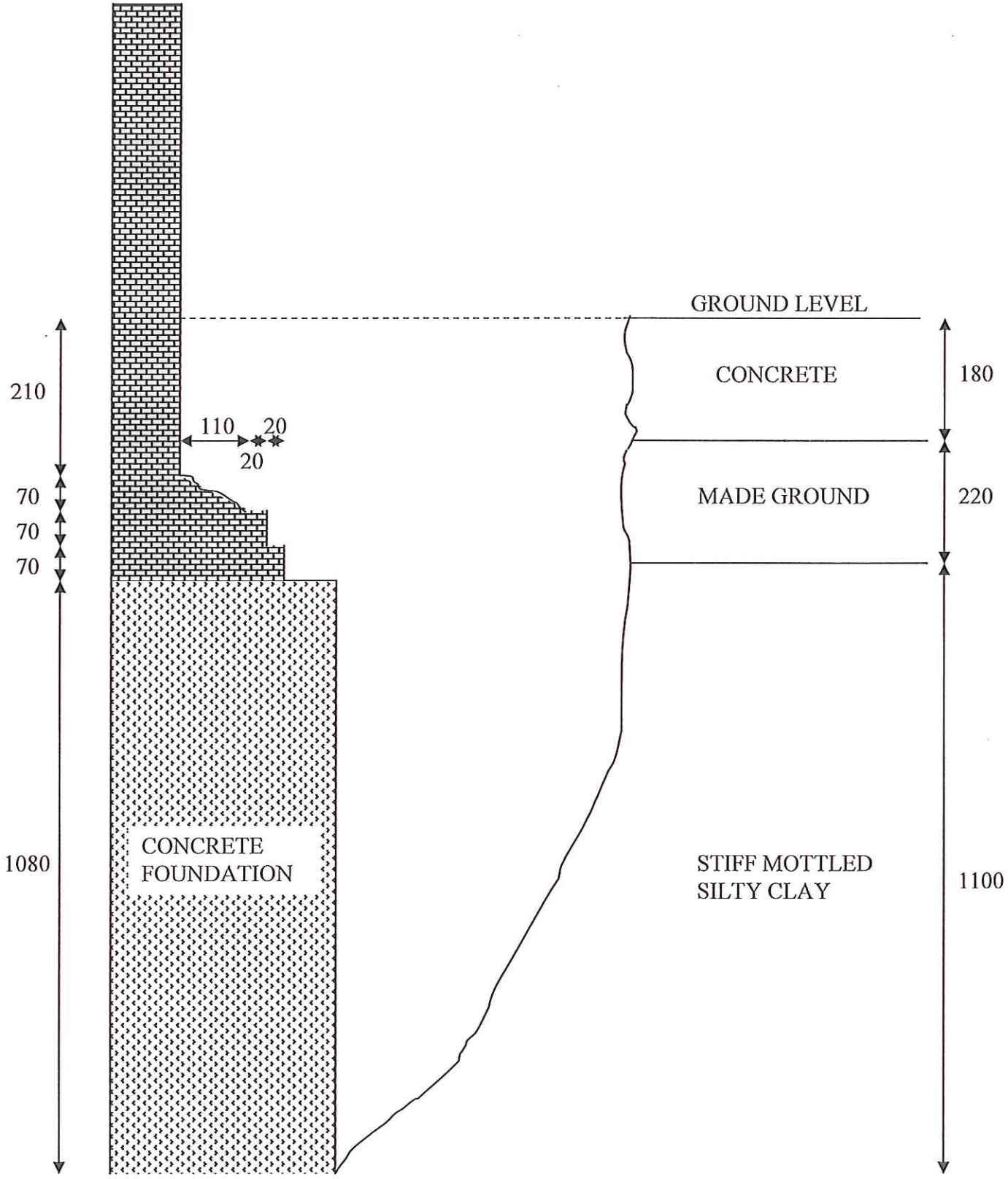


BASE OF FOUNDATION NOT FOUND

END OF TRIAL PIT 2 AT 1500mm DEPTH

DIMENSIONS IN mm

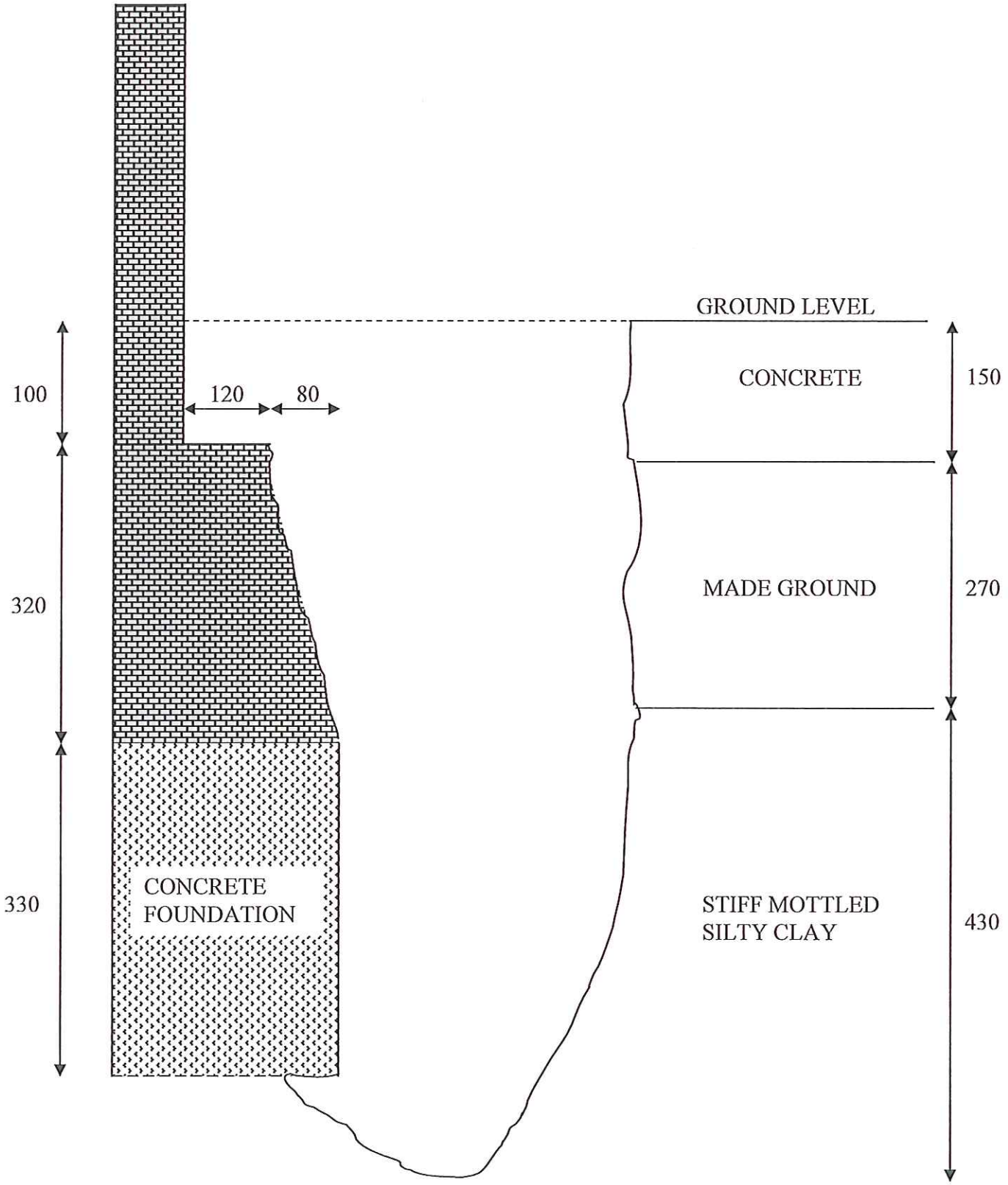
Site Analytical Services Ltd.				REF: 13/20593
LOCATION:	147 Kentish Town Road, London, NW1 8PD			FIG: 4
TITLE:	Trial Pit 3	DATE:	April 2013	SCALE: NTS



END OF TRIAL PIT 3 AT 1500mm DEPTH

DIMENSIONS IN mm

Site Analytical Services Ltd.				REF: 13/20593
LOCATION:	147 Kentish Town Road, London, NW1 8PD			FIG: 5
TITLE:	Trial Pit 4	DATE:	April 2013	SCALE: NTS



END OF TRIAL PIT 4 AT 850mm DEPTH

DIMENSIONS IN mm

APPENDIX `A'

Borehole / Trial Pit Logs

Site Analytical Services Ltd.

Site 147 KENTISH TOWN ROAD, LONDON, NW1 8PD			**Borehole Number** BH1
Boring Method CONTINUOUS FLIGHT AUGER	**Casing Diameter** 100mm cased to 0.00m	**Ground Level (mOD)**	**Client** RINGLEY LIMITED	**Job Number** 1320593
	Location TQ 289 844	**Dates** 25/04/2013	**Engineer** RWA LONDON	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.10)	MADE GROUND : Concrete surface.		
						0.10			
0.25	D1					(0.30)	MADE GROUND : Black ashes and clinker.		
0.50	D2					0.40	MADE GROUND : Very soft black silty clay with ashes and brick fragments.		
0.75	D3								
1.00	D4								
1.00-1.30	M1 34/300					(1.50)			
1.50	D5								
1.50-1.80	M2 38/300								
						1.90			
2.00	D6					(0.50)	Dense brown very sandy sub angular fine to coarse very clayey flint GRAVEL. Sand is fine to coarse.		
2.00-2.30	M3 100/100					2.40			
2.50	D7						Stiff becoming very stiff brown and mottled orange brown, veined blue grey silty CLAY with occasional partings of light brown silty fine sand and occasional small gypsum crystals		
2.50	V1 140+								
3.00	V2 140+								
3.00	D8								
3.50	D9								
3.50	V3 140+								
4.00	D10								
4.00	V4 140+								
4.50	D11								
4.50	V5 140+					(4.60)			
5.00	V6 140+								
5.00	D12								
6.00	D13								
6.00	V7 140+								
						7.00			
7.00	D14						Very stiff dark grey brown fissured silty clay with occasional partings of light brown silty fine sand and scattered small gypsum crystals		
7.00	V8 140+								
8.00	D15								
8.00	V9 140+								
						(3.00)			
9.00	D16								
9.00	V10 140+								
						10.00			

Remarks
Groundwater was not encountered during drilling
D = Disturbed Sample
M = Mackintosh Probe - Blows/Penetration (mm)
V = Vane Test - Result in kPa

Scale (approx)	Logged By
1:50	APS

Figure No. 1320593.BH1

Site Analytical Services Ltd.

Site	Borehole Number
147 KENTISH TOWN ROAD, LONDON, NW1 8PD	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		RINGLEY LIMITED	1320593
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 289 844	25/04/2013	RWA LONDON	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00 10.00	D17 V11 140+						AS PREVIOUS SHEET		
11.00 11.00	V12 140+ D18								
12.00 12.00	D19 V13 140+					(5.00)			
13.00 13.00	D20 V14 140+								
14.00 14.00	D21 V15 140+								
15.00 15.00	D22 V16 140+			25/04/2013:DRY		15.00	Complete at 15.00m		

Remarks

Scale (approx)	Logged By
1:50	APS

Figure No.
1320593.BH1

Site Analytical Services Ltd.

Site	Borehole Number
147 KENTISH TOWN ROAD, LONDON, NW1 8PD	BH2

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
CONTINUOUS FLIGHT AUGER	100mm cased to 0.00m		RINGLEY LIMITED	1320593
	Location	**Dates**	**Engineer**	**Sheet**
	TQ 289 844	26/04/2013	RWA LONDON	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.10)	MADE GROUND : Concrete surface.		
						0.10			
0.25	D1					(0.10)	MADE GROUND : Brick and concrete rubble		
0.50	D2					0.20	MADE GROUND : Very soft black silty clay with ashes and brick fragments.		
0.75	D3					(1.10)			
1.00	D4								
1.00-1.30	M1 42/300					1.30	Dense brown very sandy sub angular fine to coarse very clayey flint GRAVEL. Sand is fine to coarse.		
1.50	D5								
1.50-1.68	M2 138/175					(1.10)			
2.00	D6								
2.00-2.14	M3 100/140					2.40	Stiff becoming very stiff brown and mottled orange brown, veined blue grey silty CLAY with occasional partings of light brown silty fine sand and occasional small gypsum crystals		
2.50	D7								
2.50	V1 140+								
3.00	V2 140+								
3.00	D8								
3.50	D9								
3.50	V3 140+								
4.00	D10								
4.00	V4 140+								
4.50	D11								
4.50	V5 140+					(4.50)			
5.00	V6 140+								
5.00	D12								
6.00	D13								
6.00	V7 140+								
						6.90	Very stiff dark grey brown fissured silty clay with occasional partings of light brown silty fine sand and scattered small gypsum crystals		
7.00	D14								
7.00	V8 140+								
8.00	D15								
8.00	V9 140+					(3.10)			
9.00	D16								
9.00	V10 140+								
						10.00			

Remarks
Groundwater was not encountered during drilling
D = Disturbed Sample
M = Mackintosh Probe - Blows/Penetration (mm)
V = Vane Test - Result in kPa

Scale (approx)	Logged By
1:50	APS

Figure No.
1320593.BH1

Site Analytical Services Ltd.

Site: 147 KENTISH TOWN ROAD, LONDON, NW1 8PD			Borehole Number: BH2
Boring Method: CONTINUOUS FLIGHT AUGER	Casing Diameter: 100mm cased to 0.00m	Ground Level (mOD):	Client: RINGLEY LIMITED	Job Number: 1320593
	Location: TQ 289 844	Dates: 26/04/2013	Engineer: RWA LONDON	Sheet: 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00 10.00	D17 V11 140+						AS PREVIOUS SHEET		
11.00 11.00	V12 140+ D18								
12.00 12.00	D19 V13 140+					(5.00)			
13.00 13.00	D20 V14 140+								
14.00 14.00	D21 V15 140+								
15.00 15.00	D22 V16 140+			26/04/2013:DRY		15.00	Complete at 15.00m		

Remarks

Scale (approx)	Logged By
1:50	APS

Figure No. 1320593.BH1

Site Analytical Services Ltd.

Site 147 KENTISH TOWN ROAD, LONDON, NW1 8PB			**Trial Pit Number** TP1
Excavation Method HAND EXCAVATION	**Dimensions** 300 x 300	**Ground Level (mOD)**	**Client** RINGLEYS LIMITED	**Job Number** 1320593
	Location TQ 289 844	**Dates** 25/04/2013	**Engineer** RWA LONDON	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.12) 0.12	MADE GROUND : Concrete		
0.25	D1				(0.76)	MADE GROUND : Very soft black silty clay with ashes, brick fragments and clinker		
0.50	D2							
0.75	D3				0.88			
0.88-0.88	M1 100/50		25/04/2013:DRY		(0.10) 0.98	MADE GROUND : Very dense black silty brick rubble		
						Complete at 0.98m		

Plan

Remarks

For details of foundations exposed - see sketch
Groundwater was not encountered during the excavation
M = Mackintosh Probe - Blows/Penetration (mm)
D = Distrubed Sample

Scale (approx)	Logged By	Figure No.
1:50	APS	1320593.TP1

Site Analytical Services Ltd.

Site 147 KENTISH TOWN ROAD, LONDON, NW1 8PB			**Trial Pit Number** TP2
Excavation Method HAND EXCAVATION	**Dimensions** 300 x 300	**Ground Level (mOD)**	**Client** RINGLEYS LIMITED	**Job Number** 1320593
	Location TQ 289 844	**Dates** 25/04/2013	**Engineer** RWA LONDON	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.12) 0.12	MADE GROUND : Concrete		
0.25	D1					MADE GROUND : Very soft black silty clay with ashes, brick fragments and clinker		
0.50	D2							
0.75	D3				(1.38)			
1.00	D4							
1.50	D5		25/04/2013:DRY		1.50	Complete at 1.50m		

Plan

Remarks

For details of foundations exposed - see sketch
Groundwater was not encountered during the excavation
M = Mackintosh Probe - Blows/Penetration (mm)
D = Distrubed Sample

Scale (approx)	Logged By	Figure No.
1:50	APS	1320593.TP2

Site Analytical Services Ltd.

Site 147 KENTISH TOWN ROAD, LONDON, NW1 8PB			**Trial Pit Number** TP3
Excavation Method HAND EXCAVATION	**Dimensions** 300 x 300	**Ground Level (mOD)**	**Client** RINGLEYS LIMITED	**Job Number** 1320593
	Location TQ 289 844	**Dates** 25/04/2013	**Engineer** RWA LONDON	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.18)	MADE GROUND : Concrete		
					0.18			
0.25	D1				(0.22)	MADE GROUND : Very soft black silty clay with ashes, brick fragments and clinker		
0.50	D2				0.40			
0.75	D3					Stiff brown and mottled orange brown, veined blue grey silty CLAY with occasional partings of light brown silty fine sand		
1.00	D4				(1.10)			
1.50	D5		25/04/2013:DRY		1.50	Complete at 1.50m		

Plan

Remarks

D = Distrubed Sample
M = Mackintosh Probe - Blows/Penetration (mm)
Groundwater was not encountered during the excavation
For details of foundations exposed - see sketch

Scale (approx)	Logged By	Figure No.
1:50	APS	1320593.TP2

Site Analytical Services Ltd.

Site 147 KENTISH TOWN ROAD, LONDON, NW1 8PB			**Trial Pit Number** TP4
Excavation Method HAND EXCAVATION	**Dimensions** 300 x 300	**Ground Level (mOD)**	**Client** RINGLEYS LIMITED	**Job Number** 1320593
	Location TQ 289 844	**Dates** 25/04/2013	**Engineer** RWA LONDON	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	MADE GROUND : Concrete		
0.25	D1				(0.27) 0.42	MADE GROUND : Very soft black silty clay with ashes, brick fragments and clinker		
0.50	D2				(0.43) 0.85	Stiff brown and mottled orange brown, veined blue grey silty CLAY with occasional partings of light brown silty fine sand		
0.75	D3							
0.85	V1 140+		25/04/2013:DRY			Complete at 0.85m		

Plan

Remarks

For details of foundations exposed - see sketch
Groundwater was not encountered during the excavation
M = Mackintosh Probe - Blows/Penetration (mm)
D = Distrubed Sample

Scale (approx)	Logged By	Figure No.
1:50	APS	1320593.TP4

APPENDIX `B'

Laboratory Test Data

Site Analytical Services Ltd.

Ref: 13/20593

PLASTICITY INDEX & MOISTURE CONTENT DETERMINATIONS

LOCATION 147 Kentish Town Road, London, NW1 8PD

BH/TP No.	Depth m	Natural Moisture %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425 μm %	Class
BH1	2.50	24	76	25	51	100	CV
	3.00	26	72	26	46	99	CV
BH2	2.50	24	67	23	44	99	CH
	3.50	30	77	29	48	99	CV

Table 1

Aubrey Davidson
Site Analytical Services Ltd
Units 14 -15
River Road Business Park
33 River Road
Barking
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IG11 0EA

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f: 0208 5948072
e: aubreyd@siteanalytical.co.uk

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Building 19,
BRE,
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Watford,
WD25 9XX

t: 01923 67 00 20
f: 01923 67 00 30
e: reception@i2analytical.com

Analytical Report Number : 13-42113

Project / Site name:	147 Kentish Town Rd	**Samples received on:**	01/05/2013
Your job number:	13/20593	**Samples instructed on:**	01/05/2013
Your order number:	11354	**Analysis completed by:**	09/05/2013
Report Issue Number:	1	**Report issued on:**	09/05/2013
Samples Analysed:	4 soil samples		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Customer Services Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 13-42113
Project / Site name: 147 Kentish Town Rd
Your Order No: 11354

Lab Sample Number				261035	261036	261037	261038	
Sample Reference				BH1	BH1	BH2	BH2	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				3.50	9.00	3.00	14.00	
Date Sampled				01/05/2013	01/05/2013	01/05/2013	01/05/2013	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Moisture Content	%	N/A	NONE	21	18	17	16	
Total mass of sample received	kg	0.001	NONE	1.5	1.6	1.7	1.6	
General Inorganics								
pH	pH Units	N/A	MCERTS	8.2	8.2	8.2	8.4	
Water Soluble Sulphate as SO_4 (2:1)	g/l	0.0025	MCERTS	1.2	3.1	0.91	1.5	
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	1200	3100	910	1500	

Analytical Report Number : 13-42113

Project / Site name: 147 Kentish Town Rd

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 2 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
261035	BH1	None Supplied	3.50	Light brown clay with gravel.
261036	BH1	None Supplied	9.00	Brown clay.
261037	BH2	None Supplied	3.00	Light brown clay with chalk.
261038	BH2	None Supplied	14.00	Brown clay.

Analytical Report Number : 13-42113

Project / Site name: 147 Kentish Town Rd

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Client Specific Preparation - Crush Whole Sample	Client specific preparation instructions - sample(s) crushed whole prior to analysis.	In house method	L019-UK	W	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample results are not corrected for the stone content of the	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by extraction with water followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.