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Basement Impact Assessment & Site Investigation Report

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

Site: 36 Redington Road, London NW3

Client: Mr Zolf

Report Date: September 2014

Project Reference: J11894

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Basement Impact Assessment (Screen/Scoping) Report

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

Site: 36 Redington Road, London NW3

Client: Mr Zolf

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Project Reference: J11894Rev01

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FIGURES

A INTRODUCTION

1 Introduction

The object of this study was to produce an impact assessment for the proposed basement construction on this site in accordance with the requirements of the London Borough of Camden. Their requirements are set out within their Development Policy DP27 – Basements and Lightwells and the recent LB Camden guidance document entitled "Camden geological, hydrogeological and hydrological study – Guidance for subterranean development".

This report covers the initial desk study and screening process.

2 Scope

This report presents our desk study findings and our interpretation of these data.

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

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

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

B THE SITE

3 Site Location

The site is referred to as 36 Redington Road and is located in the Hampstead area of London, to the south and west of Hampstead Heath. It is approximately centred at National Grid Reference TQ 257 859.

The site is a rough rectangular shape with a width of around 10 to 15m and some 40m in depth from the frontage. The existing two-storey semi detached house has a single-storey extension and garage to the side, taking up the entire width of the plot. The rear garden area is set to lawn, the front garden area is again lawn with a concrete driveway and path. There is an established hedge at the front and forming the boundaries to the rear garden. There are a number of mature trees along the eastern boundary. Immediately to the west the other half of the semi-detached house has been redeveloped with a three-storey building with a basement

extending both to the front and rear of the building. In the immediate area around this site the buildings are almost entirely detached residential properties of varying sizes.

A site location plan is presented as Figure 1.

4 Proposed Development

The proposals for this site are to demolish the existing building and redevelop the site with a new three-storey residential property including a two level basement. The footprint of the new building will be slightly bigger than the existing above ground, but extends out below the existing front and rear garden areas. The appended Figure 2A illustrates the proposals.

C GROUND CONDITIONS

5 Published Geological Data

The British Geological Survey Map No 256 indicates that the site geology consists of Claygate Member overlying London Clay.

The study site is marked on appended Figure 3 based upon the North Camden Geological Map figure taken from "Camden geological, hydrogeological and hydrological study – Guidance for subterranean development", which indicates the same mapped geology.

6 Previous Ground Investigation data

Very few publicly available records of ground investigation or historical boreholes are shown on the BGS website. The borehole information that is available does not disagree with the published information.

D HYDROLOGY & HYDROGEOLOGY

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

Data		Remarks	Possible Hazard to/from Site Y/N
Aquifer Designation	Superficial Deposits	No superficial Deposits present.	N

Data		Remarks	Possible Hazard to/from Site Y/N
	Bedrock	Secondary A aquifer, relating to the Bagshot Formation and Claygate Member. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers	Y
Groundwater Vulnerability		Minor Aquifer High.	Y
Abstractions		The site on the website on 8th August 2014 does not show any abstractions within the area.	N
Source Protection Zones		The site on the website on 8th August 2014 is not shown within an area mapped as overlying a SPZ.	N
Surface Water Features		The nearest feature is a pond on Hampstead heath some 550m to the northeast.	N
Marine/Fluvial Flood Risk		The site on the website on 8th August 2014 is not shown within an area mapped as being at risk.	N
Surface Water Flood Risk		The site on the website on 8th August 2014 is shown within an area mapped as being at low to high risk.	Y
Reservoir Flood Risk		The site on the website on 8th August 2014 is not shown within an area mapped as being at risk.	N

7 Shallow Groundwater

Shallow groundwater is contained within the Claygate Member, which forms part of a 'secondary' aquifer in this area. These soils are seen as around 5m thick beneath this site.

Groundwater information obtained from the site indicates that standing levels are around 1.0m BGL. It is believed that the groundwater gradient/flow will be in an southeasterly direction.

8 Surface Water Features

No culvert, rivers and or other water bodies are known within the immediate vicinity of the site.

From information shown on appended Figures 4, 5 & 6 this site is located at or near two historical branches of the headwaters of a tributary of the River Westbourne. A pond on the western side of Hampstead Heath about 550m to the northeast represents the nearest surface water features. The site is also outside the catchment of the Hampstead Heath ponds.

E UNDERGROUND STRUCTURES

9 Basements

From our walkover survey of the local area and from a search of London Borough of Camden online planning applications, it appears that the neighbouring property have just constructed a two level basement.

10 Transport & Other Infrastructure

No tunnels are known to be within the immediate vicinity of the site.

F BASEMENT IMPACT ON STRUCTURAL STABILITY

11 Structural Stability

DP27 "Maintain the structural stability of the building and neighbouring properties".

The proposed development consists of a new basement similar in depth to the adjacent property at 38 Redington Road. Due to the presence of groundwater at approximately 1.0m below existing ground levels, the new basement will need to be formed using a watertight construction. It is thought at this will be formed using contiguous or secant piled walls with suitable waterproofing/drainage measures. The walls would be designed to resist lateral pressures from the water, soil and adjacent party wall.

The walls would be propped during the construction phase using some flying shores/diagonal bracing and in the permanent condition through the new basement floor slabs.

The extent and nature of propping, and the size and detail of the piled wall will be explored during the detailed design phase of the works in order to allow discussions with the party wall surveyor to occur.

Throughout the construction phase the party wall with 38 Redington Road would be monitored for both movement and vibration to make sure these are within acceptable limits.

G SCREENING EXERCISE

DP27 "Avoid adversely affecting drainage and run-off or causing other damage to the water environment and Avoid cumulative impacts upon structural stability or the water environment in the local area" LB Camden's "guidance for subterranean development" requires that any development proposal which includes a subterranean basement should be screened in order to determine whether there is an requirement for a BIA to be carried out.

The existing building on the site does not have a basement. However, the proposed new building will include a two level basement. Therefore screening is required.

In this section, the questions in the screening flowcharts of Appendix E of the LB Camden guidance document are addressed in turn.

12 Surface Flow and Flooding

Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?

No. The site is outside the Golders Hill Chain Catchment, which is about 300m to the north (see Figure 5).

Question 2: 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?

Yes, given the proposed increase in hard surfaced area. The current proposal is to re-use the existing storm water connections to the Thames Water sewer. Subject to a more detailed condition survey of these connections, it is not envisaged that any new connections will be required.

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

Yes. There will be an increase in the area of hard surfaced/paved areas as roof areas have increased and part of the footprint of the proposed basement covers an area currently used as garden/soft landscaping.

Question 4: 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. The proposed basement will not alter surface water flows downstream as they will use existing connections to the sewer network.

Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

No. The quality of the surface water should be unaltered that is discharged to the sewer.

Question 6: Is the site in an area known to be at risk from surface water flooding, such as South Hampstead, West Hampstead, Gospel Oak and King's Cross, or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?

Yes, the site is close to Templewood Avenue and Gardens which are recorded to have flooded in 2002 (see Figure 7), however just to the east of 36 Redington Road where Redington Gardens and Heath Drive meet, the road is at a significantly lower elevation, lessening the local affect to this site significantly.

13 Groundwater Flow

Question 1a: Is the site located directly above an aquifer?

Yes. The site is located above the northern aquifer, designated a Secondary A Aquifer by the EA which comprises Claygate Member and Bagshot Formation, see Figure 8.

Question 1b: Will the proposed basement extend beneath the water table surface?

Yes. The water table is within the Claygate Member. Proposed retaining walls around the basement cut into the underlying London Clay.

Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?

Yes. The nearest historical watercourse is within 50m of the site, see figure 6, any current surface water features are in excess of 100m from the site. We are unaware of any waterwells within the immediate area. Springlines for the adjacent Golders Hill Chain Catchment are greater than 100m to the north of this site. See figure 5.

Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?

No. The site is outside the Highgate Chain Catchment, around 300m to the south (see Figure 5).

Question 4: Will the proposed basement development result in a change in the proportion of hard surfaced /paved areas?

Yes. The new basement will increase the area of hard surfaced/paved areas as the proposed roof area is larger and footprint of the proposed basement covers an area which is currently garden.

Question 5: As part of the 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. All surface water will be discharged to the sewer network through existing connections, replicating the existing arrangement. The volume of water will increase from the existing condition.

Question 6: 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 (not just the pond chains on Hampstead Heath) or spring line?

No. There are no known local water features in the immediate vicinity of this site, however the historical watercourse of River Westbourne is very close to the site.

14 Slope Stability

Question 1: Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)

No. The site has shallower slopes than 7 degrees within its boundaries.

Question 2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7 degs? (approximately 1 in 8)

No.

Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degs? (approximately 1 in 8)

No. But around 100m to the east is a shallow valley feature with slopes in excess of 7 degrees, see figure 9.

Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approximately 1 in 8)

No. The site is located on a hillside setting sloping towards the southwest, but with slopes in the main at less than 7 degrees, see figure 9.

Question 5: Is the London Clay the shallowest strata at the site?

No. The Claygate Member underlies the site, see figure 3.

Question 6: Will any tree/s be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained? (Note that consent is required from LB Camden to undertake work to any tree/s protected by a Tree Protection Order or to tree/s in a Conservation Area if the tree is over certain dimensions).

No trees are to be felled, but the proposals are very close to trees on the eastern boundary.

Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?

No. We have no evidence indicating any possible shrink-swell subsidence in the local area.

Question 8: Is the site within 100m of a watercourse or a potential spring line?

No. The nearest watercourse or springline is in excess of 100m from this site, see figures 4 & 5, but it is within 100m of the historical water course (see Figure 6).

Question 9: Is the site within an area of previously worked ground?

No. The site is not within an area shown as having been worked.

Question 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?

Yes. The site does overlie an area of aquifer (Claygate Member/Bagshot Formation), see figure 8.

The proposed basement will be below the standing water levels recorded on site (around 1m BGL). Limited dewatering would be anticipated during construction, as a secant or contiguous piled wall construction method would be used.

Question 11: Is the site within 50m of the Hampstead Heath ponds?

No. See figure 4.

Question 12: Is the site within 5m of a highway or pedestrian right of way?

Yes.

Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?

The proposed lowest point of the proposals are around 7m below ground level and it is understood that it will be very similar to the existing two-level basement recently constructed on the neighbouring property.

Question 14: Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?

No there are no known tunnels within the vicinity of this site.

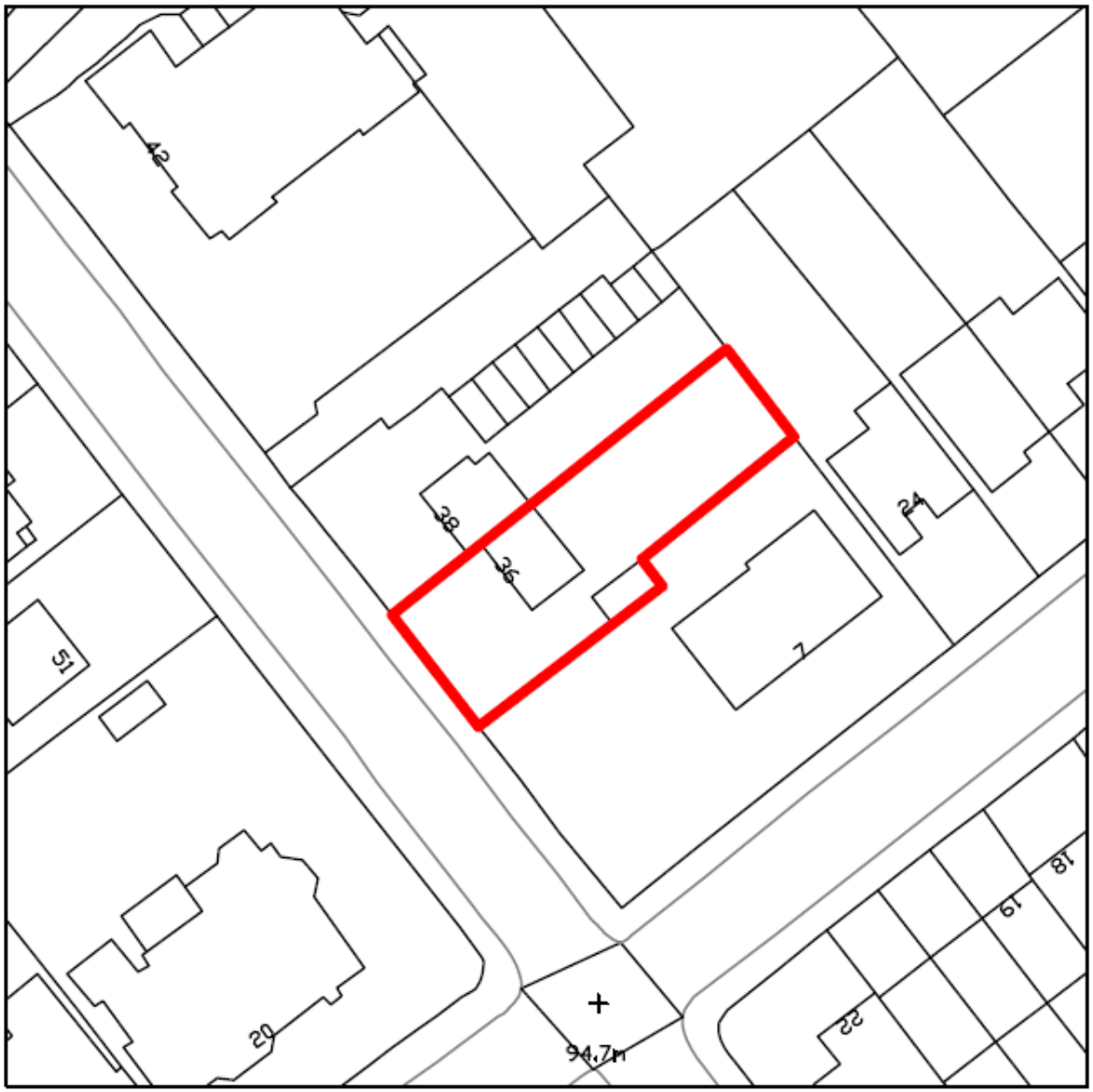
15 Conclusions from Screening

On the basis of this screening exercise, it is concluded that there are a number of items that will need to be investigated further and taken into the scoping stage of the process.

There is a need for an assessment of the potential impact of the new basement on groundwater levels in the Upper aquifer. The new basement will extend through the Claygate Member and could, potentially, have a local 'damming effect' on groundwater flow. However the presence of the adjacent basement will also need to be considered. This assessment is included within the attached Site Investigation Report.

The other issue that will need to be addressed is the potential for surface water flooding at the site.

FIGURES

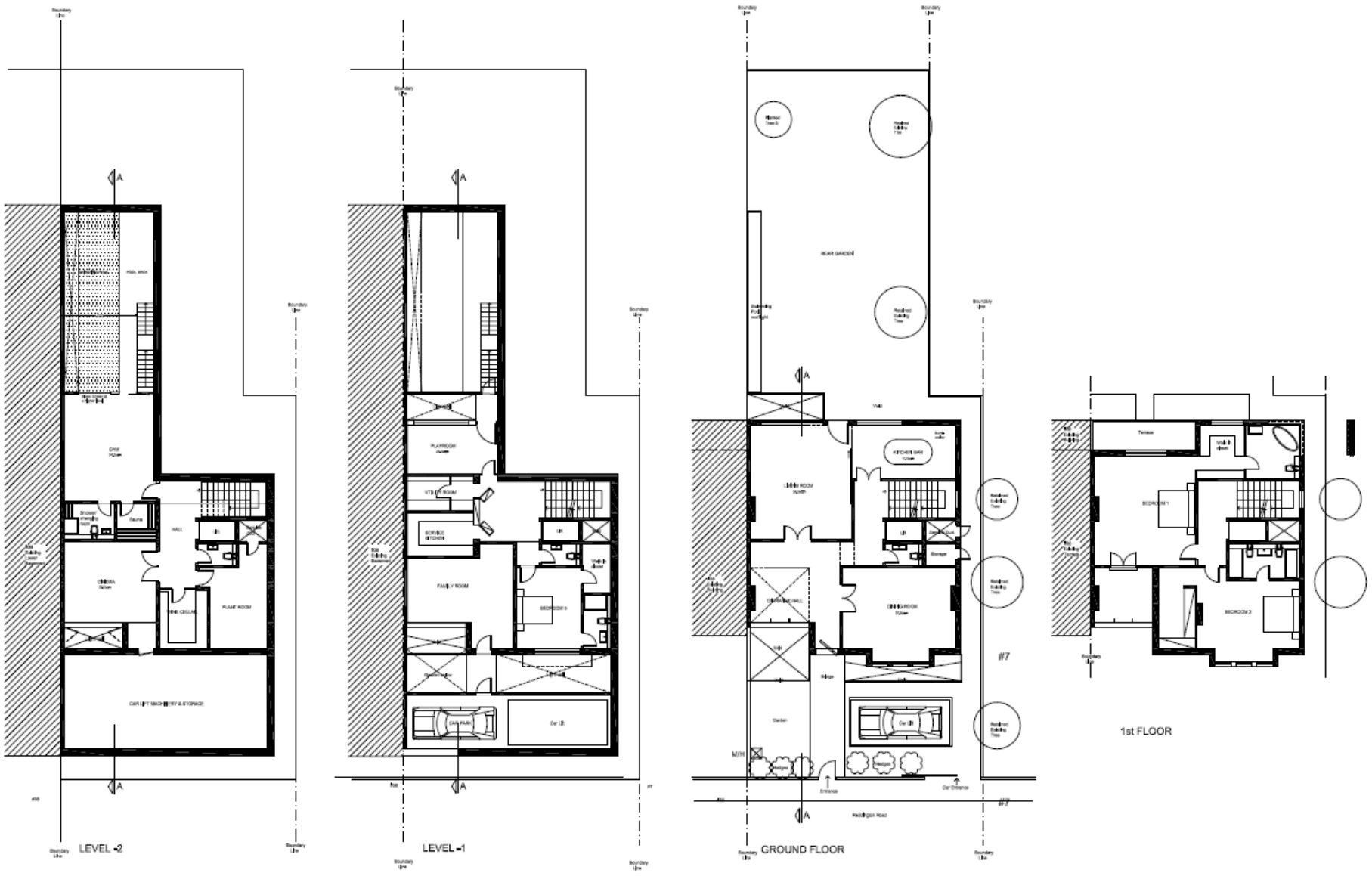


Site: 36 Redington Road, London NW3	STL: J11894	Fig No: 1
Date: 18 August 2014	Site Location Plan	

Southern Testing

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

ST Consult



Site: 36 Redington Road, London NW3	STL: J11894	Fig No: 2A
Date: 25 September 2014	Plan showing proposals	

Southern Testing

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

ST Consult

524000

526000

528000

186000

THE SITE

Data Source: BGS Mapping - Scale 1:10,000

N

Scale at A3: 1:15,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.25 0.5 1 1.5

Kilometers

Legend

- London Borough of Camden
- Railway Lines
- A Roads

BGS 1:10K Artificial Ground

- MADE GROUND
- WORKED GROUND

BGS 1:10K Drift Geology

- ALLUVIUM
- HACKNEY GRAVEL FORMATION
- LANGLEY SILT FORMATION
- LYNCH HILL GRAVEL FORMATION
- STANMORE GRAVEL FORMATION

BGS 1:10K Solid Geology

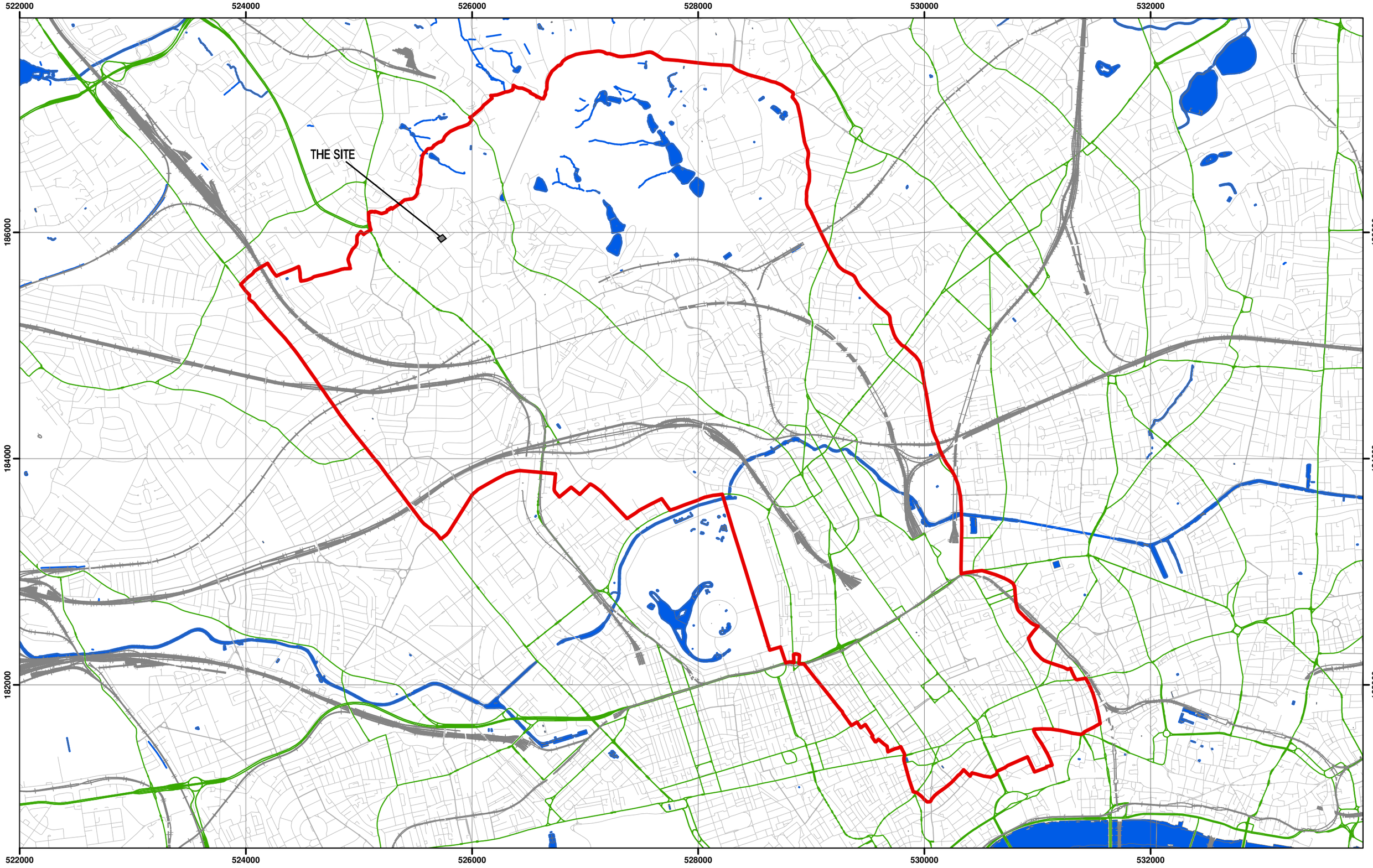
- BAGSHOT FORMATION
- CLAYGATE MEMBER
- LAMBETH GROUP
- LONDON CLAY FORMATION

NB. Geological boundaries are largely indicative based on available geological mapping data

Camden Geological, Hydrogeological and Hydrological Study

North Camden Geological Map

Report: J11894 Site: 36 Redington Road, London NW3 Figure: 3



Data Source: London Borough of Camden, 2010

N

Scale at A3: 1:30,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.5 1 2 3
Kilometers

Legend

- London Borough of Camden
- Surface water
- Railway Lines
- A Roads

Camden Geological, Hydrogeological and Hydrological Study

Camden Surface Water Features

Report: J11894 Site: 36 Redington Road, London NW3 Figure: 4

526000

528000

188000

186000

THE SITE

Catchments and Drainage after Haycock, 2010

N

Scale at A3: 1:10,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.125 0.25 0.5 0.75 1

Kilometers

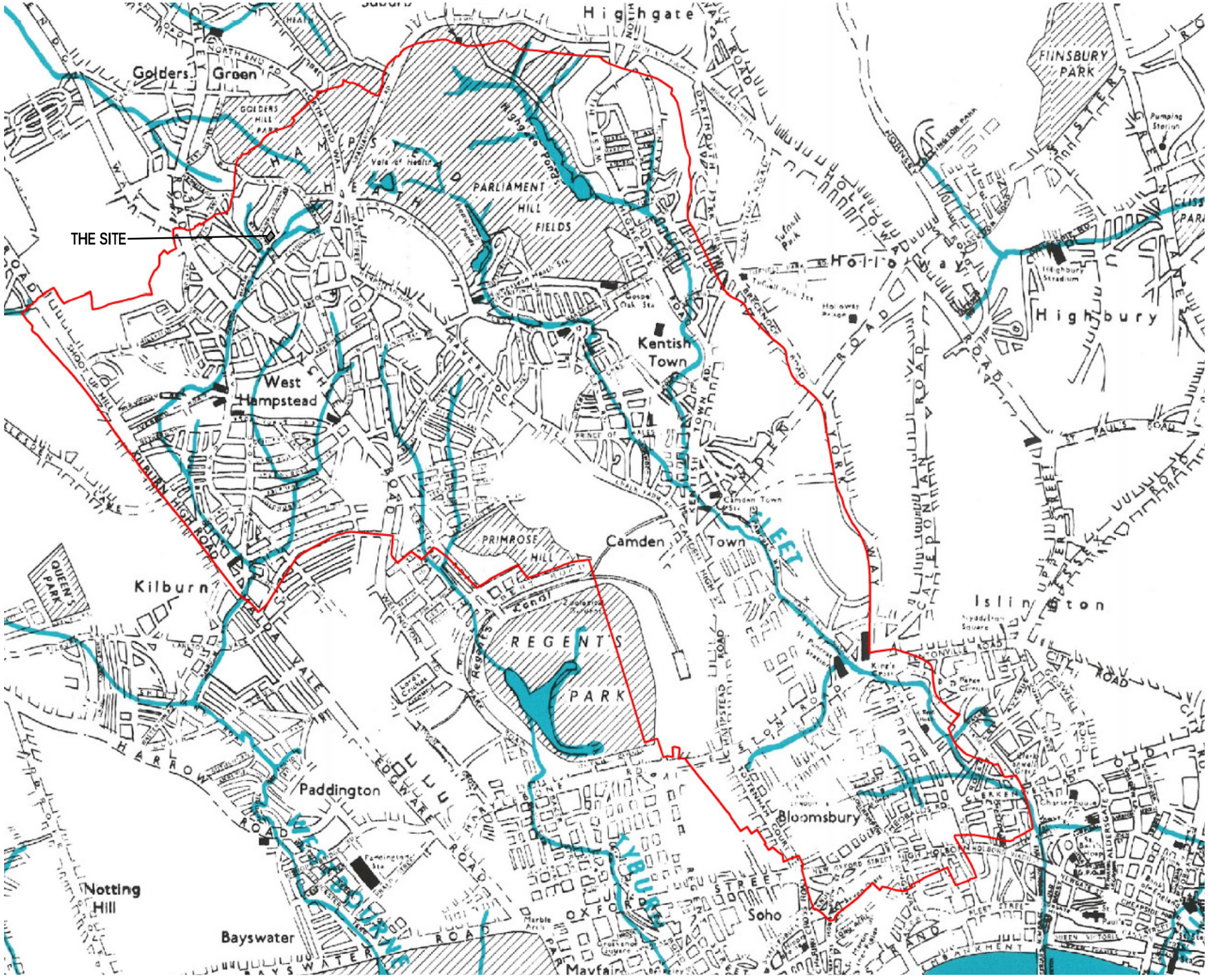
Legend

- London Borough of Camden
- Railway Lines
- A Roads
- Surface Water
- Highgate Chain Catchment
- Golders Hill Chain Catchment
- Hampstead Chain Catchment
- Hampstead Heath Extension Chain Catchment

Camden Geological, Hydrogeological and Hydrological Study

Hampstead Heath Surface Water Catchments and Drainage

Report: J11894 Site: 36 Redington Road, London NW3 Figure: 5



Source – Barton, Lost Rivers of London

Camden Geological, Hydrogeological and Hydrological Study
Watercourses

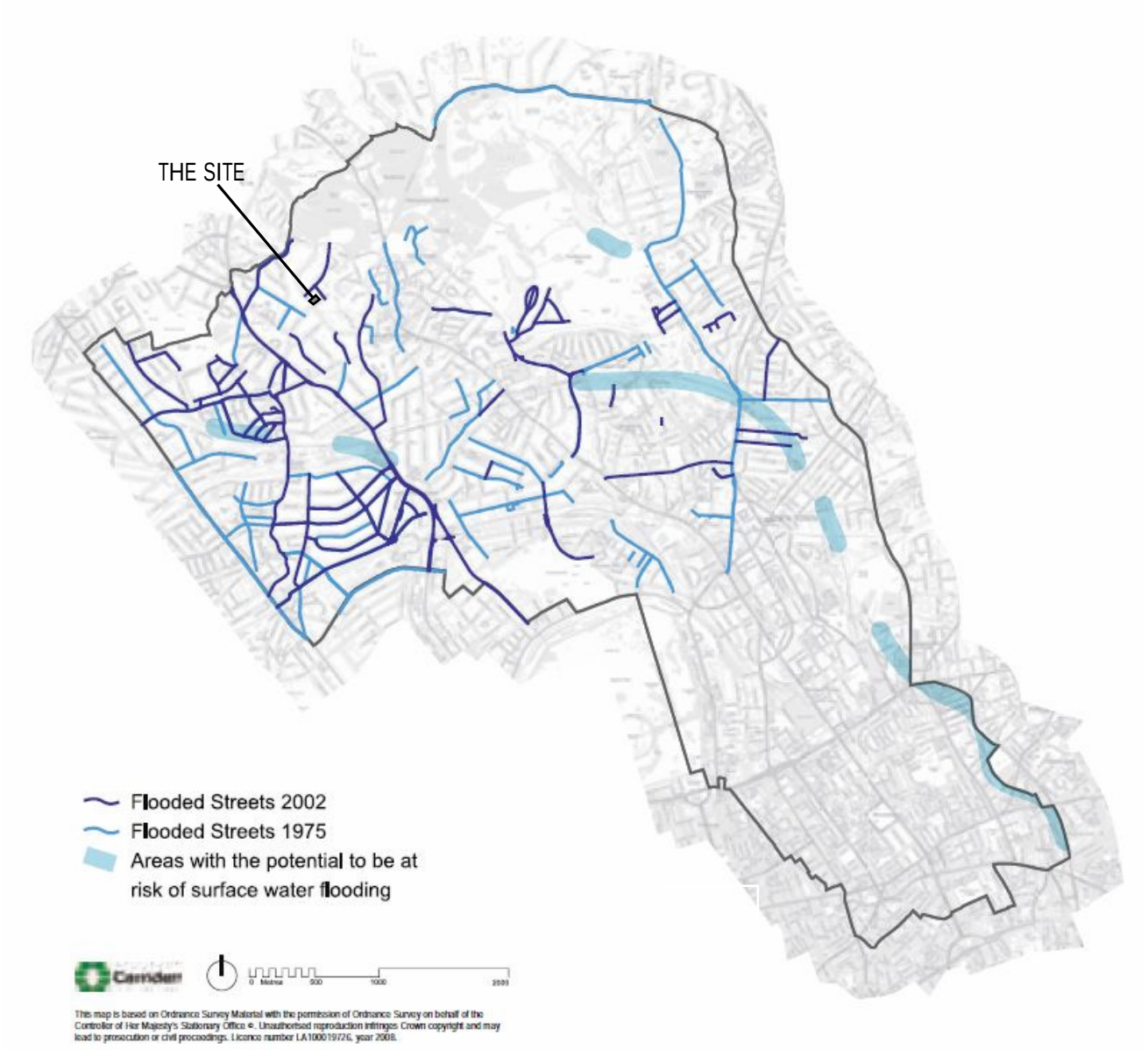


Figure 5 from Core Strategy, London Borough of Camden

Camden Geological, Hydrogeological and Hydrological Study
Flood Map

524000 526000 528000 530000 532000 534000

188000 186000 184000 182000

THE SITE

Environment Agency Aquifer Designation based on BGS Mapping

N

Scale at A3: 1:30,000

Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.5 1 2 3
Kilometers

Legend

- Borough of Camden
- Railway Lines
- A Roads

Aquifer Designation

- Secondary A Aquifer
- Unproductive Strata

Source Protection Zone

- Outer Source Protection Zone
- Inner Source Protection Zone

NB. Aquifer boundaries are indicative based on available geological mapping data

Camden Geological, Hydrogeological and Hydrological Study

Camden Aquifer Designation Map

Report: J11894 Site: 36 Redington Road, London NW3 Figure: 8

524000 526000 528000 530000 532000 534000

186000

184000

182000

THE SITE

Slope Angles calculated from Digital Terrain Model Provided By Camden Bourough Council

N

Scale at A3: 1:30,000

1:10,000 BGS Mapping
Coordinate System:
British National Grid
GCS_OSGB_1936

0 0.5 1 2 3
Kilometers

Legend

Slope
- 0° - 7°
- 7° - 10°
- > 10°

London Borough of Camden
Railway Lines
A Roads

BGS 1:10K Artificial Ground
- MADE GROUND
- WORKED GROUND

BGS 1:10K Drift Geology
- ALLUVIUM
- HACKNEY GRAVEL FORMATION
- LANGLEY SILT FORMATION
- LYNCH HILL GRAVEL FORMATION
- STANMORE GRAVEL FORMATION

BGS 1:10K Solid Geology
- BAGSHOT FORMATION
- CLAYGATE MEMBER
- LAMBETH GROUP
- LONDON CLAY FORMATION

NB. Geological boundaries are largely indicative based on available geological mapping

Camden Geological, Hydrogeological and Hydrological Study

Slope Angle Map

Report: J11894 Site: 36 Redington Road, London NW3 Figure: 9

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Site Investigation Report

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

Site: 36 Redington Road, London NW3

Client: Mr Zolf

Report Date: August 2014

Project Reference: J11894

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SUMMARY

The site comprises a two-storey semi detached property with front and rear gardens. It is proposed to redevelop the site with a new three-storey residential property with two level basement.

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

A single phase of intrusive investigation was carried out.

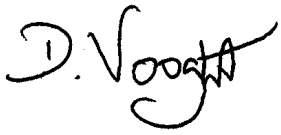
The soils encountered comprised superficial made ground over sandy clays presumed to be Claygate Member over London Clay at around 5m depth.

Groundwater levels appear to be shallow, and influenced by the higher permeability of the overlying Claygate Member soils.

The sulphate content of the fill and natural soil was found to fall within Class DS-3. The ACEC classification for the site is AC-3.

The development includes a basement which is anticipated to be constructed using bored pile walls. Parameters for retaining wall design are given.

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



D Vooght MSc
(Countersigned)

Jon Race MSc CGeol
(Signed)

For and on behalf of Southern Testing Laboratories Limited

STL: J11894
27 August 2014

TABLE OF CONTENTS

A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in an STL Order from Mr M Parvardin of Archetype Associates Ltd. Completed on behalf of Abbey Property, dated 26th June 2014.

2 Location

The site is located in a residential road about 0.6 km to the northwest of Hampstead Underground Station. The approximate National Grid Reference of the site is TQ 257 859.

3 Proposed Construction

It is proposed to redevelop the site with a new three-storey residential property including a two level basement. The footprint of the new building will be slightly bigger than the existing above ground, but extends out below the existing front and rear garden areas.

For the purposes of the contamination risk assessment, the proposed development land use is classified as Residential with plant uptake (CLEA model[1]/C4SL report[2]). The gas sensitivity of the site is rated as High (CIRIA C665[3]).

4 Object

The object of the investigation was to assess foundation bearing conditions and other soil parameters relevant to the proposed development. An initial Basement Impact Assessment (screening & scoping) was undertaken and this report addresses some of the issues that came out of that exercise.

5 Scope

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

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

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

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

[1] Environment Agency Publication SC050021/SR3 'Updated technical background to the CLEA Model' (2009).
[2] SP1010 Development of Category 4 Screening Levels DEFRA (2014)
[3] CIRIA C665 (2006) Assessing risks posed by hazardous ground gases to buildings.

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

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

B DESK STUDY & WALKOVER SURVEY

6 Desk Study

A desk study has been carried out. Reference has been made to the following information sources.

- Geological Maps
- Online Historical Ordnance Survey Maps
- Environment Agency website
- Camden Borough Council website
- Bomb Maps
- BRE Radon Atlas[4]

The environmental databases search report compiled for this desk study contains site-specific environmental data drawn from data sets that comprise publicly available information together with data from third parties, some of which is under review. Accordingly, Southern Testing Laboratories Limited does not warrant its accuracy, reliability or completeness.

6.1 Geology

The British Geological Survey Map No 256 indicates that the site geology consists of Claygate Member overlying London Clay. The overlying Bagshot Formation outcrops approximately 200m to the northeast.

Bagshot Formation

This formation consists of fine white, buff and crimson sands with occasional seams of pipe clay, silt, and local beds of flint gravel.

The Beds are usually 30-45m in thickness and often have a band of flint pebbles at the base. There is a basal layer of mottled loams and clay, with subordinate amounts of reddish sand that resembles the Reading Beds. The clays are succeeded by more sandy, locally pebbly, yellow or gold coloured strata. These beds produce a marked feature above the loam, and sometimes have been taken as the junction with the underlying London Clay.

Claygate Member

The Claygate Member of the London Clay formation comprises sandy transition beds, about 15 m thick, at the top of the London Clay and consists of alternations of sand and clay. Sand predominates above, and clay below. They were commonly worked for brick making.

[4] BR 211 (2007) 'Radon: guidance on protective measures for new buildings'

London Clay

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

6.2 Hydrology and Hydrogeology

Data from the Environment Agency and other information relating to controlled waters is summarised below.

Data		Remarks	Possible Hazard to/from Site Y/N
Aquifer Designation	Superficial Deposits	No superficial Deposits present.	N
	Bedrock	Secondary A aquifer, relating to the Bagshot Formation and Claygate Member. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers	Y
Groundwater Vulnerability		Minor Aquifer High.	Y
Abstractions		The site on the EA website on 8th August 2014 does not show any abstractions within the area.	N
Source Protection Zones		The site on the EA website on 8th August 2014 is not shown within an area mapped as overlying a SPZ.	N
Surface Water Features		The nearest feature is a pond on Hampstead heath some 550m to the northeast.	N
Marine/Fluvial Flood Risk		The site on the EA website on 8th August 2014 is not shown within an area mapped as being at risk.	N
Surface Water Flood Risk		The site on the EA website on 8th August 2014 is shown within an area mapped as being at low to high risk.	Y
Reservoir Flood Risk		The site on the EA website on 8th August 2014 is not shown within an area mapped as being at risk.	N

The greatest risk from any onsite contamination is to the underlying minor aquifer. Additionally the site would appear to be at potential risk from surface flooding (also highlighted in BIA screening/scoping); this could be evaluated by a site-specific surface water flood risk assessment.

6.3 Historical Map Search

A viewing of publicly available (online) historical Ordnance Survey maps indicates that the site was undeveloped until around 1900 when it became part of the garden for a large house in Templewood Avenue. The site appears to have remained garden until sometime after 1954 when a pair of semi-detached houses were constructed, the south-eastern of which comprises this site.

6.4 Other Sources

Camden Borough Council's planning website indicates that the planning application for the subject property as part of semi-detached houses was passed in 1955. Since that time the property has had permission for two single-storey extensions to be added.

With reference to The London County Council 'Bomb Damage Maps 1939-1945', this site was not subject to damage during WWII.

6.5 Radon Risk

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

7 Walkover Survey

A walkover survey was carried out on 9th July 2014.

7.1 General Description

The site is a rough rectangular shape with a width of around 10 to 15m and some 40m in depth from the frontage. The existing two-storey semi detached house has a single-storey extension and garage to the side, taking up the entire width of the plot. The rear garden area is set to lawn with a couple of fruit(?) trees, the front garden area is again lawn with a concrete driveway and path. There is an established hedge at the front and forming the boundaries to the rear garden. There are a number of mature trees along the eastern boundary.

Immediately to the west the other half of the semi-detached house has been redeveloped with a three-storey building with basements both to the front and rear of the building. In the immediate area around this site the buildings are almost entirely detached residential properties of varying sizes.

In terms of topography, the site is relatively level, with a slight slope to the east. In the immediate area, looking along the roads, the area slopes down slightly to the junction with Heath Rise just to the east, which is located in the base of a shallow valley features itself sloping from north to south.

C SITE INVESTIGATION

11 Method

The strategy adopted for the intrusive investigation comprised the following:

- 2 No 20m deep boreholes were drilled using a light percussion, 150mm diameter, breakdown shell and auger boring rig.

- 2 shallow hand excavated trial trenches were dug to examine the presence of tree roots as per specification from the project arboriculturalist.

Exploratory hole locations are shown in Figure 1 in Appendix A.

12 Weather Conditions

The fieldwork was carried out between 15th July and 23rd July 2014, at which time the weather was generally dry and sunny.

13 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), but in general comprised a thin covering of made ground over sandy clays (assumed to represent the Claygate Member) over London Clay. A summary is given below.

Depth	Thickness	Soil Type	Description
GL to 0.7m	0.7m	Made Ground	Dark brown to brown silty sandy CLAY with occasional to frequent brick, ash and concrete fragments.
0.7 to 5.1/5.2m	4.5/4.6m	Claygate Member	Variable firm pale brown to brown and bluish grey silty sometimes slightly sandy CLAY. Some more gravelly or sandy clays present.
5.1/5.2 to 20m+	Thickness unproven	London Clay	Firm to stiff /high strength dark brown to grey silty CLAY.

13.1 Visual and Olfactory Evidence of Contamination

No obvious evidence of possible contamination was recorded during the fieldwork other than the presence of superficial made ground; which can contain elevated levels of some contaminants.

14 Groundwater Strikes

Water was struck in the exploratory holes as follows:

BH	Water Strikes
BH1	Groundwater strike at 2.7m depth.
BH2	No groundwater strikes were made.

The shallow trenches were dry.

D FIELD TESTING AND SAMPLING

The following in-situ test and sampling methods were employed. Descriptions are given in Appendix B together with the test results.

- Disturbed samples;
- Open Drive U100 samples;
- Standard Penetration Tests;
- Hand Penetrometer tests.

E GEOTECHNICAL LABORATORY TESTS

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

- Moisture content & Atterberg Limit determinations;
- Soluble sulphate & pH value determinations;
- Undrained Triaxial tests.

F DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS

15 Soil Classification and Properties

Soil Type	Depth	Compressibility	VCP	Permeability	Frost Susceptible	CBR	Remarks
Made Ground	GL to 0.7m	Potentially high	N/A	Variable	Potentially	Poor	Not suitable for foundations
Claygate Member	0.7 to 5.1/5.25m	Low to moderate	Medium	Low generally, but better in the upper more sandy layers	Potentially	Poor	Seepages on fissures possible
London Clay	5.1/5.2m +	Low to moderate	High	Low generally	No	Poor	Seepages on fissures possible

16 Swelling and Shrinkage

The results of the Atterberg Limit determinations for the soils on this site indicate that NHBC High Volume Change Condition precautions should be adopted. Any foundations for the proposals are generally to a depth beyond where shrinkage and swelling effects will be noted. However given the very close presence to the proposed structure to existing mature trees, especially along the eastern boundary, the Engineer should check their influence using guidance within NHBC Chapter

4.2 and make sure that the design caters for the potential effects of lateral pressure/heave from the trees in the future.

17 Groundwater Levels

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

While siteworks were in progress, a groundwater entry in the more permeable shallow materials was noted, with no significant entries being recorded in the lower London Clay.

The groundwater monitoring visits to date have measured standing water levels within BH1 at 1.04m BGL and 8.82m BGL in BH2. This probably reflects the shallow seepage seen in BH1 during drilling, and the absence of this in BH2 where standing water levels within the monitoring well are slowly moving towards equilibrium.

On the basis of the measurements to date, groundwater ingress is not expected to be a significant problem in terms of dewatering issues etc during construction. Allowances for some dewatering, however, should be made from the sandy upper Claygate Member, in the form of intermittent pumping from strategically placed collector sumps. In the short-term very local lowering of the watertable within the Claygate Member may occur.

For the longer term condition, seepage entries from fissure flow within the clays and from within the sandy clays should be allowed for in the design of the basement area e.g. provision of drainage cavity/tanking, and also for hydrostatic uplift of the floor slab. Equilibrium standing water levels should be anticipated at around 1m BGL.

Published data for the permeability of the London Clay indicates the horizontal permeability to generally range between 1 x 10^{-9} m/s and 1x 10^{-14} m/s, with an even lower vertical permeability. The Claygate Member will have slightly higher permeability values, but, the overall groundwater flow rate is anticipated to be very low.

Any groundwater flows that take place will likely follow the local topography which in this instance is very gently to the east and southeast. Given the slight topography and hence negligible hydraulic gradient, and the generally very low permeability nature of the underlying clays, there is a very low risk of the proposed basement walls causing a "damming effect" or mounding of water on the upstream faces. It is also noted that on the upstream side of this proposal is a recently constructed two-level basement.

In terms of the potential cumulative effects of other future basements being granted/constructed in the immediate area, again the gentle topography and very low permeabilities/hydraulic gradients should have little influence on groundwater levels both locally or regionally.

On the basis of the above observations and comments, it is concluded that the proposed development is unlikely to result in any specific issues relating to the hydrogeology and hydrology of the site.

18 Sulphates and Acidity

The recorded pH values within the natural soils are in the range 6.3 to 8.0, being generally mildly alkaline in reaction. The made ground samples indicated similar mildly alkaline results.

The Design Sulphate Class is DS-3. Groundwater should be assumed to be mobile due to the recorded shallow seepage into BH1. The ACEC site classification is AC-3.

19 Bearing Capacity & Foundations

Given the proposals include for the construction of a substantial two-level basement as part of the new dwelling and the fact that the proposed footprint will be close to the front and eastern boundary and abutting the recently constructed basement to the west, it is assumed that a contiguous or secant piled wall construction would be used. The design of the structure is likely to allow for long-term propping of the walls by the floorslabs. It would also be anticipated that the main loadings of the building will be supported on nominated piles along the walls and piles within the main footprint. It is understood that the adjacent building at 38 Redington Road was designed with contiguous piled walls.

At the anticipated formation level of around 7.10m BGL, the base of the excavation and basement floors will be formed within the stiff London Clay. For any foundations proposed at this depth a net allowable bearing pressure of 120 kPa would be available. Excavation of the basement will result in soil unloading and associated unload displacements within the clay soils, both immediate and long-term in nature. Heave precautions will be required in the design of the basement slab.

19.1 Piling

If contiguous or secant bored piles are to be installed as part of the basement construction, as with any piling scheme, discussions should be held with selected piling contractors to discuss the technical and financial merits of their various systems and overall resources, with respect to equipment available for the soils described and anticipated, to achieve the depths and diameters considered with an adequate safety margin.

From the viewpoint of pile type, and given the close proximity of adjacent structures, a bored pile solution is considered to be a more appropriate pile type. In terms of bored piles and, noting the presence of potentially unstable soils (sandy clays), and the potential presence of perched groundwater, a continuous flight auger grout injected pile (CFA) would be best suited to the ground conditions encountered. Careful monitoring during construction of these pile types is, however, required. The site history is unknown however it should be noted that subsurface obstructions could be encountered in the form of old foundations, drain runs etc. accordingly allowances for their removal/breaking out should be made when carrying out piling works and excavations.

Within the Claygate Member/London Clay the design of piles is typically based on a cohesive model using a plot of undrained cohesion versus depth derived from both SPT results and triaxial tests. The equivalence factor for SPT to undrained cohesion was chosen as $f_1 = 4.5$. The plot of results from the boreholes is appended as figure P1 on which a suggested design line is indicated. Capacities could be calculated using the following crude soil model:

0- 1m depth: made ground (no contribution to the pile capacity)

1 – 5.2m depth: Claygate Member with cohesion profile as shown in figure P1.

5.2 - 20m depth: London Clay with cohesion profile as shown in figure P1.

Given that a basement level of around 7.1m bgl is proposed, skin friction over this depth should be ignored.

In the case of a contiguous bored pile wall solution, this will likely comprise a series of bored piles with a typical gap of approximately 100-150mm between each pile. There is a risk of erosion/migration of sandy clay materials from between the gaps in the piles (particularly where perched groundwater is present) and therefore the use of mesh/sprayed concrete to ensure that no soil erosion/movement takes place from between the pile gaps could be considered. In addition to cater for the permeation of groundwater through the piled wall and sprayed concrete, a drainage cavity or some other form of waterproofing measures will need to be considered as part of the basement construction.

20 Heave

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

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

For the analysis of heave movements the following stiffness parameters after Burland and Kalra (1986)[5] are suggested for the London Clay:

Undrained Young's Modulus (E_u) = (10+5.2z) (MN/m^2)

Undrained Poisson Ratio (ν_u) =0.5

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

Drained Poisson Ratio (ν_d) =0.2

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

Calculations for the magnitude of any movements could be undertaken once design proposals and loading have been finalised.

21 Basement Construction

The following soil parameters are suggested for design of retaining walls:

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

Soil Type	Bulk density γ_b (kN/m^3)	Undrained Shear Strength (Temporary Condition)	Long Term Drained Condition	
			c' (kN/m^2)	φ^o
Made Ground	19	N/A	0	27
Claygate Member	20	See Figure P1	0	27
London Clay	20	See Figure P1	0	25

22 Excavations and Trenching

Statutory lateral earth support will be required in all excavations where men must work. Instability of the sides of any open excavations carried out must be expected. Accordingly, measures should be taken at all times to ensure that excavations are adequately supported. Groundwater seepages into excavations from the upper sandy clays should be anticipated, until suitable waterproofing measures have been employed. Such inflows are anticipated to be manageable using a simple sump pumping arrangement, rather than more complex dewatering systems.

Given the presence of the existing adjacent foundations, close attention in design of temporary and permanent propping is required at all times to prevent settlement or excessive lateral yielding of the excavation/foundations.

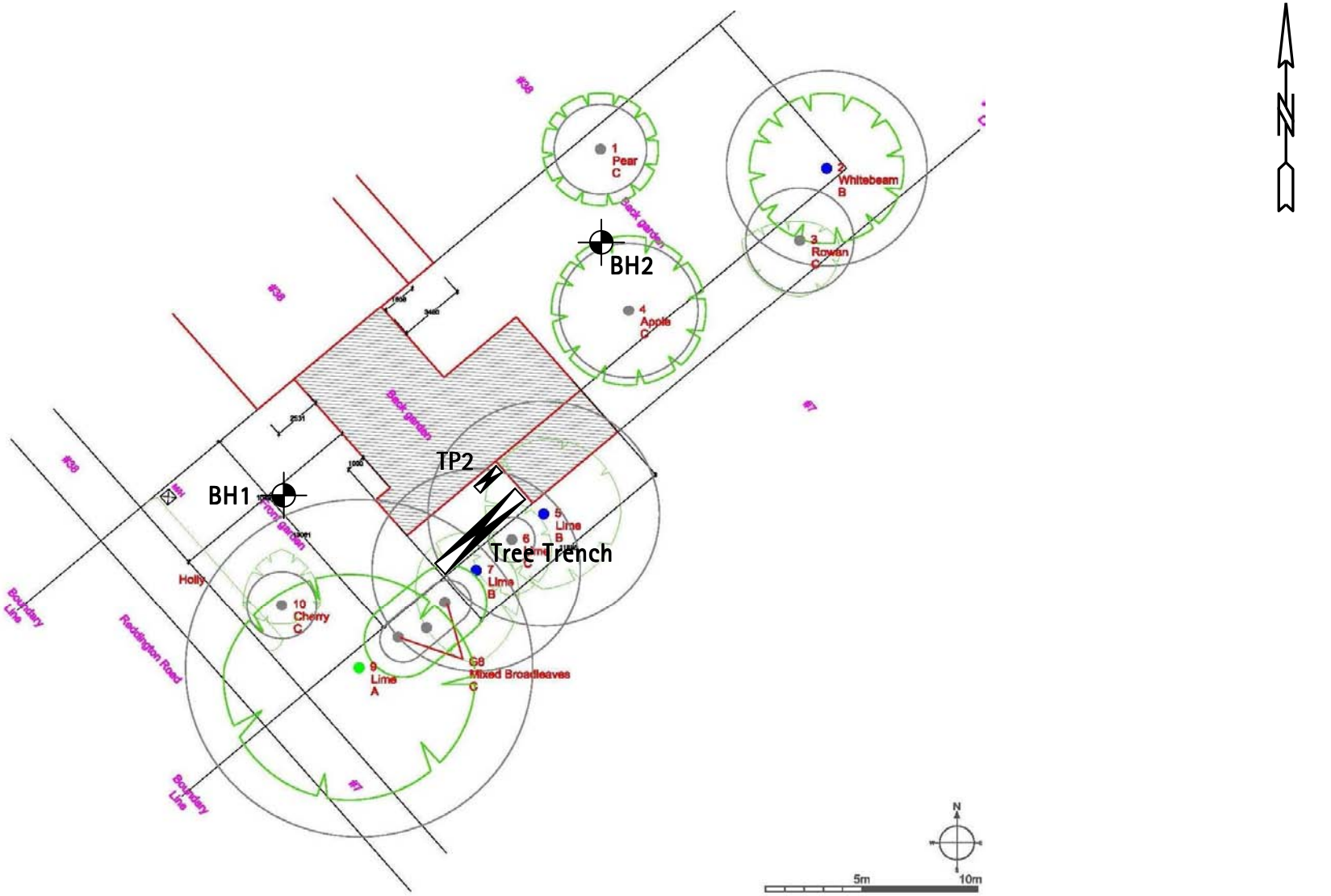
23 Discussion on Waste Disposal

Two samples of shallow made ground and one of the underlying natural soils were sent for chemical testing and a sample of the made ground and one from the natural soils have been subject to Waste Acceptance Criteria testing.

The test results, included within Appendix D, indicate that the made ground and underlying soils are likely to be classified as inert or non-hazardous waste. However, final waste classification is determined by the receiving landfill, so we would suggest that all the results be forwarded to the landfill for their assessment.

APPENDIX A

Site Plan, Exploratory Hole Logs & Figures



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

Site: 36 Redington Road, London NW3	STL: J11894	Fig No: 1
Date: 13 August 2014	Fieldwork Location Plan	

Southern Testing

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

ST Consult

Key to Exploratory Hole Logs

General

All soil and rock descriptions in general accordance with BS5930:1999+A2:2010
Geology Code only entered where positive identification of the sampled strata has been made

Sampling

ES	Environmental Sample (taken in appropriate sampling container)
D	Disturbed Sample
B	Bulk Sample
LB	Large Bulk for Earthworks testing
C	Core Sample
U	Undisturbed Sample (number of blows indicated in results column)
SPTLS	SPT Liner Sampler
P	Piston Sample
W	Water Sample

Insitu Tests

SPT	Standard Penetration Test in accordance with BS EN22476-3:2005
SPT (C)	Cone Penetration Test in accordance with BS EN22476-3:2005
PT	Penetration Test - STL documented equivalent SPT N Value
PPT	Perth Penetration Test - STL in house documented method (N Value)
UCS (⊥)	Unconfined Compressive Strength measure by hand penetrometer (kN/m^2)
IVN	Hand Vane (kPa)
PID	Photo Ionisation Detector Results (ppm)
MEXE	Mexecone CBR Result

Drilling Records (In accordance with BS 5930:1999+A2:2010)

Depth to standing water level	▼
Depth to water strike	▽
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Index (%)
FI	Fracture Index

Backfill Symbols

Arisings
Concrete
Blacktop
Bentonite Seal
Gravel Filter
Sand Filter

Pipe Symbols

Plain Pipe
Slotted Pipe
Filter Tip

Principal Soil Types

Topsoil
Made Ground
Clay
Silt
Sand
Gravel
Peat

Principal Rock Types

Mudstone/Claystone
Siltstone
Sandstone
Limestone
Chalk

Southern Testing Environmental & Geotechnical | ST Consult Environmental & Geotechnical

Tel: 01342 333100

Project No.	Hole Type	Borehole No
J11894	Cable	**BH1** Sheet 1 of 1

Project Name: 36 Redington Road (London NW3)

Dates: 15/07/2014-18/07/2014

Location: London NW3

NGR: -

Client: Archetype Associates Ltd

Level: -

Logged By: SM

Depth (m)	Type	Results	Level (m AOD)	Thickness	Depth (m)	Stratum Description
0.20	ES			0.70		MADE GROUND brown, silty, sandy, CLAY, with occasional fragments of brick, ash, flint gravel and rootlets.
0.50	D				0.70	
1.00		UCS = 110		0.60		Firm, medium strength, yellow brown to pale orange brown, silty, sandy, CLAY.
1.00	D				1.30	
1.50	U					Dark greenish grey, slightly clayey, sandy SILT.
2.00	D			1.60		
2.10	ES					
3.00	SPT	N=15			2.90	Firm, medium to high strength, pale brown, slightly sandy, silty, CLAY.
3.00		UCS = 80				
3.00	D					
3.00	SPTLS					
4.00		UCS = 110		2.20		
4.00	D					
4.50		UCS = 250				
4.50	D					
4.50	U				5.10	
5.00		UCS = 240				Firm to stiff, medium to high strength, laminated, dark grey, slightly silty, CLAY.
5.00	D					
6.00	SPT	N=15				
6.00		UCS = 160				
6.00	D					
6.00	ES					
6.00	SPTLS					
7.00		UCS = 260				
7.00	D					
7.50		UCS = 300				
7.50	D					
7.50	U					
8.00		UCS = 150				
8.00	D					
9.00	SPT	N=16				
9.00		UCS = 230				
9.00	D					
9.00	SPTLS					
10.00		UCS = 340				
10.00	D					
10.50		UCS = 290				
10.50	D					
10.50	U					
11.00		UCS = 200				
11.00	D					
12.00	SPT	N=22		14.90		
12.00		UCS = 350				
12.00	D					
12.00	SPTLS					
13.00		UCS = 490				
13.00	D					
13.50		UCS = 470				
13.50	D					
13.50	U					
14.00		UCS = 460				
14.00	D					
15.00	SPT	N=23				
15.00		UCS = 450				
15.00	D					
15.00	SPTLS					
16.00		UCS = 350				
16.00	D					
16.50		UCS = 430				
16.50	D					
16.50	U					
17.00		UCS = 510				
17.00	D					
18.00	SPT	N=26				
18.00		UCS = 410				
18.00	D					
18.00	SPTLS					
19.50		UCS = 510				
19.50	D					
19.50	U				20.00	End of Borehole at 20.00 m

Water Strike: ▽ at 2.10

Type	Results

Borehole Details

Casing Depth m bgl	Hole Depth m bgl	Casing Diameter mm
	0.00	

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)
16/07/2014	2.70	-	-	-	5.00

General Remarks:

Southern Testing | ST Consult
Environmental & Geotechnical

Tel: 01342 333100

Project No.	Hole Type	Borehole No
J11894	Cable	**BH2** Sheet 1 of 1

Project Name: 36 Redington Road (London NW3)

Dates: 21/07/2014-23/07/2014

Location: London NW3

NGR: -

Client: Archetype Associates Ltd

Level: -

Logged By: SM

Well	Water Strikes	Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
		Depth (m)	Type	Results					
		0.25	ES			0.70			MADE GROUND composed of dark grey brown, slightly sandy, silty CLAY, with frequent flint gravel, rootlets and occasional fragments of brick and concrete.
		0.50	ES					0.70	
		1.00		UCS = 10					Soft, very low strength, orange brown mottled grey brown, sandy, silty CLAY, with frequent fine to medium, sub-angular to sub-rounded, flint gravel.
		1.00	D						2.00m - 3.00m: Firm and medium strength.
		1.50	SPT	N=6					
		1.50	SPTLS			2.30			
		2.00		UCS = 90					
		2.00	D						
		3.00		UCS = 160				3.00	Firm, medium to high strength, laminated, orange brown mottled blue grey, slightly silty, CLAY.
		3.00	D						
		4.00		UCS = 110		2.20			
		4.00	D						
		4.00	U						
		4.50	SPT	N=15					
		4.50		UCS = 280				5.20	
		4.50	D						Firm to stiff, high strength, laminated, dark brown to grey, CLAY.
		4.50	SPTLS						
		5.00		UCS = 100					
		5.00	D						
		6.00		UCS = 250					
		6.00	D						
		7.00		UCS = 270					
		7.00	D						
		7.00	U						
		7.50	SPT	N=14					
		7.50	SPTLS						
		8.00		UCS = 250					
		8.00	D						
		9.00		UCS = 280					
		9.00	D						
		9.00	U						
		9.50		UCS = 260					
		9.50	D						
		10.00		UCS = 270					
		10.00	D						
		10.50	SPT	N=19					
		10.50	SPTLS						
		11.00		UCS = 280					
		11.00	D						
		12.00		UCS = 400					
		12.00	D						
		12.00	U			14.80			
		12.50		UCS = 380					
		12.50	D						
		13.00		UCS = 330					
		13.00	D						
		13.50	SPT	N=20					
		13.50	SPTLS						
		14.00		UCS = 300					
		14.00	D						
		15.00		UCS = 320					
		15.00	D						
		15.00	U						15.50m - 20.00m: Occasional silty patches.
		15.50		UCS = 200					
		15.50	D						
		16.00		UCS = 270					
		16.00	D						
		16.50	SPT	N=23					
		16.50	SPTLS						
		18.00		UCS = 410					
		18.00	D						
		18.00	U						
		18.50		UCS = 550					
		18.50	D						
		19.00		UCS = 300					
		19.00	D						
		19.50	SPT	N=24					
		19.50	SPTLS					20.00	End of Borehole at 20.00 m

	Type	Results

Borehole Details

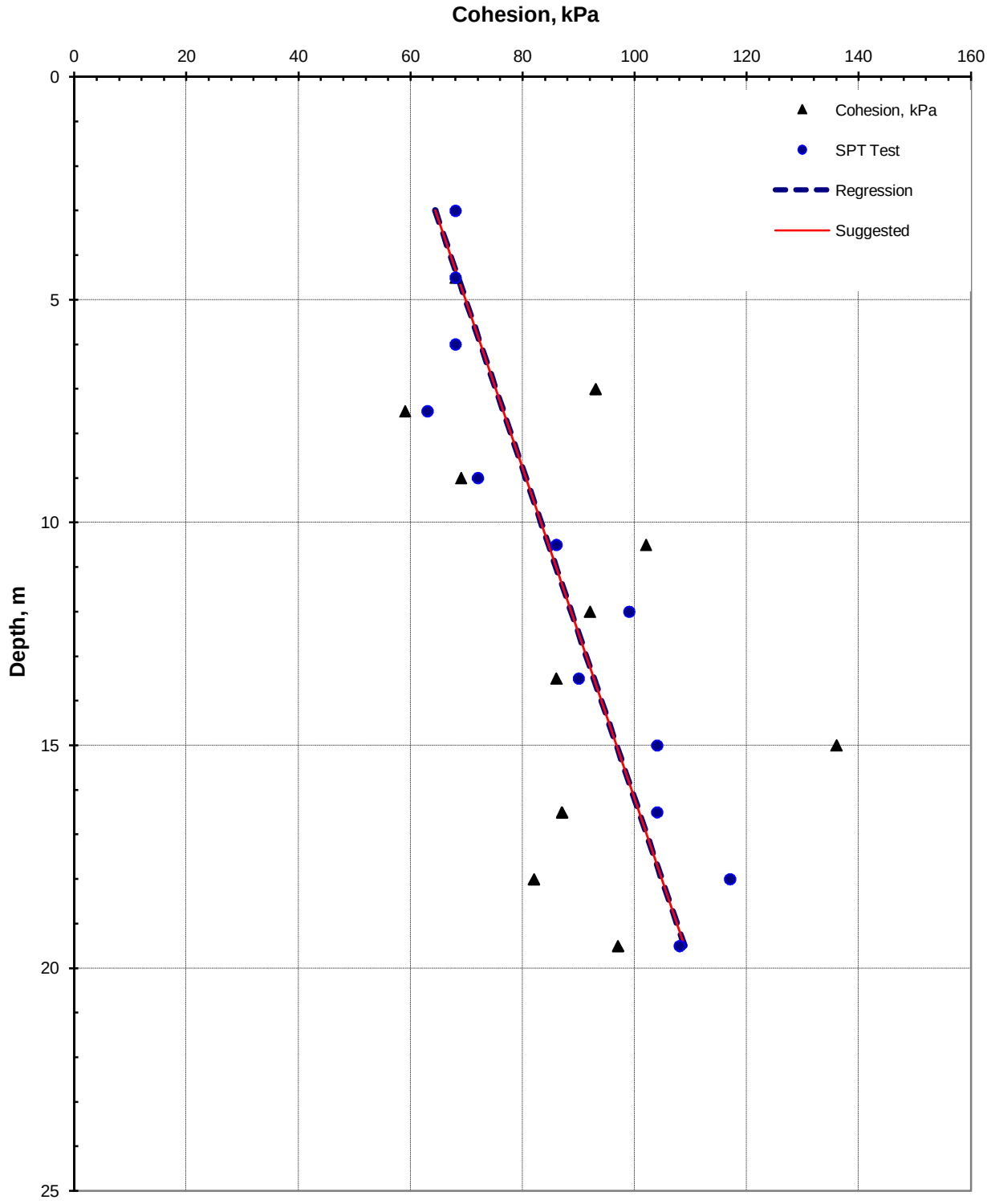
Casing Depth m bgl	Hole Depth m bgl	Casing Diameter mm
	0.00	

Water Strikes

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

General Remarks:

Plot of Cohesion vs Depth



Linear Regression of the Test Results: *Slope =* 2.7 *kPa/m,* *Zero intercept =* 56.3 *kPa*

Suggested Design Line: *Slope =* 2.7 *kPa/m,* *Zero intercept =* 56.3 *kPa*

Client: Mr Zolf	**Site:** 36 Redington Road, London NW3	
Job No: J11894	**Date:** 13/08/2014	**Figure No: P1**

APPENDIX B

Field Sampling and in-situ Test Methods & Results

Field Sampling and in-situ Test Methods

Disturbed Samples

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

Open Drive U100 Samples

U100 samples were taken in the clay soils at appropriate intervals. These samples are taken in a 100 mm diameter, 450 mm long, thin-walled steel tube, and are sealed with paraffin wax and tightly fitting end caps for transporting to the laboratory.

Standard Penetration Test

The Standard Penetration (SPT) Test is specified in BS EN ISO 22476-3 : 2005. In this test, a 51mm diameter open-ended tube is driven into the ground by a 63.5 kg hammer falling freely through 760 mm. The tube is seated by driving to a penetration of 150mm, or by 25 standard blows, whichever occurs first. It is then driven for a maximum of a further 300mm and the number of blows is termed the penetration resistance (N). If 300mm penetration cannot be achieved in 50 blows (100 blows in soft rock), the test drive is terminated.

When testing in gravels, a conical end piece is attached to the tube. The test is then called an SPT(C).

This test provides an indirect method of assessing the properties of cohesionless soils, and the following table (after Terzaghi and Peck) gives the approximate condition:-

Number Blows (N)	Density
0 - 4	Very Loose
4 – 10	Loose
10 – 30	Medium Dense
30 – 50	Dense
Over 50	Very Dense

Clay

An approximate value for the shear strength of clay may be obtained using Stroud (1974), which paper indicates that the cohesive strength is a function of plasticity and SPT 'N' value. The relation is:

C_u = f_i x N kPa

C_u = undrained shear strength

f_i = factor related to plasticity index and ranging from 4 to more than 6

The SPT test is not generally accepted as giving a reliable indication of the strength of cohesive soils but it does give a guide; often the following table:-

Number Blows (N)	Soil Strength
Less than 2	Very Soft (Very Low Strength)
2 – 5	Soft (Low Strength)
5 – 10	Firm (Medium Strength)
10 – 15	Stiff (High Strength)
15 – 30	Very Stiff (Very High Strength)

Hand Penetrometer Test

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

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

APPENDIX C

Geotechnical Laboratory Test References & Results

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Atterberg and Moisture Content Summary

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

AGS

Project Name	36 Redington Road (London NW3)			Project Number	J11894
Client	Archetype Associates Ltd	PE	JNR	Date Issued	12-Aug-14

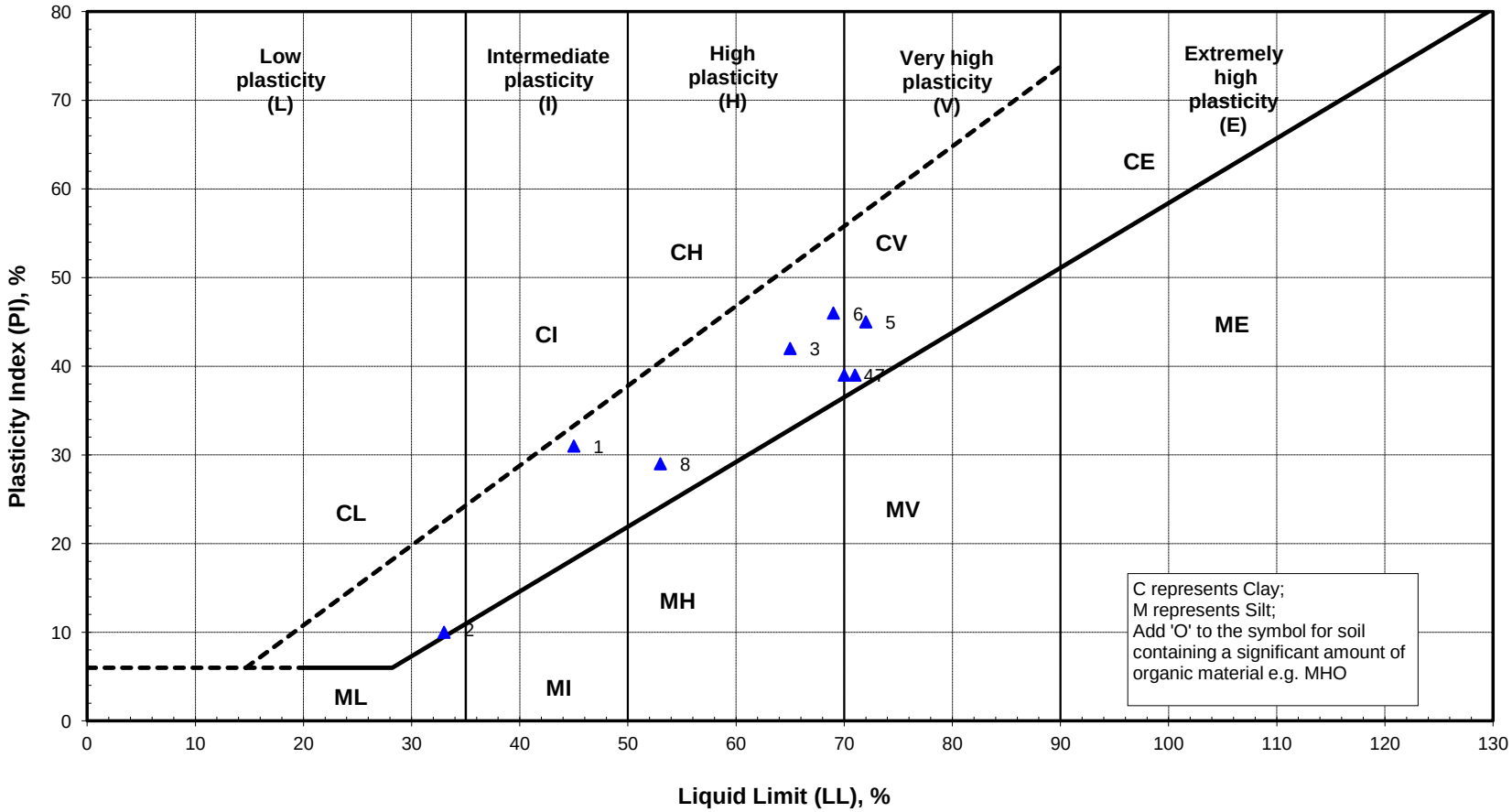
Location	Depth m	Sample Type	Visual Description	Comments	Natural MC %	Liquid Limit %	Plastic Limit %	Plasticity Index	Classi-fication	Passing 425 micron %
BH1	1.00	D	*Firm medium strength light brown patched yellow brown sandy CLAY with occasional flint and brick gravel.*		*23*	*45*	*14*	*31*	*CI*	*95*
BH1	2.00	D	*Very soft very low strength dark grey organic very sandy CLAY with occasional flint gravel.*		*27*	*33*	*23*	*10*	*CLO*	*95*
BH1	3.00	D	*Firm low strength light brown CLAY with occasional gravel.*		*34*	*65*	*23*	*42*	*CH*	*95*
BH1	7.50	U	*Very stiff fissured very high strength dark grey CLAY.*		*31*	*70*	*31*	*39*	*CH/CV*	*100*
BH1	16.50	U	*Very stiff very high strength dark brown CLAY.*		*27*	*72*	*27*	*45*	*CV*	*100*
BH2	2.00	D	*Firm medium strength light brown CLAY with occasional gravel.*		*34*	*69*	*23*	*46*	*CH*	*90*
BH2	9.00	U	*Very stiff fissured very high strength dark grey CLAY.*		*29*	*71*	*32*	*39*	*CV*	*100*
BH2	15.00	U	*Very stiff very high strength dark grey slightly sandy CLAY.*		*26*	*53*	*24*	*29*	*CH*	*100*

Plasticity Chart for Atterberg Limit Tests

Project Name	*36 Redington Road (London NW3)*			**Project Number**	*J11894*
Client Name	*Archetype Associates Ltd*	**PE**	*JNR*	**Date Issued**	*13-Aug-14*

Key

No.	TH No.	Depth
1	BH1	1.00
2	BH1	2.00
3	BH1	3.00
4	BH1	7.50
5	BH1	16.50
6	BH2	2.00
7	BH2	9.00
8	BH2	15.00



Liquid Limit		**Plastic Limit**		**Plasticity Index**	
Maximum Value	72	Maximum Value	32	Maximum Value	46
Minimum Value	33	Minimum Value	14	Minimum Value	10
Average Value	60	Average Value	25	Average Value	35

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CHEMICAL & ELECTROCHEMICAL TESTING SUMMARY

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

AGS

Project Name	36 Redington Road (London NW3)					Project Number	J11894
Client	Archetype Associates Ltd			PE	*JNR*	Date Issued	*12-Aug-14*

TH No.	Depth m	Sample Type	Visual Description	Comments	Passing 2mm %	pH Value	Soil Sulphate 2:1 Water Extract		Groundwater Sulphate	
							g/l SO_3	BRE mg/l SO_4	g/l SO_3	BRE mg/l SO_4
BH1	2.00	D	Very soft very low strength dark grey organic very sandy CLAY with occasional flint gravel.		68.6	6.3	0.22	269		
BH1	4.50	U	Stiff very high strength light brown patched light blue grey CLAY.		100.0	7.8	2.15	2582		
BH1	10.50	U	Very stiff fissured very high strength dark grey CLAY.		100.0	7.9	0.47	566		
BH1	19.50	U	Very stiff very high strength dark grey sandy CLAY.		100.0	8.0	0.38	451		
BH2	1.00	D	Soft low strength grey brown sandy CLAY with occasional gravel.		53.6	7.5	0.86	1037		
BH2	3.00	D	Very stiff very high strength light brown CLAY.		100.0	7.7	0.17	202		
BH2	12.00	U	Very stiff fissured very high strength dark grey CLAY.		100.0	7.8	0.38	451		

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IMMEDIATE UNDRAINED TRIAXIAL SUMMARY

To BS1377-7:1990(1994)

AGS

Project Name	36 Redington Road (London NW3)			Project Number	J11894
Client	Archetype Associates Ltd	PE	JNR	Date Issued	12-Aug-14

Location	Depth (m)	Sample Type	Visual Description	Comments	Test Type	UCS by Hand Pen. (KPa)	NMC (%)	Cell Press. (KPa)	Deviator Stress (KPa)	Apparent Cohesion C_u (KPa)	Bulk Density (Mg/m^3)
BH1	4.50	U	*Stiff very high strength light brown patched light blue grey CLAY.*		*Single Stage*	*220*	*34.3*	*90*	*136*	*68*	*1.91*
BH1	7.50	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*430*	*31.2*	*150*	*118*	*59*	*1.90*
BH1	10.50	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*350*	*29.5*	*210*	*203*	*102*	*1.94*
BH1	13.50	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*380*	*31.5*	*270*	*172*	*86*	*1.95*
BH1	16.50	U	*Very stiff very high strength dark brown CLAY.*		*Single Stage*	*370*	*30.7*	*330*	*173*	*87*	*1.99*
BH1	19.50	U	*Very stiff very high strength dark grey sandy CLAY.*		*Single Stage*	*310*	*28.3*	*390*	*193*	*97*	*1.97*
BH2	4.00	U	*Stiff fissured very high strength light brown CLAY.*	*Unsuitable sample for test.*	*Single Stage*	*310*	*31.4*				
BH2	7.00	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*440*	*27.5*	*140*	*185*	*93*	*1.96*
BH2	9.00	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*400*	*29.2*	*180*	*138*	*69*	*1.90*
BH2	12.00	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*390*	*30.9*	*240*	*183*	*92*	*1.96*

Southern Testing | ST Consult

IMMEDIATE UNDRAINED TRIAXIAL SUMMARY

To BS1377-7:1990(1994)

AGS

Project Name	*36 Redington Road (London NW3)*			Project Number	J11894
Client	*Archetype Associates Ltd*	PE	JNR	Date Issued	12-Aug-14

Location	Depth (m)	Sample Type	Visual Description	Comments	Test Type	UCS by Hand Pen. (KPa)	NMC (%)	Cell Press. (KPa)	Deviator Stress (KPa)	Apparent Cohesion C_u (KPa)	Bulk Density (Mg/m^3)
BH2	15.00	U	*Very stiff very high strength dark grey slightly sandy CLAY.*		*Single Stage*	*340*	*25.9*	*300*	*276*	*138*	*2.06*
BH2	18.00	U	*Very stiff fissured very high strength dark grey CLAY.*		*Single Stage*	*510*	*27.5*	*360*	*164*	*82*	*1.91*

APPENDIX D

Contamination Laboratory Test Results

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

Scientific Analysis Laboratories Ltd

Certificate of Analysis

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

Report Number: 411332-1

Date of Report: 05-Aug-2014

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

Customer Contact: Mr Jon Race

Customer Job Reference: J11894
Customer Purchase Order: J11894_1
Customer Site Reference: 36 Redington Road (London NW3)
Date Job Received at SAL: 25-Jul-2014
Date Analysis Started: 30-Jul-2014
Date Analysis Completed: 05-Aug-2014

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

UKAS TESTING
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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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

Issued by :
Miss Claire Brown
Customer Service Manager

SAL Reference: 411332
Project Site: 36 Redington Road (London NW3)
Customer Reference: J11894

Soil Analysed as Soil
STL Key Contamintion Suite

				SAL Reference	**411332 001**	**411332 002**	**411332 004**
				Customer Sample Reference	**BH1 @ 0.20m**	**BH1 @ 2.10m**	**BH2 @ 0.50m**
				Date Sampled	**15-JUL-2014**	**16-JUL-2014**	**18-JUL-2014**
				Type	**Fill**	**Clay**	**Fill**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Arsenic	T257	A40	2.0	mg/kg	**14**	**8**	**16**
Cadmium	T257	A40	0.1	mg/kg	**0.2**	<0.1	**0.3**
Chromium	T257	A40	0.5	mg/kg	**26**	**36**	**22**
Copper	T257	A40	2	mg/kg	**31**	**12**	**52**
Lead	T257	A40	2	mg/kg	**160**	**32**	**950**
Mercury	T245	A40	1.0	mg/kg	<1.0	<1.0	<1.0
Nickel	T257	A40	0.5	mg/kg	**16**	**6.8**	**16**
Selenium	T257	A40	3	mg/kg	<3	<3	<3
Zinc	T257	A40	2	mg/kg	**93**	**32**	**170**
Asbestos ID	T27	A40			Asbestos not detected	-	Asbestos not detected
Chromium VI	T6	A40	1	mg/kg	<1	<1	<1
Fraction Organic Carbon - F(oc)	T21	A40	1	%	<1	<1	<1
pH	T7	A40			**7.0**	**7.2**	**7.6**
Soil Organic Matter	T287	A40	0.1	%	**2.6**	**0.9**	**2.6**
(Water Soluble) SO4-- expressed as SO4	T242	A40	0.01	g/l	**0.01**	**0.08**	**0.07**
Sulphide	T4	AR	10	mg/kg	(64) <10	(64) <10	(64) <10
Cyanide(Total)	T4	AR	1	mg/kg	(64) <1	(64) <1	(64) <1
Phenols(Mono)	T221	AR	0.5	mg/kg	(64) <0.5	(64) <0.5	(64) <0.5
Moisture @ 105 C	T162	AR	0.1	%	**12**	**21**	**12**
Retained on 2mm	T2	A40	0.1	%	**3.6**	**0.4**	**3.3**

SAL Reference: 411332
Project Site: 36 Redington Road (London NW3)
Customer Reference: J11894

Soil Analysed as Soil
Total and Speciated USEPA16 PAH (SE) (MCERTS)

				SAL Reference	**411332 001**	**411332 002**	**411332 004**
				Customer Sample Reference	**BH1 @ 0.20m**	**BH1 @ 2.10m**	**BH2 @ 0.50m**
				Date Sampled	**15-JUL-2014**	**16-JUL-2014**	**18-JUL-2014**
				Type	**Fill**	**Clay**	**Fill**
Determinand	**Method**	**Test Sample**	**LOD**	**Units**			
Naphthalene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1
Fluorene	T16	AR	0.1	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	T16	AR	0.1	mg/kg	**0.4**	<0.1	**0.8**
Anthracene	T16	AR	0.1	mg/kg	<0.1	<0.1	**0.2**
Fluoranthene	T16	AR	0.1	mg/kg	**1.3**	<0.1	**1.9**
Pyrene	T16	AR	0.1	mg/kg	**1.1**	<0.1	**1.7**
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	**0.5**	<0.1	**1.0**
Chrysene	T16	AR	0.1	mg/kg	**0.6**	<0.1	**1.0**
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	**0.9**	<0.1	**1.6**
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	**0.4**	<0.1	**0.9**
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	**0.3**	<0.1	**0.4**
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	**0.1**	<0.1	**0.2**
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	**0.3**	<0.1	**0.4**
PAH(total)	T16	AR	0.1	mg/kg	**5.8**	<0.1	**10**

Index to symbols used in 411332-1

Value	Description
A40	Assisted dried < 40C

AR	As Received
64	Analysis was performed by an alternative technique
W	Analysis was performed at another SAL laboratory
S	Analysis was subcontracted
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except phenol, cyanide and sulphide
Where an asbestos result of none detected is reported, this is obtained from analysis of a representative sub sample.
No loose asbestos fibres or asbestos containing materials were found
Sub contracted analysis performed by SAL Scotland & REC Asbestos South East Limited
Retained on 2mm is removed before analysis

Method Index

Value	Description
T21	OX/IR
T245	ICP/OES(Aqua Regia Extraction)
T4	Colorimetry
T16	GC/MS
T2	Grav
T7	Probe
T162	Grav (1 Dec) (105 C)
T27	PLM
T221	Colorimetry (CE)
T257	ICP/OES (SIM) (Aqua Regia Extraction)
T287	Calc TOC/0.58
T6	ICP/OES
T242	2:1 Extraction/ICP/OES (TRL 447 T1)

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Arsenic	T257	A40	2.0	mg/kg	U	001,004
Arsenic	T257	A40	2	mg/kg	M	002
Cadmium	T257	A40	0.1	mg/kg	U	001,004
Cadmium	T257	A40	0.1	mg/kg	M	002
Chromium	T257	A40	0.5	mg/kg	U	001,004
Chromium	T257	A40	0.5	mg/kg	M	002
Copper	T257	A40	2	mg/kg	U	001,004
Copper	T257	A40	2	mg/kg	M	002
Lead	T257	A40	2	mg/kg	U	001,004
Lead	T257	A40	2	mg/kg	M	002
Mercury	T245	A40	1.0	mg/kg	U	001-002,004
Nickel	T257	A40	0.5	mg/kg	U	001,004
Nickel	T257	A40	0.5	mg/kg	M	002
Selenium	T257	A40	3	mg/kg	U	001-002,004
Zinc	T257	A40	2	mg/kg	U	001,004
Zinc	T257	A40	2	mg/kg	M	002
Asbestos ID	T27	A40			SU	001,004
Chromium VI	T6	A40	1	mg/kg	N	001-002,004
Fraction Organic Carbon - F(oc)	T21	A40	1	%	WN	001-002,004
pH	T7	A40			U	001,004
pH	T7	A40			M	002
Soil Organic Matter	T287	A40	0.1	%	WN	001-002,004
(Water Soluble) SO4-- expressed as SO4	T242	A40	0.01	g/l	U	001,004
(Water Soluble) SO4-- expressed as SO4	T242	A40	0.01	g/l	M	002
Sulphide	T4	AR	10	mg/kg	WN	001-002,004
Cyanide(Total)	T4	AR	1	mg/kg	WU	001,004
Cyanide(Total)	T4	AR	1	mg/kg	WM	002
Phenols(Mono)	T221	AR	0.5	mg/kg	WU	001,004
Phenols(Mono)	T221	AR	0.5	mg/kg	WM	002
Moisture @ 105 C	T162	AR	0.1	%	N	001-002,004
Retained on 2mm	T2	A40	0.1	%	N	001-002,004
Naphthalene	T16	AR	0.1	mg/kg	U	001-002,004

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Acenaphthylene	T16	AR	0.1	mg/kg	U	001-002,004
Acenaphthene	T16	AR	0.1	mg/kg	U	001,004
Acenaphthene	T16	AR	0.1	mg/kg	M	002
Fluorene	T16	AR	0.1	mg/kg	U	001,004
Fluorene	T16	AR	0.1	mg/kg	M	002
Phenanthrene	T16	AR	0.1	mg/kg	U	001-002,004
Anthracene	T16	AR	0.1	mg/kg	U	001,004
Anthracene	T16	AR	0.1	mg/kg	M	002
Fluoranthene	T16	AR	0.1	mg/kg	N	001-002,004
Pyrene	T16	AR	0.1	mg/kg	N	001-002,004
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	U	001,004
Benzo(a)Anthracene	T16	AR	0.1	mg/kg	M	002
Chrysene	T16	AR	0.1	mg/kg	U	001,004
Chrysene	T16	AR	0.1	mg/kg	M	002
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	U	001,004
Benzo(b/k)Fluoranthene	T16	AR	0.1	mg/kg	M	002
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	U	001,004
Benzo(a)Pyrene	T16	AR	0.1	mg/kg	M	002
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	U	001,004
Indeno(123-cd)Pyrene	T16	AR	0.1	mg/kg	M	002
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	U	001,004
Dibenzo(ah)Anthracene	T16	AR	0.1	mg/kg	M	002
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	U	001,004
Benzo(ghi)Perylene	T16	AR	0.1	mg/kg	M	002
PAH(total)	T16	AR	0.1	mg/kg	U	001-002,004

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

Scientific Analysis Laboratories Ltd

Certificate of Analysis

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Tel : 01376 560120
Fax : 01376 552923

Report Number: 411332-1 A

Date of Report: 05-Aug-2014

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

Customer Contact: Mr Jon Race

Customer Job Reference: J11894
Customer Purchase Order: J11894_1
Customer Site Reference: 36 Redington Road (London NW3)
Date Job Received at SAL: 25-Jul-2014
Date Analysis Started: 30-Jul-2014
Date Analysis Completed: 05-Aug-2014

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

UKAS TESTING
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mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

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

Issued by :
Miss Claire Brown
Customer Service Manager

Waste Acceptance Criteria

Customer Sample Reference : BH1 @ 6.00m
SAL Sample Reference : 411332 003
Project Site : 36 Redington Road (London NW3)
Customer Reference : J11894
Test Portion Mass (g) : 175
Date Sampled : 16-JUL-2014
Type : Clay

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			M	7.5		>6.0	
Loss on Ignition @450C	Ign 450C/Grav	0.1	%	M	7.6			10.0
Total Organic Carbon	OX/IR	0.1	%	WN	0.3	3.0	5.0	6.0
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
PAH (Sum)	Calc	1.6	mg/kg	N	<1.6	100.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	U	<0.35	1.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	M	<10	500.0		
Moisture @ 105 C	Grav (1 Dec) (105 C)	0.1	%	N	24			
Retained on 2mm	Grav	0.1	%	N	1.9			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.0032	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.14	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	<0.00020	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	65	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.016	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	20	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	1.5	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	<0.0030	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.043	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CE)	0.050	mg/kg	N	<0.050	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.0054	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	4700	**1000.0**	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	5600	**4000.0**	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.063	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Note:- Sample failed to produce sufficient eluate within the specified time after vacuum filtration for 1 hour and centrifugation for 30 minutes. Therefore, the exact application of the two-step leaching test is precluded on technical grounds. (ref: Section 5.2.4 BS EN 12457-3:2002) Results are derived from a single step leaching at L/S 10/1 as prescribed by the EA guidance. (Ref Section C4.1.1 Guidance on Sampling and Testing of Wastes to meet Landfill Waste Acceptance Procedures Version 1 April 2005, Environment Agency)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

Waste Acceptance Criteria

Customer Sample Reference : Tree trench @ 0.50m
SAL Sample Reference : 411332 005
Project Site : 36 Redington Road (London NW3)
Customer Reference : J11894
Date Sampled : 15-JUL-2014
Test Portion Mass (g) : 175
Type : Fill

Soil Summary					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
pH	Probe			U	8.1		>6.0	
Loss on Ignition @450C	Ign 450C/Grav	0.1	%	U	4.6			10.0
Total Organic Carbon	OX/IR	0.1	%	WN	1.9	3.0	5.0	6.0
Acid Neutralising Capacity (pH 7)	Titration	2.0	Mol/kg	N	<2.0			
BTEX (Sum)	Calc	0.040	mg/kg	U	<0.040	6.0		
Coronene	GC/MS (MCERTS)	0.1	mg/kg	N	<0.1			
PAH (Sum)	Calc	1.6	mg/kg	N	10	100.0		
PCB EC7 (Sum)	Calc	0.00035	mg/kg	U	<0.35	1.0		
TPH (C10-C40)	GC/FID (SE)	10	mg/kg	U	44	500.0		
Moisture @ 105 C	Grav (1 Dec) (105 C)	0.1	%	N	5.2			
Retained on 2mm	Grav	0.1	%	N	13.6			

10:1 Leachate					Result	Inert Waste Landfill	Stable non reactive	Hazardous Waste Landfill
Determinand	**Technique**	**LOD**	**Units**	**Symbol**				
Antimony (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.036	0.06	0.7	5.0
Arsenic (Dissolved)	Calc / ICP/MS (Filtered)	0.0020	mg/kg	N	0.036	0.5	2.0	25.0
Barium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.13	20.0	100.0	300.0
Cadmium (Dissolved)	Calc / ICP/MS (Filtered)	0.00020	mg/kg	N	0.00023	0.04	1.0	5.0
Chloride	Calc / Discrete Analyser	10	mg/kg	N	21	800.0	15000.0	25000.0
Chromium (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	<0.010	0.5	10.0	70.0
Copper (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.063	2.0	50.0	100.0
Dissolved Organic Carbon	Calc / OX/IR	10	mg/kg	N	29	500.0	800.0	1000.0
Fluoride	Calc / Discrete Analyser	0.50	mg/kg	N	8.5	10.0	150.0	500.0
Lead (Dissolved)	Calc / ICP/MS (Filtered)	0.0030	mg/kg	N	0.077	0.5	10.0	50.0
Mercury (Dissolved)	Calc / ICP/MS (Filtered)	0.00050	mg/kg	N	<0.00050	0.01	0.2	2.0
Molybdenum (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.031	0.5	10.0	30.0
Nickel (Dissolved)	Calc / ICP/MS (Filtered)	0.010	mg/kg	N	0.019	0.4	10.0	40.0
Phenols(Mono)	Calc / Colorimetry (CE)	0.050	mg/kg	N	<0.050	1.0		
Selenium (Dissolved)	Calc / ICP/MS (Filtered)	0.0050	mg/kg	N	0.0066	0.1	0.5	7.0
SO4--	Calc / Discrete Analyser	5.0	mg/kg	N	28	1000.0	20000.0	50000.0
Total Dissolved Solids	Calc	100	mg/kg	N	570	4000.0	60000.0	100000.0
Zinc (Dissolved)	Calc / ICP/MS (Filtered)	0.020	mg/kg	N	0.033	4.0	50.0	200.0

From: EC Directive 99/31/EC and Landfill Regulations 2002 (as ammended)

Notes:- Cumulative release at L/S=10 (mg/kg of dry matter) in accordance with BS EN 12457. Soil leaching procedure is not covered by our UKAS accreditation

SAL Reference: 411332
Project Site: 36 Redington Road (London NW3)
Customer Reference: J11894

Soil Analysed as Soil
Total and Speciated USEPA16 PAH (SE) (MCERTS)

				SAL Reference	**411332 003**	**411332 005**
				Customer Sample Reference	**BH1 @ 6.00m**	**Tree trench @ 0.50m**
				Test Sample	**AR**	**AR**
				Date Sampled	**16-JUL-2014**	**15-JUL-2014**
				Type	**Clay**	**Fill**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Naphthalene	GC/MS	0.1	mg/kg	U	<0.1	<0.1
Acenaphthylene	GC/MS	0.1	mg/kg	U	<0.1	<0.1
Acenaphthene	GC/MS	0.1	mg/kg	M	<0.1	-
Acenaphthene	GC/MS	0.1	mg/kg	U	-	<0.1
Fluorene	GC/MS	0.1	mg/kg	M	<0.1	-
Fluorene	GC/MS	0.1	mg/kg	U	-	<0.1
Phenanthrene	GC/MS	0.1	mg/kg	U	<0.1	**0.9**
Anthracene	GC/MS	0.1	mg/kg	M	<0.1	-
Anthracene	GC/MS	0.1	mg/kg	U	-	**0.2**
Fluoranthene	GC/MS	0.1	mg/kg	N	<0.1	**2.2**
Pyrene	GC/MS	0.1	mg/kg	N	<0.1	**1.8**
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	M	<0.1	-
Benzo(a)Anthracene	GC/MS	0.1	mg/kg	U	-	**0.8**
Chrysene	GC/MS	0.1	mg/kg	M	<0.1	-
Chrysene	GC/MS	0.1	mg/kg	U	-	**0.9**
Benzo(b/k)Fluoranthene	GC/MS	0.1	mg/kg	M	<0.1	-
Benzo(b/k)Fluoranthene	GC/MS	0.1	mg/kg	U	-	**1.6**
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	M	<0.1	-
Benzo(a)Pyrene	GC/MS	0.1	mg/kg	U	-	**0.9**
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	M	<0.1	-
Indeno(123-cd)Pyrene	GC/MS	0.1	mg/kg	U	-	**0.4**
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	M	<0.1	-
Dibenzo(ah)Anthracene	GC/MS	0.1	mg/kg	U	-	**0.2**
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	M	<0.1	-
Benzo(ghi)Perylene	GC/MS	0.1	mg/kg	U	-	**0.5**
Polyaromatic Hydrocarbons (Total)	GC/MS	0.1	mg/kg	U	<0.1	**10**

SAL Reference: 411332
Project Site: 36 Redington Road (London NW3)
Customer Reference: J11894

Soil Analysed as Soil
BTEX

				SAL Reference	**411332 003**	**411332 005**
				Customer Sample Reference	**BH1 @ 6.00m**	**Tree trench @ 0.50m**
				Test Sample	**AR**	**AR**
				Date Sampled	**16-JUL-2014**	**15-JUL-2014**
				Type	**Clay**	**Fill**
Determinand	**Method**	**LOD**	**Units**	**Symbol**		
Benzene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	-
Benzene	GC/MS(Head Space)(MCERTS)	10	µg/kg	U	-	<10
EthylBenzene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	-
EthylBenzene	GC/MS(Head Space)(MCERTS)	10	µg/kg	U	-	<10
Meta/Para-Xylene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	-
Meta/Para-Xylene	GC/MS(Head Space)(MCERTS)	10	µg/kg	U	-	<10
Ortho-Xylene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	-
Ortho-Xylene	GC/MS(Head Space)(MCERTS)	10	µg/kg	U	-	<10
Toluene	GC/MS(Head Space)(MCERTS)	10	µg/kg	M	<10	-
Toluene	GC/MS(Head Space)(MCERTS)	10	µg/kg	U	-	<10

SAL Reference: 411332
Project Site: 36 Redington Road (London NW3)
Customer Reference: J11894

Soil Analysed as Soil
PCBs EC7 (SE)

	SAL Reference	411332 003	411332 005
	Customer Sample Reference	BH1 @ 6.00m	Tree trench @ 0.50m
	Test Sample	AR	AR
	Date Sampled	16-JUL-2014	15-JUL-2014
	Type	Clay	Fill

Determinand	Method	LOD	Units	Symbol		
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#101	GC/MS	20	µg/kg	U	-	(62) <50
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#118	GC/MS	20	µg/kg	U	-	(62) <50
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#138	GC/MS	20	µg/kg	U	-	(62) <50
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#153	GC/MS	20	µg/kg	U	-	(62) <50
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#180	GC/MS	20	µg/kg	U	-	(62) <50
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#28	GC/MS	20	µg/kg	U	-	(62) <50
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	M	(62) <50	-
Polychlorinated biphenyl BZ#52	GC/MS	20	µg/kg	U	-	(62) <50

Index to symbols used in 411332-1 A

Value	Description
AR	As Received
A40	Assisted dried < 40C
8:1	Leachate to BS EN 12457-3 (8:1)
2:1	Leachate to BS EN 12457-3 (2:1)
62	LOD was raised due to the method performance of the analytical procedure used
W	Analysis was performed at another SAL laboratory
M	Analysis is MCERTS accredited
U	Analysis is UKAS accredited
N	Analysis is not UKAS accredited

Notes

Sub contracted analysis performed by SAL Scotland
pH, LOI & TOC were performed on assisted dried samples (<40 degree centigrade). All other results relate to samples as received.
Reported results on as received samples are corrected to a 105 degree centigrade dry weight basis except ANC
Retained on 2mm is removed before analysis

APPENDIX E

Monitoring Data

Southern Testing

ST Consult

SOIL GAS AND GROUND WATER DAILY RECORD SHEET

Project Name: 36 Redington Road, London NW3	**Project Engineer:** JNR		**Date:** 18-Aug-14		**Project No:**
Client: Mr Zolf	**Operative:** AW		**Day of the week:** Monday		J11894

Well / TH No.	Atmospheric Pressure (mb) and Ambient Temperature		PID (ppm)	BH pressure (pa)	Flow Rate (l/hr)		CH_4 (%)	CO_2 (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Depth to base of well (m below top of cover)	Water level (m below top of cover)	Height of Cover (m above GL)	Details of water samples (colour, clarity, odour etc)	Ground Conditions (soft, wet/dry, frozen etc) & Weather Conditions	General Remarks
			Land Gas Data									**Groundwater Data**			**Remarks**		
BH1		P				P						10.00	1.04	0.00			
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
BH2		P				P						10.00	8.82	0.00			
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					
		P				P											
		S				S											
		Time Of Readings:				Time Of Readings:						Time Of Readings:					

P = Peak Reading, S = Steady reading — Equipment Used: Interface Meter, MiniRAE 2000, GFM435 Gas Analyser — Checked By: JNR