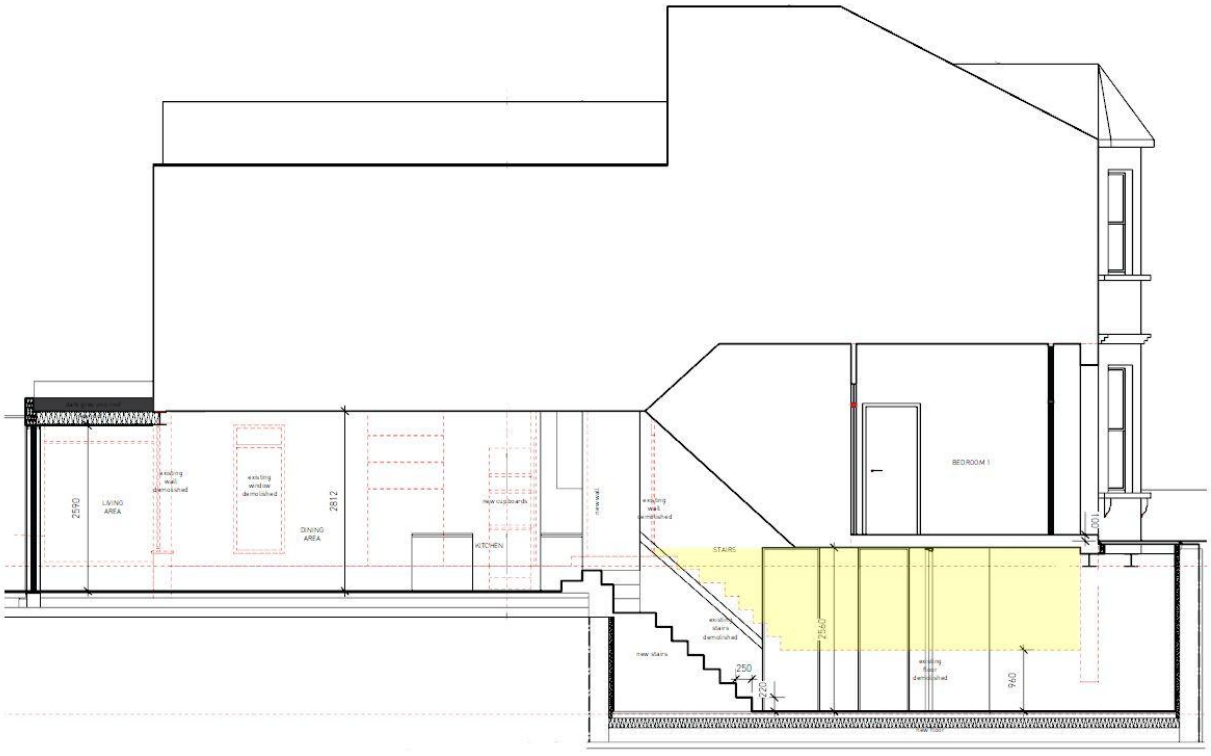
Basement Impact Assessment

Ground Floor Flat

54 Sumatra road, London, NW6 1PR

For

Mr. Shaun McKinlay



Project Number: 11654 October 2018

Project Number: 11654
Date: 19th October 2018
Document reference: BIA_11654

Client: Shaun McKinlay

Report prepared & reviewed by:

Daniel Barac (MEng)

BiniamDesta (MEng, MI StructE, CEng)

Bini Struct-E Limited
Consulting Structural Engineers
Unit 415, 241-251 Ferndale Road
London SW9 8BJ

T: 020 7326 4939
M: 077 3718 1063
E: biniam@biniengineering.co.uk
Web site: http://biniengineering.co.uk/

Registered office address: 52 Jebb Avenue,
London, SW2 5XQ
Company number: 06177832

Document History and Status

Revision	Date	Purpose/Status
-	19.10.2018	First issue

Contents

Appendices

Other mapping/data as required to evidence Screening assessments:

- *WW2 Bomb Damage Map Extract*
- *Transport for London map*
- Aquifer Map Extract from The Environment Agency
- *LB Camden GHHS figures 1-23*

- *Figure 2 - 1920' Geology Map rev1*
- *Figure 6 LFRZ's and CDA's Flood Risk Zones*

Appendix 2: Site Investigation

Appendix 3: Existing and Proposed Development Drawings (both Architectural & Structural)

Appendix 4: Ground Movement and Damage Impact Assessment

Appendix 5: Report Structural Engineer's Statement and Calculations

Appendix 6: Flood Risk Assessment

Appendix 7: Tanking and sump pumps manufacturer brochure

1.0 Non-Technical Summary

The site location is No. 54 Sumatra Road, West Hampstead, London NW6 1 PR. Refer to drawing No.217-001 SITE LOCATION PLAN of the Architectural set of drawings, also attached to this document under Appendix3.

The existing property is occupying the ground floor flat of a late Victorian two storey terraced house with traditional timber sash windows and London Stock brickwork. The property features an existing basement partially below the front part of the main house. The building is of masonry construction with timber floor structure under a hipped roof.

The proposed development comprises of an extension of the existing basement together with other alterations such as rear and side extensions.

The following assessments are presented:

- Desk Study
- Screening
- Scoping
- Additional evidence/assessments
    - *Site investigation*
    - *Structural scheme and design of the proposed alterations*
    - *Flood Risk Assessment*
- Impact Assessment

The ground conditions beneath the site are of a 700-800mm made ground strata underlain by the London Clay formation. No water inflows were encountered within the 5m deep boreholes that were dug on site, meaning that the formation level of the new basement extension is above the water table.

The construction methods proposed are those of a traditional reinforced concrete underpinning of the existing perimeter walls of the property.

A structural monitoring strategy to control the works and impacts to neighbouring structures will comprise of tilt sensors being set up on the neighbouring properties by specialist surveying companies, with precise levelling being conducted on a regular basis and trigger levels being followed.

The BIA has assessed land stability and the impact of the proposed development on neighbouring structures is expected to fall into Category 0 'Negligible' to Category 1 'Very Slight'.

The BIA has identified the following *potential slope stability impacts:*

- London Clay is the shallowest strata at the site.

The potential impact is that the London Clay is prone to seasonal shrink-swell (subsidence and heave).

A detailed soil investigation has been carried out together with laboratory testing and the results have been considered within the structural design of the retaining walls as well as the basement slab, presented in the following sections of the report.

- The basement extension is within 5m of a pedestrian right of way.

The potential impact is that the excavation for a basement may result in damage to the road, pathway or any underground services buried in trenches beneath the road or pathway, but these are negligible.

The design of the front retaining wall as presented in Appendix 5 has taken into consideration an applied Surcharge loading of 10kN/m2.

- The proposed basement will increase the differential depth of foundations relative to neighbouring properties.

The guidance advises that the excavation for a basement may result in structural damage to neighbouring properties through ground movement which will be minimal. Damage impact to adjacent neighbouring structures has been assessed as Category 0 (Negligible) in accordance with the Burland Scale.

It is considered that the development proposals can be suitably designed to maintain stability. In order to demonstrate this, a site specific ground investigation is presented in Section 6, with structural information and damage impact assessment due to ground movement is presented in Section 7. Conclusions of the impact assessment are provided in Section 8.

The BIA has identified the following no *potential hydrological & hydro geological impacts.*

The BIA has identified *a low flood risk for the proposed development.*

54 Sumatra Road

2.0 Introduction

The purpose of this assessment is to consider the effects of a proposed basement development at Ground Floor Flat, 54 Sumatra Road, West Hampstead, London NW6 1PR on the local hydrology, geology and hydrogeology and potential impacts to neighbours and the wider environment.

The site location is presented on the OS map within the Architectural set of drawings in Appendix 3, on drawing No.217-001 SITE LOCATION PLAN.

The BIA approach follows current planning procedure for basements and light wells adopted by LB Camden and comprise the following elements (CPG Basements):

- Desk Study;
- Screening;
- Scoping;
- Site Investigation, monitoring, interpretation and ground movement assessment;

2.1. Authors

The BIA has been *prepared by Mr* Daniel Barac (MEng) & Mr Biniam Desta (MEng, MI StructE, CEng) – Structural Engineers, Mr James Woodward BSc(Hons) DipHE and Mr Mark Pickering - FGS Geotechnical report, Ms Eloise Murray BSc (Hons) PIEMA Associate Auditor Hydrology and Flood Risk assessment report.

2.2. Sources of Information

The following baseline data have been referenced to complete the BIA in relation to the proposed development:

- Site walkover and discussion with residents on the 13th July 2018;
- Current/historical mapping(Google maps, https://www.francisfrith.com);
- Geological mapping (British Geological Survey, ARUP);
- Hydrogeological data(British Geological Survey, ARUP);
- Current/historical hydrological data(ARUP);
- LB Camden, Strategic Flood Risk Assessment (produced by URS, 2014);
- LB Camden, Floods in Camden, Report of the Floods Scrutiny Panel (2013);
- LB Camden, Planning Guidance (CPG) – Basements (March 2018);
- LB Camden, Camden Geological, Hydro geological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010);
- LB Camden, Local Plan Policy A5 Basements (2017);
- LB Camden's Audit Process Terms of Reference;

2.3. Existing and Proposed Development

The Application site is located on the lower south-western slopes of Hampstead Heath on a land that falls gently to the south with an angle of approximately 2%.

The street level at the front of the site appears to be situated at +55-60m OD (as per GHHS, figure 16.)

The existing property is occupying the ground floor flat of a late Victorian two storey terraced house with traditional timber sash windows and London Stock brickwork. The property features an existing

basement partially below the front part of the main house. The building is of masonry construction with timber floor structure under a hipped roof.

The adjacent neighbouring buildings are of similar construction and height.

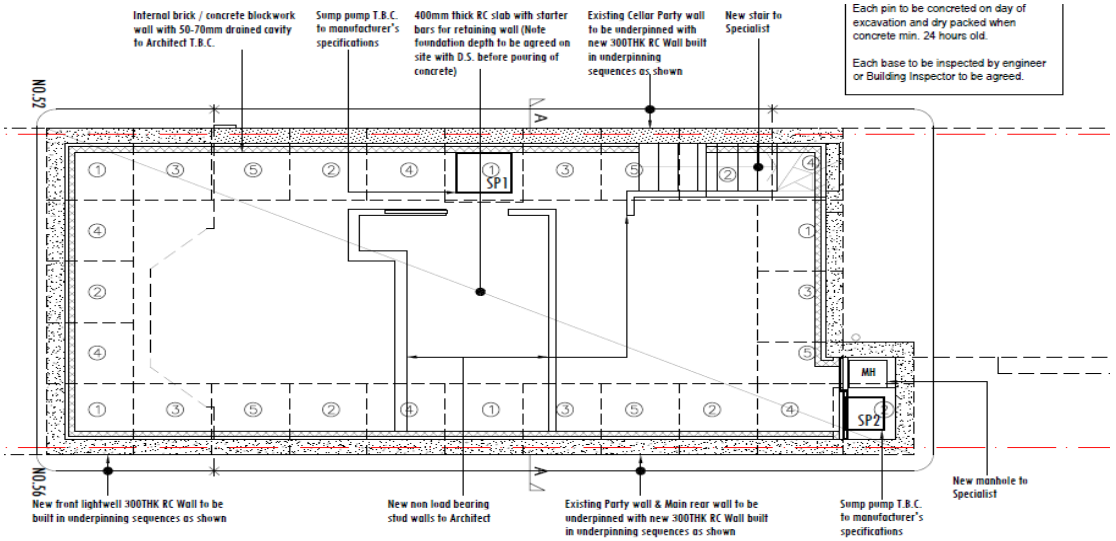
The neighbouring building at No. 52 Sumatra Road is expected to have a similar basement partially below the front part of the main house. The depth of the existing party wall foundation is approximately 290-320 mm below existing basement level.

The depth of the foundation below the party wall with No. 56 Sumatra Road is expected to be approximately 720mm below rear ground level as per trial pit information obtained from site. (Refer to Soil Investigation on Appendix 2).

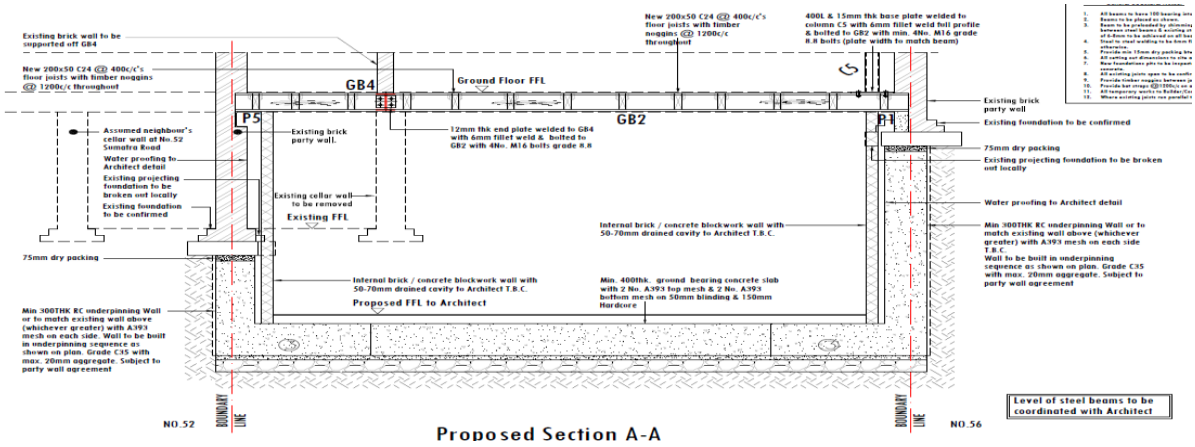
Existing and Proposed development drawings are presented in *Appendix 3.*

The proposed basement extension will be formed using traditional reinforced concrete underpinning around the perimeter of the building with a front lightwell build in the same manner of hit-and-miss sequence. These will be designed to take vertical and lateral loads in the permanent situation. A new internal brick / concrete block work wall will be built in front of the reinforced underpinning concrete wall with 50-70mm drain cavity in between in order that a drained cavity waterproofing system will be installed to provide a type C form of construction thus providing habitable grade 3 basement.

The new ground floor level and upper floors will consist of timber floor with steel beams supported on perimeter walls and taken down to basement walls.



PROPOSED BASEMENT PLAN



Proposed Section A-A

3.0 Desk Study

3.1. Site History

As referenced in the next section of the report, from the historical maps, the site seems to have been residential since at least 1894.

According to the Bomb sight mapping (see data extracted in Appendix 1), the site seems to not have been damaged by the bombing during the World War II.

3.2. Geology

The British Geology Survey (BGS) map of the area, as well as the attached Soil Investigation report on Appendix 2, indicate that the site is underlain by London clay formation.

3.3. Hydrogeology

The geology underlying the site is classified as Unproductive Strata. Relevant maps have been referenced in the next section of the report.

LB Camden data indicates the site is not within a groundwater source protection zone.

3.4. Hydrology, Drainage and Flood Risk

The site is located within approximately 2km of surface water features and hence presenting no potential impacts relating to the proximity of these watercourses.

The site is located within 250m of the closest historical water courses to the south of the site, as highlighted in the next section, and hence presenting no potential impacts relating to the proximity of these watercourses.

The site is not within the catchment of the Hampstead Heath Pond Chain, which is 2km to the North.

The site is classified as low risk of flooding from river or the sea, and is within a Local Flood Risk Zone 1.

The site is not within a Critical Drainage Area.

4.0 Screening

4.1. Ground Water Flow

Question	Response	Details
1a. Is the site located directly above an aquifer?	NO	The Environment Agency maps indicate that the site is not directly underlain by an aquifer. See figure 1 & 2 below
1b. Will the proposed basement extend beneath the water table surface?	NO	As per the Soil Investigation that was carried out, no ground water was encountered within the borehole. Refer to Appendix 2.
2. Is the site within 100mof a watercourse, well (used / disused) or potential spring line?	NO	Figure 11 of the Arup report shows no surface water within 200m of the site. See figure 3 below
3. Is the site within the catchment of the pond chains on Hampstead Heath?	NO	The site is approximately 2km away from Hampstead Heath which is also the areas denoted by figure 14 of the Arup reportto contain the catchment of the ponds. See figure 4 below
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	**YES**	**New lightwell partially covered with walk-on-glass will be added to the front of the property.**
5. 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 roof drainage will run into the existing drainage system. Surface water will still discharge to ground.
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	From walkover and OS maps, there are no local ponds or springs of significance.

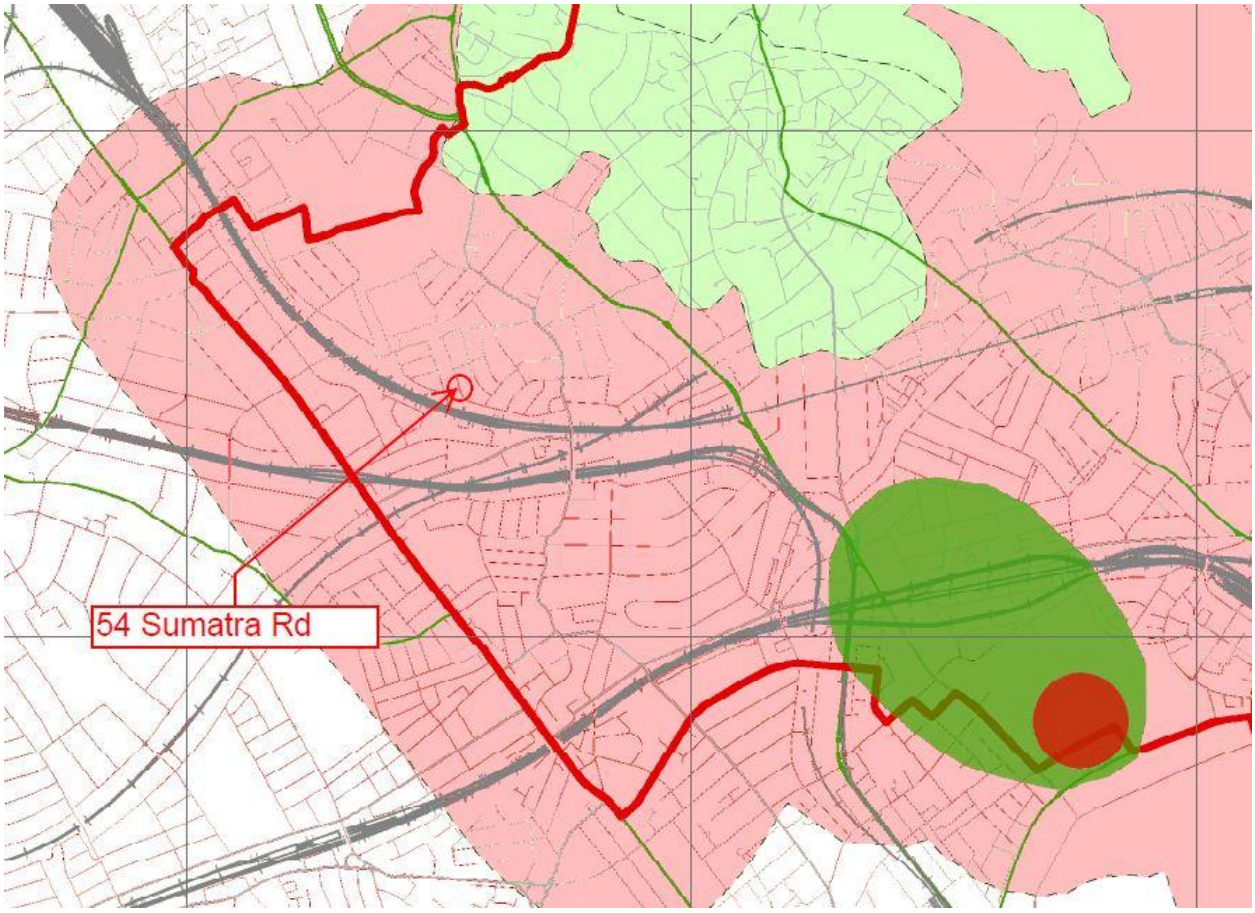


Figure 1 - Extract from Figure 8 of the Camden Geological, Hydrogeological and Hydrological Study (Camden Aquifer Designation Map)

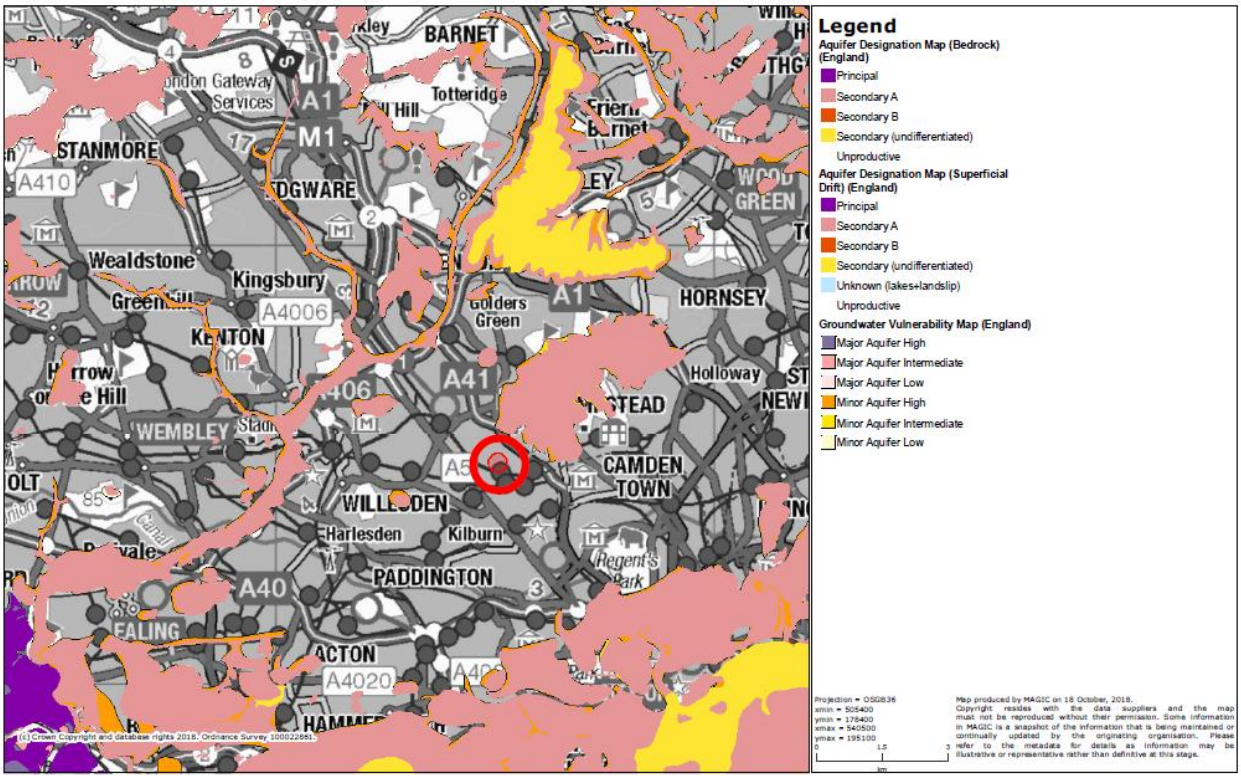


Figure 2 - Extract fromThe Environment Agency – aquifer data

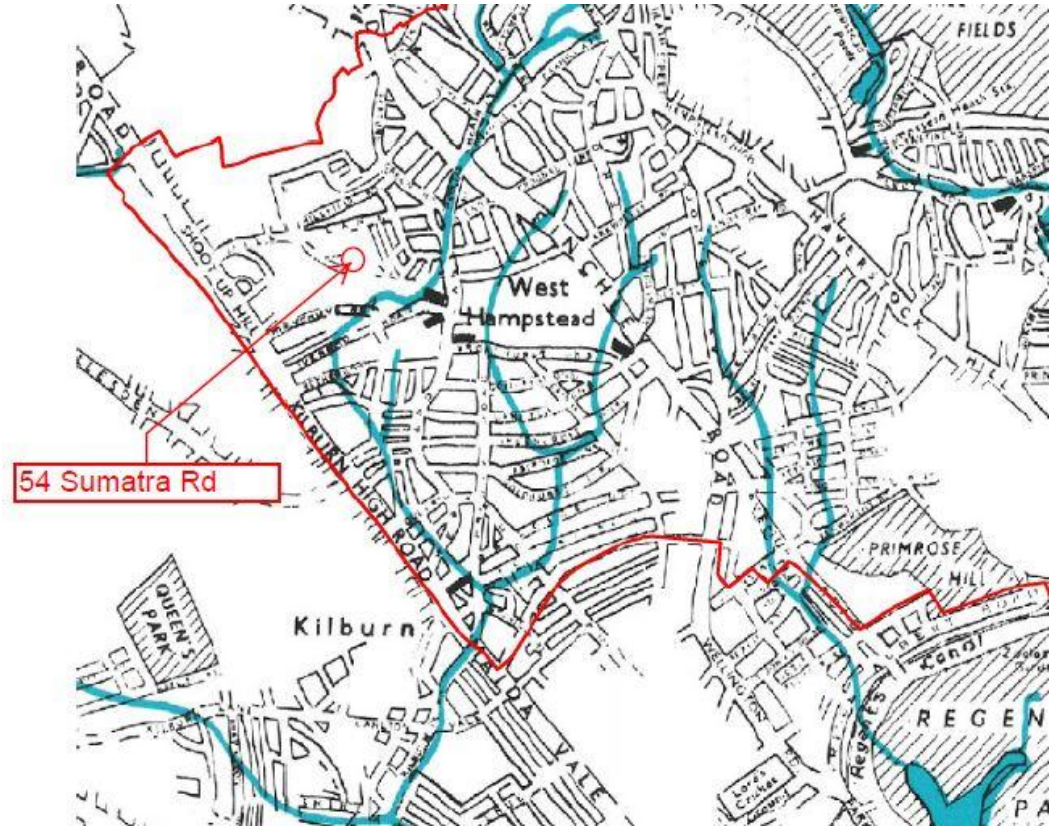


Figure 3 - Extract from Figure 11 of the Camden Geological, Hydrogeological and Hydrological Study (Watercourses)

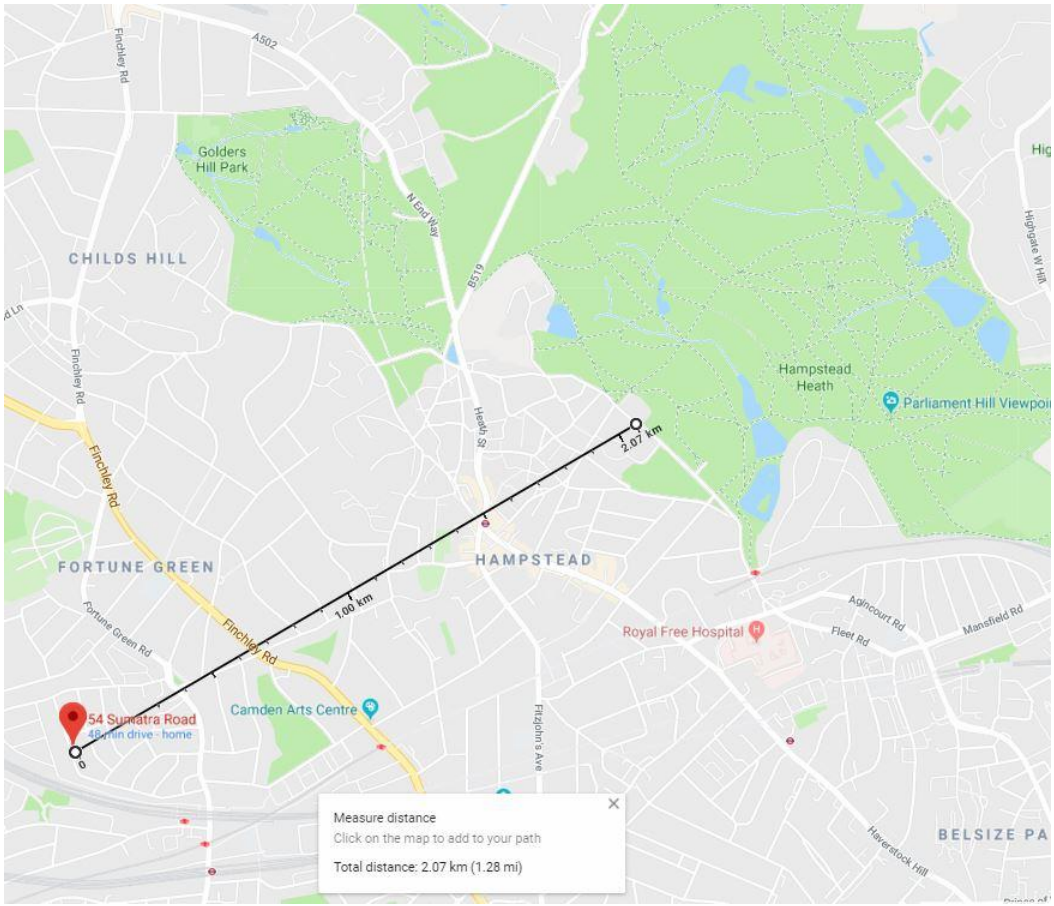


Figure 4 - Extract from Google Maps

4.2. Slope Stability

Question	Response	Details
1. Does the existing site include slopes, natural or man-made greater than 7 degrees (approximately 1 in 8)?	NO	Figure 16 of the Arup report shows the site to be in an area with slopes less than 7 degrees. See figure 5 below
2. Will the proposed re-profiling of landscaping at the site change slopes at the property boundary to more than 7 degrees (approximately 1 in 8)?	NO	Proposed landscaping does not affect the slope.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	NO	Figure 16 of the Arup report shows the site to be in an area with slopes less than 7 degrees. See figure 5 below
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately1 in 8)?	NO	Figure 16 of the Arup report shows no significant slopes in the proximity of the studied area. See figure 5 below
5. Is the London Clay the shallowest strata at the site?	**YES**	**The site sits on The London Clay formation. Please refer to borehole Log and Soil Investigation report attached in Appendix 2.**
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	No local trees are to be felled. Some shrubbery at the back of the property approximately 10 away from the proposed basement development is to be maintained, and they are unlikely to be affected by the works.
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	NO	From the walk over survey Subsidence was not considered as an issue on this site. The site is on Shrinkable ground and as such has an increased risk to subsidence. The basement and all foundations will be designed to take account of the ground conditions. The basement construction places the loads of the property on to deep ground. The depth further protects the building from the seasonal changes in the ground.
8. Is the site within 100m of a watercourse or a potential spring line?	NO	OS maps and local walkover survey show no wells, watercourses. Figure 11of the Arup report shows no surface water abstraction licenses within 200m of the site (See figure 3 above). There are no springs shown in OS mapping, and no known local geological features that might give rise to springs. The vicinity of the site experienced flooding in 1975 and 2002, however the area surrounding the site is not identified as having the potential to be at risk of surface water flooding. Further, a flood risk assessment has been carried out. Refer to Appendix 6.
9. Is the site within an area of previously worked ground?	NO	From the historical maps, the site has been residential since at least 1894. See figure 6 below. Refer to Soil Investigation report attached in Appendix 2 to confirm the ground

		conditions.
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 Environment Agency maps do not show the site to lie above an aquifer. It is confirmed by Arups report, Figure 8. See figure 1 & 2 above. The ground is London Clay, which is relatively impermeable; as such it is not anaquifer. (Soil investigation report is included in Appendix 2)
11. Is the site within 50m of the Hampstead Heath Ponds?	NO	The site is located more than 2km from the Hampstead Heath ponds. See Figure 4 above.
12. Is the site within 5m of a highway or pedestrian right of way?	**YES**	**Site is within 5m of the footpath/alleyway. 10kN/m2 Surcharge loading will be applied.** **Refer to the structural calculations included in the Appendix5.**
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	**YES**	**Existing footings are of corbelled masonry with mass concrete base (refer to Soil Investigation on Appendix 2, for details).** **The differential depth will be increased by approximately stem of 850mm on the existing basement side, and by approximately 2.2m for the shallow foundations. The new footings will similarly be bearing on the Clay strata and no significant change will occur. Both party walls as well as the front and rear walls of the main house will be underpinned and the new foundation will be formed as a raft foundation and this will nod yield to differential movement. This has been considered in the design process.**
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	NO	Nearest railway line is the National Rail at approximately 117m away from the site, and the nearest tunnels are the Jubilee and Metropolitan lines approximately 400m from the site. See figures 7-10 below showing the location of the site with measurements extracted from Google Maps as well as the extract from Property Asset Register Public Web Map from Transport for London, according to which the assets are not affected.

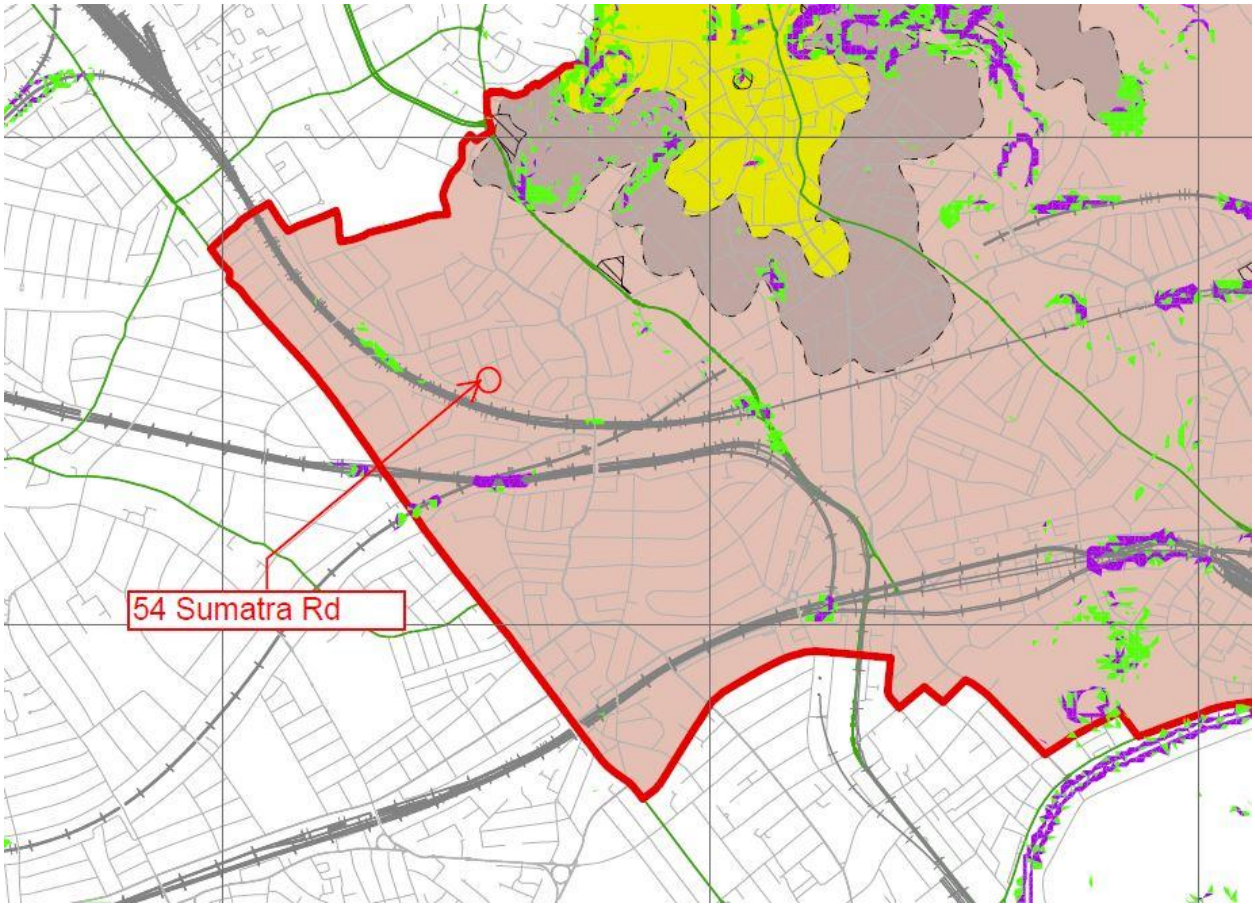


Figure 5 - Extract from Figure 16 of the Camden Geological, Hydrogeological and Hydrological Study (Slope Angle Map)

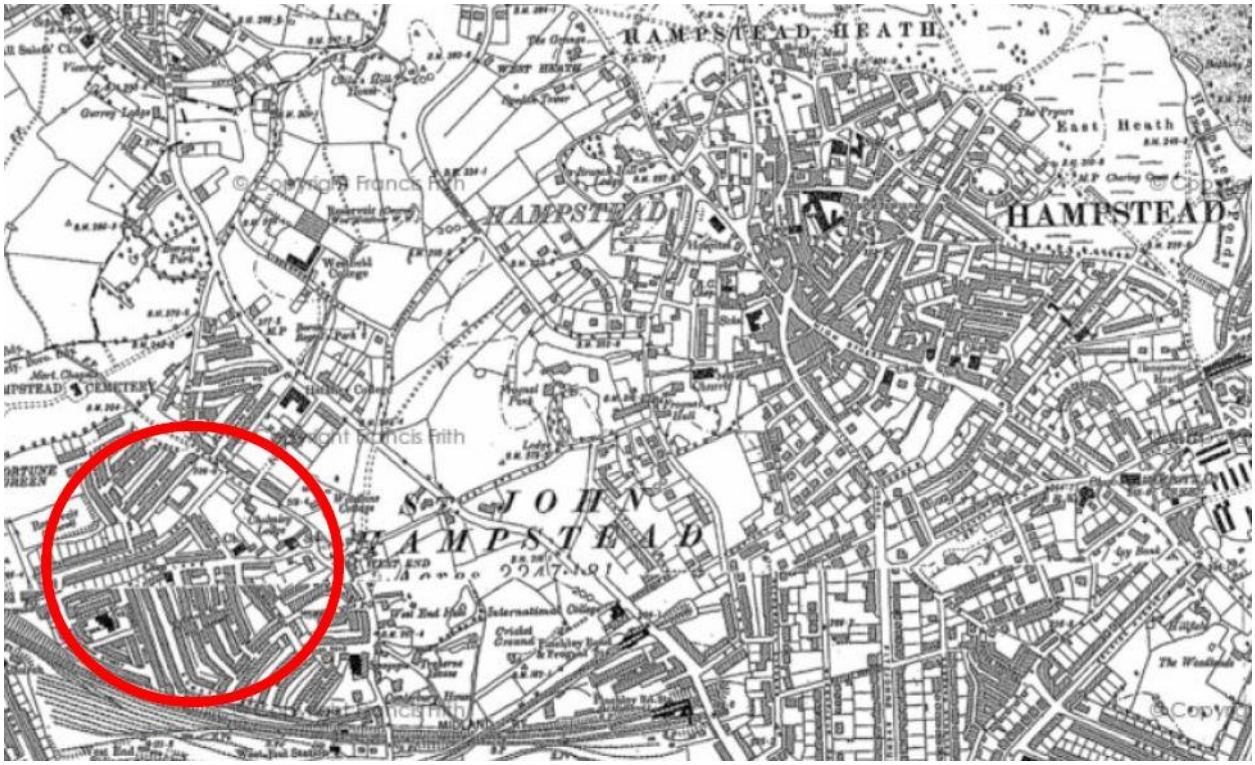


Figure 6 - Extract fromhttps://www.francisfrith.com/hampstead/hampstead-1894_hosm65588

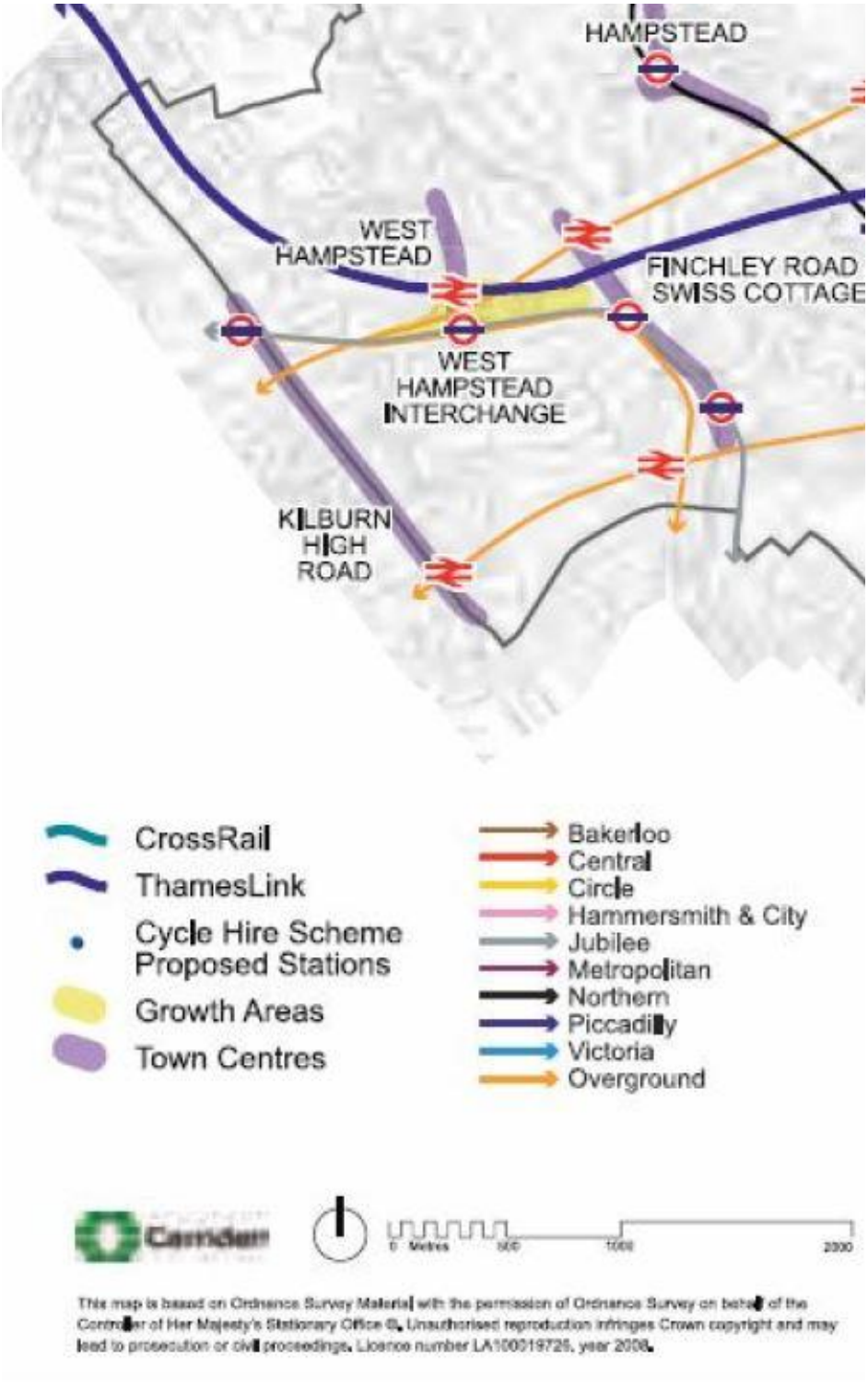


Figure 7 - Extract from Figure 18 of the Camden Geological, Hydrogeological and Hydrological Study (Transport Infrastructure)

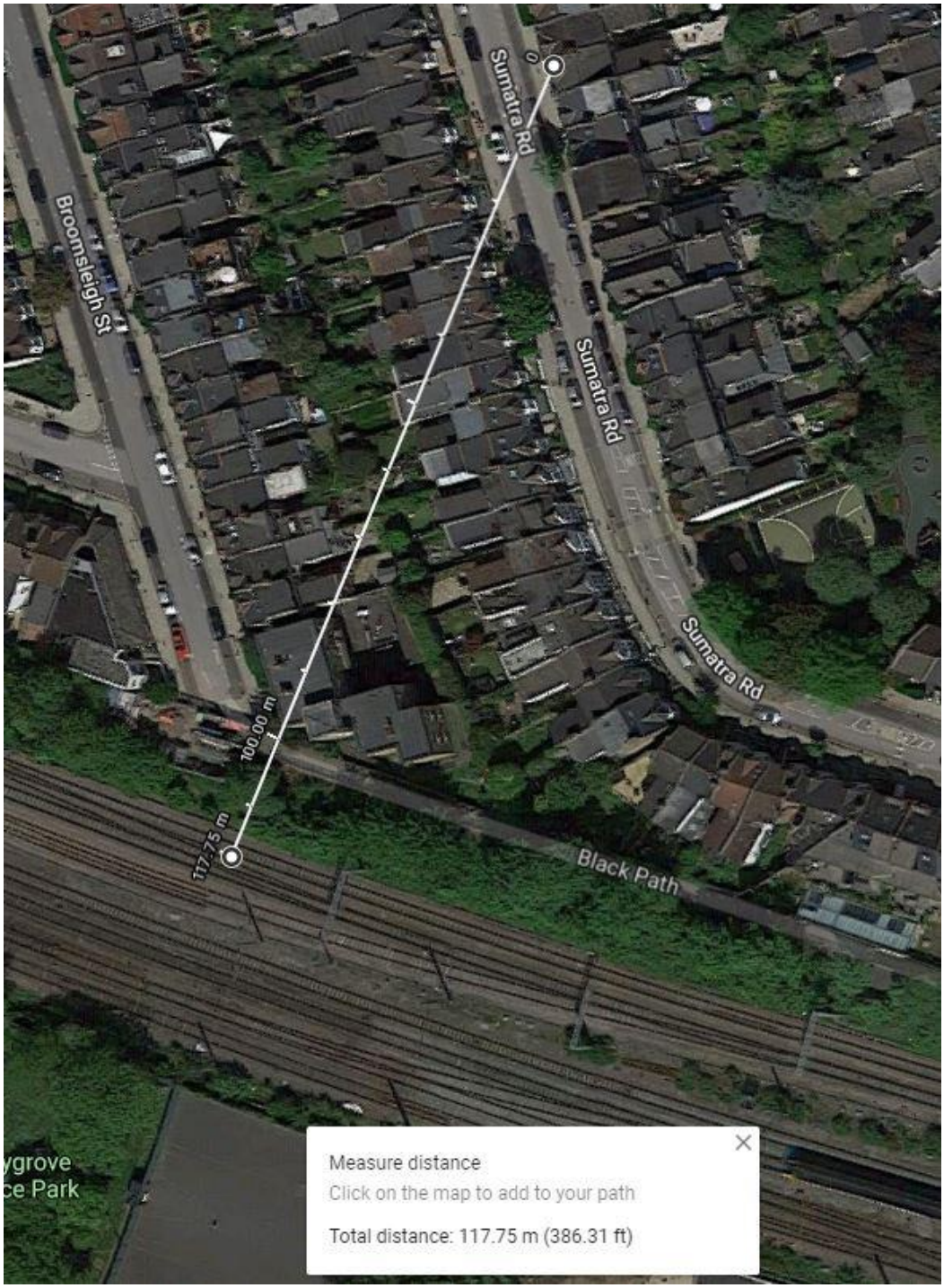


Figure 8 - Extract from Google maps

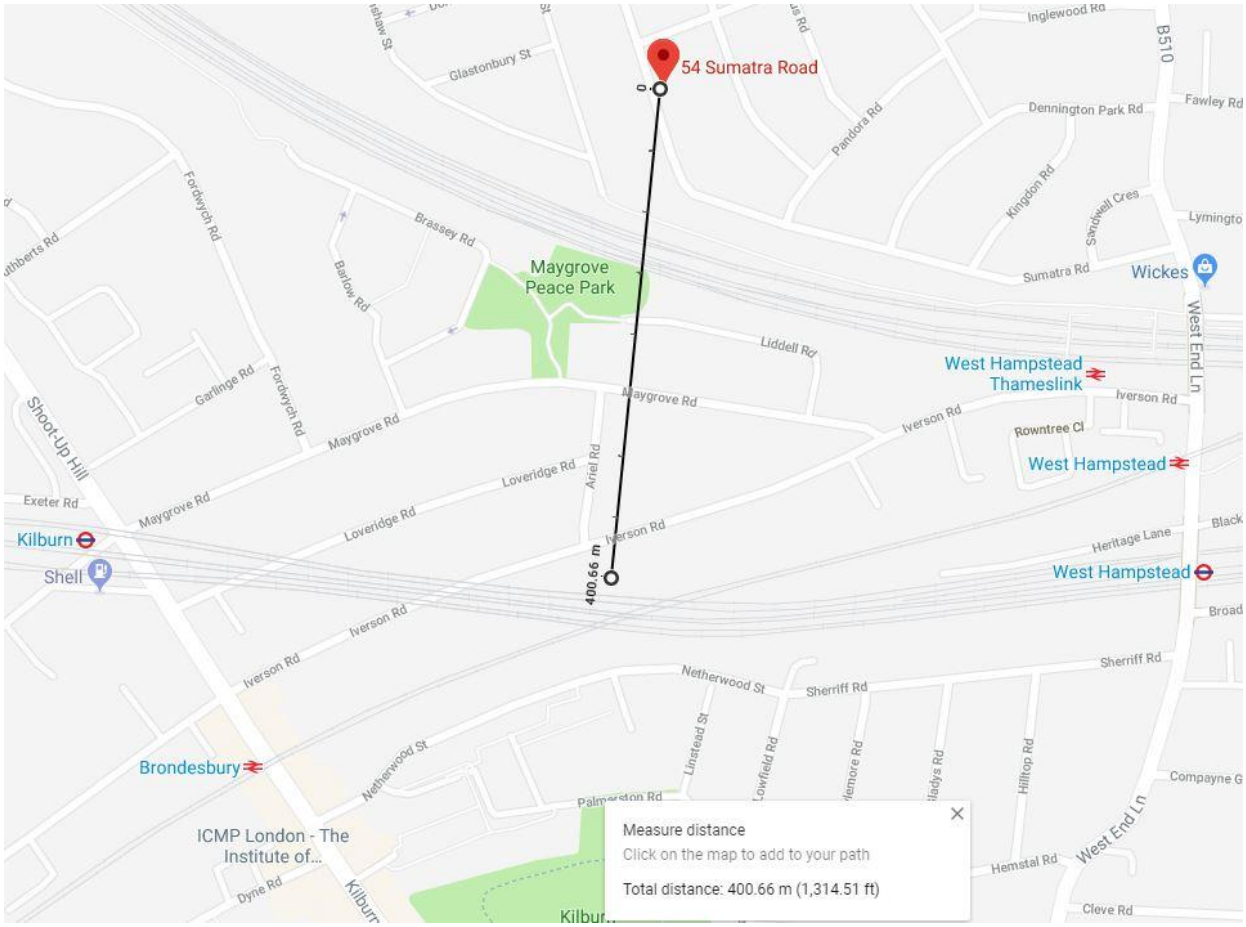


Figure 9 - Extract from Google maps

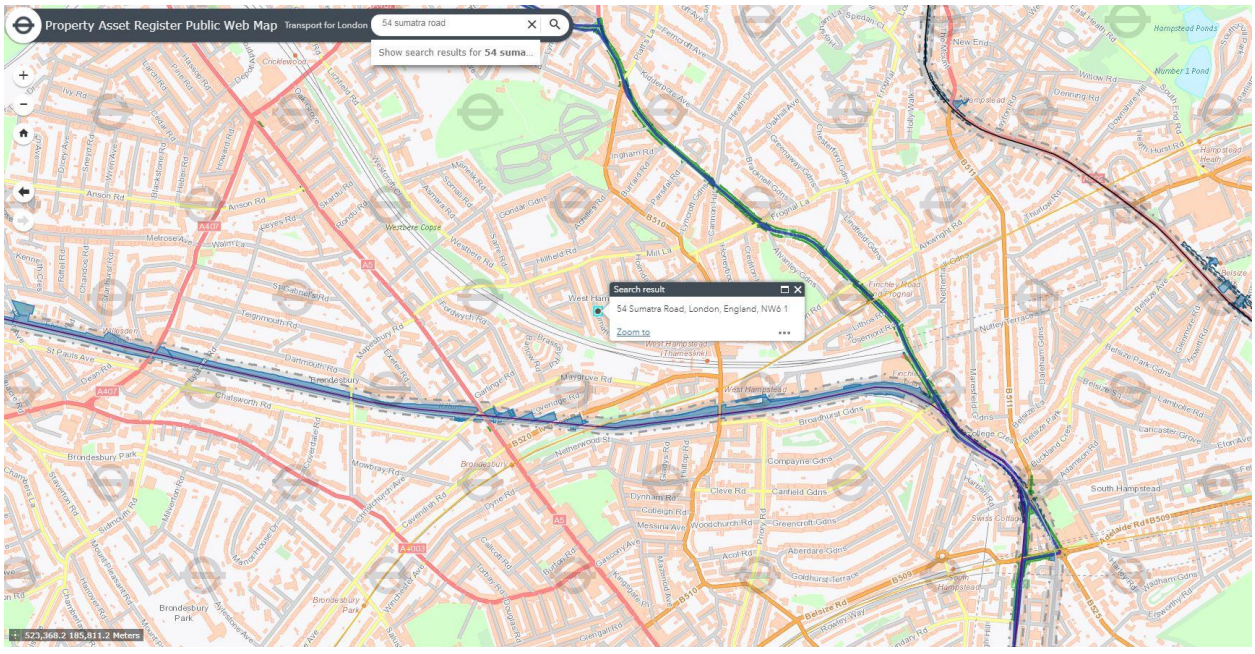


Figure 10 - Extract from Property Asset Register Public Web Map

Transport for London

4.3. Surface Water and Flooding

Question	Response	Details
1. Is the site within the catchment of the ponds chains on Hampstead Heath?	NO	The site lies outside the catchment areas of the Hampstead heath ponds as shown on figure 14 and 12 of the Camden Hydrological Study See figure 4 above
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?	NO	The development will not result in a material change of the surface water flows into the existing sewers. The proposed development will enter the current drainage system.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	**YES**	**New lightwell partially covered with walk-on-glass will be added to the front of the property.**
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 development (surface water) will enter the current drainage system.
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 water is unlikely to be altered.
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of nearby surface water feature.	**YES**	**The data from the EA website shows that the site is not within a zone at risk of flooding from the rivers.** **However, on Figure 15 of Camden Geological, Hydrological and Hydrological Study (Arup), the street is noted to have flooded in 2002.** **See Figure 11 below.** **A flood risk assessment has been undertaken. Refer to Appendix 6.**

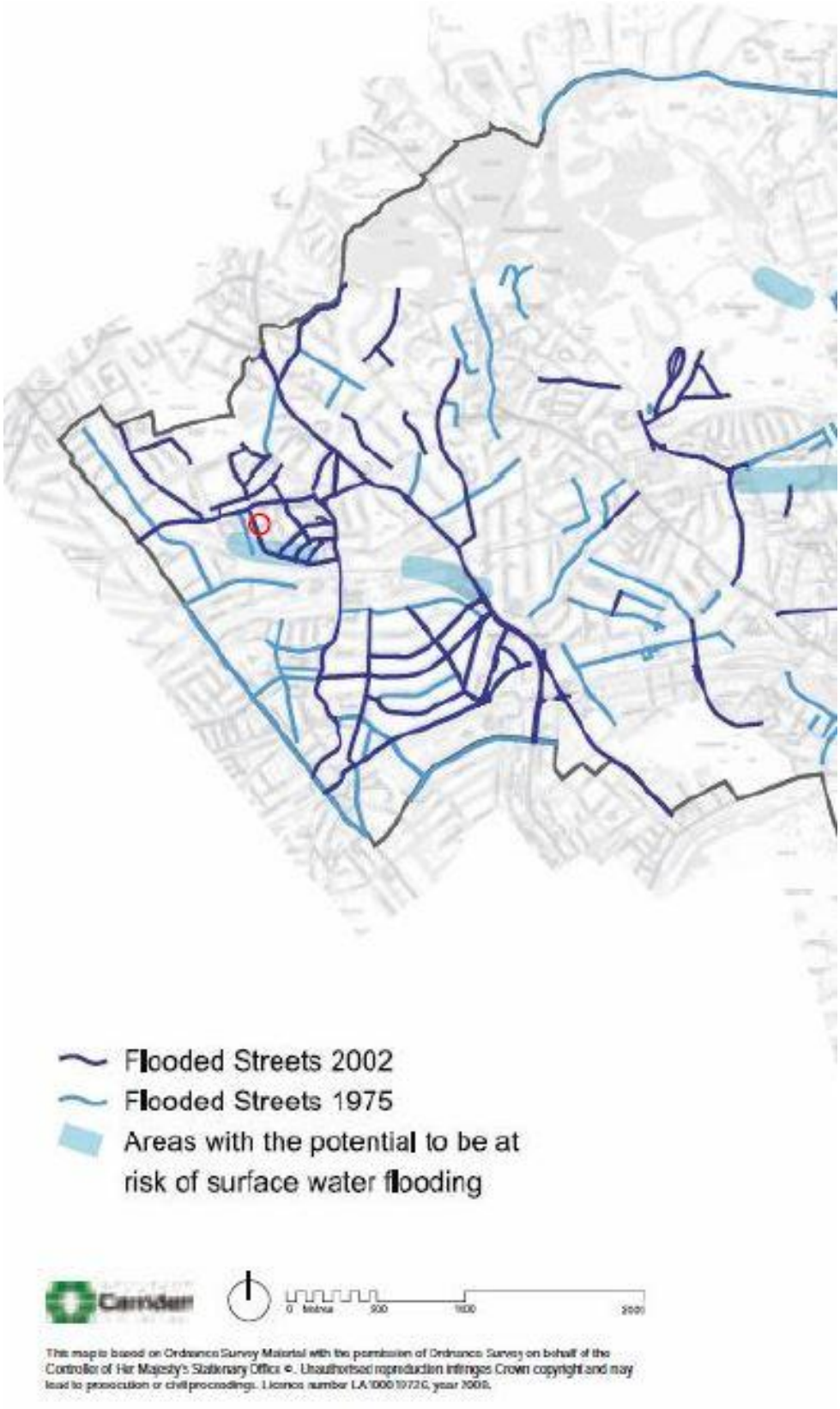


Figure 11 - Extract from Figure 15 of the Camden Geological, Hydrogeological and Hydrological Study (Flood map)

4.4. Non-Technical Summary of Screening Process

The screening process identifies the following issues to be carried forward to scoping for further assessment:

- Impermeable site area will increase due to the proposed development
- London Clay is the shallowest strata at the site.
- The basement extension is within 5m of a pedestrian right of way.
- The proposed basement will increase the differential depth of foundations relative to neighbouring properties.
- The site is situated on a street that was flooded in 2002

The other potential concerns considered within the screening process have been demonstrated to be not applicable or not significant when applied to the proposed development.

5.0 Scoping

The following issues have been brought forward from the Screening process for further assessment:

5.1. Ground Water Flow

- Impermeable site area will increase due to the proposed development.

  New lightwell partially covered with walk-on-glass will be added to the front of the property.

  The proposed development will increase impermeable site area by approximately 3m2. This is negligible and less likely to cause a significant increase in drainage flow rates. A drainage assessment is not necessary.

  No further assessment is considered to be required.

5.2. Slope Stability

- London Clay is the shallowest strata at the site.

  The potential impact is that the London Clay is prone to seasonal shrink-swell (subsidence and heave).

  A detailed soil investigation has been carried out together with laboratory testing and the results have been considered within the structural design of the retaining walls as well as the basement slab, presented in the following sections of the report.

- The basement extension is within 5m of a pedestrian right of way.

  The potential impact is that the excavation for a basement may result in damage to the road, pathway or any underground services buried in trenches beneath the road or pathway.

  The design of the front retaining wall as presented in Appendix 5 has taken into consideration an applied Surcharge loading of 10kN/m2.

- The proposed basement will increase the differential depth of foundations relative to neighbouring properties.

  The guidance advises that the excavation for a basement may result in structural damage to neighbouring properties.

  It is considered that the development proposals can be suitably designed to maintain stability. In order to demonstrate this, a site specific ground investigation is presented in Section 6, with structural information and a ground movement assessment presented in Section 7. Conclusions of the impact assessment are provided in Section 8.

5.3. Surface Water and Flooding

- The site is situated on a street that was flooded in 2002

Although the overall risk of flooding on site is considered to be negligible, a more detailed assessment of the flood risks is presented in Appendix 6 as prepared by Argyll Environmental.

No further assessment is considered to be required.

6.0 Site Investigation/Additional Assessments

6.1. Site Investigation

A development specific site investigation has been prepared by CONNAUGHTSSITE INVESTIGATION LTD on the 1st of September 2018.

Refer to Appendix 2.

7.0 Construction Methodology/Engineering Statements

7.1. Outline Geotechnical Design Parameters

The following outline, reasonably conservative geotechnical parameters have been determined, based on the site investigation data presented *(Appendix 2)* and relevant technical guidance (as referenced in paragraph 2.2 of this BIA).

The site

- Location: 54 Sumatra Road, London, NW6 1PR

- Present use – The property, 54 Sumatra Road, is a two storey, mid terrace property of masonry construction and of an estimated 1920's age. The property had a narrow partial basement which ran beneath the entrance corridor to the front left hand side of the property and with a head height of approximately 1.60m.
  The existing footings are of corbelled masonry with mass concrete base (refer to Soil Investigation on Appendix 2, for details).

- Proposed – The construction of a full height basement to run beneath the main footprint of property with light wells to the front and back.

- Geology and ground conditions – The London Clay Formation which is present on site comprises a series of silty clays which can become clayey silts and sands. These deposits tend to be of high to very high plasticity with a moderate to high volume change potential.

- Hydrogeology/groundwater – No water inflows were encountered within any of the trial pits or boreholes (5m deep) with all excavations found to be dry on completion of the site works.

- History of site – Borehole searches revealed historical boreholes drilled to the south west of the site encountered brown weathered clay then blue grey less weathered clay to the close of all boreholes drilled.

Review of site investigation

- Contractor, scope of work, dates of field and lab work, supervision, British Standards and codes complied with

  Site investigation was carried out by CONNAUGHTS SITE INVESTIGATION LTD on the 8th of August for the purpose of providing information on the foundations and founding subsoil to the property in order for an assessment to be made regarding a proposed redevelopment at this property.

  Selected soil samples taken from the window sample borehole was sent to Soil Property Testing for UKAS accredited soils testing in accordance with British Standards 1377: Testing of soils for civil engineering purposes.

- Details of boreholes and trial pits: (number, locations – refer to figure, depths, diameters, details of installations (e.g. standpipes, piezometers), difficulties encountered, water:

  A number of 3 trial pits were carried out, one in the existing basement and two at the rear of the property. The location of the pits is indicated on the attached soil report under Appendix 2 as well as on the existing structural drawings under Appendix 3. The depth of each pit was dug to expose the underside of the adjacent foundation and a hand augured bore hole was drilled through the base of each trial pit to the maximum depth of 5m below the rear garden level.

  No water inflows were encountered within any of the trial pits or boreholes

- Details of samples taken and in-situ tests

  The samples were tested between: 14/08/2018 and 30/08/2018, starting 6 days after collection from site. Disturbed soil samples taken from each trial pit along with carrying out insitu strength testing.

- Details of laboratory tests

  The soils testing comprised the determining the moisture content of nine samples and plasticity testing of five samples using the Atterberg limits tests. Two samples were also tested for their soluble sulphate and pH value.

  The moisture content of nine samples was tested along with the plasticity of three of these samples taken from boreholes 1 and 2 using the Atterberg limits test. This testing found the underlying silty CLAY to be of high to very high plasticity with plasticity indices ranging from 44-48%which indicates a high volume change potential for this soil.

- Full review of the field and laboratory work

  The laboratory testing and correlations with field descriptions and insitu strength testing of the London Clay showed no compelling evidence for desiccation which would indicate that the soils unaffected by any clay desiccation and as a result is a low risk factor. No water inflows were encountered within any of the trial pits or boreholes which would indicate that water inflows should not impact on any of the excavations conducted as part of the development. It is common that small inflows can occur within a London Clay with the water trapped within silt or clay stone bands although this tends to be easily controlled with localised pumping of excavations. The London Clay Formation which underlies the site would provide a suitable founding stratum for the basement to be formed at 2.5-3.0 m below ground, presenting a high bearing capacity of 170-195 kN/m2.

Ground conditions

• Stratigraphy – general description of strata – tabulated:

LOCATION	54 Sumatra Road, London, NW6 1PR					
Description of Stratum	(m)	Legend	Depth (m)	Samples Type	Samples Depth	Tests Type	Tests Value
Concrete			0.05m				
Hardcore			0.10m				
Grey / brown, clayey gravel with much ash, brick and flint pieces MADE GROUND	0.5			C1	0.40		
			0.72m	D1	0.72	V	48-50kPa
Firm, medium strength, orange brown / grey, silty CLAY	1.0						
				D1	1.100	V	50-52kPa
Containing rare flint gravel by 1.20m	1.5			D2	1.50	V	68kPa
Becoming a darker brown / grey colour by 1.70m	2.0			D3	2.00	V	80kPa
Orange brown silt partings at 2.20m	2.5			D4	2.50	V	84-90kPa
	3.0			D5	3.00	V	98kPa
	3.5			D6	3.50	V	90-94kPa
Gypsum crystals by 4.00m	4.0			D7	4.00	V	100-108kPa
	4.5			D8	4.50	V	122-128kPa
	5.0		5.00m	D9	5.00	V	126-134kPa

• Groundwater was not encountered within the trial pits or borehole

• Description of individual strata

At a depth of 2.5 - 3.0 m below ground level where the new basement is proposed to be formed, the London Clay is becoming orange brown silty, high strength clay.

• A review and summary of the derived values of geotechnical parameters.

The London Clay Formation which underlies the site would provide a suitable founding stratum for the basement to be formed at 2.5-3.0 m below ground, presenting a high bearing capacity of 170-195 kN/m2.

7.2. Outline Temporary and Permanent Works Proposals

The Contractor for the works will be appointed through check of their related experience on basement construction and also references check will be made. They will be asked to provide detailed programme for development phase and provide detailed design for temporary works, construction sequencing and method statements. At the current stage of development, the following outline design works proposals are presented for assessment during planning consultations.

The proposed scheme requires excavated stem base underpinning to form retaining walls for the new basement floor, with the limited height of 850mm to existing cellar walls and 2.2m to remainder new perimeter walls forming the new basement. All of the new reinforced concrete underpinning and retaining wall structures will be propped in the temporary case during the construction stage in accordance with best practise until the basement floor slab is been installed and set in as all of the retaining walls have been designed as cantilevering walls off the reinforced basement raft slab.

The construction of the stem bases will be based on excavating short sections, temporarily propped and constructed in line with the Association of Specialist Underpinning Contractors (ASUC) Guidelines for Safe and Efficient Basement Construction Directly Below or Near to Existing Structures, 2nd Edition, 2016. This guidance has been endorsed by the Health and Safety Executive (HSE). This construction methodology is considered to provide a “high stiffness” retaining wall, which will minimise any potential for ground movements.

The new basement perimeter walls have been designed as new reinforced concrete retaining walls underpinning part of the existing perimeter walls above with ground bearing basement raft slab which will act as spreader footing.

The proposed basement will be formed using traditional reinforced concrete underpinning to the existing walls around the perimeter of the building. These have designed to take vertical and lateral loads in the permanent situation. The lowest basement level is to be designed to take account of potential uplift due to heave of any underlying clay strata. This will be achieved by having the basement slab spanning between the underpinned load bearing reinforced concrete perimeter walls which will be designed accordingly to withstand the tension. The new suspended lower ground floor level above basement will consist of timber floor joists with steel beams supported on new basement perimeter walls.

A brick/concrete block work wall will be built in front of the reinforced underpinning concrete wall with 50-70mm drain cavity in between. A drained cavity water proofing system will be installed to provide a type C form of construction thus providing habitable grade 3 basement.

Stability
The inherent stability of the load bearing masonry building above will be capable of transferring the existing lateral loads to the substructure walls and foundations. The substructure will then dissipate this load to the substrata.

Robustness
The existing building is currently two storeys. The building is to have an additional basement storey partially under the footprint of the house. In accordance with the Building Regulation Approved Document A 2004 Edition, the building falls with the class 1. However, as we are adding a basement, it is

the intention to design the basement structure alone as 2B. The superstructure only then needs to satisfy a class 1 structure. The new reinforced concrete basement can easily be designed to fulfil the robustness requirements of the Approved Document.

Basement Heave
It has been estimated that the excavation of approximately 3m of soil from the existing finish floor level of the lower ground floor, to form the proposed basement beneath part of the existing lower ground floor level will result in an unloading of approximately 54kN/m2. This unloading could result in heave of the underlying London Clay, which will comprise short term elastic movement and longer term swelling that will continue over a number of years. The slab has been designed to span as two way spanning slab between the reinforced concrete perimeter walls.

Spread Foundations
It will be possible to support the building on the new underpinning within the CLAY strata at approximately 2.5 – 3.0m below ground level. The expected groundwater level which is below the proposed depth of the basement suggests that it should be possible to complete the basement by traditional underpinning of the existing foundations.

Conclusion
Care should be taken during excavation to ensure that support is not removed from beneath the building under consideration and adjacent structures including the adjoining dwellings, services and possibly the footpath. The stability of excavation will need to be assessed during construction. However, it is reasonable that the soil strata with adequate temporary support will prevent loss of material and minimise deflections that could lead to associated settlement of adjacent ground / structures.

Based on the available information on groundwater level, basement excavation to a depth of 3.0m below ground floor level should not encounter the water table. In addition to the above, some minor inflows of perched water may be experienced during excavation. Although this should be limited in nature and simple pumping will be adequate to deal with any such flow, care should be undertaken to prevent loss of material which may cause loss of support and potential settlements.

A system of regular monitoring will be adopted during the construction of the substructure to assess any possible structural movement in the existing adjacent buildings.

7.3. Ground Movement and Damage Impact Assessment

Although during the past basement construction no ground movement was encountered, in some instances on construction of the basement some ground movement may result. If movement is to occur it will happen during the mass excavation. Every effort will be made to minimise this movement by installing adequate temporary propping. Detailed analysis of the pins will enable the likely movement to be predicted.

A Ground Movement Assessment has been carried out in accordance with CIRIA C580 and takes into account the construction methodology and site specific ground and groundwater conditions as appended on appendix 4 and it is anticipated that the damage to the building and surrounding building will be in the category 0 negligible to very slight category.

Temporary works will be designed to ensure that any damage to adjacent buildings is limited to category O (negligible) or I (very slight) as stated in BRE Digest 251.

Damage category assessment
Table 1. Classification of damage visible to walls (reproduction of Table 2.5, CIRIA C580)

Category	Description
0 (Negligible)	Negligible – hairline cracks
1 (Very slight)	Fine cracks that can easily be treated during normal decoration (crack width <1mm)
2 (Slight)	Cracks easily filled, redecoration probably required. Some repointing may be required externally (crack width <5mm).
3 (Moderate)	The cracks require some opening up and can be patched by a mason. Recurrent cracks can be masked by suitable linings. Repointing of external brickwork and possibly a small amount of brickwork to be replaced (crack width 5 to 15mm or a number of cracks > 3mm).
4 (Severe)	Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows (crack width 15mm to 25mm but also depends on number of cracks).
5 (Very Severe)	This requires a major repair involving partial or complete re-building (crack width usually >25mm but depends on number of cracks).

Careful monitoring with good construction control will limit the damage to adjacent structures generated by the assumed construction methods and sequence.

The ranges of predicted short-term and long-term movements for each of the main sections of the proposed basement are presented in Table 2 below. These indications indicate that the perimeter walls are predicted to undergo movements ranging from 3 mm settlement to 2 mm heave. The basement slab is predicted to undergo slightly greater displacements, between 0 and 6 mm heave. Careful monitoring with good construction control will limit the damage to adjacent structures generated by the assumed construction methods and sequence.

The ranges of predicted short-term and long-term movements for each of the main sections of the proposed basement are presented in Table 2 below. These indications indicate that the perimeter walls are predicted to undergo movements ranging from 3 mm settlement to 2 mm heave. The basement slab is predicted to undergo slightly greater displacements, between 0 and 6 mm heave and hence the raft slab is been designed to counter this movement.

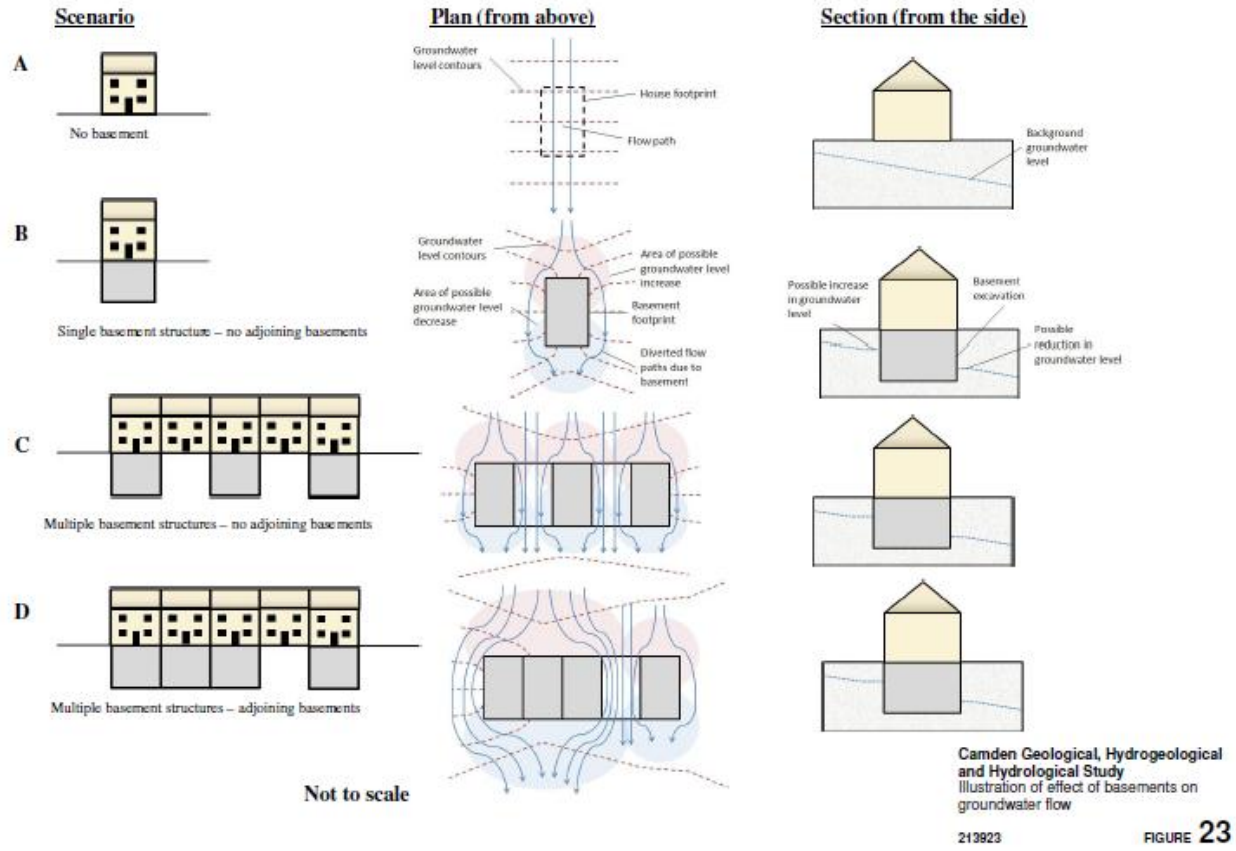
Table 2

Summary of Predicted Ground Movements				
Location / Building Element	*Stage 1 (short term)*	*Stage 2 (short term)*	*Stage 3 (short term)*	*Stage 4 (long term)*
Party Wall	0 - 1 mm Settlement	0 – 2 mm Settlement	0 – 3 mm Settlement	2 mm settlement to 1 mm Heave
Basement slab	0 - 5 mm Heave	2 - 5 mm Heave	2 - 5 mm Heave	2 - 6 mm Heave
Rear wall of proposed development	1 mm Heave	1 mm Settlement to 1 mm Heave	0 – 1 mm Heave	1 mm Heave
Front wall of proposed development	0 - 1 mm Heave	0 – 1 mm Heave	0 – 1 mm Heave	1 - 2 mm Heave

The site is not within the catchment of the Hampstead Heath Ponds which is 2km away. The development is considerable distance from the ponds and standing water courses in the area and hence will not have an impact on the Hampstead heath ponds nor their catchment.

The proposed development depth is expected to be at 3.0m below ground floor level and no groundwater was encountered during drilling.

The local effect of the basement will be to divert any flowing ground water away from the foot print of the building. To the front side and rear of the property have large areas over 10m wide and with this large dispersal area the flow will be diverted back around to its original flow path and hence the effects on the surrounding area will be minimal.



Camden Geological, Hydrogeological and Hydrological Study
Illustration of effect of basements on groundwater flow

213923 FIGURE 23

7.4. Control of Construction Works

The construction works will be closely controlled in accordance with ASUC guidelines. As there is no groundwater on site within the construction elevations, no ground water instability issues are anticipated. Adequate temporary site drainage will be provided at all times to ensure safe working conditions and to prevent the softening of the underlying clay prior to construction. It is proposed to maintain 2 No. 50mm submersible pumps in chambers placed below the formation level of new basement on a temporary basis.

Groundwater monitoring will continue over the winter period to confirm that groundwater will not impact upon, or be impacted by, the proposed development.

Despite the ground movement and damage impact assessment indicating Negligible (Category 0) damage to the neighbouring buildings during construction, movement monitoring of the boundary wall and the neighbouring garage buildings will be undertaken during the construction stage and trigger levels will be set as a precautionary measure. A specification for movement monitoring will be incorporated into the final construction scheme and will be agreed with the Party Wall Surveyor, as necessary, and the Building Control Officer.

Precise levelling would be conducted on a regular basis but data will be automatically collected at pre agreed intervals and will be made available to the interested parties.

Trigger / action levels will be agreed and the following actions will be taken should the agreed levels be exceeded.

Trigger Level Action:

Green: Notify all Party Wall Surveyors and Engineers. Review works with co works with contractor and revise sequence (methodology if necessary). Closer monitoring of walls required.

Red: Contractor to stop work. Notify all parties. Review methodology and ensure further movement is limited. Monitoring to be carried out on a regular basis.

8.0 Basement Impact Assessment

The purpose of this assessment is to consider the effects of a proposed basement extension development on the local hydrology, geology and hydrogeology. The BIA has been produced specifically to meet the requirements set out by Camden Planning Guidance - Basements and Lightwells (CPG4, July 2015) and The Local Plan 2017: Policy A5 Basements - in order to assist the London Borough (LB) of Camden with their decision making process.

The assessments have been undertaken by appropriately qualified professionals in accordance with the criteria of CPG4.

8.1. Land Stability/Slope Stability

The site investigation has identified a suitable founding stratum of underlain by the London Clay Formation. This formation typically comprises firm to stiff clay of medium to high strength and is a suitable bearing stratum for the proposed development's foundations.

The risk of movement and damage to this development due to shrink and swell of the London Clay is negligible, considering the proposed deep foundations, the lack of trees and the existing conditions on site, which show no evidence of historical movements or damage.

The site is level and is not situated in a wider hillside environment of slopes of 7° or more. The BIA has concluded that there will be no risk or stability impact to the development or adjacent sites due to slopes.

The BIA has concluded that there will be no risk to the overall stability or robustness due the development and the damage impact to adjacent properties is category 0 (Negligible).

No residual risks have been identified and no additional mitigation is proposed.

As a contingency, and in accordance with best practise, a ground movement monitoring plan is been set out and enclosed with the relevant drawings and this will include a movement monitoring strategy, instrumentation and action plans, including defining trigger levels to be agreed with relevant parties. Monitoring will include precise levelling or reflective survey targets to be installed on the boundary wall and adjacent buildings. This will be agreed under the Party Wall Act.

8.2. Hydrogeology and Groundwater Flooding

The BIA has concluded there is a low risk of groundwater flooding. A drained cavity waterproofing system will be installed to provide a type C form of construction thus providing habitable grade 3 basement and any ingress of water through the reinforced concrete wall will be collected to pumping station which will be formed below the basement level as shown on the enclosed drawings.

The BIA has concluded there are no impacts to the wider hydro geological environment.

8.3. Hydrology, Surface Water Flooding and Sewer Flooding

The BIA has concluded there is low risk of surface water/sewer flooding and hence the proposed development will not impact on the wider hydrological environment.