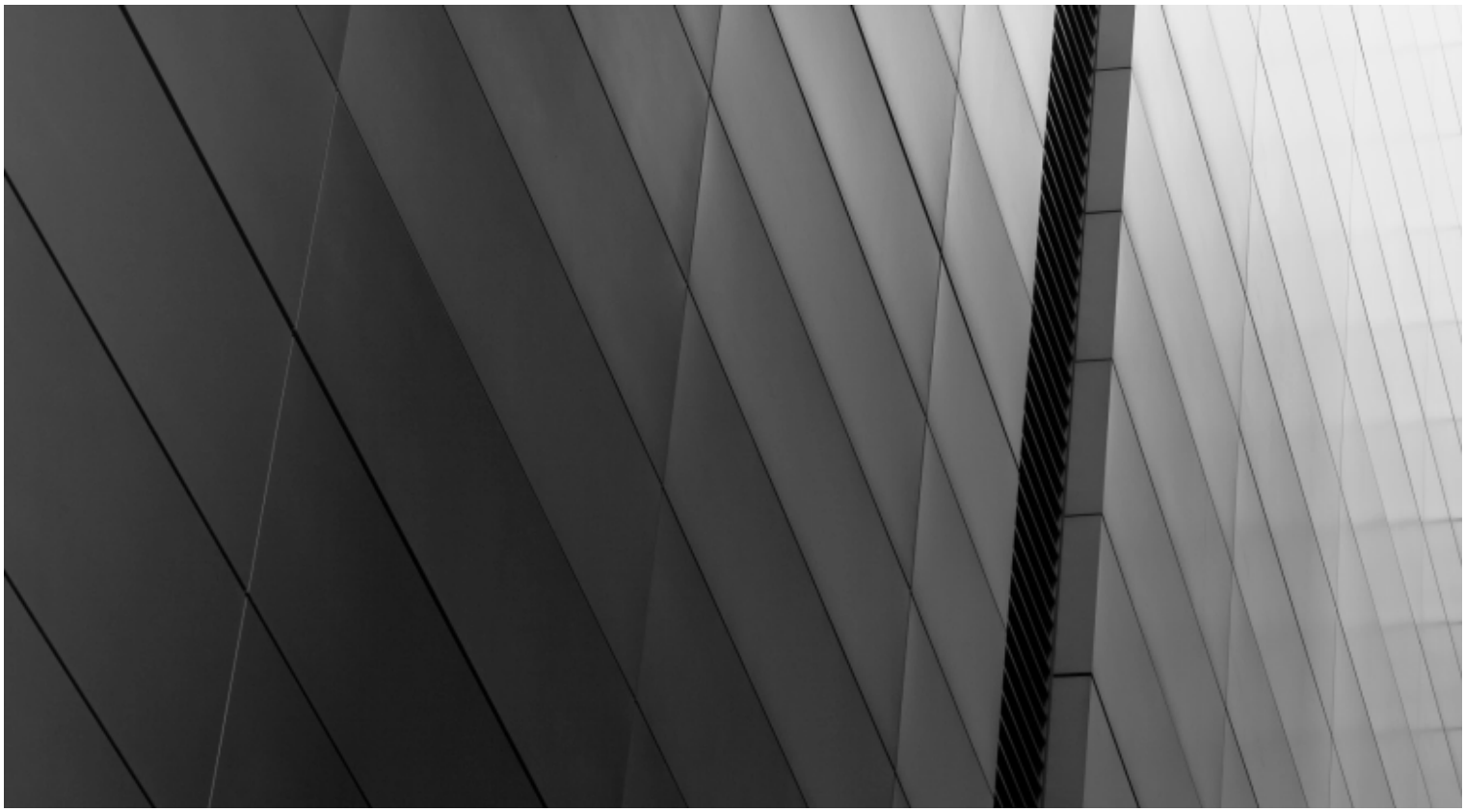


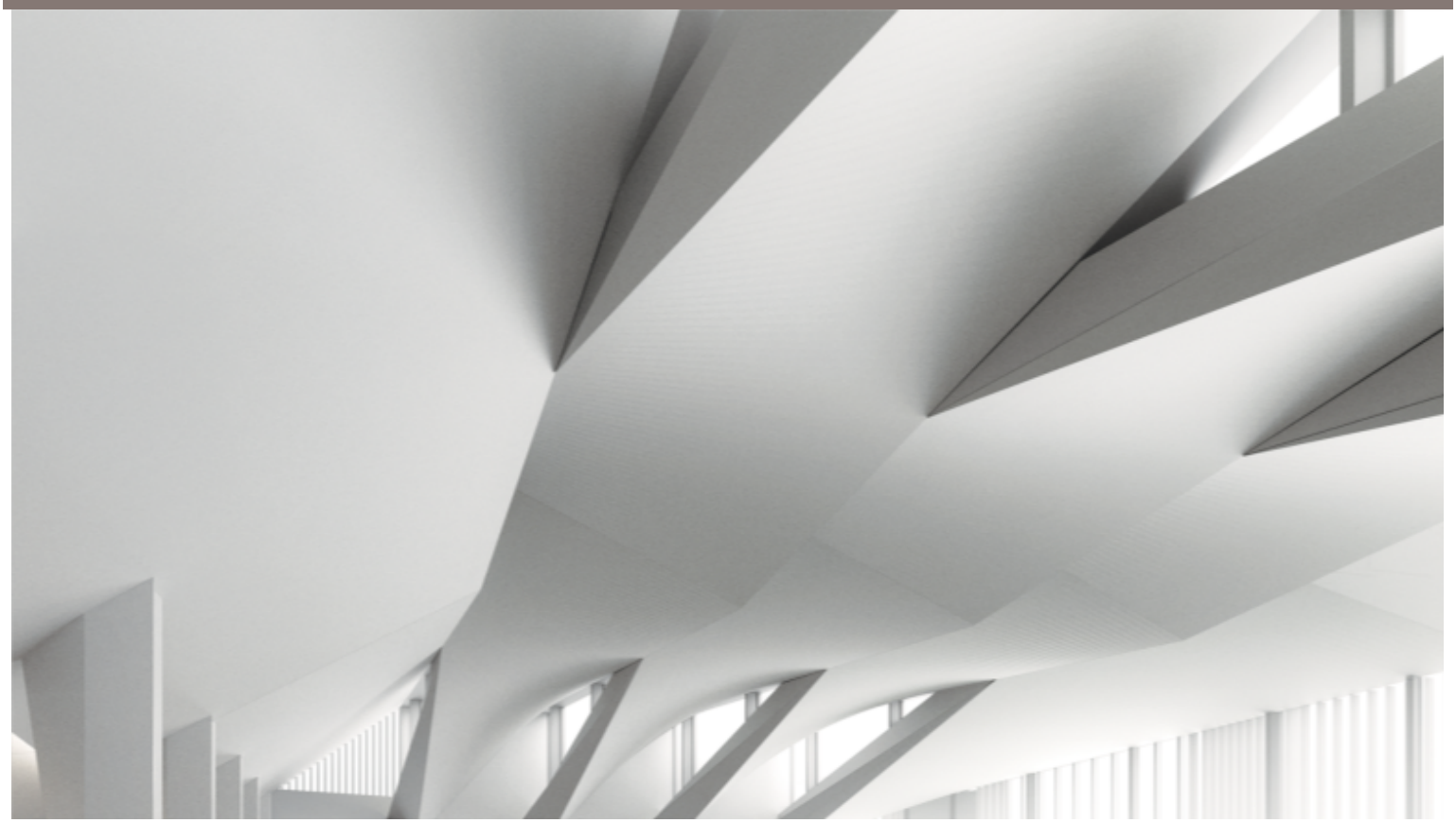
ENTUITIVE

BASEMENT IMPACT ASSESSMENT

Flat 2, 8 Compayne Gardens NW6

Project No: G018-0007

FOR: MAGGIE ROSEN | **DATE:** 8TH NOVEMBER 2019



ENTUITIVE

BASEMENT IMPACT ASSESSMENT

Flat 2, 8 Compayne Gardens, NW6

Project No: G018-0007

Report: G018.0007/BIA-01				
Issue	Date	Status	Prepared by	Checked by
Rev.0	08 Nov 2019	Issued for planning	FA	HM

ENTUITIVE

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ENTUITIVE

1. NON-TECHNICAL SUMMARY

The site is located at:

Flat 2, 8 Compayne Gardens
London
NW6 3DH
Approximate OS Grid reference: TQ261846

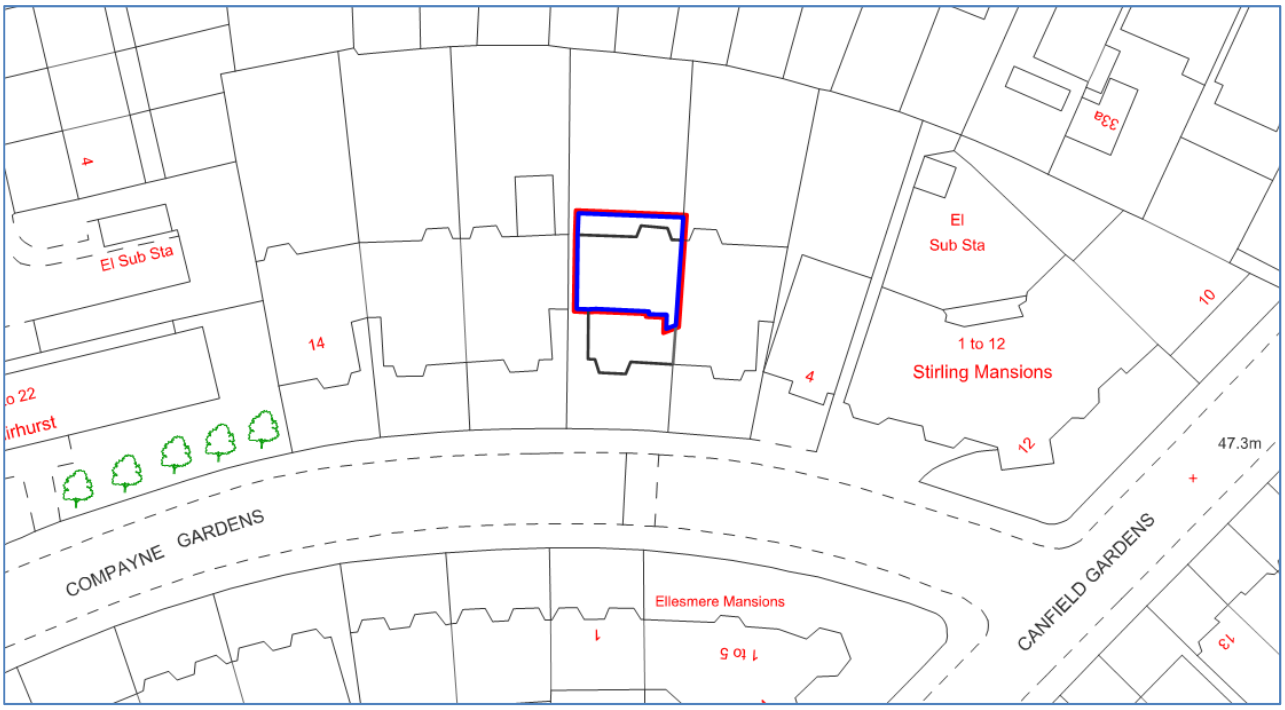

Figure 1: Site plan (building in question highlighted)

The building is a 5-storey (including roof and lower ground floor) semi-detached property which is formed of several flats. Flat 2 comprises part of the ground floor and the entire basement at lower ground floor. The existing basement covers part of the building footprint towards the rear of the building.

The proposed works include the refurbishment of ground floor and the demolition of some load bearing walls, which are to be replaced by steel beams supported onto the existing masonry load bearing walls. In order to install a new reinforced and insulated slab with underfloor heating at lower ground floor, it will be necessary to excavate downwards by approximately 400 to 500mm and so underpinning of the existing footings will be required. The existing lightwell will also be demolished and replaced with a cantilevered reinforced concrete retaining wall to its perimeter. The proposed roof to the lightwell structure will be of timber construction. Note that the finished floor level to the lower ground floor remains unchanged and in this respect the basement is not being deepened.

Refer to the architect's Design and Access Statement and the structural drawings for full details.

This Basement Impact Assessment (BIA) Report includes:

- Desk Study
- Screening
- Scoping
- Additional evidence/assessments
- Impact Assessment and conclusions
- Construction methodology/engineering statements

The authors of the assessment are Harvey Mistry, MEng(Hons) CEng MIStructE and Federico Annoni MEng(Hons) from Entuitive. The Flood Risk Assessment (FRA) was prepared by Andrew Forshaw CEng MICE MIStructE, also from Entuitive.

From a review of the British Geological Survey maps and the Camden Geological, Hydrogeological and Hydrological Study by Arup, the soil in the area is likely to be London Clay (generally mixed with fine gravel) immediately under the usual made ground or top soil, which is quite common for the area. Borehole records in the vicinity confirm these assumptions. The soil excavated for the trial pits appeared to be clay mixed with fine gravel, also confirming the initial assumptions.

The BIA has assessed land stability and due to the limited alterations to the existing basement the impacts of the proposed development on neighbouring structures are expected to be 'Very Slight' with good construction practice and a competent contractor (based on the Burland Scale-BRE Damage Classification Table). If any damage develops in the structure of the adjacent buildings then normal Party Wall procedures provide a mechanism for completing any repairs.

A structural monitoring strategy to control the works and impacts to neighbouring structures is suggested in the report and includes a movement monitoring procedure and condition surveys of the affected properties.

The BIA has not identified any risks related to the slope stability of the site or any significant hydrological/hydrogeological impacts.

The attached Flood Risk Assessment by Entuitive shows that the existing site has a low risk of flooding from rivers, sea, surface water and ground water. The proposed development doesn't change the flooding characteristics of the site and therefore the future flood risk at the site is also low.

2. INTRODUCTION

The purpose of this assessment is to consider the effects of a proposed basement development at Flat 2, 8 Compayne Gardens, NW6 3DH on the local hydrology, geology and hydrogeology and potential impacts to neighbours and the wider environment. The site location is presented in Figure 1.

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

- Desk Study
- Screening
- Scoping
- Additional evidence/assessments
- Impact Assessment and conclusions
- Construction methodology/engineering statements

The content of the report and investigations completed have been scaled in order to be proportionate to the extent of works taking place.

2.1 AUTHORS

The BIA has been authored by Federico Annoni, MEng(Hons) and reviewed by Harvey Mistry, MEng(Hons) CEng MIStructE from Entuitive. Both are qualified structural engineers and Harvey Mistry is a Chartered Structural Engineer.

The attached Flood Risk Assessment has been produced by Andrew Forshaw, CEng MICE MIStructE. He is a Chartered Civil Engineer.

2.2 SOURCES OF INFORMATION

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

- A site visit of Flat 2 and the common areas at 8 Compayne Gardens was carried out by Federico Annoni on 13th September 2019;
- Trial pits were dug on the same day (13th September 2019) in the rear garden and in the basement to expose the existing foundations and investigate the soil condition.
- The existing topographical survey and was prepared by Focus Surveying in October 2017.
- GeoSmart Maps were used for the Flood Risk Assessment report attached.
- MATA Architects provided the site plan and the proposed floor layouts.
- Historical information, including historical OS maps were found on www.british-history.ac.uk
- Unexploded Ordnance (UXO) Maps are from www.bombsight.org
- The following documents were also consulted (see Appendices):
    - 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, Hydrogeological 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 building falls within the Swiss Cottage Ward of the London Borough of Camden. It is situated between Canfield Road and Fairhazel Gardens. The building is not listed but falls within the South Hampstead Conservation Area.

Existing structure and site condition

The site is not within a wider hillside setting and the slope angles are <7 degrees. Refer to Appendix 1. This is also confirmed by the topographical survey drawings and the FRA findings. In general, the site is level with the surrounding topography falling gently to the south west.

The building is a 5-storey (including roof and lower ground floor) semi-detached property which is formed of several flats. Flat 2 comprises part of the ground floor and the entire basement at lower ground floor. Note that the basement does not cover the entire footprint of the building superstructure.

The existing building has loadbearing masonry walls, suspended timber floors throughout with a ground bearing slab in the reduced height basement and loadbearing brick and masonry or timber internal walls. The roof is assumed to be of timber construction, with a loft conversion built in the 1980s according to archived planning drawings. Access to the other flats was not granted and therefore the actual structural layout above ground floor could not be conclusively confirmed.

The foundations are shallow stepped brick footings. At ground floor level, where there is no basement below, the depth of the footings is approximately 600mm below ground level (BGL). Where trial pits have been completed at lower ground level, the footings are shallow with an approximate depth of 250mm below finished floor level (FFL) and the floor structure appears to be an uninsulated 100mm thick unreinforced concrete slab.

The condition of the existing structure is good. A few cracks were noted above the ground floor openings but this is consistent with the age of the building. No significant structural damage was noted during the site walkover.

Proposed works

The proposed works include the refurbishment of ground floor and the demolition of some load bearing walls which are to be replaced by steel beams supported onto the existing masonry load bearing walls.

In order to install a new reinforced and insulated slab with underfloor heating at Lower Ground, it will be necessary to excavate approximately 400 to 500mm beneath the existing slab. As the current footings only extend to 250mm beneath the slab, it will be necessary to underpin the existing footings. Note that the existing FFL will not be lowered, and the works are to be completed in order to provide adequate insulation and heating capabilities to the existing space.

The existing lightwell will be demolished and replaced with a cantilevered reinforced concrete retaining wall to the perimeter. The proposed flat roof above will be of timber construction.

The soil is conservatively assumed to be plastic and specific precautions were considered with respect to protecting foundations from the effects of seasonal soil heave/ shrinkage induced by frost and trees. However, given the depth of the proposed foundations and the distance from the trees in the back garden, the effect of trees is considered to be negligible.

Refer to the architect's Design and Access Statement and the structural drawings for full details.

Impact on adjacent structures and services

8 Compayne Gardens shares a Party Wall with No.6. On the other side there is a gap of approximately 800mm between 8 and 9 Compayne Gardens. Neither of the properties is a listed building and the three semi-terraced buildings are very similar, most likely built using the same template at the end of the 19th century.

Correspondence with the owners Flat 1, 10 Compayne Gardens (the Garden Flat) and some research on the planning portal also proved that on this side there is a basement mirroring the one at No.8. According to the available drawings the basement ceiling height is comparable to No.8 and therefore we would assume that the formation levels for both basements are approximately the same.

In summary, according to the Party Wall etc Act 1996:

- Further investigation is required to determine if the proposed works will trigger Section 6 of the Act on the side of No.10.
    - The basement depth should be sufficient to avoid serving a Party Wall notice but the extent of the basement wall into the rear garden has to be confirmed in relation to the proposed lightwell at No.8;
- No Party Wall Notice is required for No. 6.
    - The building is considered not be affected because the proposed excavations for the lightwell will be less than 6.0m away from the boundary line, but not within the 45 degrees load spread angle suggested by the Party Wall Act. No structure is inserted into the Party Wall;
- No Party Wall Notice is required for the flats above the property in question.
    - The floor structure, in this case considered to be the Party Wall, will remain untouched and all new beams will be installed below the existing ceiling.
- The existing garden wall between No. 8 and No. 10 is in poor condition and leaning, possibly due to the growth or removal of trees.
    - The Building Owners on both sides have already agreed to repair it or rebuild it soon. Note that the garden wall footings are approximately 500mm BGL and the affected areas are towards the back of the garden, near the trees.

Neighbouring gardens and trees are present on both sides at No.6 and No.10. There are no plans to remove or plant any large tree in the vicinity of the rear wall and therefore no significant impact on the basement footing is expected.

Finally, it is not anticipated that the work will have an impact on buried services passing across the site e.g. sewers, cables etc and the TFL register confirmed that there is no infrastructure adjacent to the site. Detailed searches into the locations of any mains services will be carried out in due course, but at this stage there are no known services in the vicinity of the basement excavation. In the course of the normal design development these will be considered, and appropriate designs developed for rerouting or protection should it be required.

Refer to Appendix 3 for the Existing and Proposed development drawings.

Refer to the architect's Design and Access Statement for full details.

Outline of construction methods

The proposed development will utilise the following construction techniques:

- Mass concrete underpins cast in sequence;
- Cantilevered reinforced concrete retaining wall cast in sequence to form the new lightwell;
- Prop and needle support of load bearing masonry walls prior for the installation of steel beams;
- Removal of the chimney breast at ground floor and lower ground floor. Chimney to be supported at first floor level by a steel beam with a galvanised steel plate welded to the top;
- Timber flat roof construction;
- Repair and replacement of existing floor joists at ground floor level.

The outline construction programme for the proposed development is presented in Section 7 of this report and an outline construction sequence in Appendix 3.

Refer also to the notes on the structural drawings.

Basement water tightness

It is expected that the basement will need to meet a minimum level of Grade 3 water-tightness in accordance with BS8007 and BS 8102. Grade 3 implies full water and vapour tightness within the useable space.

We recommend that the basement design will incorporate the use of a drained cavity construction for the perimeter walls and slab. This is a system of drainage blankets, slots and sumps used to control and discharge any below ground water leakage, via burst pipe, through the retaining structure.

For an additional level of security, water resisting concrete admixtures in addition to a drained cavity may be considered.

Final design of the waterproofing should be carried out by the architect and the appointed specialist in due course.

3. DESK STUDY

3.1 SITE HISTORY

Our desk study suggests that the building at 8 Compayne Gardens was built between 1886 and 1894 by local builders, James Tomblin and E. Michael. The historical Map of Middlesex (Southampton, 1868-1883) suggests that in 1883 the site was still farmland. There are no signs of potential ground contamination or underground works. The UXO maps from www.bombsight.org also confirmed that the site was not affected by WWII bombing.

Refer to Figures 2-3 presented in Appendix 1.

3.2 GEOLOGY

From a review of the British Geological Survey maps and the Camden Geological, Hydrogeological and Hydrological Study by Arup, the soil in the area is likely to be London Clay (generally mixed with fine gravel near the surface) immediately under the usual made ground or top soil, which is quite common for the area. Borehole records in the vicinity confirm these assumptions. The soil excavated for the trial pits appeared to be clay mixed with fine gravel, also confirming the initial assumptions.

Refer to the Figures 4-5 presented in Appendix 1.

3.3 HYDROGEOLOGY

The geology underlying the site is classified as Unproductive Strata. LB Camden data also indicates the site is not within a groundwater source protection zone.

Refer to Figure 6 presented in Appendix 1.

3.4 HYDROLOGY, DRAINAGE AND FLOOD RISK

Please refer to the attached Flood Risk Assessment Report by Entuitive. In addition to maps provided by GeoSmart also refer to Figures 8-9 presented in Appendix 1.

3.5 OTHER INFORMATION

The TFL Property Asset Register shows that there are no tunnels directly below the property.

Refer to Figure 10 presented in Appendix 1.

4. SCREENING

A screening process has been undertaken and the findings are described below.

Question	Response	Details
1a. Is the site located directly above an aquifer?	No	Refer to Appendix 1.
1b. Will the proposed basement extend beneath the water table surface?	No	By inspection. Existing basement remains unchanged, no signs of waterproofing and/or water damage.
2. Is the site within 100mof a watercourse, well (used / disused) or potential spring line?	No	Refer to Appendix 1 and attached Flood Risk Assessment.
3. Is the site within the catchment of the pond chains on Hampstead Heath?	No	Refer to Appendix 1.
4. Will the proposed basement development result in a change in the proportion of hard surfaced / paved areas?	No	Refer to architect's Design and Access Statement.
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	Refer to attached Flood Risk Assessment.
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	Refer to attached Flood Risk Assessment.

4.1 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	Refer to Appendix 1.
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	Refer to architect's Design and Access Statement.
3. Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7 degrees (approximately 1 in 8)?	No	Refer to Appendix 1.
4. Is the site within a wider hillside setting in which the general slope is greater than 7 degrees (approximately1 in 8)?	No	Refer to Appendix 1.
5. Is the London Clay the shallowest strata at the site?	Yes	Refer to Appendix 1.

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	Refer to architect's Design and Access Statement.
7. Is there a history of seasonal shrink-swell subsidence in the local area and/or evidence of such effects at the site?	No	To be confirmed.
8. Is the site within 100m of a watercourse or a potential spring line?	No	Refer to attached Flood Risk Assessment
9. Is the site within an area of previously worked ground?	No	Refer to Appendix 1.
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	Refer to Appendix 1.
11. Is the site within 50m of the Hampstead Heath Ponds?	No	Refer to attached Flood Risk Assessment
12. Is the site within 5m of a highway or pedestrian right of way?	No	Refer to architect's Design and Access Statement.
13. Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	No	Refer to structural drawings.
14. Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	Refer to Appendix 1.

4.2 SURFACE WATER AND FLOODING

Question	Response	Details
1. Is the site within the catchment of the ponds chains on Hampstead Heath?	No	Refer to Appendix 1.
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	Refer to attached Flood Risk Assessment.
3. Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	Refer to attached Flood Risk Assessment.
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	Refer to attached Flood Risk Assessment.
5. Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	Refer to attached Flood Risk Assessment.
6. Is the site in an area identified to have surface water flood risk according to either the Local Flood	No	Refer to attached Flood Risk Assessment.

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.		

4.3 NON- TECHNICAL SUMMARY OF SCREENING PROCESS

The screening process confirmed that:

- The impact on the existing drainage will be negligible, as detailed within the attached FRA;
- The flood risk is low as shown in the FRA;
- The existing site is generally level and the proposed plans will not change the site slopes. As such no issues relating to slope stability need to be addressed;
- The proposed development is not likely to affect the neighbouring properties and underground services or infrastructure.

Also 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. SCOPING

The screening process has not highlighted any significant concerns regarding the slope stability, site drainage or surface water flooding. The risk is low in all categories.

Refer to the Appendix, Section 3 of this report, and to the attached Drainage and Flood Risk Assessment for full details.

6. SITE INVESTIGATION/ADDITIONAL ASSESSMENTS

6.1 SITE INVESTIGATION

We have completed site investigations proportionate to the works taking place and the associated risks and concerns which would arise for a project of this nature. As detailed within the report, these site investigations comprise a desk study of the site conditions followed by intrusive trial pits at various points within the property, opening up of the superstructure and visual inspection of all, including the soil. Based on our findings we did not consider a full geotechnical investigation to be appropriate and full expect that any borehole would confirm the results from the various British Geological Survey (BGS) borehole records in the vicinity.

Trial pits confirmed the depth of the existing footings at No.8 and exposed the soil at formation level below the foundations. No tests were carried on these disturbed samples, but a visual inspection confirmed that the soil is clay mixed with gravel.

Refer to the site visit notes in Appendix 2 for further details.

6.2 ADDITIONAL ASSESSMENTS

Refer to the attached Drainage and Flood Risk Assessment report by Entuitive (Appendix 5).

7. CONSTRUCTION METHODOLOGY/ENGINEERING STATEMENTS

7.1 OUTLINE GEOTECHNICAL DESIGN PARAMETERS

From our experience in similar projects around the area we are confident that a ground bearing capacity of 100 kN/m^2 at foundation level is an appropriate and conservative estimate to be used in the design of the new foundations. The actual ground bearing capacity is expected to be significantly higher considering the height of the existing building and the relatively small width of the existing footings.

The following soil properties were assumed for the retaining walls design:

- Moist density; Y_{mb} = 18.0 kN/m^3
- Design shear strength; ϕ'_b = 24.2 degrees
- Design friction angle; δ_b = 18.6 degrees
- Allowable bearing pressure; $P_{bearing}$ = 100 kN/m^2 (conservative)

7.2 OUTLINE TEMPORARY AND PERMANENT WORKS PROPOSALS

Our proposals constitute a possible construction sequence that would allow the proposals to be built safely. It must be recognised that the contractor will be responsible for determining the actual construction sequence, designing the necessary temporary works and correctly executing the works.

A detailed method statement will be required from the contractor even if the contractor chooses to follow this suggested construction sequence. Should the contractor follow this suggested construction sequence it in no way relieves them of the responsibility to ensure the stability of the building and neighbouring structures during construction stage.

Refer to the structural drawings and the outline construction sequence drawings in Appendix 3 for full details including the underpinning and retaining wall sequencing and propping required.

Refer to the attached Design and Flood Risk Assessment for the proposed drainage strategy.

7.3 GROUND MOVEMENT AND DAMAGE IMPACT ASSESSMENT

As detailed within Section 6.1, we have completed investigations proportionate to the extent of works and therefore a Ground Movement Assessment (GMA) has not been completed. The desk study and preliminary site investigation confirmed that the ground is level and that the soil corresponds to what is shown in the BGS records.

Also, in consideration of the conservative criteria of the Party Wall etc Act (1996) and considering that there is an existing basement at No.10, the proposed 400-500mm of underpinning are assumed to have a negligible impact on the neighbouring structures.

Based on these considerations and assuming good construction practice, the impacts can be safely assumed to be ‘Very Slight’ (refer to Burland Scale-BRE Damage Classification Table).

7.4 CONTROL OF CONSTRUCTION WORKS

To ensure the predicted movements in the adjacent buildings remain within acceptable limits, a structural monitoring plan has been devised to enable mitigation to be effectively implemented in the event of agreed trigger values for movement being exceeded.

Responsibilities for the Implementation pf the Monitoring Plan

The responsibility for the implementation of the monitoring plan shall rest with the appointed contractor, working in conjunction with the appointed structural engineer.

Location of Monitoring Positions

Monitoring positions are to be located along the rear elevation of 8 Compayne Gardens, NW6.

Movement Monitoring Equipment

Precise survey equipment is to be used for monitoring movement. This equipment is to record all vertical and horizontal components of movement (in two perpendicular plan directions) to a minimum accuracy of 1mm.

Condition Survey

Conditions Surveys will be prepared for all the properties affected by the works according to the Party Wall Act. These surveys will record the present physical condition of each property. Note that the surveys cannot be carried out without approval from the Adjoining Building Owners.

Baseline Situation

Before any excavation or construction works commence, monitoring is to be undertaken in order to establish a baseline situation.

Frequency of Monitoring

During all underpinning works and the basement extension excavation works, monitoring is to be undertaken daily at the start and end of every work shift. At other times monitoring is to be undertaken weekly to cover a period prior to commencement of any works and ceasing after completion of the works, by agreement of all interested parties.

Criteria for assessment of Monitoring data and Comparison with Predicted Movements

The cumulative movements in any directions of any monitoring point are to be compared with the predicted movements at any stage and using the following decision table:

MONITORING CRITERIA		
Total movement less than 2mm in any direction		Green
Total movement in excess of 2mm in any direction or additional movement of 2mm in any direction	Notify Structural Engineer	Amber
Total movement in excess of 5mm in any direction or additional movement of 5mm in any direction	Notify Structural Engineer and Party Wall Surveyor	Red

Communication of the Monitoring Data to Interested Parties
The monitoring data are to be distributed to all interested parties on a weekly basis during Green and Amber conditions and daily during any Red conditions.

7.5 OUTLINE OF PROGRAMME

The table below outlines the estimated time required for each item of the proposed construction works, based on our previous experience from similar domestic projects in London. It must be recognised that the contractor will be responsible for preparing the actual construction programme and for identifying the critical path and any critical items based on their Construction Method Statement.

OUTLINE OF PROGRAMME (preliminary estimate)	
Site set-up	2 weeks
Enabling works	4 weeks
Underpinning of existing foundations	8 weeks
Installation of drainage	2 weeks
Installation of lower ground floor steel frame	2 weeks
Retaining walls construction	6 weeks
Installation of ground floor steel beams and other structural items	8 weeks
Installation of services	2 weeks
Fit out	8 weeks
Commissioning	2 weeks
TOTAL	**44 weeks**

8. BASEMENT IMPACT ASSESSMENT

Our judgment based upon the investigations carried out, the geological records and our experience of basement developments in similar conditions in the London Borough of Camden is as follows:

- The development will maintain the structural stability of the existing building and neighbouring properties in the temporary and permanent stages. The engineering of basements of this kind is well understood and there are no difficult or peculiar issues that will arise in this case.
- The development will have no adverse effects on drainage, run-off or hydrogeology. We do not consider that this site raises any unusual or adverse groundwater or drainage issues.

8.1 LAND STABILITY/SLOPE STABILITY

The desk study and the preliminary site investigation has identified a suitable founding stratum of London Clay for the proposed underpins and retaining walls. The site is level and the BIA has concluded that there will be no risks or stability impacts to the development caused by the proposed basement design. Note that a detailed method statement will be required from the contractor even if the contractor chooses to follow the construction sequence suggested by Entuitive.

The risk of movement and damage to this development is very low considering the minor alterations to the existing structure and landscaping. Assuming good construction practice, the impacts can be safely assumed to be 'Very Slight' (refer to Burland Scale-BRE Damage Classification Table) and control measures are presented in Section 7.4 to ensure that the predicted movements remain within acceptable limits.

8.2 HYDROGEOLOGY AND GROUNDWATER FLOODING

The BIA has concluded there is a low risk of groundwater flooding. No mitigation measures are necessary.

The BIA has concluded there are no impacts to the wider hydrogeological environment. No mitigation measures are necessary. Refer to the attached Drainage and Flood Risk Assessment.

8.3 HYDROLOGY, SURFACE WATER FLOODING AND SEWER FLOODING

The BIA has concluded there is a low risk of surface water or sewer flooding. No mitigation measures are necessary. Refer to the attached Drainage and Flood Risk Assessment.

The BIA has concluded there are no impacts to the wider hydrological environment. No mitigation measures are necessary. Refer to the attached Drainage and Flood Risk Assessment.

APPENDIX 1: DESK STUDY REFERENCES

Site location is circled in RED below.

Citation: BHO
'Sheet 016', in *Map of Middlesex* (Southampton, 1868-1883), *British History Online* http://www.british-history.ac.uk/os-1-to-10560/middlesex/016 [accessed 16 October 2019].

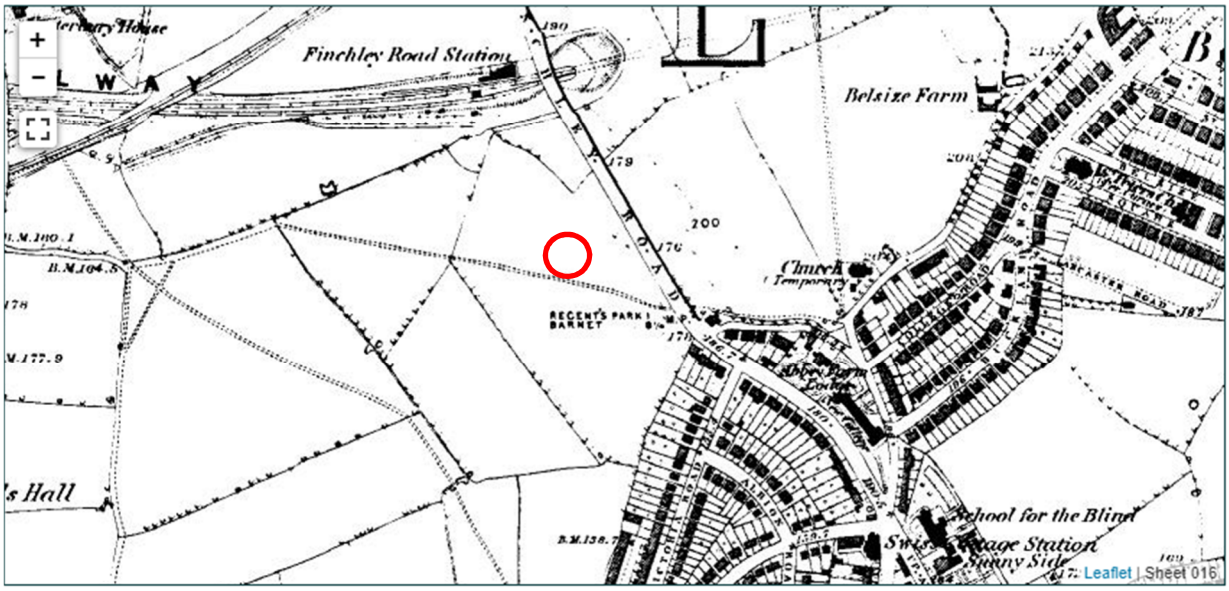

Figure 2: Historical Map of Middlesex (1868-1883) https://www.british-history.ac.uk/os-1-to-10560/middlesex/016

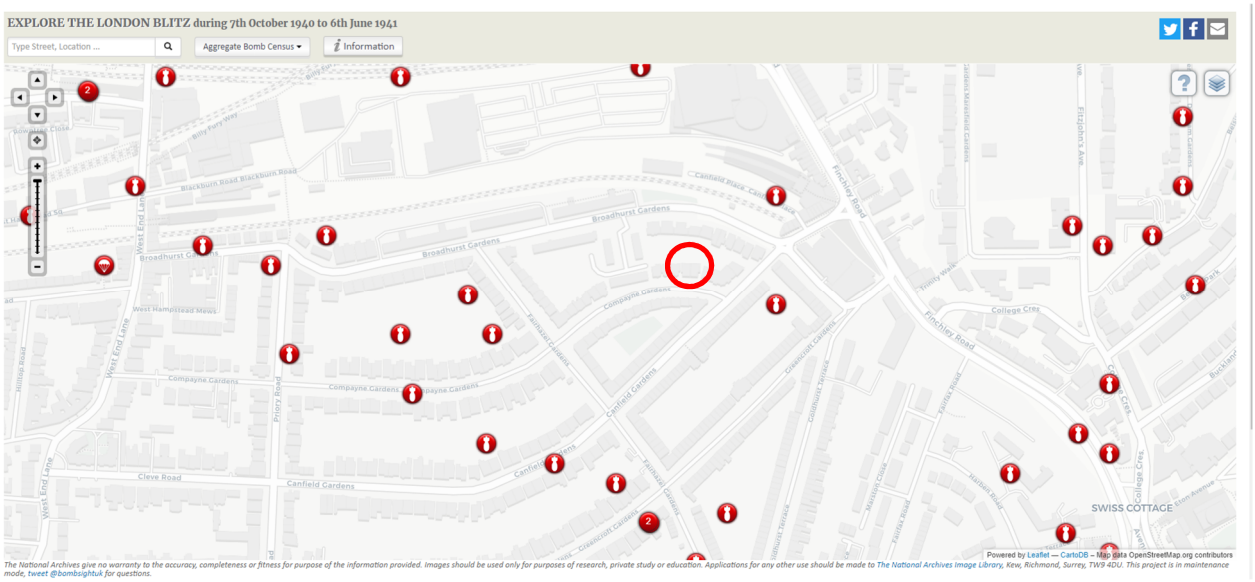

Figure 3: Bomb map

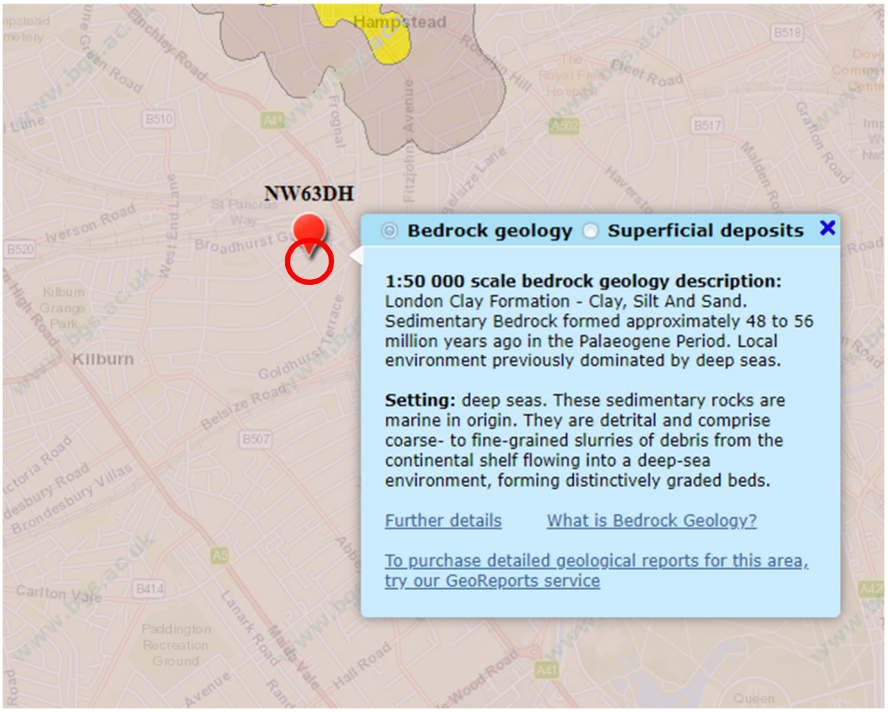

Figure 4: BGS maps bedrock geology

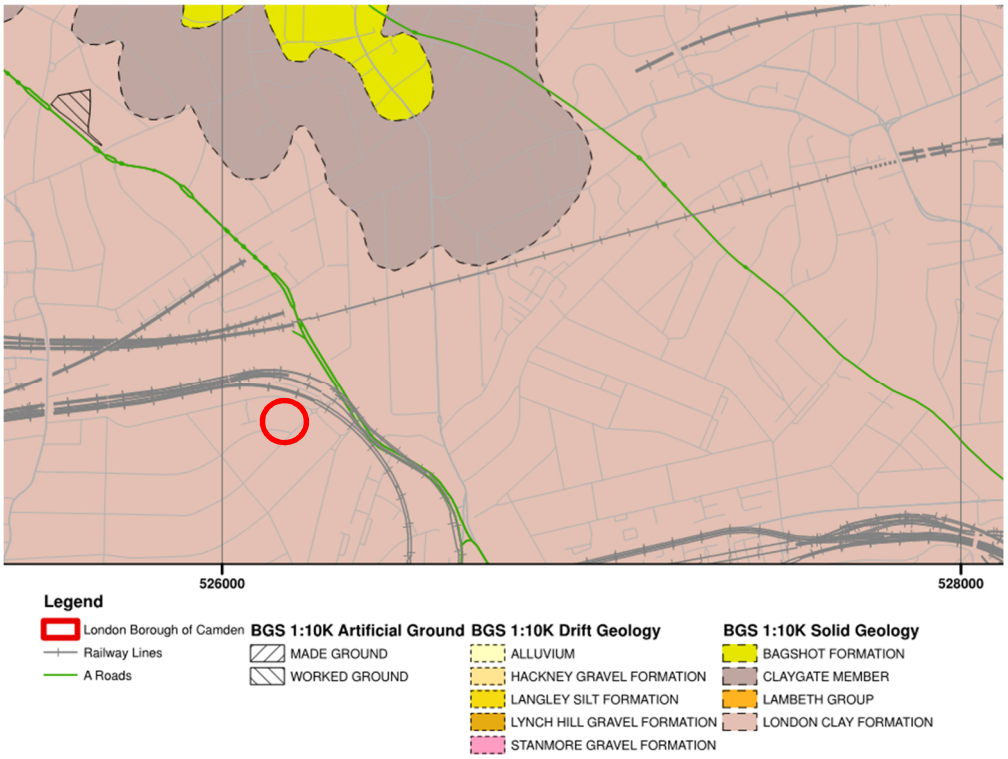

Figure 5: LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010 Figure 3

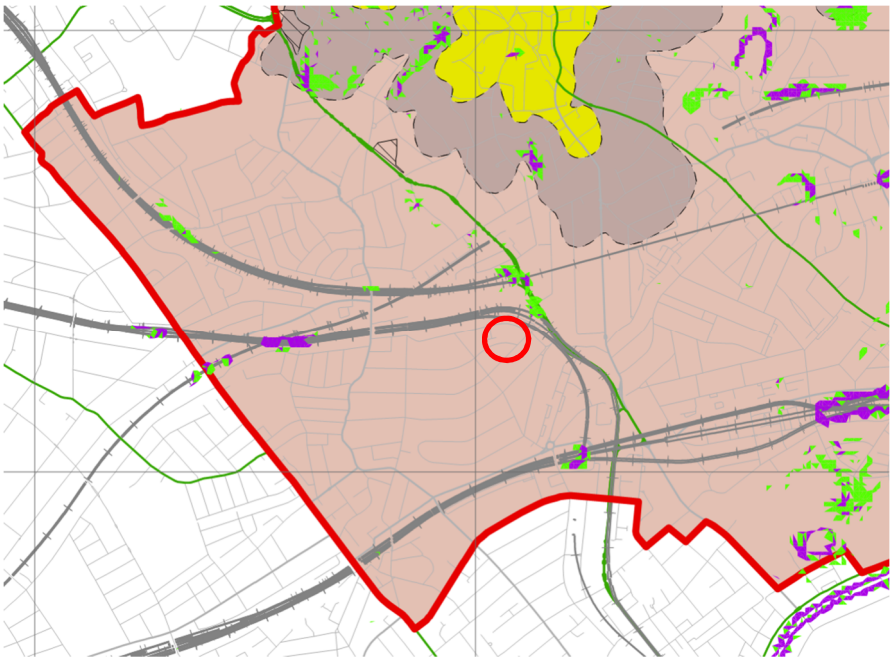

Figure 6: LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010) Figure 16. 7-10 degrees slope shown in green. More than 10 degrees in purple.

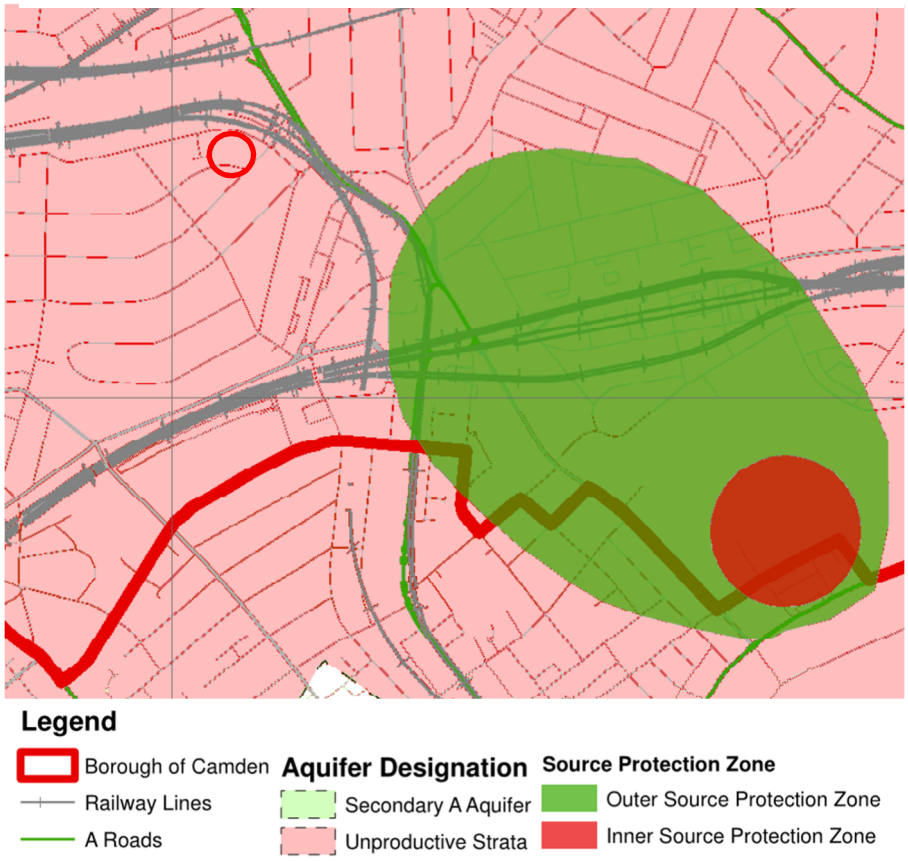

Figure 7: LB Camden, Camden Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development (produced by Arup, 2010) Figure 8