20/01/2015

Our ref: GE10516LET/GE200115

Planning & Party Wall Specialists Ltd
39 Shirley Way
Shirley
Croydon
CR0 8PJ

By Email Only

FAO Mike Harry,

**45 Lancaster Grove, Camden, London NW3–GROUND INVESTIGATION**

## 1. Introduction

Geo-Environmental Services Limited was instructed by Planning and Party Wall Specialists Limited to undertake a retrospective intrusive ground investigation in order to augment and confirm the information presented in a Hydrogeological Review, carried out by Geotechnical Consulting Group in March 2012, a copy of which is attached. To this report.

The investigation was required in order to comply with Section 6.0 of the aforementioned report and Camden Planning Guidance CPG4 “Basements and Lightwells”.

## 2. Development Proposals

It was understood that the development comprised the extension of an existing basement together with additional ground floor accommodation within the rear garden of the house.

## 3. Site Conditions

The site lies within the Belsize Camden Administrative Boundary and was located approximately halfway between Swiss Cottage Park tube station (about 500m to the west of the site) and Belsize Park tube station (about 550m northeast from the site). The property comprised a detached three storey house, facing Lancaster Grove to the south and a single level rear extension and a rear garden with mature trees to the north.

The main house has approximate dimensions of 14m by 11.5m and the original rear extension was approximately 10m by 4.5m.

The site was bounded by No. 43 Lancaster Grove and No. 47 Lancaster Grove to the west and east respectively. The rear garden (to the north) overlooked a garden, which is believed to be the back garden of No. 5 Lambolle Road.

No significant factors that may impact the environmental condition of the site were recorded. There were a number of mature and semi-mature trees located on the boundaries of the rear garden.

## 4. Fieldwork

The scope of works was agreed with the Client and comprised:

- The construction of window sampling boreholes a depth of 5.00m bgl or maximum achievable depth, with regular sampling and in situ testing where appropriate.
- The installation of a groundwater monitoring standpipe to measure long term groundwater levels.
- Laboratory analysis for geotechnical parameters.
- Provision of brief interpretative letter report in respect of the completed construction and the general hydrogeological aspects associated with the works.

The intrusive investigation was carried out on 15th December 2014.

## 5. Ground Conditions

With reference to BGS map Sheet number 270 South London, the site was indicated to be underlain by London Clay.

***London Clay*** *comprises a stiff grey fissured clay, weathering to brown near surface. Concretions of argillaceous limestone in nodular form (Claystones) occur throughout the formation. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required.*

*The lowest part of the formation is a sandy bed with black rounded gravel and occasional layers of sandstone and is known as the Basement Beds.*

*In the north London area the upper part of the London Clay has been disturbed by glacial action and may contain pockets of sand and gravel.*

Made Ground was encountered within each of the boreholes to a depth of 0.70m and 1.20mbgl in WS1 and WS2 respectively. The Made Ground was generally found to comprise dark grey brown sandy silty clay with ash, brick and timber fragments.

Underlying the Made Ground, London Clay was encountered in each of the boreholes to the full depth investigated (5.0mbgl) and comprised stiff to very stiff brown grey silty CLAY with rare calcareous nodules and fine sand partings.

The locations of the window sampling boreholes are shown on Figure 1.

For further details of the ground conditions encountered, reference should be made to the borehole logs appended.

## 6. Groundwater

Groundwater was not encountered during the intrusive investigation. However, it should be noted that changes in groundwater levels do occur for a number of reasons including effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a standpipe or piezometer installed within appropriate response zones over a long period of time.

During a return monitoring visit made on 7th January 2015 the standpipe which was installed in WS1 to a depth of 5.0m, with a response zone from 1.0m to 5.0mbgl was recorded as dry.

## 7. Laboratory Testing

The results of the Atterberg Limit tests carried out on the samples of London Clay indicated the soils tested to have Plasticity Indices ranging between 44-50% (High Volume Change Potential).

## 8. Summary and Conclusions

A Desk Based Hydrogeological report was prepared by Geotechnical Consulting Group in March 2012 in respect of a proposed extension to an existing basement at 45 Lancaster Grove. Within the report recommendations were made for intrusive works to confirm the findings of the desk study and comply with the requirements of Camden Planning Guidance CPG4.

Geo-Environmental carried out a retrospective intrusive investigation in December 2014, comprising the drilling of two 5.0m deep window sampling boreholes with associated sampling and testing.

The investigation confirmed the anticipated ground conditions of a thin capping of Made Ground overlying the London Clay.

Groundwater was not encountered during the fieldworks. A groundwater monitoring standpipe was installed within WS1 and a subsequent visit made on 7th January 2015, recorded the standpipe as dry.

Based on the results of the investigation Geo-Environmental concurs with the interpretations made by the Geotechnical Consulting Group, in particular that the new basement construction is highly unlikely to cause adverse changes to the local hydrogeology.

Observations (albeit not detailed) made of the walls of the adjacent buildings indicated that the basement construction has not caused any significant adverse movements of party wall foundations.

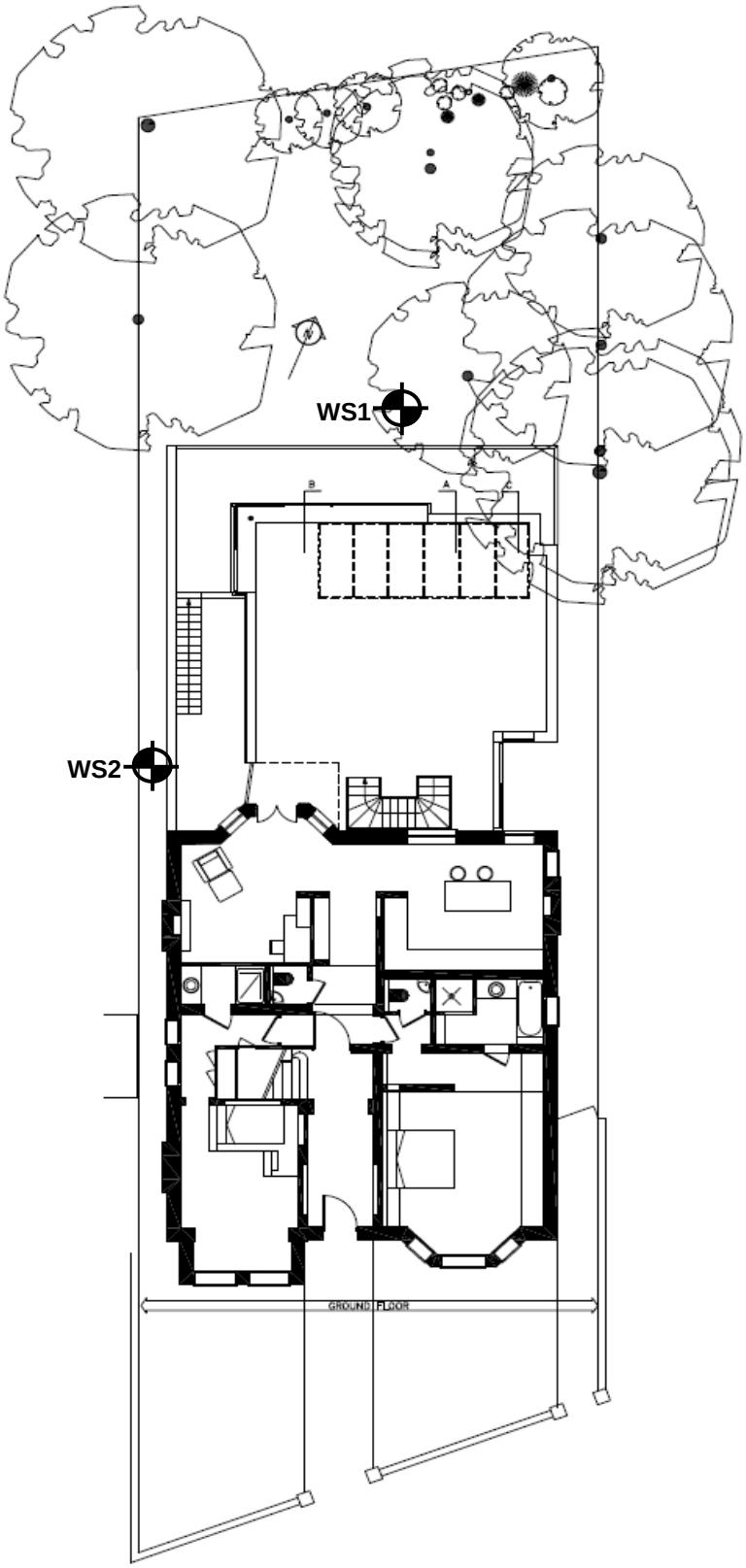
We trust that we have interpreted your instructions correctly, and please do not hesitate to contact us should you have any queries.

Yours sincerely
For and on Behalf of Geo-Environmental

**GLYN EVANS BSc, MSc, PGDip, FGS, MIEnvSc**
**Managing Director**
glyn.evans@gesl.net

**GAVIN ROBERTS CGeol, BSc, MSc, FGS**
**Technical Director**
gavin.roberts@gesl.net

Encs - Figure 1 – Site Investigation Plan
Engineer's Borehole Logs
Geotechnical Laboratory Test Results
Hydrogeology Report March 2012




| | | | | |
|---|---|---|---|---|
| **Project:** | 45 Lancaster Grove, London | **Title:** | Exploratory Hole Location Plan | |
| **Client:** | Mr L G Silver | **Date:** | 12/12/2014 | Geo-Environmental |
| | | **Revision:** | Rev 1 | |
| **Scale:** | Not To Scale | **Ref:** | GE10516 | |
| **Drawn:** | CA | **Figure:** | 2 | |

| Geo-Environmental | Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net | Borehole Log | Borehole No.<br>**WS01**<br>Sheet 1 of 1 |
|---|---|---|---|

| Project Name: | 45 Lancaster Grove | Project No.<br>GE10516 | Co-ords: | Hole Type<br>WS |
|---|---|---|---|---|
| Location: | London | | Level: | Scale<br>1:25 |
| Client: | Mr L Siver | | Dates: 15/12/2014 | Logged By<br>CA |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|---|---|---|---|---|---|---|---|---|---|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.50 | D | | | | | MADE GROUND: Dark greyish brown very sandy clay with frequent ash and brick fragments. | |
| | | | | | 0.70 | | | Stiff light orange mottled grey micaceous silty CLAY. LONDON CLAY | 1 |
| | | 1.00<br>1.00 | D<br>PP | 1.0kg/cm2 | | | | | |
| | | | | | 1.30 | | | Stiff becoming very stiff light greyish brown micaceous silty CLAY with rare calcareous nodules. LONDON CLAY | |
| | | 1.50<br>1.50 | D<br>PP | 1.5kg/cm2 | | | | | |
| | | 2.00<br>2.00 | D<br>PP | 2.0kg/cm2 | | | | | 2 |
| | | 2.50<br>2.50 | D<br>PP | 3.0kg/cm2 | | | | | |
| | | | | | 2.70 | | | Very stiff light greyish brown micaceous silty CLAY with rare calcareous nodules, occasional pockets of light orange fine sand and traces of selenite. LONDON CLAY | |
| | | 3.00<br>3.00 | PP<br>D | 2.5kg/cm2 | | | | | 3 |
| | | 3.50<br>3.50 | D<br>PP | 2.0kg/cm2 | | | | | |
| | | 4.00<br>4.00 | D<br>PP | 2.5kg/cm2 | | | | | 4 |
| | | 4.50<br>4.50 | D<br>PP | 3.2kg/cm2 | | | | | |
| | | | | | 5.00 | | | End of Borehole at 5.00m | 5 |

Remarks

Groundwater not encountered.
Occasional rootlets at 1.9m bgl.

AGS

| Geo-Environmental | Unit 7, Danworth Farm<br>Hurstpierpoint<br>BN6 9GL<br>www.gesl.net | Borehole Log | Borehole No.<br>**WS02**<br>Sheet 1 of 1 |
|---|---|---|---|

| Project Name: | 45 Lancaster Grove | Project No.<br>GE10516 | Co-ords: | Hole Type<br>WS |
|---|---|---|---|---|
| Location: | London | | Level: | Scale<br>1:25 |
| Client: | Mr L Siver | | Dates: 15/12/2014 | Logged By<br>CA |

| Well | Water Strikes | Sample and In Situ Testing | | | Depth (m) | Level (m) | Legend | Stratum Description | |
|---|---|---|---|---|---|---|---|---|---|
| | | Depth (m) | Type | Results | | | | | |
| | | 0.50 | D | | | | | MADE GROUND: Dark greyish brown very sandy clay with frequent ash, wooden and brick fragments. | |
| | | 1.00 | D | | | | | | 1 |
| | | | | | 1.20 | | | Very stiff light orange mottled grey micaceous silty CLAY.<br>LONDON CLAY | |
| | | 1.50<br>1.50 | PP<br>D | 3.0kg/cm2 | | | | | |
| | | 2.00<br>2.00 | PP<br>D | 2.5kg/cm2 | | | | | 2 |
| | | 2.50<br>2.50 | D<br>PP | 2.5kg/cm2 | | | | | |
| | | | | | 2.70 | | | Very stiff light greyish brown micaceous silty CLAY with rare calcareous nodules and occasional pockets of light orange fine sand.<br>LONDON CLAY | |
| | | 3.00<br>3.00 | D<br>PP | 3.5kg/cm2 | | | | | 3 |
| | | 3.50<br>3.50 | PP<br>D | 4.0kg/cm2 | | | | | |
| | | | | | 3.80 | | | Very stiff light greyish brown micaceous silty CLAY with rare calcareous nodules and traces of selenite.<br>LONDON CLAY | |
| | | 4.00<br>4.00 | D<br>PP | 4.5kg/cm2 | | | | | 4 |
| | | 4.50<br>4.50 | D<br>PP | 3.2kg/cm2 | | | | | |
| | | | | | 5.00 | | | End of Borehole at 5.00m | 5 |

Remarks

Groundwater not encountered.

| | | | |
|---|---|---|---|
| **Project Name:** | 45 Lancaster Grove | **Samples Received:** | 15/12/2014 |
| | | **Project Started:** | 19/12/2014 |
| **Client:** | Geo-Environmental Services Ltd | **Testing Started:** | 12/01/2015 |
| **Project No:** | GE10516 **Our job/report no:** 18062 | **Date Reported:** | 13/01/2015 |

**K4 SOILS**

| Borehole No: | Sample No: | Depth (m) | Description | Moisture content (%) | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | Passing 0.425 mm (%) | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| WS1 | D3 | 1.50 | Brown CLAY | 34 | 77 | 30 | 47 | 100 | |
| WS1 | D4 | 2.00 | Brown CLAY | 32 | | | | | |
| WS1 | D6 | 3.00 | Brown CLAY with scattered selenite | 33 | 80 | 30 | 50 | 100 | |
| WS1 | D8 | 4.00 | Brown CLAY with blue grey veins and scattered selenite | 30 | | | | | |
| WS1 | D9 | 4.50 | Brown CLAY with scattered selenite | 30 | 72 | 28 | 44 | 100 | |
| WS2 | D3 | 1.50 | Brown CLAY | 36 | 75 | 28 | 47 | 100 | |
| WS2 | D4 | 2.00 | Brown CLAY with scattered roots | 34 | | | | | |
| WS2 | D5 | 3.00 | Brown CLAY with orange brown sandy patches | 30 | 72 | 27 | 45 | 100 | |
| WS2 | D | 4.50 | Brown CLAY with blue grey veins | 30 | 77 | 29 | 48 | 100 | |

UKAS TESTING 2519

## Summary of Test Results

BS 1377 : Part 2 : Clause 4.4 : 1990 Determination of the liquid limit by the cone penetrometer method.
BS 1377 : Part 2 : Clause 5 : 1990 Determination of the plastic limit and plasticity index.
BS 1377 : Part 2 : Clause 3.2 : 1990 Determination of the moisture content by the oven-drying method.

**Checked and Approved**
Initials: K.P
Date: 12/01/2015

**HARTLEYS PROJECTS LTD**

**45 Lancaster Grove NW3 4HB**

**HYDROGEOLOGICAL REVIEW**

**March 12**

**Rev 0**

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# Table of Contents

**HARTLEYS PROJECTS LTD**

**45 LANCASTER GROVE NW3 4HB**

**HYDROGEOLOGICAL REPORT**

**March 12**

**REV 0**

## 1 INTRODUCTION

The proposed project comprises the refurbishment of the property at No. 45 Lancaster Grove. The works include the construction of a rear extension to the main house with single level basement.

This report reviews the available information about the site and the current scheme and aims to produce a hydrogeological impact assessment for the proposed basement construction in accordance with the requirements of the London Borough of Camden. The requirements are set out within their Development Policy DP27 and Camden Planning Guidance CPG4 - Basements and Lightwells as well as within the recent LB Camden guidance document entitled 'Camden geological, hydrogeological and hydrological study – Guidance for subterranean development'.

Information on the proposed redevelopment has been provided by Hartleys Projects. At present, no site-specific ground investigation has been carried out. The comments herein are therefore based on record information and are made subject to review following receipt of an investigation identifying the soil profile, thickness of the superficial deposits and current water levels in the near-surface soils.

This report has been prepared for Hartleys Projects as part of the requirements set by the DP27/CPG4 and LB Camden's 'Guidance for Subterranean Development'. It addresses the issues of the subterranean (ground water) flow screening chart that is shown in full details in Appendix A and comments on issues of surface water.

## 2 THE PROPERTY AND THE PROPOSED RE-DEVELOPMENT

The site lies within the Belsize Camden Administrative Boundary and is located approximately halfway between Swiss Cottage Park tube station (about 500m to the west of the site) and Belsize Park tube station (about 550m northeast from the site), refer to Figure 1. It occupies a rectangular plot with dimensions of 48m x 14m. The property comprises a detached three storey house, facing Lancaster Grove to the south and a single level rear extension and a rear garden with mature trees to the north.

The main house has approximate dimensions of 14m by 11.5m and the rear extension is about 10m by 4.5m (see Figure 2). A single level cellar of approximate dimensions of 4m by 11.5m exists underneath the central core of the house (refer to Figure 2). No. 43

Lancaster Grove and No. 47 Lancaster Grove bound the site to the west and to the east, respectively. The rear garden (to the north) overlooks a garden, which is believed to be the back garden of No. 5 Lambolle Road.

It is proposed to refurbish the site replacing the existing extension with a new single level structure with a single level basement under the front part of the rear garden. The dimensions in plan of the new extension are about 14 x 14m, as shown in Figure 3. The basement is expected to require around 3-4m of excavation below the existing ground level (bgl). It is understood that the basement will be formed by underpinning the rear wall of the existing house.

## 3 TOPOGRAPHY AND GEOLOGY

The property is located about 700m to the north of Primrose Hill on a ground sloping southwards at an approximate gradient of 1:50. The ground level at the front of the site is about +58.5mOD.

The geology of the area is shown on the British Geological Survey 1:50000 England and Wales Sheet 256 – North London (Figure 4) and on the 1922 British Geological Survey Map, London Sheet IV N.E (Figure 5). The site is located in an area where the London Clay outcrops. London Clay is underlain by the Lambeth Group, Thanet Sand and then Chalk. Head deposits, including remolded clay, sand and silt are known to be present in this area above the London Clay (see Figure 5). Approximately 550m to the northwest of the site the London Clay is overlain by the Claygate Beds.

The British Geological Survey have made available records of old boreholes[1]. From this source details from four boreholes sunk about 550 m to the west, 400 m to the southwest and 600m to the east of the site have been analysed (TQ2SE2335, TQ28SE1769 and TQ28SE1164 & 1163, respectively). Figure 6 depicts the borehole locations. TQ2SE2335 shown the presence of 3m of Made Ground above about 7 m thick weathered London Clay and unweathered London Clay, which was proved to the full depth of the investigation of 30m bgl. At a site approximately 600m east from 45 Lancaster Grove (TQ28SE1163 and TQ28SE1164), the records show the presence of 2.3-3m thick Made Ground over about 5 to 7 m of weathered London Clay underlain by stiff grey (unweathered) London Clay.

All record boreholes were terminated in the London Clay, but the water well TQ28SE1769, about 400m to the southwest of the site (Figure 6), shows that the thickness of the clay is approximately 83m and that it overlays 12m of Lambeth Group over 4m of Thanet Sand deposits. Chalk occurs at a depth of about 100m bgl. These levels are consistent with those provided in the contour plots on the 1:50,000 scale BGS map.

Furthermore, a site-specific ground investigation carried out at a location about 200m to the north of the site indicates that the stratigraphy includes about 0.7m of Made Ground over London Clay.

[1] These records are available online to the public from the British Geological Survey.

The thickness of the London Clay suggests that most of the superficial lithological units of the London Clay are present at the site. These would be expected to be siltier and sandier than the deeper lithological units generally encountered in Central London at similar shallow depths. Sandy lenses and layers could be encountered in these units.

## 4 HYDROGEOLOGICAL CONDITIONS AND HAZARDS

The proposed basement is expected to extend to approximately 3 to 4m bgl. Assuming that the ground surface is at an approximate elevation of +58.5 mOD, the basement will extend down to around +55.5 to +54.5mOD and will be most likely in the clay.

The 1922 BGS map in Figure 5 and a map from Barton (1962) 'The lost Rivers of London' (Figure 7) show that a stream exists close to the site. This stream seems to cross Lancaster Grove immediately to the west of the site and to continue south towards Primrose Hill and the Tyburn River. Water in the area of the site would be expected to drain towards this stream. The BGS map shows also a tributary to this stream at about 100m to the north of the site.

More streams surround the site, but at a distance greater than 100m. These flow into various drainage channels throughout Hampstead Heath and form tributaries of the four main rivers which can be found within the LB Camden: the Westbourne River to the southwest, the Brent River to the nortwest, the Tyburn River to the south and the Fleet River to the east. All these springs would be expected to be culverted.

From the same British Geological Survey Map (1922) the closest pond appears to be at approximately 1100m to the north of the site (Hampstead Pond – Reservoir). The Union Canal (Regent's Canal) is at a distance of 1300m south from the site (see figure 5).

More springs and wells are expected to be present along the geological boundary with the Claygate Member approximately 550m northwest from the site. The site is more than 100m away from the Hampstead Chain Catchment.

According to the Camden Flood Map, shown in Figure 8 and Camden Strategy Risk Assessment present in the Guidance Notes for Camden New Basement Development and Extensions to Existing Basement Accommodation, Lancaster Grove was affected by flooding in 1975 and in 2002. On this basis Lancaster Grove has been identified as a "primary" location for risk of flood from surface water.

The Environment Agency has been approached to confirm that there is no risk of flooding for the site from sources other than surface water.

The London Clay that underlies the site is defined as an 'unproductive strata' (see Figures 9 & 10). Given its permeability it acts as a barrier to flow between the lower (Chalk) aquifer and superficial groundwater. The water head in the Chalk was about -50 mOD in 1965 (see Figure 11), and has been rising since as the demand for water abstraction began to diminish after 1965; in 2010, the water level in the Chalk in the area of the site was approximately -30 mOD (see Figure 12). The current policy, coordinated by the Environment Agency, is to maintain water levels in the Chalk at about their present levels. Thus, the property is unlikely to be influenced directly by

groundwater levels in the Chalk, even in the long-term. There are no known underground structures in the vicinity of the site that might indirectly induce local changes of water pressures in the London Clay, which could affect the development.

The topography and the geology of the area, based on record information, suggest that the superficial groundwater runs just above the clay towards the nearby springs.

Water infiltrating the London Clay will generally tend to flow vertically downwards at a very slow rate towards the lower aquifer. Some minor horizontal flow might be expected within the sandier layers of the most superficial deposits of the London Clay, but this would be limited and localised.

The BSG record logs and other available borehole logs in the area of the site indicate that no water was encountered during these site ground investigations. However, water seepage were recorded at various locations within the most superficial deposits of the London Clay.

Figure 10 shows that the site is located on the northern boundary of the Camden outer water source protection zone (SPZ). SPZs are areas around a groundwater source where development may be restricted and within which the Environment Agency may set up pollution prevention measures.

Construction related issues should be addressed to avoid contamination of the groundwater source.

## 5 LAND DRAINAGE REQUIREMENTS

A ‘lost stream’ is known to run across the site. This is likely to be currently culverted or filled in. This stream is likely to be a preferential way for groundwater in the area of the site, which would be expected to flow towards it. However, some minor horizontal flow could be expected within the London Clay due to its siltier and sandier nature in this area.

The existing house is likely to be founded on London Clay and, together with the existing basement, probably already obstructs, to some extent, any potential water running across the site. The proposed extension and the new basement could create an additional barrier to the potential groundwater flow. However, this effect would be expected to be limited as the water flow across the site is not expected to be significant.

The proposed construction work will result in a change in the proportion of hard surfaced/paved areas and drainage measures should be adopted to deal with water run off on hardstanding areas and in the garden area, to ensure that these remain well drained and to avoid ponding.

Given the risk of the property to flooding, architectural measures should also be adopted to deal with surface water.

A survey of existing drains should be carried out to identify how water could be discharged into the existing storm water system or soakaway (if such exist).

In the permanent condition there will need to be a suitable internal construction to bring the structure to an acceptable standard with regard to moisture ingress. Land drainage for surface run-off should also be provided.

## 6 SITE SPECIFIC GROUND INVESTIGTION

The ground investigation should be sufficient to establish the thickness of the head deposits over the full length of the new basement, identify any adverse ground conditions and to establish the groundwater conditions. Boreholes with water level measurements could be carried out within the rear garden and south part of the site in order to establish the groundwater conditions at the site and, in particular, to check the possible location of a stream.

## 7 CONCLUSION

It is proposed to refurbish the property located at 45 Lancaster Grove, London NW3 4BH. A review of the hydrogeological conditions at the site has been carried out on the basis of record information on stratigraphy and ground conditions.

The local stratigraphy is expected to include Made Ground over weathered London Clay and unweathered London Clay. A stream is known to run immediately to the west of the site, probably culverted or filled in. Perched groundwater would be expected to be flowing in the most superficial materials just above the clay towards this stream. No water ingress was recorded on the record boreholes. Some minor horizontal flow could also be expected within the London Clay due to its siltier and sandier nature in this area.

The existing house is likely to be founded on the London Clay and probably already intersects the perched groundwater flowing across the site. The proposed extension and its basement could create and additional barrier but their effects would be limited as the water flow across the site is unlikely to be abundant. A site investigation should be carried out to confirm the thickness of the superficial deposits and the groundwater conditions and to identify any adverse ground conditions

The site is in a road that has experienced flooding in the past. Land drainage should be provided to deal with water run-off from hard surfaces and garden areas and drains should be placed to deal with the risk of flooding from surface water.

In summary, on the basis of the available information on ground and groundwater conditions at the site, the proposed basement construction is not expected to cause adverse changes to the local hydrogeology provided that adequate drainage measures are adopted to deal with surface water.

## 8 REFERENCES

**British Geological Survey.** 1982. Geological Survey Sheet TQ28NE. 1: 10,560

**British Geological Survey.** England and Wales Sheet 256: North London, 1:50,000

**Camden Development Policies DP27.** Basements and Lightwells

**Camden Planning Guidance CPG4.** Basements and Lightwells

**Camden 2009** *New Basement Development and Extensions to Existing Basement Accommodation: Guidance Note*

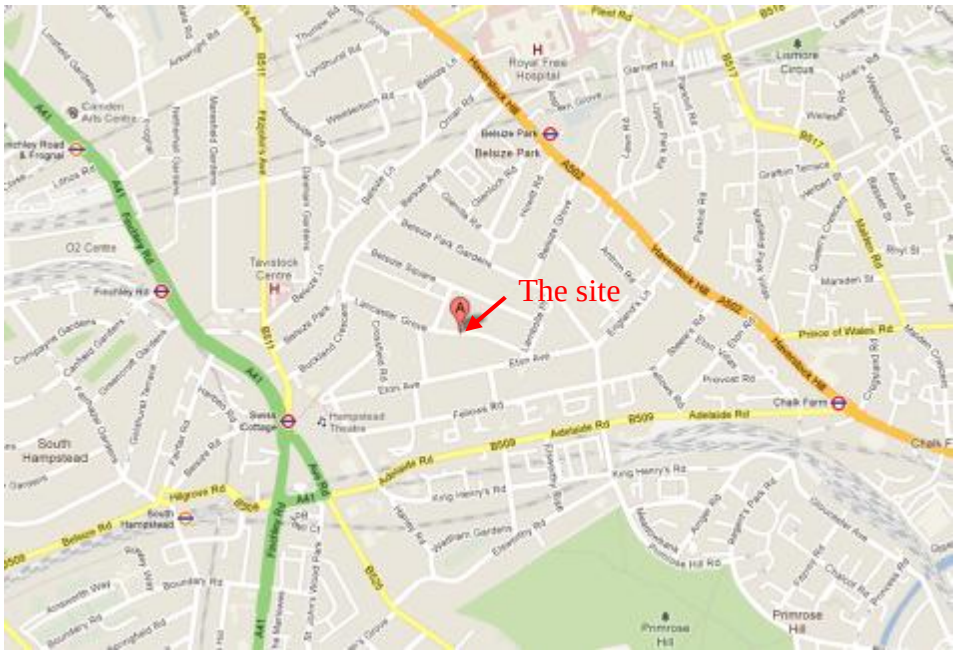
**CIRIA Special Publication 69.** 1989. The engineering implications of rising groundwater levels in the deep aquifer beneath London

**HARTLEYS PROJECT LTD.** 2012. *No. 45 Lancaster Grove, Camden Town London NW.* Briefing Drawings for Existing and Proposed Development.

**Environment Agency.** 2011. *Management of the London Basin Chalk Aquifer*.

**Ove Arup & Partners Ltd.** *Camden geological, hydrogeological and hydrological study – Guidance for subterranean development.* LB Camden Guidance Document.

**FIGURES**

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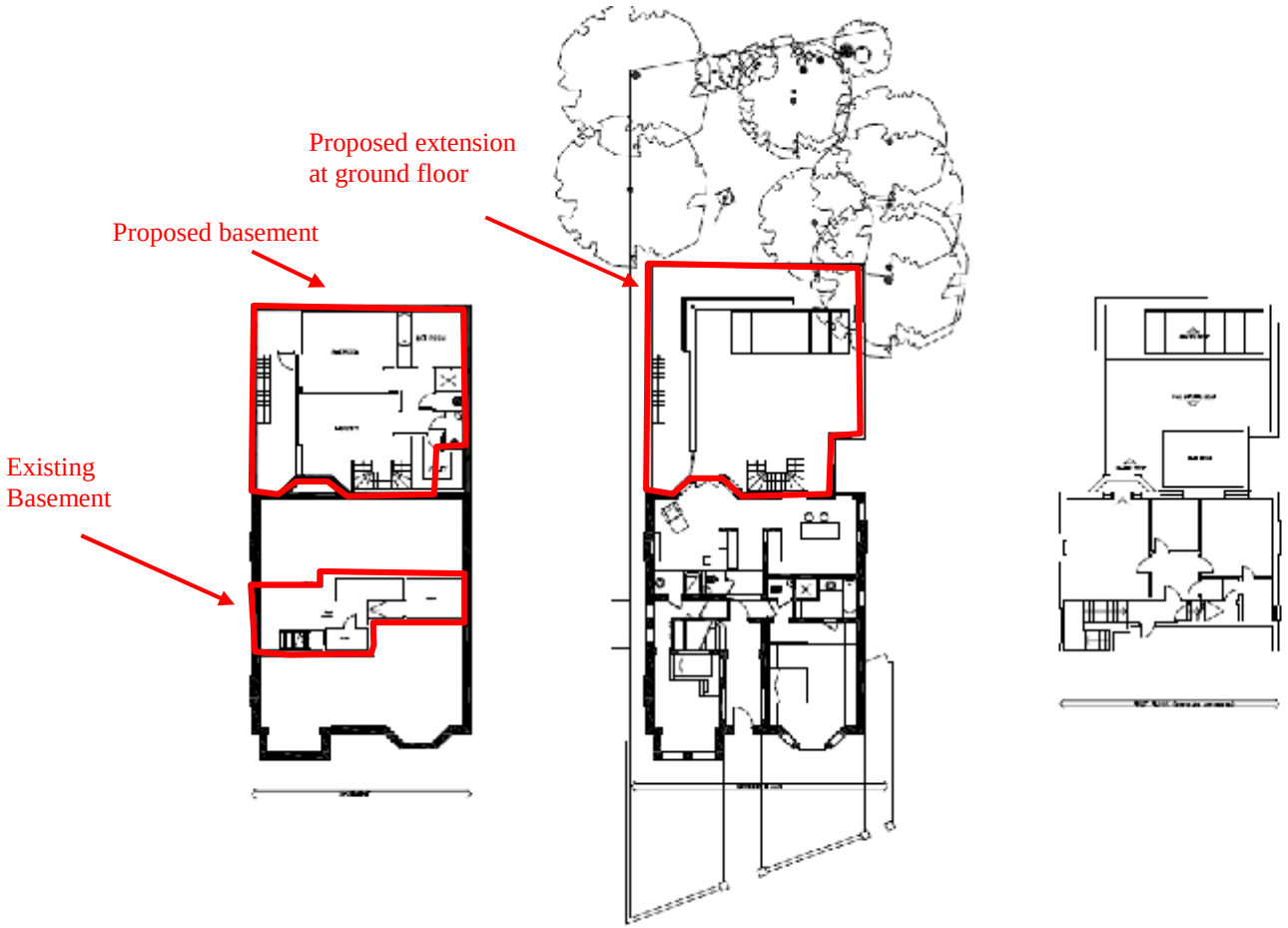
| | | |
|---|---|---|
| Geotechnical Consulting Group | Site location | Figure 1 |
| 45 Lancaster Grove | | |


| | | |
|---|---|---|
| Geotechnical Consulting Group | Existing property | Figure 2 |
| 45 Lancaster Grove | | |

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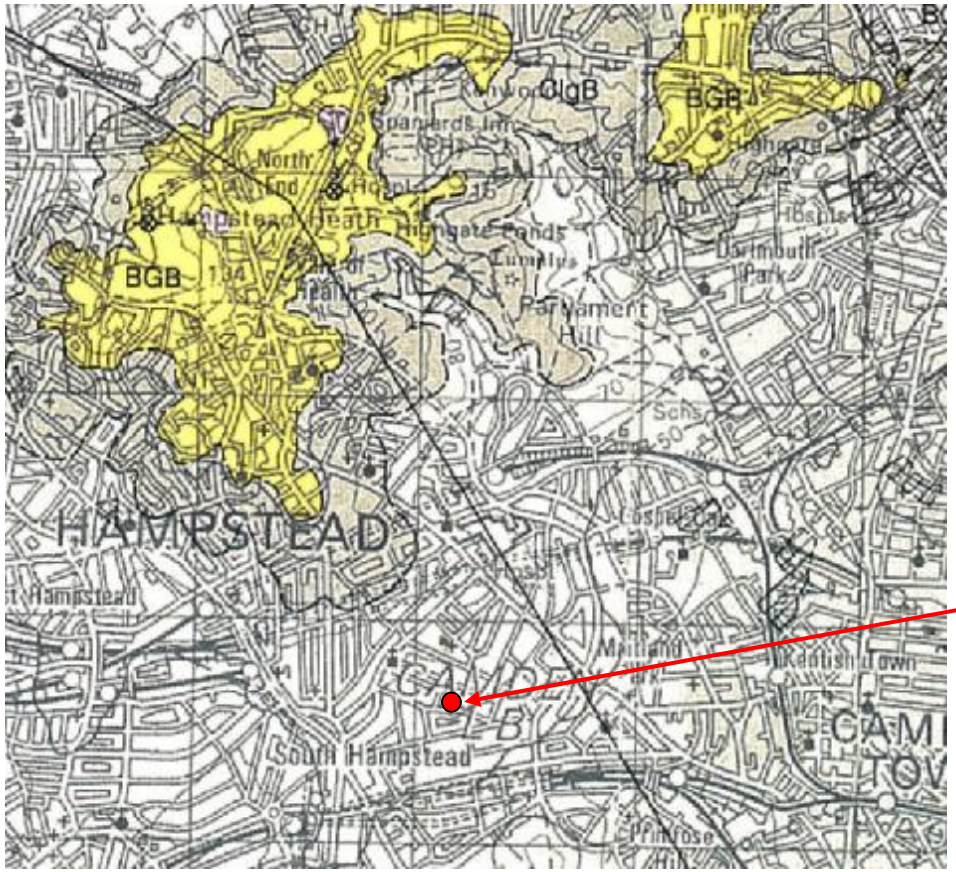
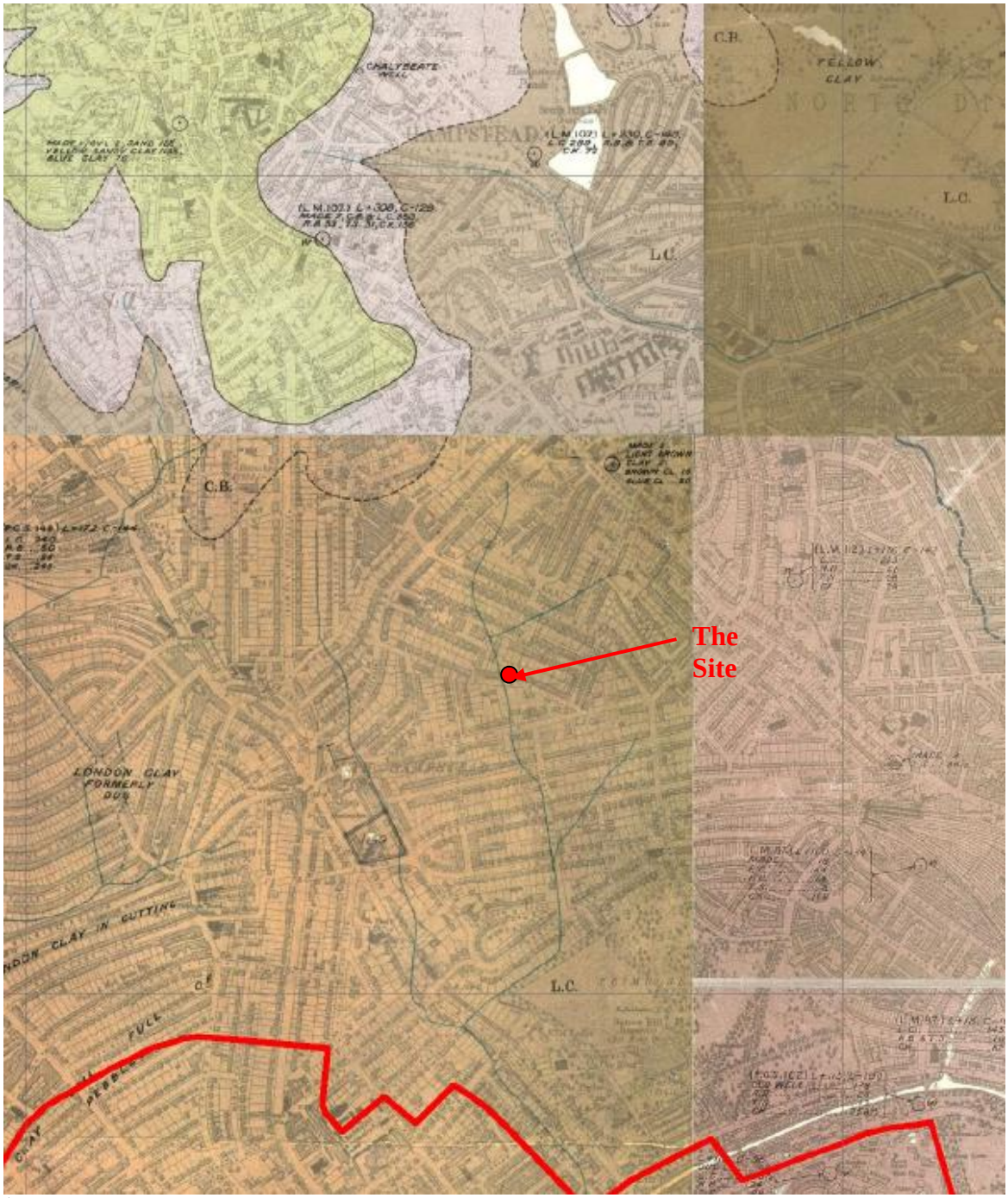
|---|---|---|
| Geotechnical Consulting Group | Proposed works - plan | Figure 3 |
| 45 Lancaster Grove | | |

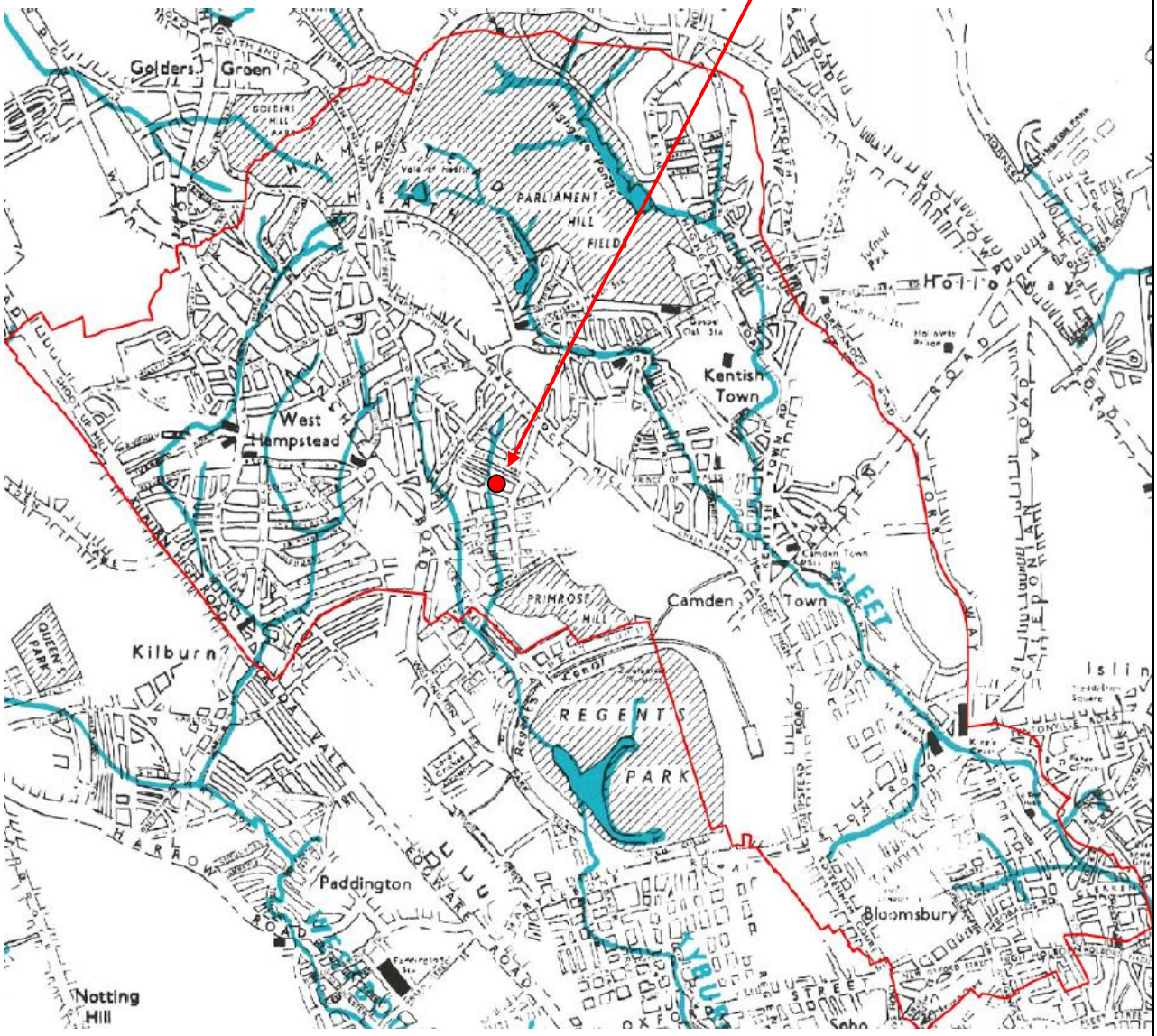



| | | |
|---|---|---|
| Geotechnical Consulting Group | BGS Map 1:50000 | Figure 4 |
| 45 Lancaster Grove | | |

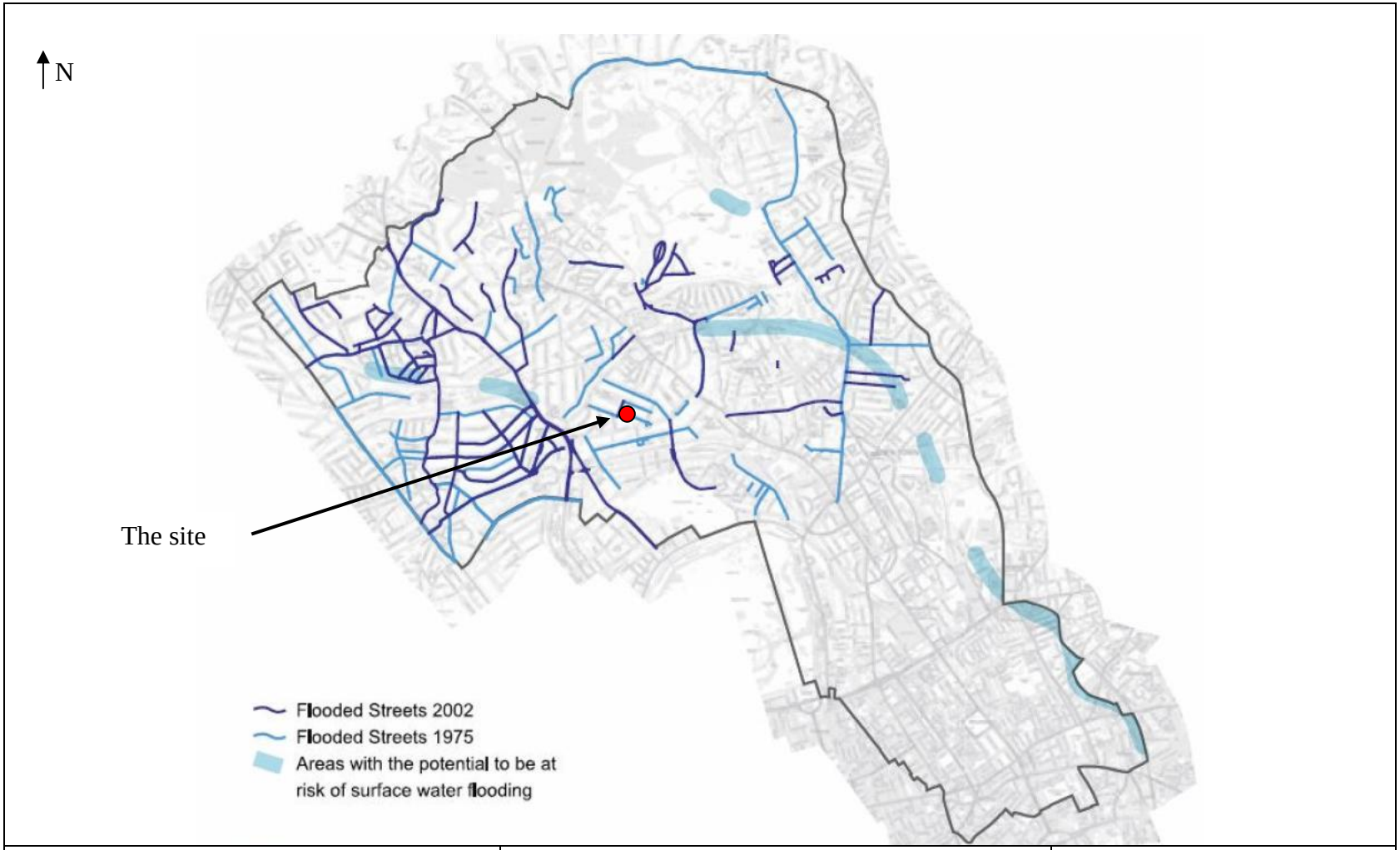



| | | |
|---|---|---|
| Geotechnical Consulting Group | BGS Map 1:10560 (1922) | Figure 5 |
| 45 Lancaster Grove | | |


| | | |
|---|---|---|
| Geotechnical Consulting Group | Location of BGS Borehole Logs | Figure 6 |
| 45 Lancaster Grove | | |



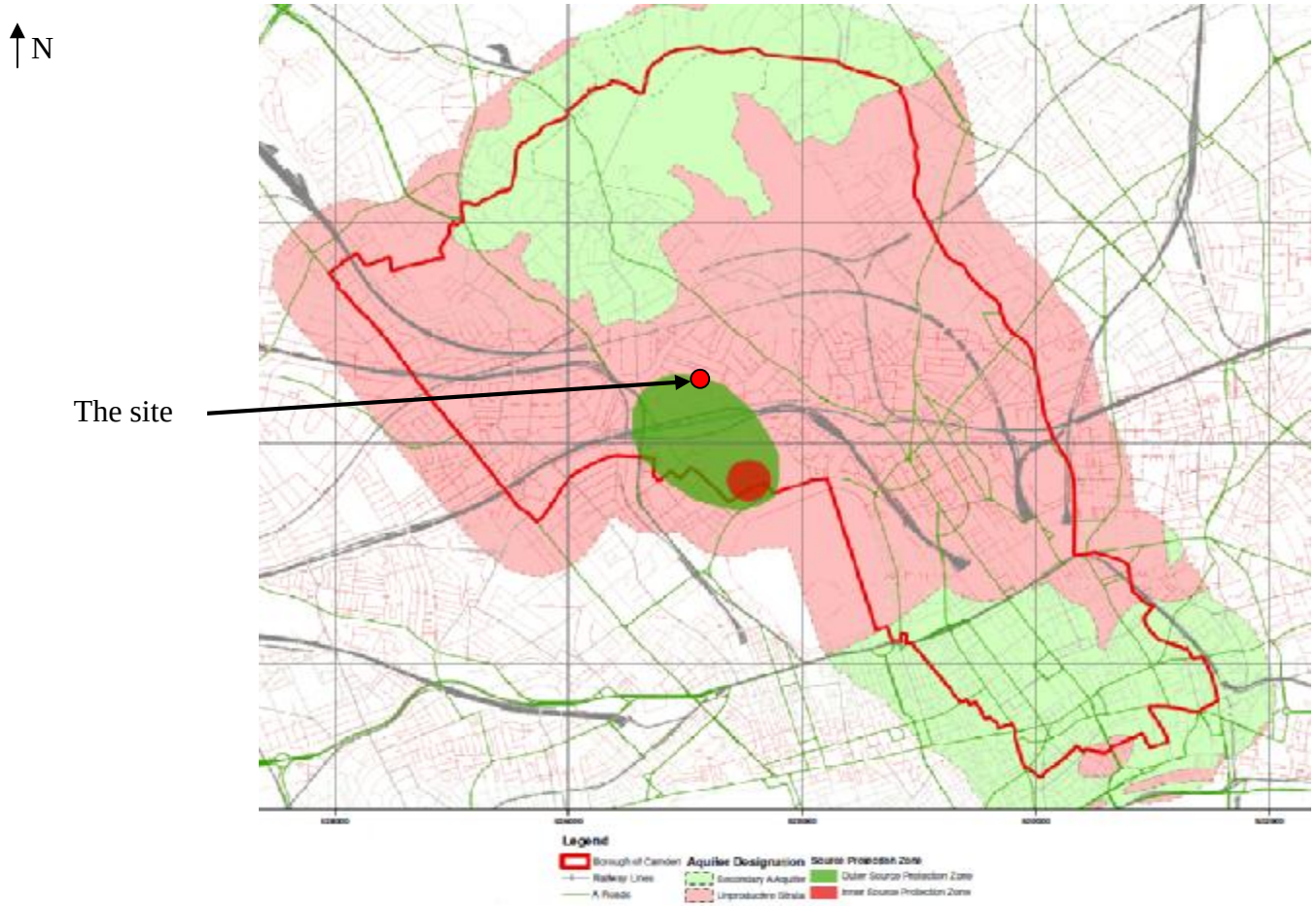

| | | |
|---|---|---|
| Geotechnical Consulting Group | Extract from The Lost Rivers of London Map (Burton N., 1962) | Figure 7 |
| 45 Lancaster Grove | | |




| | | |
|---|---|---|
| Geotechnical Consulting Group | Camden Flood Map (LB of Camden: Guidance for Subterranean Development) | Figure 8 |
| 45 Lancaster Grove | | |

| Strata | Superficial / bedrock | EA aquifer designation |
|---|---|---|
| River Terrace Deposits | Superficial | Secondary A |
| Bagshot Formation | Bedrock | Secondary A |
| Claygate Member | | Secondary A |
| London Clay Formation | | Unproductive Strata |

| | | |
|---|---|---|
| Geotechnical Consulting Group | EA Aquifer Designation of Outcropping Strata within LB Camden (LB of Camden: Guidance for Subterranean Development) | Figure 9 |
| 45 Lancaster Grove | | |

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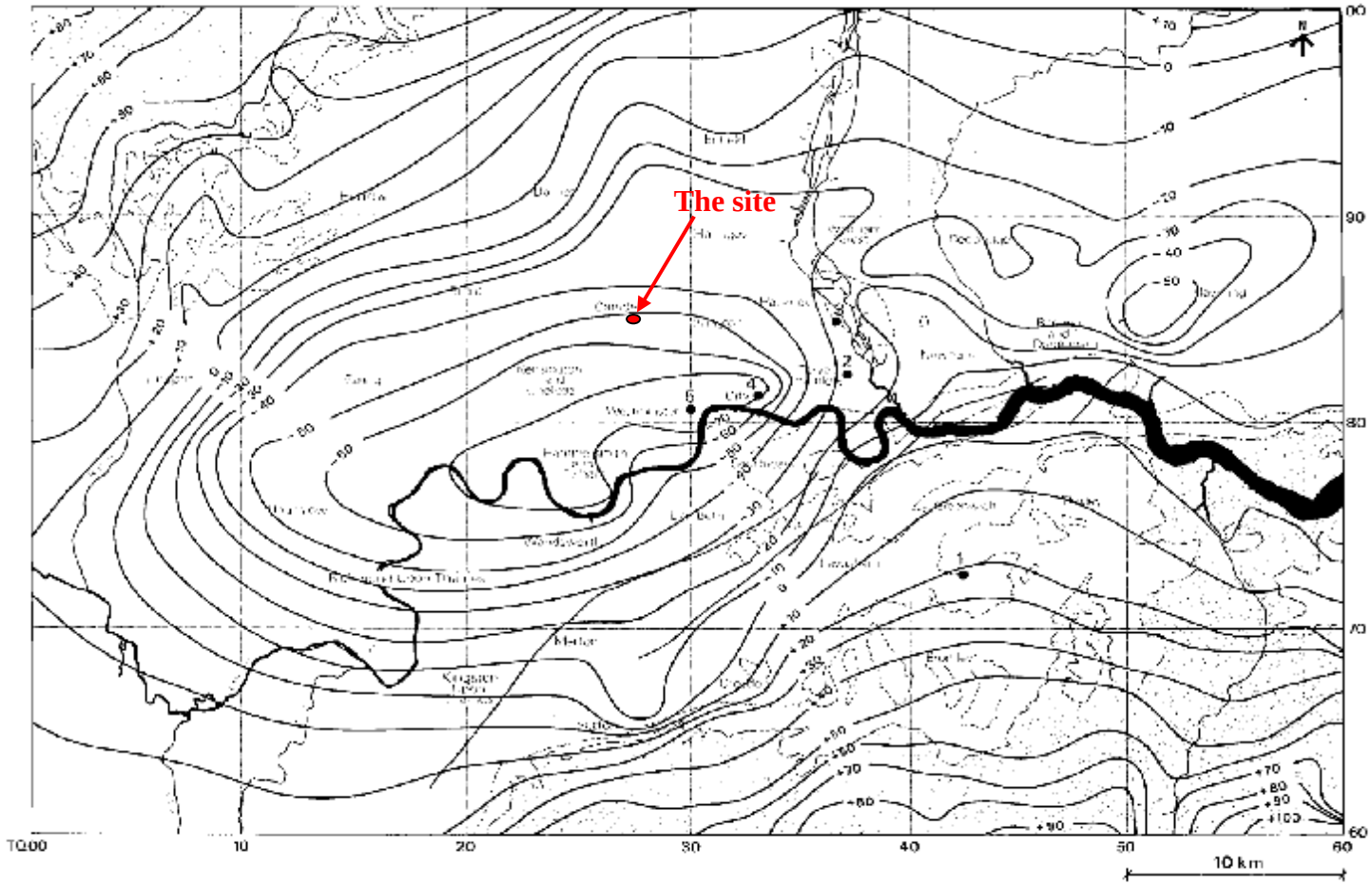
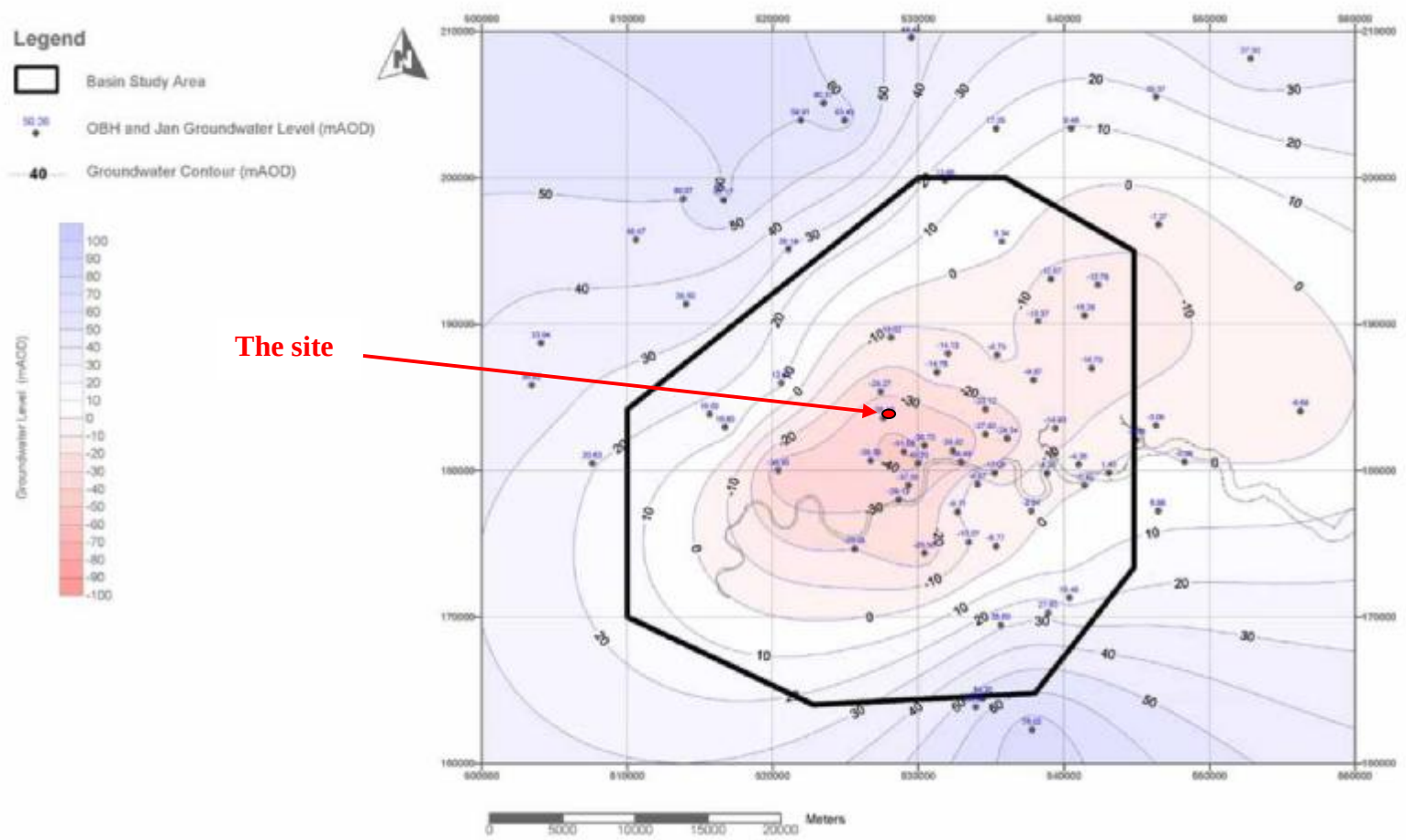
| Geotechnical Consulting Group | Camden Aquifer Designation Map (LB of Camden: Guidance for Subterranean Development) | Figure 10 |
| 45 Lancaster Grove | | |




| | | |
|---|---|---|
| Geotechnical Consulting Group | Groundwater levels in the deep aquifer in 1965 (CIRIA, 1989) | Figure 11 |
| 45 Lancaster Grove | | |




| | | |
|---|---|---|
| Geotechnical Consulting Group | Groundwater levels in the deep aquifer in 2011 (Environmental Agency) | Figure 12 |
| 45 Lancaster Grove | | |

# Appendix A

## SUBTERRANEAN GROUND WATER FLOW SCREENING CHART

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

No. The site is located above unproductive strata (London Clay) (see Figures 9 & 10).

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

No. However, some minor horizontal flow could be expected within the London Clay due to its siltier and sandier nature in this area. Seepage could also occur within the superficial deposits on top of the London Clay.

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

Yes. The site seems to be crossed by a 'lost river', which flows in a southern direction and forms one of the tributaries of the Tyburn River. This is likely to be currently culverted or filled in.

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

No. The site is more than 100m away from the Hampstead Chain Catchment.

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

Yes. The proposed work includes the construction of a single level structure with basement at the rear of the existing house. This will result in a change in the proportion of hard surfaced/paved areas.

*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. The volume of water will not be greater than in 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?*

Yes. The nearby stream is expected to be superficial within the head deposits above the top of the London Clay and therefore, the lowest point of the proposed excavation will probably be lower than the mean water level in this stream.