

1 Glenilla Road
London
NW3 4AJ

Basement Impact Assessment

Client:
Mr D Bengis

1 August 2013

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We hereby confirm that Gledsdale Associates have been appointed by Mr D Bengis as the permanent works structural engineer for this project. We will oversee all structural matters related to this project for the entire duration of the construction works in line with our appointment.

BASEMENT IMPACT ASSESSMENT

For the purpose of the proposed Planning application on this site we have formulated this supporting document relating to the proposed basement development.

The aim of this study is to assess if the proposed basement will have a detrimental impact on the surroundings with respect to groundwater and land stability and in particular to assess whether the development will affect the stability of neighbouring properties, local and regional hydrogeology and whether any identified impacts can be appropriately mitigated by the design of the development.

The conclusions and recommendations made in this report are limited to those that can be made on the basis of the research carried out. The results of the research should be viewed in the context of the work that has been carried out and no liability can be accepted for matters outside of the stated scope of the research.

The project is based on an architectural scheme designed by sporadicSPACE.

1. INTRODUCTION

Gledsdale Associates is a Structural Engineering Consultancy, serving clients in all sectors of the building construction industry.

Gledsdale Associates was formed in 1992 and has developed into its present form as a firm of consulting engineers with expertise in Structural and Civil Engineering Services.

We have gained experience in all forms of housing developments ranging from large developments of apartments to housing for both private and public sector clients. We have extensive experience in both Educational and Healthcare projects and have also been appointed by Local Authorities on a term commission basis. Projects include both new build developments and conversions or extensions of existing structures.

With regard to the Company's association with retro-fit basements, we have been working within this field for a number of years and have completed projects in various places including Camden, the Wentworth Estate in Surrey, Bexley, Royal Borough of Kensington and Chelsea. The company has extensive experience in underpinning and retro-fit basement construction.

Owner

Ian Gledsdale – B Eng,C.Eng.,M.I.Struct.E.

Professional Indemnity/Liability Insurance

PI is in place to cover our duties with cover limited to £5,000,000 and the liability period limited to 6 years. Details are available upon request.

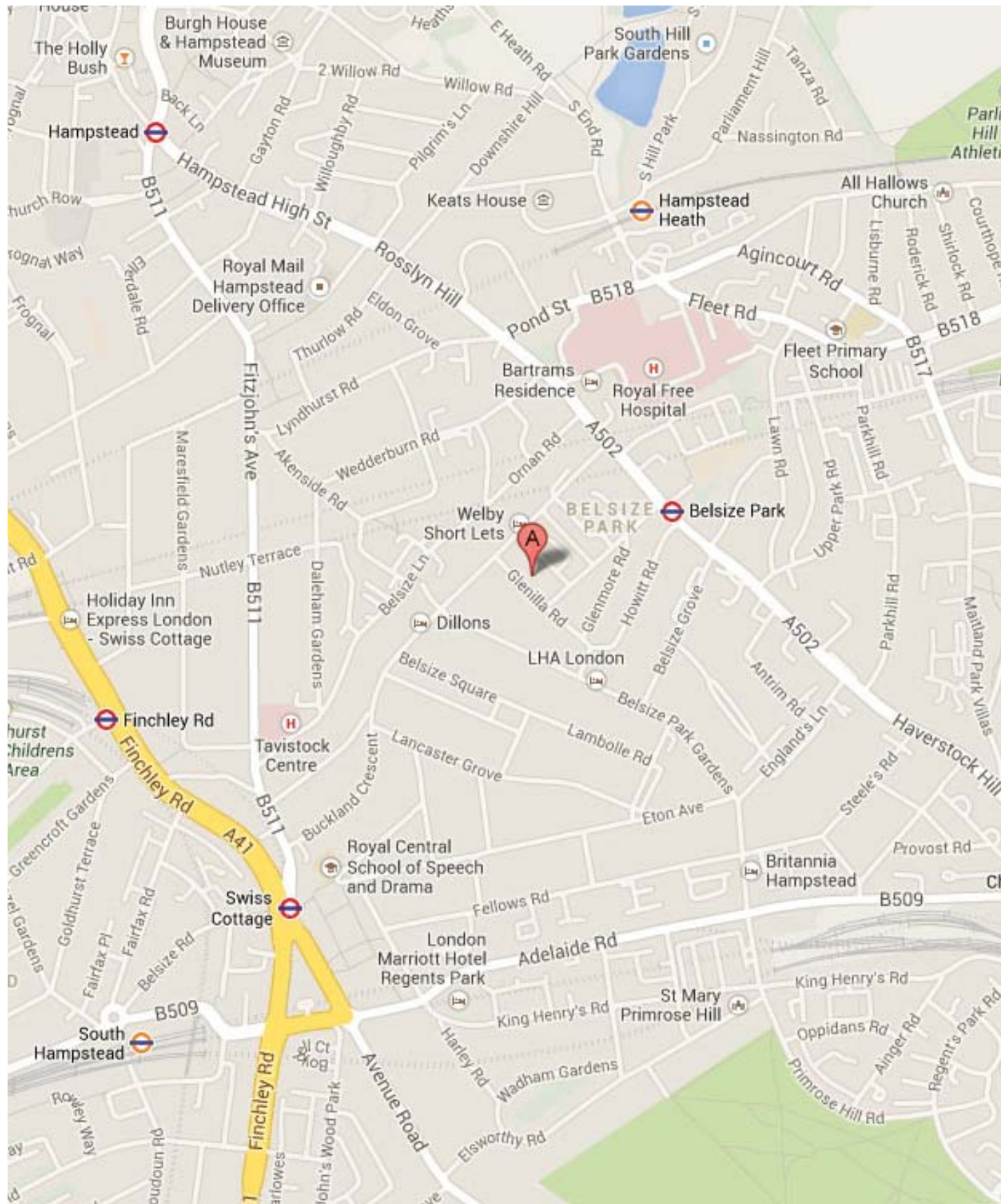


Fig1. Map showing location of no 21. Source Google Maps online

2. THE SITE

Topography: the property is situated on flat to gentle gradient road and downhill is towards a south-eastern direction away from Belsize Avenue. The slope is approximately 1:150 or less.

The property sits within a rectangular site orientated on a slight north-east/south-west axis. The Site has an approximately 7m wide frontage on Glenilla Road and extends north-eastwards from the road by approximately 23m. The property has an enclosed flat garden area at the back which is mostly covered with hard standing/paving. The building is an end terrace house with a single storey rear extension and shares a building party wall on one side with No 2. Whereby the other flank wall is the end wall of the rear garden to properties along Belsize Avenue. The building already has an existing 1.9m deep basement with a small footprint that can be accessed via external steps on the right corner when viewed from the street, currently this is closed off with timber decking.

The site is surrounded by residential properties, none of the existing terraced houses along Glenilla Road have any signs of structural damage or slope movement.



Fig2. Aerial photo's showing location of no 1. Source Bing Maps online



Fig3. Site location plan. Sketch as supplied by sporadicSPACE.

3. THE PROPOSAL

An extension is proposed that would form a single level basement beneath the entire existing building footprint extending to approximately 3.9m below the level of the existing ground floor and protruding into a part of the rear garden with a light well at the front garden/entrance area.

Existing
section:



Proposed
section:

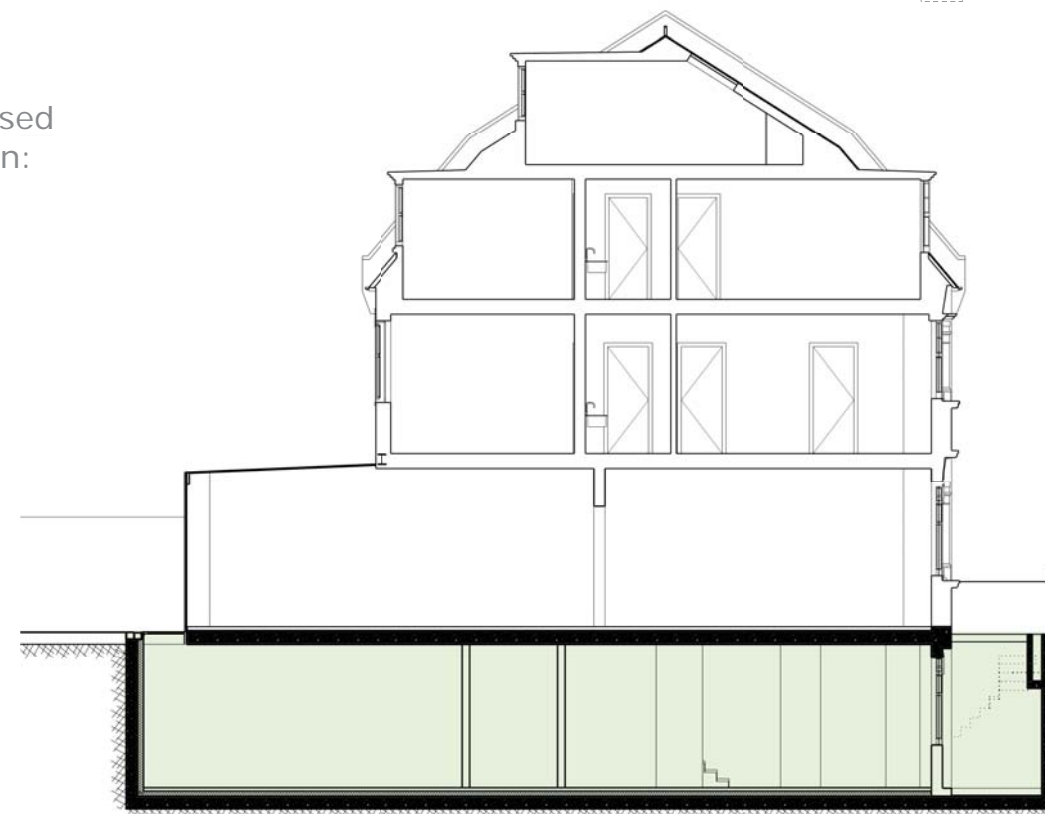


Fig5. Structural solution: 3D diagram showing the proposed basement shell underpinning the existing house.

Fig6. Sketches showing existing section and proposed section with the basement extension.



4. EXISTING BUILDING

The existing building is a three storey end-terraced house with a partial basement and a single storey rear extension.

The existing structure was originally constructed at the very early part of the 20th century as a row of terraced houses along a short section of the road. The row of houses are similar in construction with a recognisable Edwardian character. Note neither this property nor any of the adjoining properties are listed on the Statutory List of Buildings of Special Architectural or Historic Interest.

The external and party walls are of solid masonry which extends down to a corbelled brick footings; the internal load bearing walls at ground floor level are also of masonry but at first floor level and above the walls are of timber studwork.

The ground floor area consists of a ventilated suspended timber joist floor and the single storey area at the rear has a ground bearing slab at a step lower than the main floor area. All the upper floors are constructed from suspended timber joists dating back to the original period of construction.

The top floor is accommodated within a pitched mansard roof space and the roof space is subject to a structural survey.



Fig7. Site photo's: Existing front elevation and basement.

In order to gain an overview and better understanding of the potential impact of a basement development at 1 Glenilla Road; we carried out a brief study considering the local context of the geological, hydrogeological and hydrological conditions to the Site.

The British Geological Survey map for the area; reference sheet 256; indicates that the Site sits on London Clay layer with a thickness of 100meters or more.

Camden Geological, Hydrogeological and Hydrological Study as carried by ARUP dated 18/11/2010 confirms that the overlying or near-surface soil strata to the Site is London Clay; see Figures 8 & 9 confirming this.

Fig8. Geological long section - Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 7.

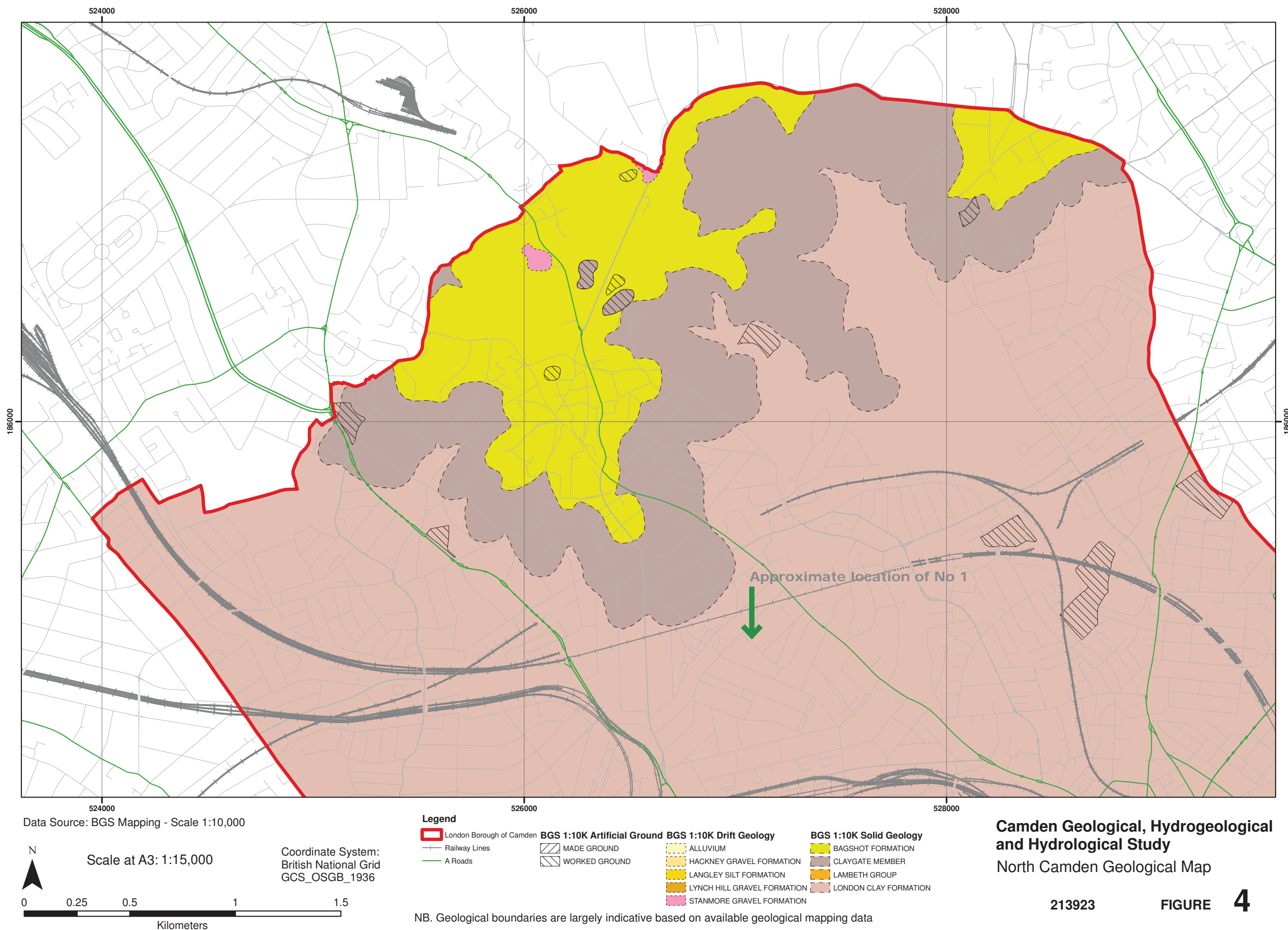


Fig9. Geological Map - North Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 4.

5.2 HYDROGEOLOGY

The London Clay Formation is considered in hydrogeological terms to be an “unproductive stratum” meaning a rock or drift deposit with low permeability that has negligible significance for water supply or river base flow.

As noted from the above study under Geology the site sits on the London Clay strata, although groundwater is contained within the clayey soil no significant water flow can be expected.

Camden Geological, Hydrogeological and Hydrological Study as carried by ARUP dated 18/11/2010 confirms that the overlying or near-surface soil strata to the Site is London Clay; see Figure 10 confirming this.

The influence of the proposed basement on the local groundwater flow of the area is not significant and therefore not considered further.

5.3 HYDROLOGY

The following figures show the culverted rivers and the surface water features present in London Borough of Camden, see Figures 11 and 12 respectively.

The diagrams confirm that the Site does not fall within any of these features and the proposed development should not have a significant affect on surface water flow or surface drainage in the area. The general lie of the land and size of the property means that surface flows are unlikely to accumulate at the proposed Site.

5.4 FLOODING

This scheme is in Flood Risk Zone 1 according to Environment Agency mapping and, therefore, the specific related requirement of DP27 does not apply. Also see Figure 13.

5.5 TOPOGRAPHY

The slope angle of the Site is slight as indicated in Figure 14.

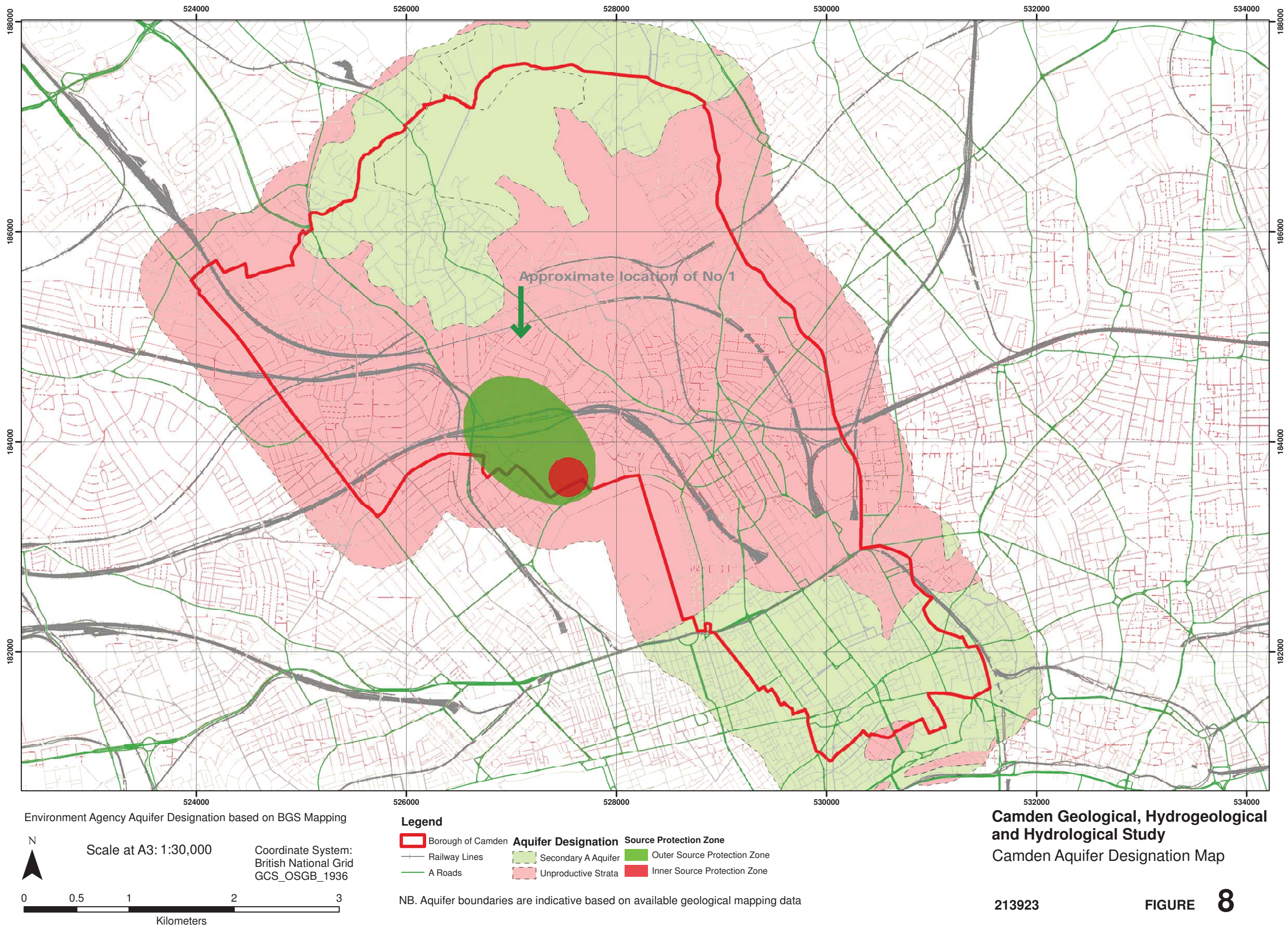
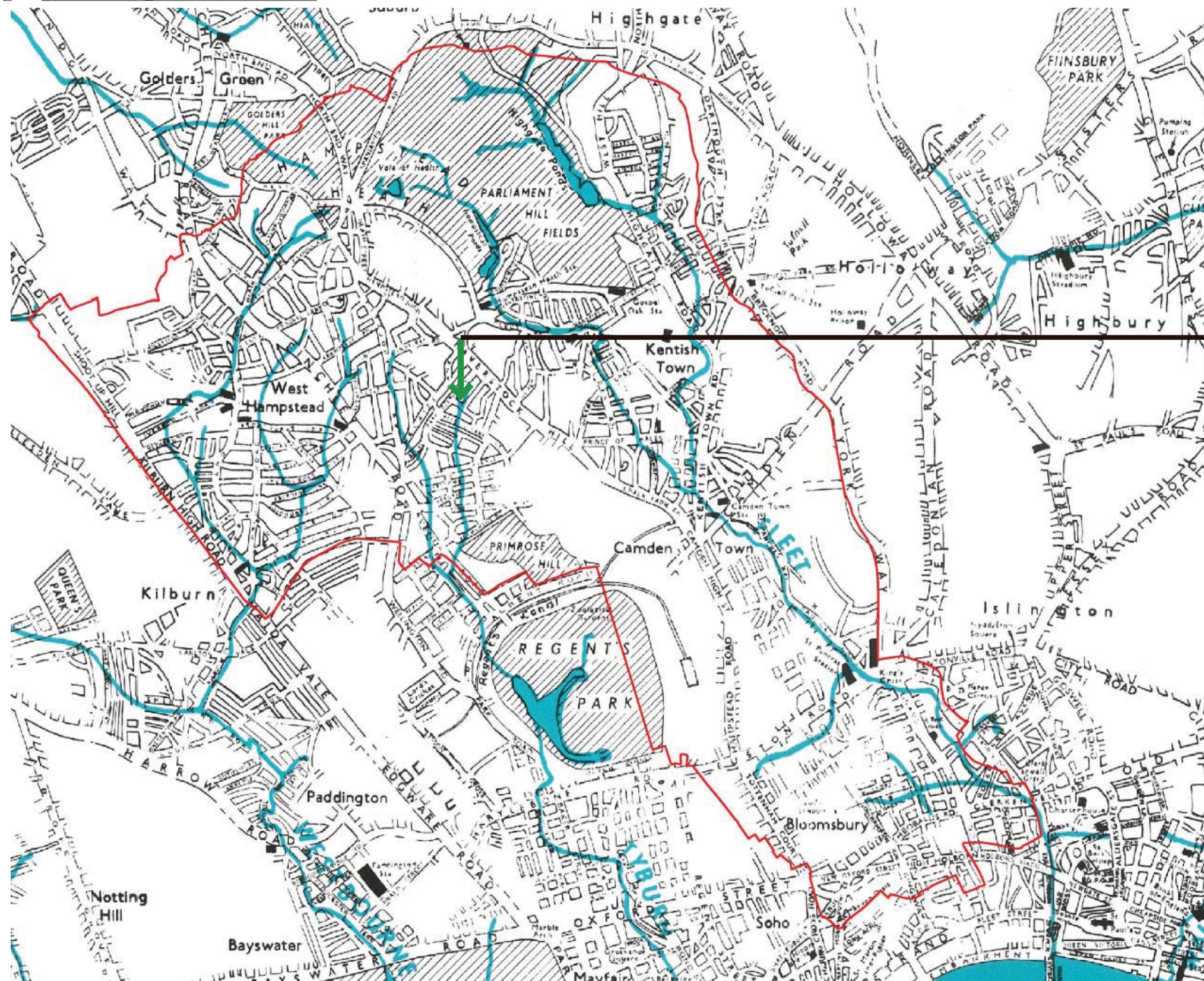


Fig10. Aquifer Designation Map - Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 8.



Approximate location of No 1

**Camden Geological, Hydrogeological
and Hydrological Study
Watercourses**

Source – Barton, Lost Rivers of London

213923

FIGURE 11

Fig11. Watercourses - Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 11.

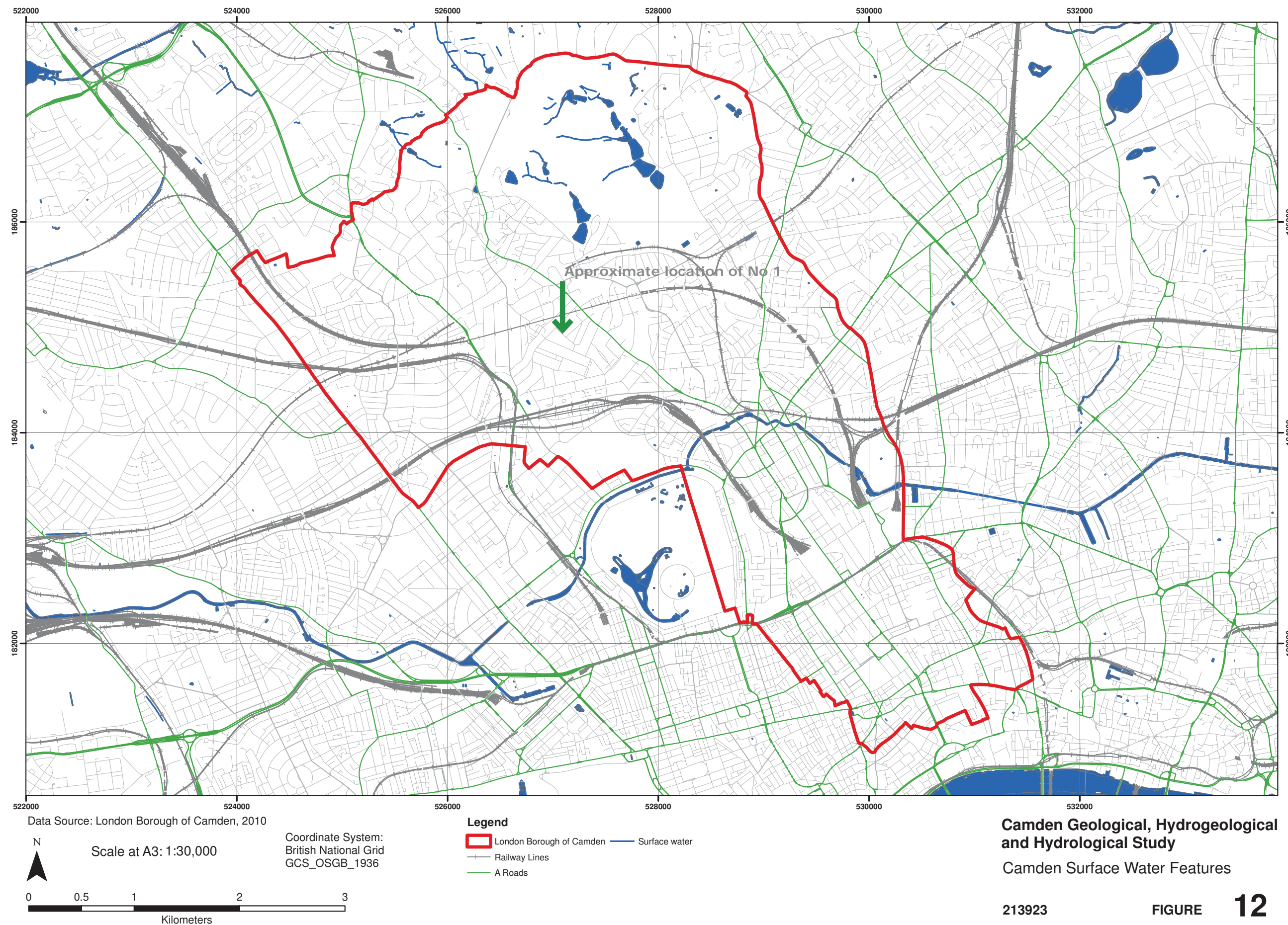


Fig12. Surface Water Features - Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 12.

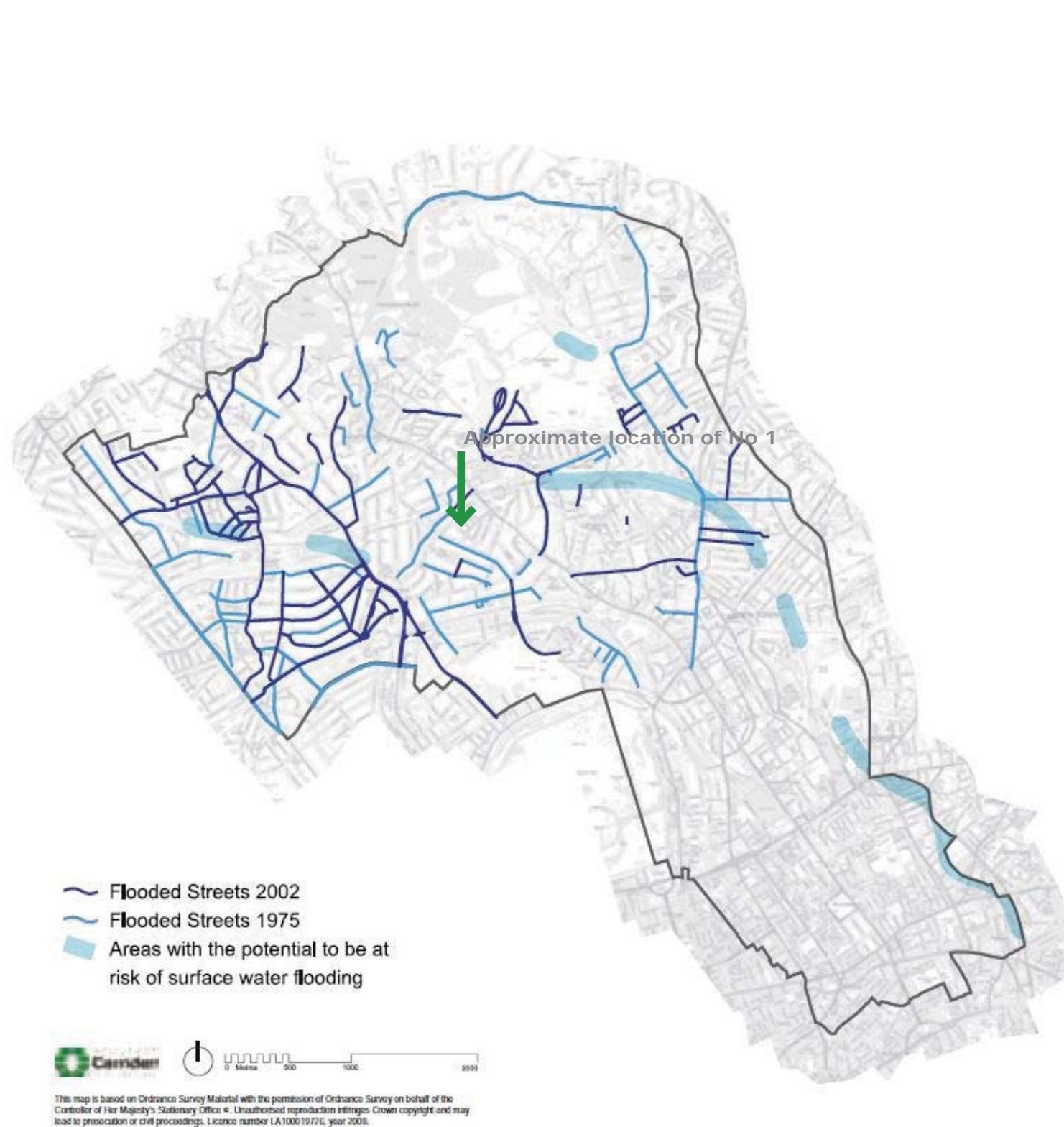


Figure 5 from Core Strategy, London Borough of Camden

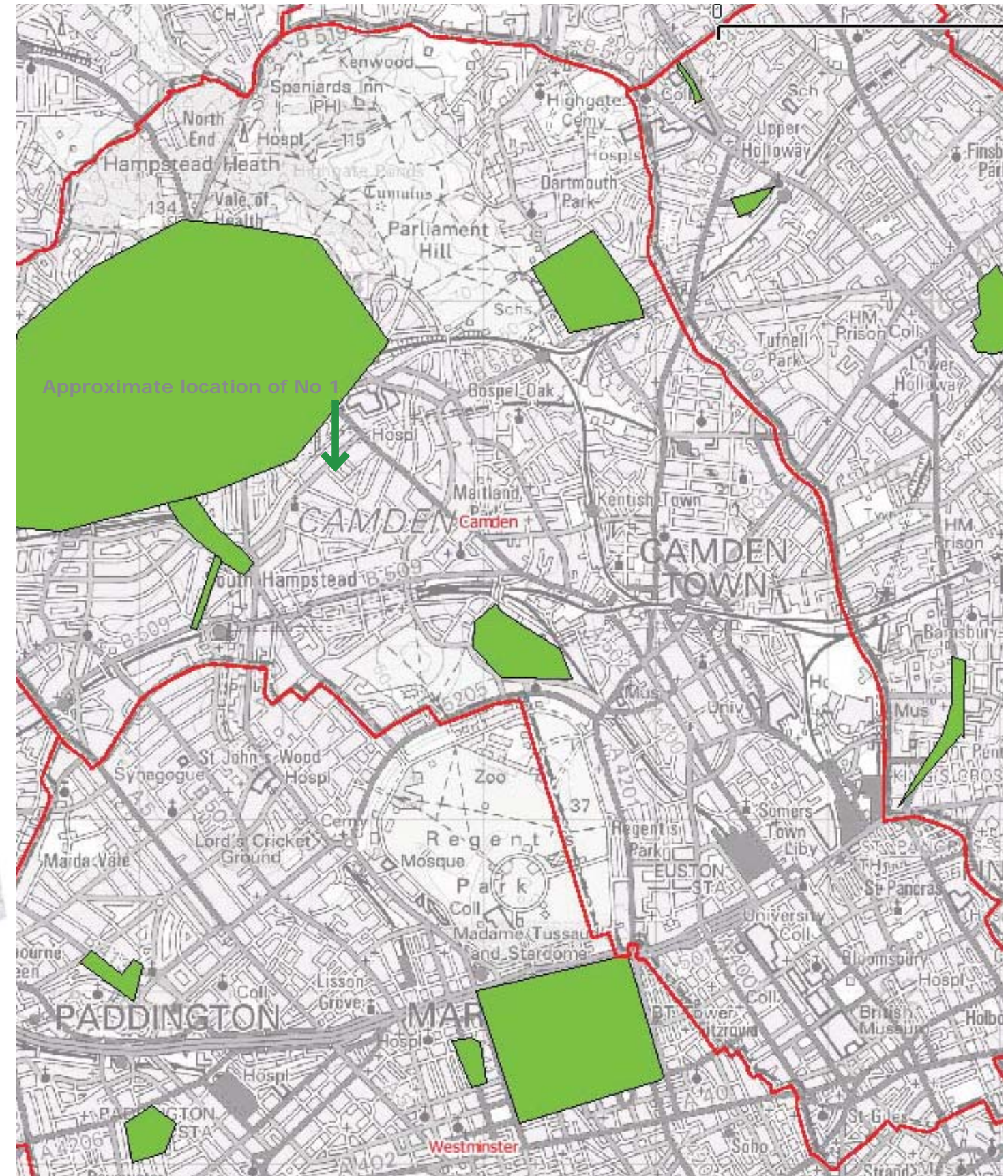


Fig13. Flood Map - Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 15.

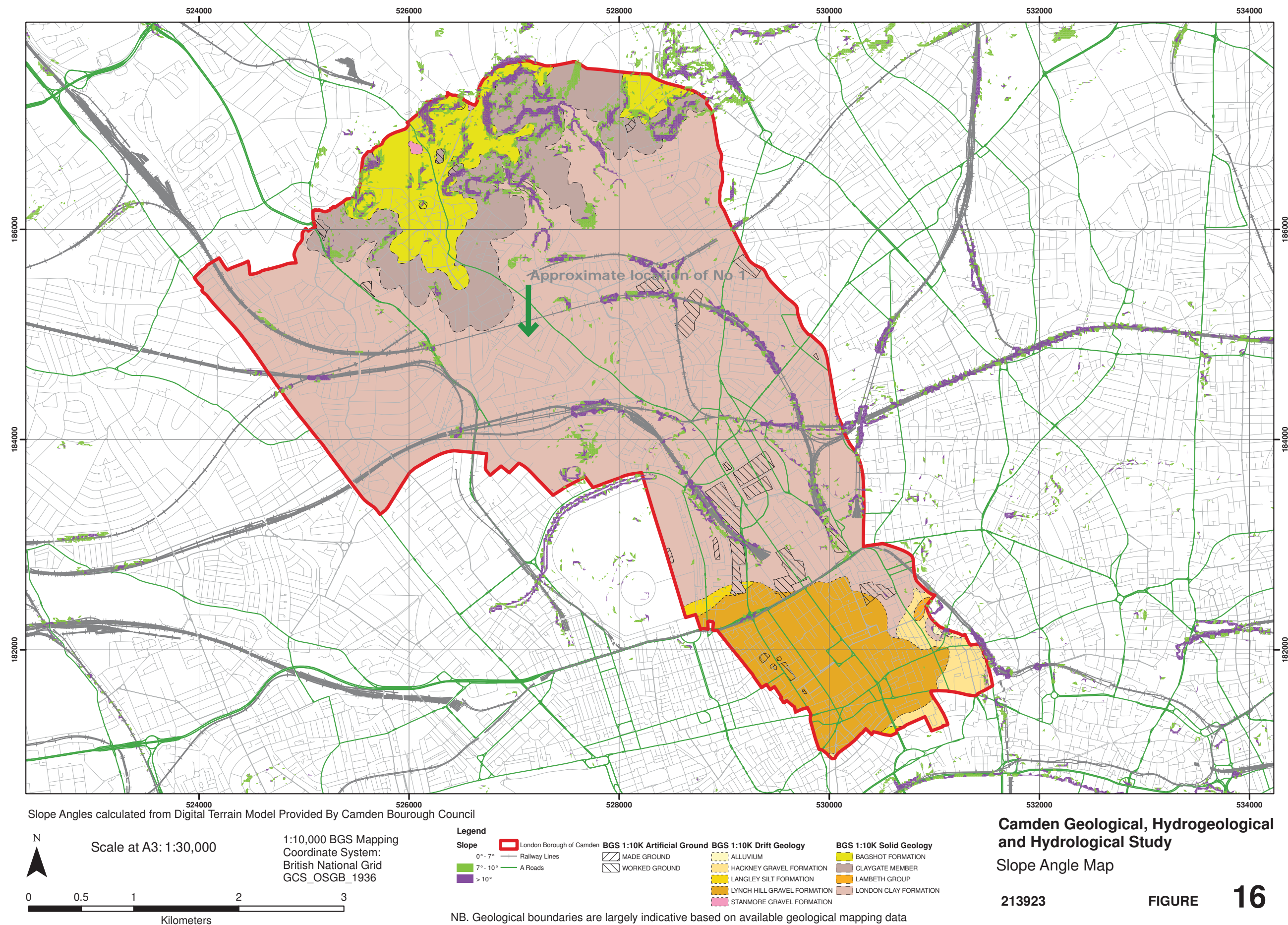


Fig14. Slope Angle Map - Camden. Source *Camden Geological, Hydrogeological and Hydrological Study* as carried by ARUP dated 18/11/2010 Figure 16.

6. SCREENING TEST

The first stage of the Basement Impact Assessment is the identification of any matters of concern due to the proposed basement intervention; which will be investigated in accordance to the guidance as set out in London Borough of Camden's CPG 4.

The guidance states that all basement proposals should be subjected to the screening stage of a Basement Impact Assessment to identify the matters relevant to assessment of local flooding and/or neighbour amenity and structural risks. This Screening is a process of determining whether or not a full Basement Impact Assessment is required for a specific planning application.

In accordance with the guidance we have answered the series of flow chart questions that cover the three main issues:

- A. Groundwater flow
- B. Land stability
- C. Surface flow and flooding

Please read in conjunction with the study carried out in the section above.

6-A. SUBTERRANEAN (GROUNDWATER) FLOW SCREENING

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

No, see Fig.10 above.

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

No, see section above and separate soil investigation report.

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

No, see Fig.11&12 above.

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

No

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

No, existing hard standing/paving to rear garden will be removed and replaced with a lawn/permeable landscaping.

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, this will be reduced see point above. All run-off water or less will discharge to the nearby public sewer as per current use.

Question 6: Is the lowest point of the proposed excavation (allowing for any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath) or spring line.

No

6-B. SLOPE STABILITY SCREENING

Question 1: Does the existing site include slopes, natural or manmade, greater than 7°?

No, See Fig.14

Question 2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7°?

No

Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°?

No

Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7°?

No

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

No

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

No

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

No

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

No

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

No

Question 10: Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that de-watering may be required during construction?

No

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

No

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

Yes, although given the small size of the frontage this is not seen as a concern. This point is addressed in the structural design section below.

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

Yes, note that all the existing properties along Glenilla Road already have partial basement excavations dating back to when originally constructed. This differential depth of foundations is addressed within the structural design of the proposed basement.

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

No

6-C. SURFACE FLOW AND FLOODING SCREENING

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

No

Question 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?

No

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

No

Question 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?

No

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

No

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

No

Statement:

From the above screening, it can be seen that the questions giving a positive answer are the two within the slope stability section relating to the adjacent Highway and adjacent foundations. The screening shows that in relation to surface flow and flooding and groundwater flow the proposed basement poses no potential risks. The location of the basement is such that it is not within an area of geological, hydrogeological or hydrological concern and that the water table is below that of the basement excavation. The proposed development also reduces the overall impermeable area on the site and hence no change in the surface water runoff or flood risk from this cause.

7. SCOPING

Within this stage the potential impact of the scheme are identified as set out in chapter 5 of the Camden Geological, Hydrogeological and Hydological Study. The purpose of scoping is to assess in more detail the factors to be investigated in the impact assessment.

7.1 SUBTERRANEAN (GROUNDWATER) FLOW

As highlighted before there is no requirement to carry the scoping stage further regarding this point.

7.2 SLOPE STABILITY

General:

The basement construction will be above the ground water table. Thus there will be no change or increase of pore water pressures within the soils from the construction. De-watering will not be a requirement, and there is no loss of vegetation.

Structural Damage beyond the boundary:

An examination of the existing structure and the adjacent properties will take place before the works commence as part of the party wall inspections. This will provide a record of the current state of the structures.

As the basement is close to the public highway a design loading surcharge pressure of 10kN/m² will be incorporated into the retaining wall design. All temporary works will be designed to limit any local movements that may impact on the existing highway. All works will be monitored for movement accordingly with all temporary works agreed prior to construction in accordance with Building Control requirements and approval.

The proposed construction method for the basement takes full account of the structural transfer of loads and load bearing capacity of both the existing and proposed foundations. The use of underpinning procedures is to be utilised which as stated in the Camden study is a technique widely and successfully used. Careful construction planning will address the issue of temporary localised reduction in bearing pressure, although this will not be a significant issue in this case due to the nature of the clay soils already identified as being present.

The proposed construction method utilises temporary propping so as to minimise and control any potential for ground movement during the course of the works.

The design and construction method of the basement are such that any potential changes in foundation behaviour are minimised as is any potential disturbance to the adjacent structures.

These issues are all covered in more detail in the remainder of this report.

7.3 SURFACE FLOW AND FLOODING

As highlighted before there is no requirement to carry the scoping stage further regarding this point.

8. SITE INVESTIGATION

A detailed site investigation was carried out by Fastrack on 25th of April 2013 at the front garden area as marked; see their Geotechnical Survey Report with reference 7954 as commissioned by Green Structural Engineering Ltd. Generally the investigations confirmed the presence of firm to very stiff London Clay to a 5m depth with no significant standing water.

The ground conditions found during the site investigations are consistent with published geological records and known history of the area. Typically with a thin layer of made up ground sitting on the London Clay strata as noted above.

The borehole was dry on completion and so the formation level of the proposed basement is above the ground water table. As construction of the proposed basement is above the ground water level, construction will not be affected by ground water and the finished basement will not affect the level of the ground water in the future. The new basement will be designed for the ground conditions encountered and be formed in the clay. The new basement will be designed to limit ground – bearing pressure to 100 kN/m², which is considered to be conservative. Thus the existing geology at the depth of the proposed basement will be capable of supporting the new imposed loads.

Trial pit investigations

Prior to commencement of construction; adequate trial pits will be carried out along the perimeter of the existing property to confirm the depth and extent of existing foundations.

Existing corbelled foundations are expected at a depth between 500-1000mm below existing ground floor level in general except along the part basement where it could be less.

9. STRUCTURAL DESIGN

The following Engineering design principles will be adhered to with the proposed basement development where necessary:

- the prediction of likely ground movements;
- assessing permissible movements (based on the vulnerability of nearby structures);
- designing the basement and selecting the construction method to limit the induced ground movements;
- pre-condition surveys of adjacent buildings;
- monitoring of movements and other effects during construction including crack monitoring;
- establishing contingencies to deal with adverse performance.

Preliminary calculations have been carried out for the design of the new basement retaining walls underpinning the existing masonry party walls. These new reinforced retaining concrete walls are designed as free standing in the temporary and permanent conditions to avoid the need for temporary propping of the party walls. In the permanent condition the new perimeter retaining walls will have additional lateral support from the new reinforced floor slab to the basement and ground floor slab construction.

Structural stability: Temporary works to permanent condition.

At all stages of the temporary works; a detailed system of both vertical and lateral propping shall be installed to maintain stability in the interim period. The type of props and the loading requirements will be shown on the Construction drawings and monitored by the Contractor throughout the construction period. Details of transferring the loading in the props to the new permanent works shall also be indicated on the structural drawings.

The front garden will be reduced in level with construction of the light well to provide the route for access of workmen and the passage of excavated material, plant and storage of new construction materials. A series of steel beams will be installed to provide support to the bay window, internal spine wall, rear wall and read addition flank wall prior to the commencement of the underpinning.

The new reinforced concrete walls will provide permanent support to the existing super-structure and adjacent properties.

Construction method and sequences

The proposed basement under the existing property will be formed using an underpinning method. This method of constructing the basement is achieved through the use of a series of sequenced 900-1000mm wide underpinning sections of the main structural elements. No adjacent underpins shall be constructed within a 48 hour period. The traditional 1, 3, 5, 2 & 4 sequence shall be adopted to ensure that no more than 20% of the existing building's walls are unsupported at any time. The sequence is controlled to ensure adequate support of the gravity loads from the building above and to provide adequate lateral restraint to the below ground lateral loads arising from earth, water pressure and surcharge.

As part of the above mentioned sequence this series of 900-1000mm wide underpins are structurally linked together as progress is made. The minimum thickness of the reinforced concrete stem wall would be 250mm and would also be tied to the basement and ground floor slab. The new vertical support stems are linked up together to form a reinforced concrete retaining wall or ultimately a closed reinforced concrete box at completion.

This method of construction reduces the amount of potential ground movement and minimises the effects of settlement of adjacent structures.

The structural calculations, construction method and sequence are described in more detail in Green Structural Engineering Ltd's Construction Method Statement for 1 Glenilla Rd dated 20/06/2013.

10. POTENTIAL IMPACT ON 1 GLENILLA ROAD AND ADJACENT PROPERTIES

Local sewers

This development will not impose any new surcharge loads on the local sewers below the host or adjacent properties. Sewers beneath the host property are to be re-routed and will be accessible for rodding and routine maintenance of the pump and ancillary items.

Ground Water

Due to the presence of London Clay, which limits the presence of ground water, and the distances to the nearest open water course the risk of contamination of ground water or surface watercourses is considered to be 'low'.

No signs of perched water levels for the site are evident but the Basement Construction will be designed accordingly based on the results of any further investigations.

The introduction of a permeable landscape to the rear garden will improve the current condition and it is also suggested that a rainwater harvesting tank is connected to the single storey extension's roof.

Existing Trees

Due to the presence of large tree adjacent to the boundary of the property, a detailed Arboricultural report for the site was commissioned, see Tim Moya Associates report dated April 2013, ref. 230408-PD-11. The report considers the potential impact of the development and condition of the trees with recommendations to manage risk. The basement design, construction methods and site management will take account of the presence of these trees accordingly.

Foundation and Basement Design

The investigation has indicated that formation level for the basement will be within the stiff London Clay. With reference to the Soil investigation report, significant groundwater inflows are not anticipated during basement excavation, although some groundwater inflows may be encountered from perched water from within the made ground. It is considered likely that the rate of any inflows will be relatively slow and localised and should be adequately dealt with through sump pumping, although it will be necessary to carry out trial excavations to confirm this view. The design of basement support in the temporary and permanent conditions will take account of the need to maintain the stability of surrounding structures and to protect against perched groundwater inflows.

Basement Heave

The proposed construction of the 3.6/6.3m deep basement will result in an unloading of the London Clay at formation level. The excavations will result in approximate unloading of the soil, which will result in an elastic heave and long term swelling of the London Clay. These movements will be mitigated to some extent by the applied structural loads but the basement floor slab will need to be designed to accommodate heave movements or suspended accordingly. A detailed heave analysis will be undertaken prior to construction to confirm.

Structural settlement or damage

The underpinning process involves transferring the foundation loads to a lower level and inevitably this leads to some settlement. Some movement will also be caused by the sequential transfer of load between different parts of the structure but the careful control of the underpinning process and sequence will keep such movements to a practicable minimum. Particular care will be taken in the vicinity of the more vulnerable parts of the existing fabric.

The depth to the London Clay and the modest dimensions of the site are such that the heave of the Clay is unlikely to exceed a few millimetres or to have any discernible effect outside the site boundaries. Any movement that does occur will be further mitigated by the necessarily slow rate of the excavation and construction.

As explained above, by installing adequate temporary propping and new permanent works the anticipated movements caused by the development are to be limited to not exceed 5mm at any location within the host or adjacent properties.

Movement not exceeding 5mm will keep the movements within the Slight category as defined by BRE Digest 251, Category 2 of damage defined as Slight – up to 5mm and described as:

- Cracks easily filled.
- Redecoration probably required.
- Recurrent cracks can be masked by suitable linings.
- Cracks not necessarily visible externally, some external re-pointing may be required to ensure weathertightness.
- Doors and windows may stick slightly.

Waterproofing Systems

A cavity drainage system is proposed which will be connected to sump chamber and pump system. The waterproofing system will be installed in accordance with a specialist contractor's details in conjunction with a manufacturer's technical specifications once the basement slab is complete.

11. SUMMARY

The above assessment finds that the proposed basement development is within the expected norm for a small scale residential basement excavation and that the proposed development has no triggering factor which initiates an instability problem in an area which otherwise would have remained stable for the foreseeable future.

We therefore can conclude that the proposed development is unlikely to result in any specific issues relating to land or slope stability, the hydrogeology and hydrology of the site. Suitable construction methods will ensure slope stability at the site and there should not be any negative impact on the groundwater.

We are of the opinion that the proposed basement construction has no long term detrimental impact to either the water environment or the neighbouring properties.