edge structures

13-15 Willes Road, NW5
Basement Impact Assessment Report

Project No: 9001 44

Date: 29 August 2012

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Revision History

Rev	Date	Purpose/Status	Document Ref.
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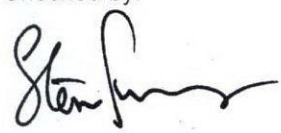

Dr Stephen Parsons, BSc PhD CEng MICE MIStructE

1 Purpose and Planning Policy Context

As part of the current Camden Local Development Framework (November 2010), there is an obligation on Developers to address the potential impacts of new basement designs with respect to (i) surface water flooding, (ii) subterranean groundwater flow and (iii) ground stability.

A screening process is presented in the Camden Planning Guidance1 that identifies whether further examination of these issues are required. Such examination is also required to address design mitigation of potential impacts and as may be required. This report articulates all this work in the form of a Basement Impact Assessment (BIA) that is specific to the design proposals and the Site.

This BIA report is the latest part in a sequence of work on the design proposals. This has involved a Desk Study including a draft conceptual ground model and scoping of intrusive Site Investigation (SI); and then SI work leading to a factual report. Relevant interpretation of the SI and revision of the conceptual model is made as part of this report.

Sections 2 and 3 of this report describe the site and the proposals: Section 4 details the screening and scoping stages of the Basement Impact Assessment: Section 5 details the relevant findings of the Site Investigation: Section 7 evaluates the Land Stability issues that are required to be addressed and Section 8 provides a summary of the process and the findings.

Edge Structures Ltd has been appointed as the consulting civil and structural engineer for the townhouse development on the application site and has been instructed to prepare this Basement Impact Assessment Report as part of the planning application.

This report has been prepared specifically as part of a preparatory process leading to planning submission and development of the site of 13-15 Willes Road and to the drawings identified here. It is not designed to be used for other purposes.

2 The Existing Site and Site History

It is proposed to construct two new townhouses with single basements in the land between 17 Willes Road, NW5 and the Kentish Town Sports Centre. The sports centre itself was subject to extensive alterations and additions in about 2008/9 and this project left vacant the parcel of land which is now the subject of this report and the planning application.

The planning application for the sports centre included for the construction of townhouses in this location but at that time three smaller houses were envisaged and these did not include basements.

Part of the buildings which were demolished for the sports centre redevelopment did include basements under part of the site for the current application and it is proposed that where these structures still remain beneath the site, these will be re-used where possible if only to provide temporary support to the public highway on that part of Willes Road while the new construction works are underway.

Both the original and the redeveloped sports centres had/have extensive basements up to the southern boundary of the application site which are far more significant in plan area than the basements for the two proposed new houses so the impact of the new construction on the application site is anticipated to be negligible.

Because of the recent redevelopment of the sports centre, there is a considerable amount of record information available which amply covers the application site.

The existing house at 17 Willes Road is understood to have originally been a semi detached property similar to others in the street as is evidenced by historical maps of the area. This

house has three storeys above ground and no basement. The adjoining house appears to have been demolished around 1901 when the Grafton & Willes Road baths were developed. There is now a system of temporary steel shores on the application site which were installed during the sports centre redevelopment works and which provide some precautionary support to the party wall while this is exposed to the elements until the application site is developed against it.

3 Description of Proposed Development

The proposed development works involves the construction of two new townhouses each with a basement, ground and two upper storeys. The houses will adjoin the flank party wall to No 17 Willes Road as well as the northern wall to the recently redeveloped sports centre.

The basement is to extend over the footprint of the new houses up to the front boundary and into the rear garden to provide level access to the garden at that level. The rear garden then steps up to ground level towards the rear part of the site. See Autor Architecture drawing 509 04 1410.

The basement construction works will involve excavating to a similar level as the new sports centre development but below the level of the public highway and the ground floor and garden to 17 Willes Road. Temporary and permanent works will therefore be required

Upholding will be required to the party wall with No 17 Willes Road and this is dealt with in the appended drawings and later sections of the report.

To the front boundary there is an existing retaining wall supporting part of the highway in front of the previously existing front lightwell which has since been infilled. This will be reused as part of the new works. The remaining part of the front boundary will be temporarily supported during the works until a new permanent reinforced concrete retaining wall is constructed.

4 Basement Impact Assessment Stages

When developing new basements within its jurisdiction, the London Borough of Camden requires under Camden Planning Guidance 4 "Basements and Lightwells" (CPG4) that 5 stages are followed to assess the impacts of developing the new basement on the local hydrogeology, surface water flooding and slope stability. This document is designed to follow those stages and to demonstrate the impacts of this new development. In the case of this development, the site forms a small part of a much larger development for the Kentish Town Sports complex constructed in 2007/8 so there is much information readily available which is specific to the site. It is still necessary to establish the need for a scoping of a BIA for the application site because this requirement was not current at the time of the 2007 application and the impacts we are assessing at this stage relate to the localised effects of the new basement. However, the benefit of the larger overall development is that there is a great deal of relevant information which is readily available.

4.1 Screening

Screening is the process of determining whether or not a BIA is required for a particular project. This is determined by answers to questions in a simple flow chart and these answers are provided in the table below:

4.1.1 Surface Flow and Flooding

Impact question	Answer	Justification	Reference
1) Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is not in this catchment.	Figure 14 (Arup, 2011)
2) As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?	No	The site was previously occupied by part of the sports centre which was drained to the sewer under Willes Road. The roof and hard surface area for that development was significantly greater than for the proposed development.	Planning Application . 2007/4426/P for former sports centre & 2007 alterations
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	No	The site was previously occupied by part of the sports centre which was drained to the sewer under Willes Road. The roof and hard surface area for that development was significantly greater than for the proposed development.	Planning Application . 2007/4426/P for former sports centre & 2007 alterations
4) Will the proposed basement result in changes to the profile of the inflows (instantaneous and longterm) of surface water being received by adjacent properties or downstream watercourses?	No	The site was previously occupied by part of the sports centre which was drained to the sewer under Willes Road. The roof and hard surface area for that development was significantly greater than for the proposed development.	Planning Application . 2007/4426/P for former sports centre & 2007 alterations
5) Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?	No	As above. No change to either run-off or infiltrating water is anticipated as a result of the development.	
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	The site is not in these areas, or another area or street liable to flooding, and not close to a surface water feature. It is outside the area of a floodplain.	Figure 15 (Arup, 2011) Environment Agency flood mapping (http://www.environment-agency.gov.uk/homeandleisure/37837.aspx).

4.1.2 Subterranean (Groundwater) Flow

Impact question	Answer	Justification	Reference
Question 1a: Is the site located directly above an aquifer?	No	The site is listed as being underlain by unproductive strata.	Figure 8 (Arup, 2011)
Question 1b: Will the proposed basement extend beneath the water table surface?	No	The site investigation included standpipes which demonstrated that the water level did not rise above the existing basement level	Site Investigation Report for Sports Centre Redevelopment. Dated August 2007.
Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	Yes	The site is close to the line of the culverted Fleet River which serves as a storm sewer to the site to transport storm water south to the River Thames.	Barton[1], Lost Rivers Of London (Figure 2) as reproduced in Arup report Fig 11.
Question 3: Is the site within the catchment of the pond chains on Hampstead Heath?	No	The site is not in this catchment.	Figure 14 (Arup, 2011)
Question 4: Will the proposed basement development result in a change in the proportion of hard surfaced /paved areas?	No	The site was previously occupied by part of the sports centre which was drained to the sewer under Willes Road. The roof and hard surface area for that development was significantly greater than for the proposed development.	Planning Application . 2007/4426/P for former sports centre & 2007 alterations
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	The site was previously occupied by part of the sports centre which was drained to the sewer under Willes Road. The roof and hard surface area for that development was significantly greater than for the proposed development. It is not proposed to provide soakaways on this project but to re-use the existing sewer under Willes Road	Planning Application . 2007/4426/P for former sports centre & 2007 alterations
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	The site is not close to a pond	

4.1.3 Land Stability

Impact question	Answer	Justification	Reference
Question 1: Does the existing site include slopes, natural or manmade, greater than 7°? (approximately 1 in 8)	No	The site is essentially flat	Refer Site survey dated July 2012
Question 2: Will the proposed re-profiling of landscaping at site change slopes at the property boundary to more than 7°? (approximately 1 in 8)	No	The site will remain flat	Refer application plans and sections.
Question 3: Does the development neighbour land, including railway cuttings and the like, with a slope greater than 7°? (approximately 1 in 8)	No	The areas surrounding the application site are essentially flat	Refer Site survey dated July 2012
Question 4: Is the site within a wider hillside setting in which the general slope is greater than 7°? (approximately 1 in 8)	No	The general area has a slope of less than 7°	Ref Fig 16 of the Arup report
Question 5: Is the London Clay the shallowest strata at the site?	Yes	The area is clearly in an area of outcropping London Clay Local head deposits were found on other parts of the sports centre site but not in the area of the current application site	Ref Fig 4 of the Arup report and Site Investigation Report for Sports Centre Redevelopment. Dated August 2007.
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	There are no trees on the site. There are trees within the Willes Road footpath adjacent to the site but there are no special requirements within the site boundary in terms of protection of the roots to these trees.	Refer Site survey dated July 2012
Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Yes	The area is prone to seasonal shrink/swell effects by its nature of being located on outcropping London Clay. However, there is no significant evidence of such effects on the site or on its immediate neighbours	Refer to photographs of adjoining house at No 17 Willes Road
Question 8: Is the site within 100m of a watercourse or a potential spring line?	Yes	The site is close to the line of the culverted Fleet River which serves as a storm sewer to the site to transport storm water south to the River Thames.	Barton[1], Lost Rivers Of London (Figure 2) as reproduced in Arup report Fig 11.
Question 9: Is the site within an area of previously worked ground?	No	The site was previously developed firstly and in part as one of a pair of semi detached houses and then as part of the Grafton Road Pool complex. The southern part of the site still contains the basement from the sports centre use.	Refer Site Investigation Report for Sports Centre Redevelopment. Dated August 2007.
Question 10: Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be	No	The site is listed as being underlain by unproductive strata.	Figure 8 (Arup, 2011)

required during construction?			
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	The eastern boundary of the site adjoins the footpath to Willes Road. Approximately half of this boundary already has a basement with a brick retaining wall to the footpath boundary	Refer existing structures drawings and records from Sports centre redevelopment
Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	No 17 Willes Road has no basement and shares a party wall with the new development. This party wall originally divided No 17 from No 15 which were constructed as semi detached houses.	
Question 14: Is the site over (or within the exclusion zone of) any tunnels, e.g. railway lines?	No	An envirocheck survey has been carried out and historical maps studied. No records of tunneling under or near the site have been identified.	Refer Site Investigation Report for Sports Centre Redevelopment. Dated August 2007.

4.2 Scoping

The following is an extract of the tables produced above as part of the screening process. The table has been extended to indicate information that ought reasonably be provided as part of the application as well as factors that we believe should be considered and any recommendation for further action.

Impact question	Answer	Justification	Reference	Information to be provided	Other Factors	Recommendations
Surface Flow and Flooding - No issues identified that require consideration at scoping stage						
Subterranean (Groundwater) Flow						
Question 2: Is the site within 100m of a watercourse, well (used/disused) or potential spring line?	Yes	The site is close to the line of the culverted Fleet River which serves as a storm sewer to the site to transport storm water south to the River Thames.	Barton[1], Lost Rivers Of London (Figure 2) as reproduced in Arup report Fig 11.	Copy of Map extract & plan of sewers showing culvert	The culverting of the Fleet River is well documented and it can now be considered that this is a sewer in the context of this site as opposed to a local watercourse.	As the river is now culverted and whilst the strict answer to the question is "Yes" it is not necessary to further consider any impact of this feature on the application site.
Land Stability						
Question 5: Is the London Clay the shallowest strata at the site?	Yes	The area is clearly in an area of outcropping London Clay Local head deposits were found on other parts of the sports centre site but not in the area of the current application site	Ref Fig 4 of the Arup report and Site Investigation Report for Sports Centre Redevelopment. Dated August 2007.	Site investigation report; photos of No 17 and trees in Willes Road	The main consideration is the relatively shallow depth of the foundations to No 17 which has no basement.	Use a traditional underpinning method with a carefully controlled sequence and a high standard of workmanship to ensure a smooth transition of load to the new foundation with minimal impact o the existing structure. Traditional underpinning has been used in this way extensively and successfully in these soils in the London area.
Question 7: Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Yes	The area is prone to seasonal shrink/swell effects by its nature of being located on outcropping London Clay. However, there is no significant evidence of such effects on the site or on its immediate neighbours	Refer to photographs of adjoining house at No 17 Willes Road			
Question 8: Is the site within 100m of a watercourse or a potential	Yes	The site is close to the line of the culverted Fleet River which serves as a	Barton[1], Lost Rivers Of London (Figure 2) as reproduced in	Copy of Map extract & plan of sewers	See response to Q2 under Groundwater Flow	See response to Q2 under Groundwater Flow

spring line?		storm sewer to the site to transport storm water south to the River Thames.	Arup report Fig 11.	showing culvert		
Question 12: Is the site within 5m of a highway or pedestrian right of way?	Yes	The eastern boundary of the site adjoins the footpath to Willes Road. Approximately half of this boundary already has a basement with a brick retaining wall to the footpath boundary	Refer existing structures drawings and records from Sports centre redevelopment	Survey; photos of street frontage with trees; existing services information; details of permanent and temporary works methodology	Consider half frontage already supported behind extg brick retaining wall	Use temporary propped retaining wall with permanent construction inside. Allow for surcharge on footpath; maintain propping at all times. Temporary retaining structure to remain in place within site boundary on completion
Question 13: Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Yes	No 17 Willes Road has no basement and shares a party wall with the new development. This party wall originally divided No 17 from No 15 which was constructed as a pair of semi detached houses.			See response to Q5 & Q7 above	See response to Q5 & Q7 above

To summarise the scoping exercise above, the issues of surface water flow and flooding and groundwater flow have been satisfied without further action. With regard to the land stability issues, the main consideration here is that the site is in an area underlain by London Clay which is subject to seasonal shrinkage and swelling so there is concern about ground movement resulting from the unloading of that part of the site which previously had no basement and also the potential for differential movement in No 17 due to seasonal effects. A carefully designed and constructed underpinning operation would be the normally accepted method of construction in such circumstances providing that the ground conditions allow for this.

A Desk Study and Site Investigation are required to assess the engineering nature of the soils beneath the site.

Given the recent history of redevelopment at the site, a site investigation is already available so the task required is to assess whether this report provides appropriate information given the revised design for the townhouses site including a basement and also the requirements for a Basement Impact Assessment at planning stage which is a requirement that has been introduced since the site investigation was carried out.

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5 Site Investigation

5.1 Topography

The site is essentially flat having been reworked for both the 19th century houses and the twentieth century sports centre.

5.2 Geology and Ground Conditions

5.2.1 *Setting*

The Desk Study work examined the 1:10 000 scale geological map from 1935 and the 1:50,000 scale sheet 295 "North London" dated 2006 [2]; Camden Geological, Hydrogeological & Hydrological study[3] and the August 2007 site investigation report for the sports centre redevelopment (including this site)[4]. The geological maps showed that the Site sits on the near-surface or out-cropping soil layer of London Clay formation and the thickness of this stratum locally may be between 70 and 100m deep.
The SI provided coverage across the entire sports centre site with two trial holes located directly on the site for the new townhouses and one borehole located just to the south of the southern boundary for the townhouse site. The wider site investigation provides extensive cover of the sports centre site generally. The investigation revealed that the entire site is underlain with London Clay at shallow depth beneath a shallow thickness of made ground below the ground or basement floors as appropriate to location.

It is noted also that all the boreholes terminated in the London Clay horizon and the local stratum thickness was unproven.

2 Sheet V NW Obtained via Sitecheck Data by the Landmark Information Group
3 London Borough of Camden, Camden Geological, Hydrogeological & Hydrological study, Guidance for subterranean development, Issue 01, November 2010.
4 Alan Baxter & Associates – Camden application 2007/4426/P

5.2.2 *Site Investigation Observations*

Borehole BH1 was carried out close to the southern boundary of the application site and was excavated from Ground Level and showed the London Clay to start at 1.6m depth with the material above this being Made Ground. Trial Pit TP1 was excavated from the existing basement level to the front elevation on Willes Road and showed that the London Clay is found at 1m depth in this location beneath mainly Clayey Made Ground. TP8 was excavated from ground level at the northern boundary of the property adjoining the boundary with No 17 Willes Road and indicated London Clay at 0.9m depth below a layer of Made Ground.

The Site Investigation essentially demonstrates that the new basement will be constructed within a depth at which the London Clay horizon originally appeared but that the top of the clay has been reworked previously to allow the construction of the house that formerly stood on the site and the sports centre that followed along with its own basement.

The desk study confirmed that the line of the river Fleet passes the western boundary of the sorts centre site so does not immediately pass through the line of the single basements proposed for the two dwellings that are the subject of this application and there are no reports of any issues relating to the fact that there was previously (and still exists to date) a basement structure across the southern half of the application site.

5.3 Groundwater

5.3.1 Setting

From Camden's Geological Study[7] – Watercourses of lost rivers in London, see Figure 3, shows that an old tributary to the River Fleet existed passing near the Site to the east and another further to the west side of the site, the two tributaries converging together just north of Camden Town Station and then southwards towards the Thames. The River Fleet was

culverted in the mid nineteenth century and regardless of its original location, we believe that it is now carried in the culvert beneath Willes Road which serves as the main north – south sewer in the area. In this case the Fleet has long ceased to connect locally with any local groundwater system.

5.3.2 *Site Investigation Observations*

Boreholes were bored dry into the London Clay although a standpipe in BH 1 recorded groundwater at 24.62m AOD which is below the proposed basement level. Water seepage was recorded in Trial Pits TP1 and TP9 were recorded above the proposed basement level at the bottom of the made ground and just above the weathered London Clay. The report goes on to state:
"Based on the conditions found during the investigation groundwater control should no generally be required for shallow or deep excavations. However, localized seepages, from groundwater perched within the made ground, should be expected. Dewatering by pumping from screened sumps should be more than sufficient to deal with any such groundwater inflows and keep excavations dry."

6 Conceptual Geotechnical Ground Model

Following the Site Investigation the Conceptual Geotechnical Ground Model key features are revised and summarised as follows:

- The townhouse site was previously part occupied by a Victorian semi detached house with no basement and then the sports centre with part basement.
- Made ground exists generally up to approximately 1.3m depth with variable depth across the site and reflecting re-profiling of the Site levels. Otherwise the London Clay extends up towards the surface and to sufficient depth for the purposes of the proposed new basement design;
- The River Fleet passes close to the Site in a culvert with no evidence found for crossing of the Site itself;
- Some weathering and geological reworking of the top of the London Clay but no evidence for higher than characteristic permeabilities for the London Clay from close inspection of the fabric or water observations;
- Groundwater levels are still probably high in the London Clay and the variation seen in the standpipes demonstrates the low permeability of the Clay rather than ambient and equalized pore pressures;

7 Land Stability: Evaluation

The existing ground level gradients on and around the Site are not sufficiently large as to cause stability issues with the London Clay in either the short- or long-term and the proposed basement works do not alter these gradients. There will be a need to retain the ground adequately during and after construction, for example using an embedded piled retaining wall and/or underpinning techniques. No new sloping ground surfaces are proposed as part of the proposed new works.

The flow chart provided in "Camden Planning Guidance 1: Design" is considered with respect to land stability issues and it is noted that:
i) the Site is within 100m of an historic sub-surface watercourse;
ii) the ground conditions have been examined through an SI;
iii) the Site is demonstrably on out-cropping London Clay;
The Site Investigation work undertaken and the examination provided here supports the view that the historic sub-surface watercourse identified passes the Site in a culvert to the east. Land stability issues on the Site are not likely to be significant beyond what is usual for out-cropping London Clay.
In view of all the above, it may be concluded that 'no further assessment of land stability [is] required.'

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8 Discussion and Conclusions

Screening and scoping exercises have been carried out in accordance with the Camden Planning Guidance note. This exercise has demonstrated that issues of groundwater flow and surface water flooding do not require any further examination for this site.

Issues of land stability do need to be addressed within the design to address the issues of the effects of seasonal soil swelling and shrinkage and the fact that the new basement will extend below the level of the foundations to No 17 Willes Road which has no basement and that the basement will bound the public highway on Willes Road. All of these issues can be addressed using a traditional underpinning technique in conjunction with adequate temporary and permanent propping.

In summary this assessment has demonstrated that the development proposed as part of this application can be safely constructed using conventional techniques without causing flooding due to ground or surface water or unacceptable movement of adjacent structures.
Construction methodology drawings are also available to illustrate how the basement will be constructed.
Good practice in construction is necessarily assumed. For example, each of the wall piles are installed and concreted within a working shift and without allowing free (or surface water) into the bores prior to concreting. It is also assumed that the project is constructed at commercially sensible rates of construction given the site constraints, in particular (e.g.), that the works are not left after an excavation phase in an unfinished state for many months and prior to continuation and completion of the permanent structural works.

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Appendices:

Appendix A – Existing Site Photographs
Appendix B – Hampstead Heath Surface Water Catchments & Drainage
Appendix C – Surface Water Flooding
Appendix D – Camden Aquifer Designation Map
Appendix E – Underground Rivers And Watercourses (By Barton)
Appendix F – Existing Site Slopes (Survey 2012)
Appendix G – Hillside Setting – Slope Angle Map
Appendix H – 17 Willes Road Photographs
Appendix I -- Site Investigation Report (2007 – issued separately)

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APPENDIX A – EXISTING SITE PHOTOGRAPHS

Photo 1 – Site elevation to Wiles Road prior to sports centre demolition in 2008.
Photo 2 – Gable wall to 17 Wiles Rd with temporary shoring
Photo 3 – Wiles Rd elevation showing new sports centre and temporary shoring
Photo 4 – Elevation to 17 Wiles Rd house and rear extension

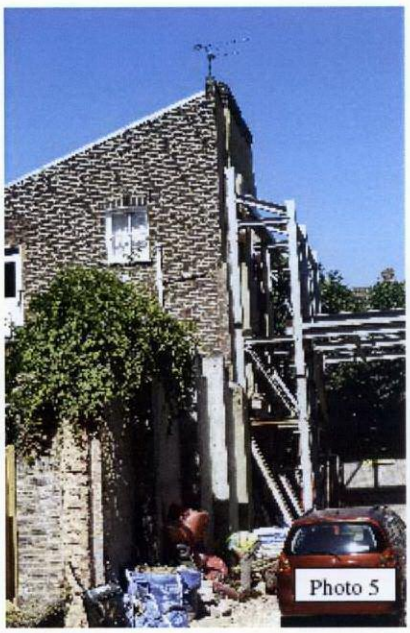
Photo 5


Photo 6


Photo 7


Photo 8

Photo 5 – Elevation to 17 Willes Rd house and rear extension.
Photo 6 – New sports centre elevation
Photo 3 – temporary shoring to 17 Willes road
Photo 4 – 17 Willes Road at Ground level.

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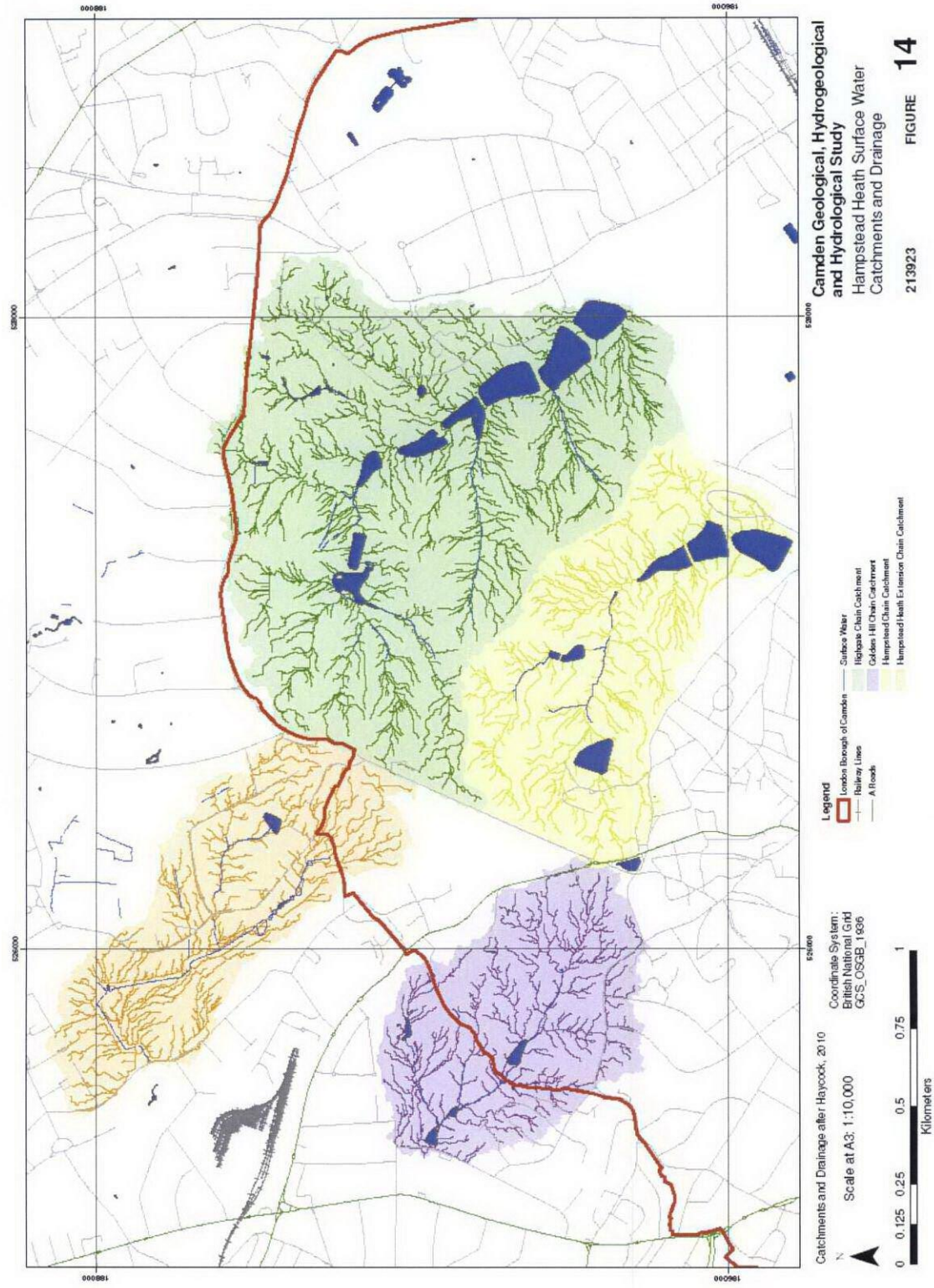
APPENDIX B – HAMPSTEAD HEATH SURFACE WATER CATCHMENTS & DRAINAGE



APPENDIX C – SURFACE WATER FLOODING

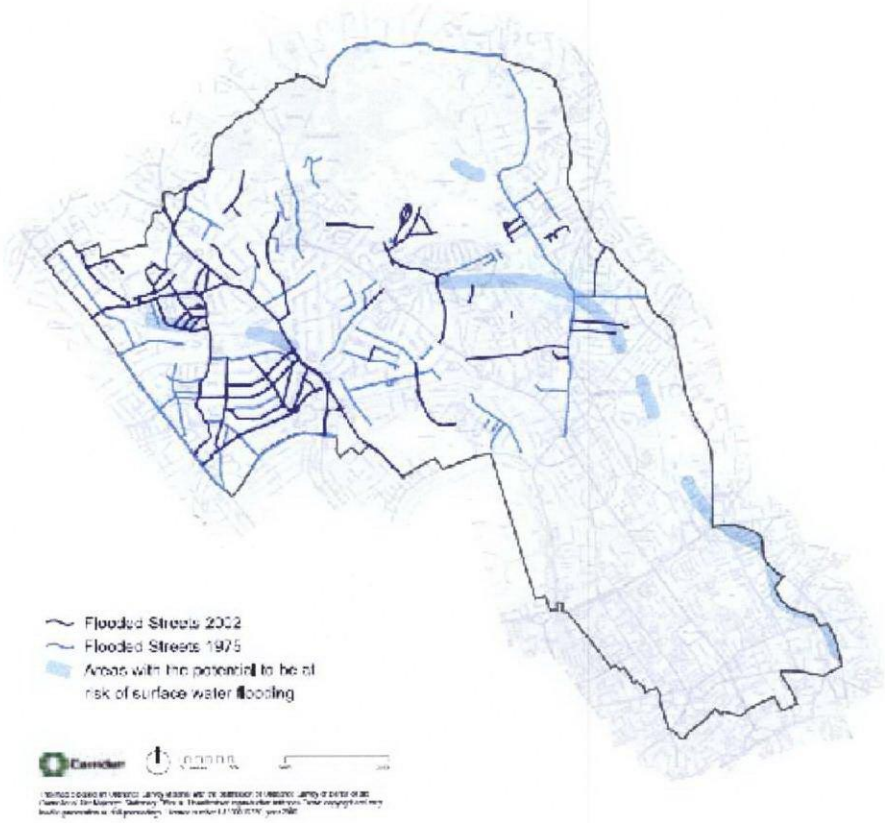


Figure 5 from Core Strategy, London Borough of Camden

Camden Geological, Hydrogeological and Hydrological Study
Flood Map

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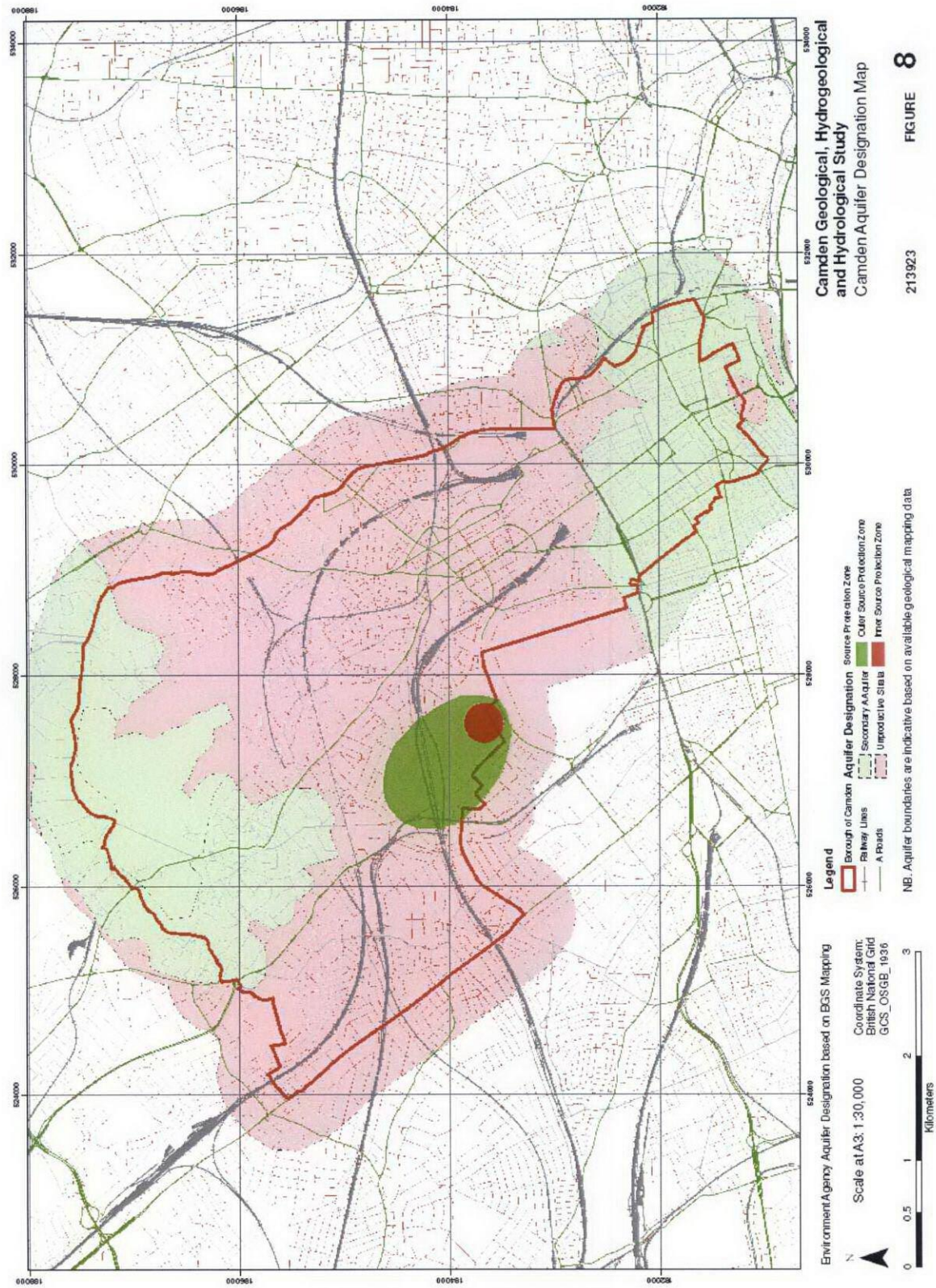
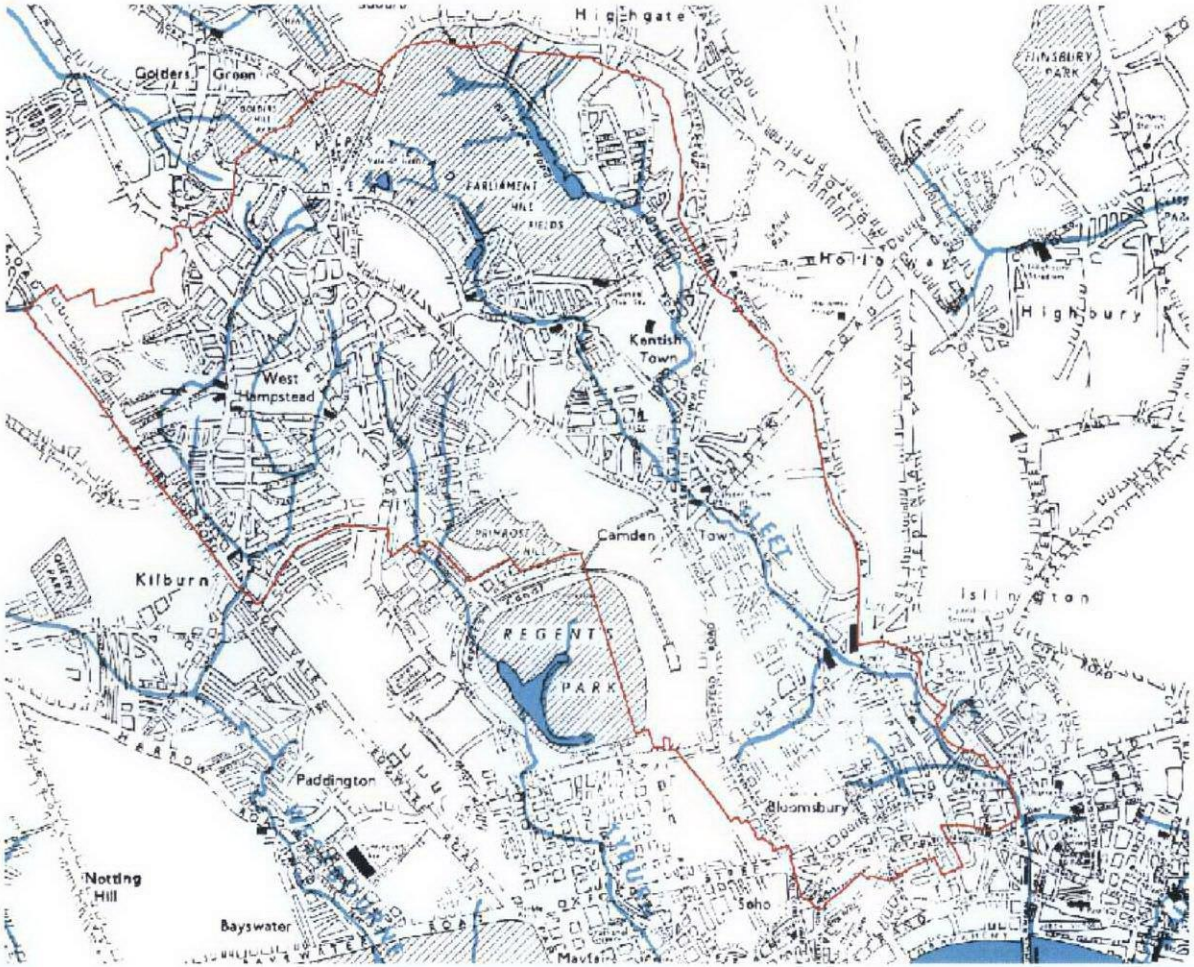
APPENDIX D – CAMDEN AQUIFER DESIGNATION MAP





Source – Barton, Lost Rivers of London

Camden Geological, Hydrogeological and Hydrological Study
Watercourses

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FIGURE **11**

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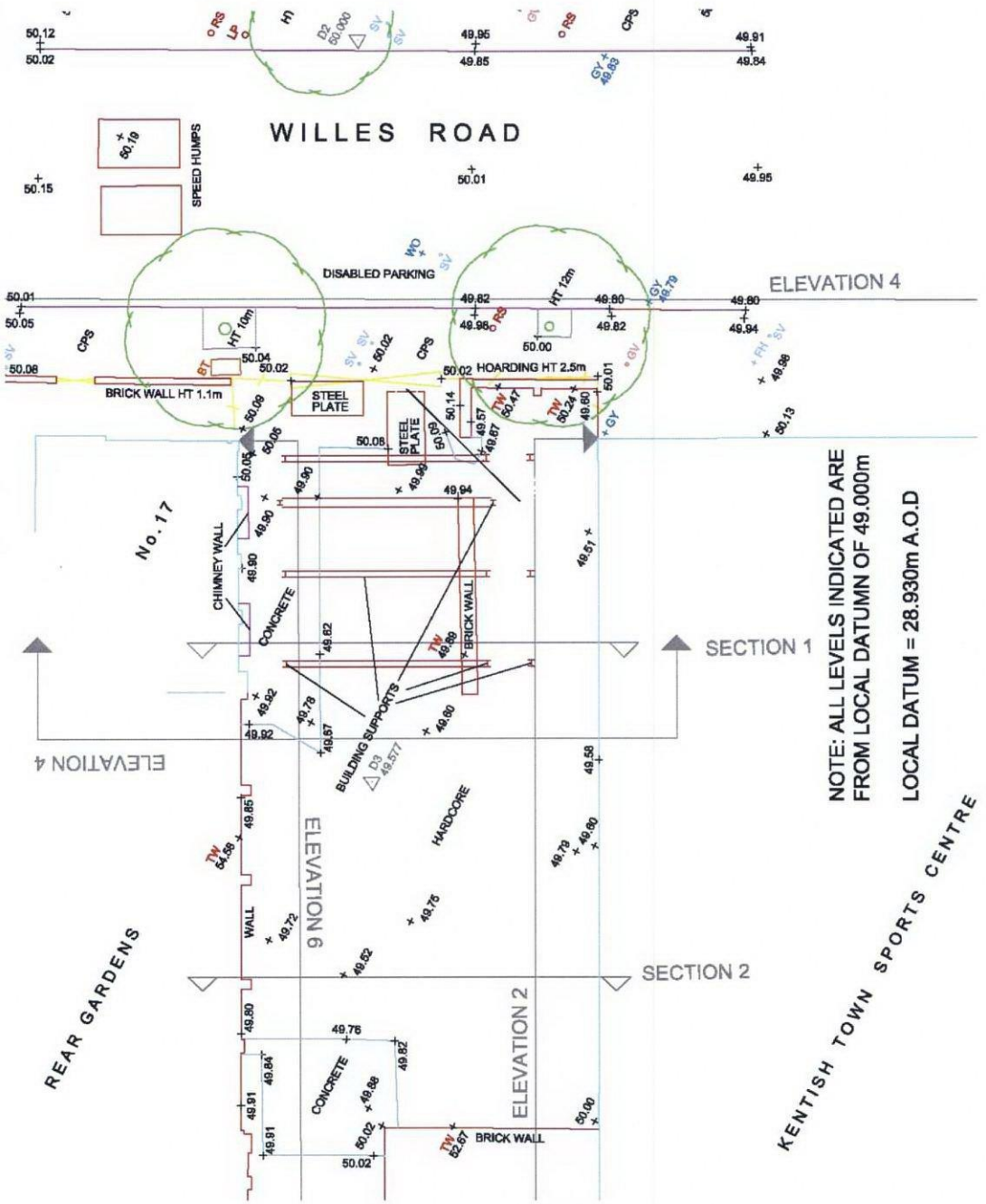
APPENDIX F – EXISTING SITE SLOPES (SURVEY 2012)



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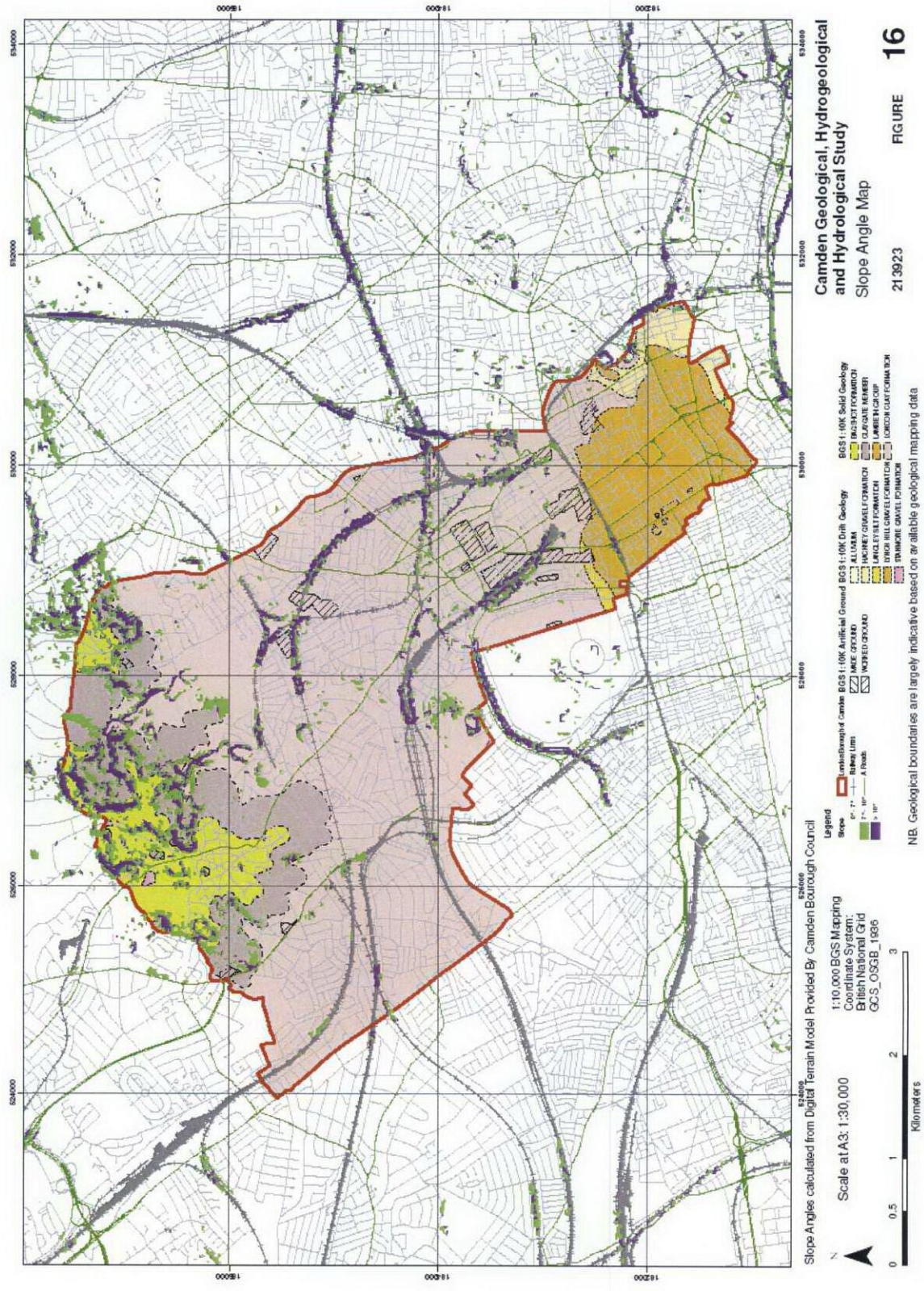
APPENDIX G – HILLSIDE SETTING – SLOPE ANGLE MAP



APPENDIX H – 17 WILLES ROAD PHOTOGRAPHS

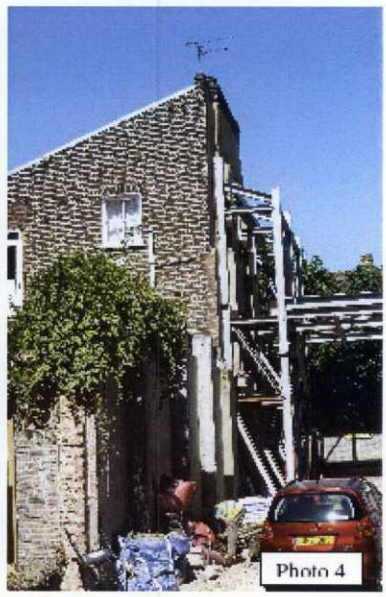
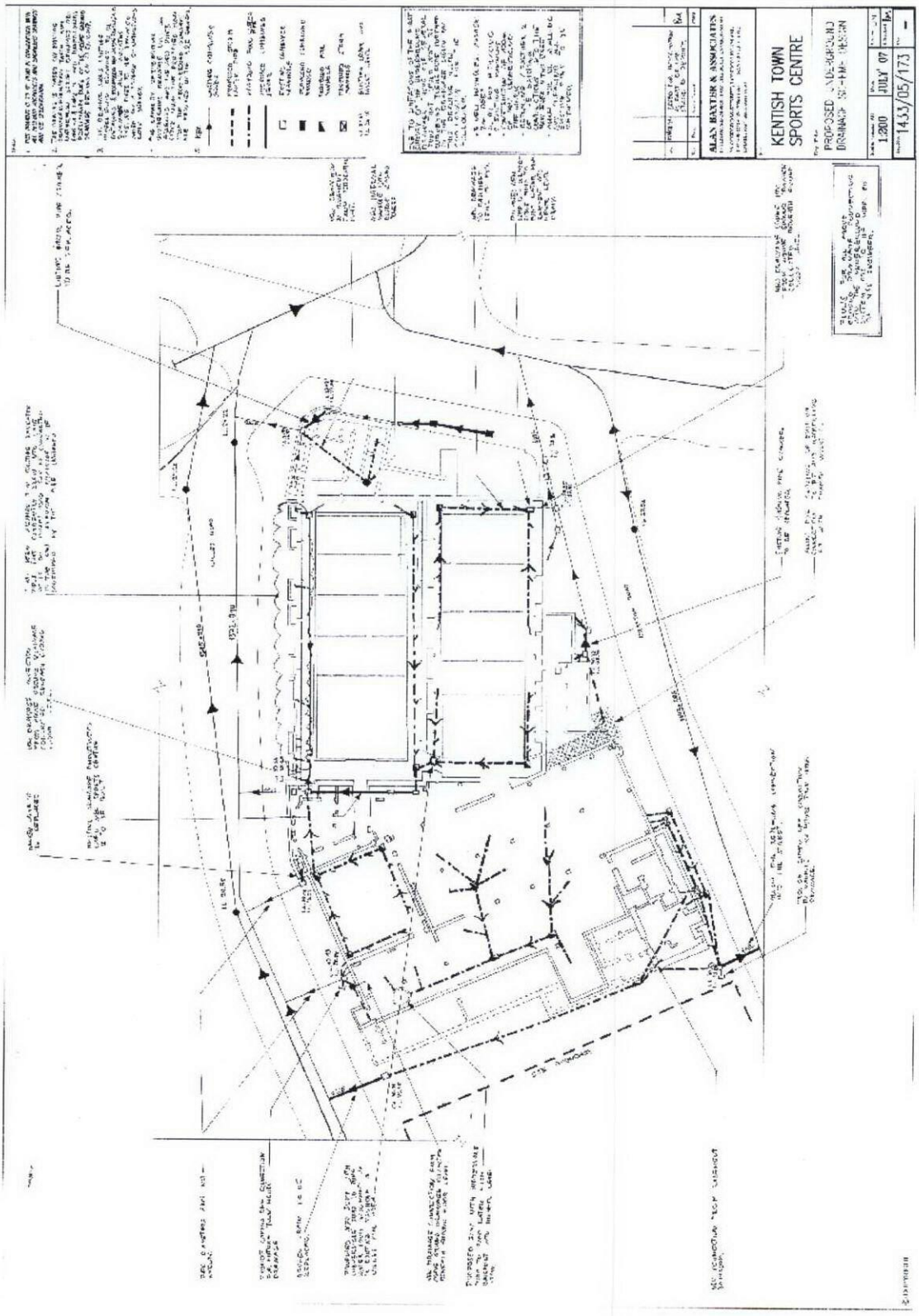


Photo 1 - Front elevation as existing
Photo 2 – Gable wall to 17 Willes Rd with temporary shoring
Photo 3 - Front elevation as existing
Photo 4 – Elevation to 17 Willes Rd house and rear extension

edge structures

APPENDIX I – UTILITIES PLAN SHOWING SEWERS & CULVERTED RIVER FLEET



edge structures

APPENDIX J – SITE INVESTIGATION (AUGUST 2007)

Note due to size this document is issued separately.