44 Ferncroft Avenue, London, NW3

Planning Application Structural Report

Ref: 110601/JF
Date: February 2013
Rev No: Planning

conisbee

Consulting Structural Engineers
Consulting Civil Engineers

1 – 5 Offord St London N1 1DH
Telephone 020 7700 6666
Fax 020 7700 6686

design@conisbee.co.uk
www.conisbee.co.uk

INVESTORS IN PEOPLE

CCAS ISO 14001 Registered UKAS ENVIRONMENTAL MANAGEMENT 055
2010/586

CCAS ISO 9001 Registered UKAS QUALITY MANAGEMENT 055
2010/586

Norwich Office
9 – 10 Redwell Street
Norwich NR2 4SN
Telephone 01603 628 074

Table of Contents

1.0 INTRODUCTION

1.1 44 Ferncroft Avenue is a partially semi detached house (attached by only a single story side extension to one side) arranged over three storeys plus plus a basement immediately beneath approximately half of the ground floor of the main house, situated on the west side of Hampstead.

1.2 The current owners of the ground floor flat own the freehold to the building which has four additional apartments on the upper floors. They intend to undertake a thorough remodelling of the ground floor apartment including extending the basement to create a complete basement storey, and associated landscaping changes to provide light and access.

1.3 Conisbee have prepared a Flood Risk Assessment and Drainage Strategy which is appended in Appendix B.

1.4 This report has been prepared to discuss the structural implications of the development and is to be read in conjunction with the parallel Screening and Scoping Study for the basement impact assessment carried out by Conisbee

1.5 The report is prepared by Jessica Foster CEng MEng MIStructE on behalf of Conisbee.

2.0 EXISTING STRUCTURE

2.1 The existing property is a partially semi detached dwelling of three stories. The property is of traditional construction, with brick load-bearing walls on brick corbelled spread foundations and timber floors and roof. Intermediate supports to the floors are provided by the brickwork internal partitions. There is a single storey extension to the right hand side of the house (looking from the front) which shares a party wall with a similar extension to the property next door. The property is otherwise detached.

2.2 The building is in Camden Conservation area Conservation Area Redington Frognal.

2.3 The building is not listed.

3.0 PROPOSED DEVELOPMENT & STRUCTURE

3.1 The ambition is to create a basement under the entire footprint of the original house, remodelling the front and rear gardens to create lightwells and terracing, and remodelling of the rear elevation at ground floor level including removal of an existing extension. This will demand a carefully planned sequence of operations – first to pick up all the load bearing elements of the existing structure, then to permit safe excavations underneath and finally to transfer the loads onto the new permanent structure – all without allowing significant settlements or subsidence taking place.

3.2 Alterations to the original house will include opening up the ground floor to create larger reception areas, removing an existing extension at ground floor and remodelling an existing bay window.

3.3 Alterations at ground floor will be made supporting the upper storeys on new steel beams after completion of basement works.

3.4 The basement perimeter below the building is to be formed by underpinning the existing perimeter walls using traditional mass concrete underpinning with a reinforced concrete liner wall picking up lateral loads and new vertical loads from the new concrete ground floor slab and will act as a retaining and supporting wall under both temporary and permanent conditions.

3.5 Internal walls will be supported on Pynford beams which will be supported on plunge columns on sacrificial piles. This will allow the new basement to be excavated below the existing structure. Propping will remain in place until the base raft and ground floor slabs have been constructed.

3.6 The extent of the basement and terraced landscaping beyond the building footprint is to be formed using contiguous piled walls with a 200mm thick liner wall providing lateral stability.

3.7 Vertical loads from the upper loadbearing stories will be transferred at ground floor level on beam strips within the new concrete slab and supported on new RC columns which will in turn be supported on thickenings in the basement raft slab

3.8 Lateral stability is provided by the reinforced concrete ground floor and basement construction. Where walls are removed at ground floor level lateral support will be retained by the steel frame and connections.

3.9 Appendix A contains a construction sequence for the basement below the existing building footprint.

3.10 Refer to structural scheme drawings within Appendix A.

4.0 FLOODING AND GROUND WATER CONTROL.

4.1 With reference to the Environment Agency's website, the site is not at risk from flooding from neither rivers, reservoirs nor the sea.

4.2 As the house is within a street listed as having suffered flooding in the past, as required, Conisbee have carried out a Flood Risk Assessment – see Appendix B

5.0 CONSTRUCTION METHOD STATEMENT

5.1 The following outline sequence of construction is to indicate the proposal to be implemented for the construction of the new basement and alterations to 44 Ferncroft Avenue. The final choice of methodology and sequencing of work for the project will be decided by the main contractor and developed in detail by their special sub-contractors (in discussion with Conisbee). A sketch drawing to show the method of construction is contained within Appendix A

5.2 The Contractor is responsible for the stability and structural integrity of the works, including enabling, temporary works and site storage, and their effect on surrounding ground, trees and structure during the full construction and post construction phases.

5.3 The method statement is to be read in conjunction with appended Conisbee drawings, reports and Lipton Plant Architects drawings.

1. Site set up including providing protected access to the upper flats, protection of services, tree roots and retained features of the house. Soft strip and openings to provide construction access.
2. Perimeter and internal piling – temporary and permanent.
3. Temporary support and protection to existing structure, insertion of Pynford beams and propping to load bearing walls onto temporary internal piles.
4. Traditional underpinning and phased excavation of basement below house, including temporary propping of underpinning.
5. Formation of reinforced concrete capping on perimeter piles.
6. Basement level dug out from the rear of the property, pumping out ground water as necessary.
7. Basement raft slab formed, tied into perimeter reinforced retaining wall.
8. Internal load bearing walls and columns constructed.
9. Internal piles cut back down to basement slab level.
10. Reinforced Concrete ground floor slab installed and tied into retaining walls
11. Removal of propping to upper floors.
12. Alterations to ground floor structure carried out with temporary works propped through ground floor to basement raft slab.
13. Make good remaining structure and all holes made by temporary works.

6.0 DRAINAGE SERVICES AND GROUND WATER

6.1 A drainage strategy has been drawn up by Conisbee; please refer to Appendix **B**.

6.2 The Basement Impact Assessment Screening and Scoping study has not immediately identified any expected impact to the surface water flows, nor significant changes to the ground water flows about the property as a result of the proposed development.

6.3 A flood risk assessment has been carried out by Conisbee. It concludes that there are no identifiable flood risks that cannot be managed and puts forward proposals for management. It also considers that development of this site will not increase flood risk elsewhere

6.4 The existing and proposed hard-surfacing of the existing and proposed schemes are similar, therefore there will be no significant change in surface water run-off.

7.0 MITIGATING NOISE AND NUISANCE

7.1 The main contractor shall implement measures in accordance with any Planning Conditions imposed to keep noise from construction activities to within acceptable limits. However the works proposed do not include traditionally noisy construction techniques and much local disturbance may be mitigated by agreed working hours.

7.2 Contiguous Piling using augured or bored piles limits noise and vibration as compared with alternative retaining options such as sheet piling.

8.0 NEXT STAGES

8.1 To allow the detailed design of the works to progress it will be necessary to carry out an investigation of the existing building as follows;

- Opening up internally to confirm the details of existing floor and wall constructions.
- Trial pits to check the full details of the existing depth and width of existing foundations
- Boreholes at the front and rear of the house to check the soil conditions at depth and to check for and if necessary monitor any ground water.

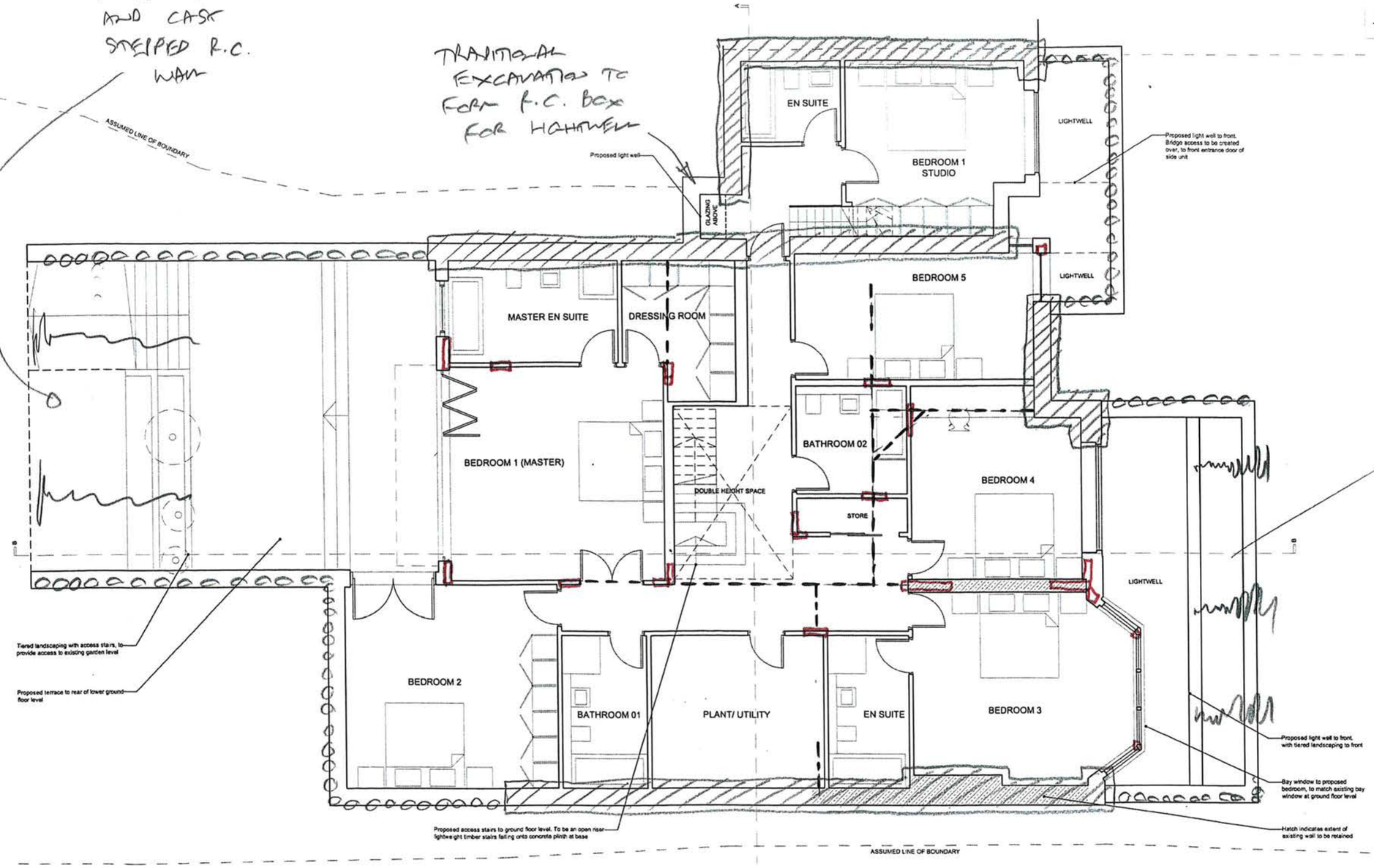
Jessica Foster MEng CEng MIStructE
Senior Engineer
Conisbee

APPENDIX A

STRUCTURAL SCHEME DESIGN – PLANS, SECTION & SEQUENCING

BATTER BACK AND CAST STEPPED R.C. WALL

TRADITIONAL EXCAVATION TO FORM R.C. BOX FOR LIGHTWELL



BATTER BACK AND CAST NEW WALLS TRADITIONALLY

UNDERPINNING + RC LINER WALL

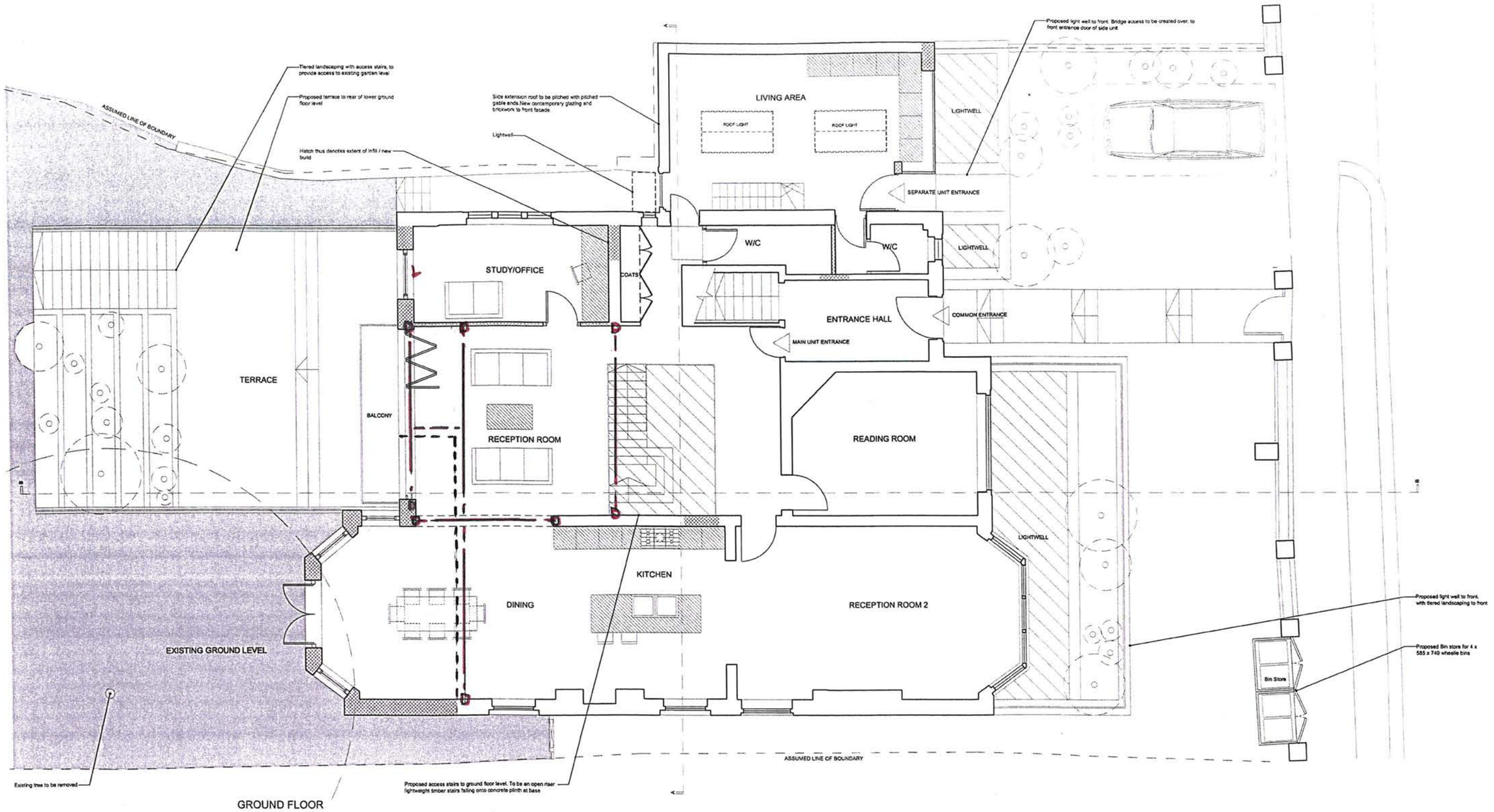
CONTIG WALLS + RC LINER WALL

INTERNAL RC COLUMN/WALLS

MAIN WALLS OVER REQUIRING BEAM STRIPS IN GROUND FLOOR SLAB

Project: 5 LADBROKE TERRACE	Job No. 110601
	Drg. No. SSK 001 B
Title: LOWER GROUND FLOOR SCHEME	Scale
	Date
	Drawn
Status	Checked

conisbee Consulting Structural Engineers Consulting Civil Engineers
1-5 Offord St London N1 1DH
Tel 020 7700 6666
Fax 020 7700 6686
design@conisbee.co.uk
www.conisbee.co.uk



WALL LINE OVER TO BE SUPPORTED

POST SUPPORTING BEAM OVER

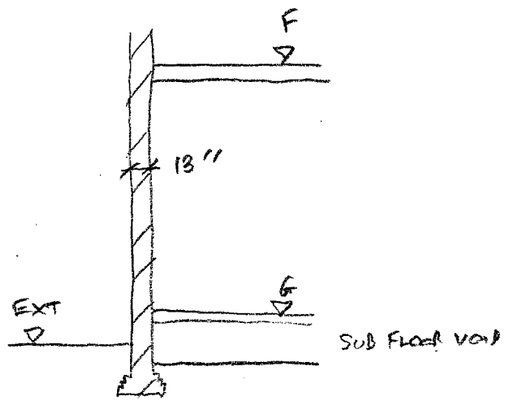
STEEL BEAM OVER

NEW OPENING

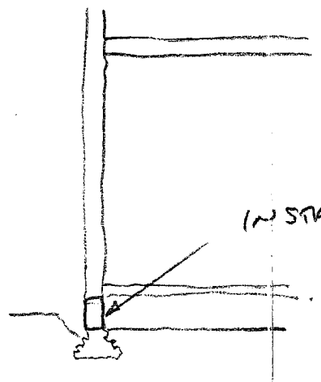
Project 5 LADBROKE TERRACE	Job No. 110601 Drg. No. SSK 002 B
Title GROUND FLOOR SCHEME	Scale Date Drawn
Status	Checked

conisbee
Consulting Structural Engineers
Consulting Civil Engineers
1-5 Offord St London N1 1DH
Tel 020 7700 6666
Fax 020 7700 6686
design@conisbee.co.uk
www.conisbee.co.uk

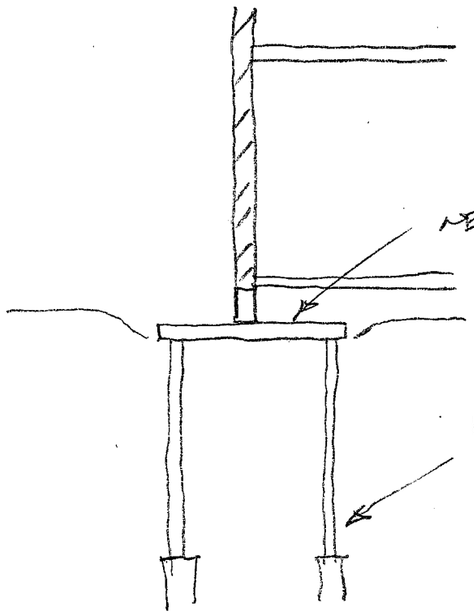
(1)



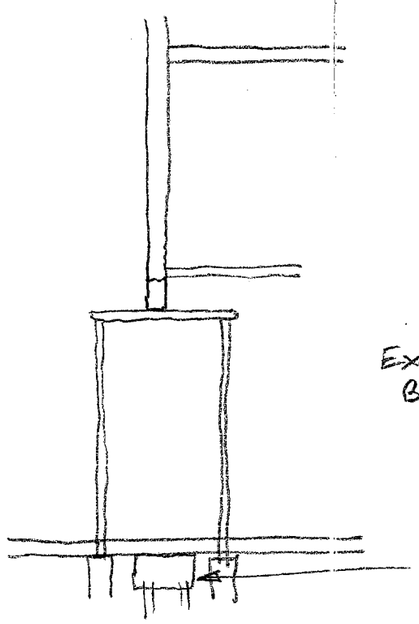
(2)



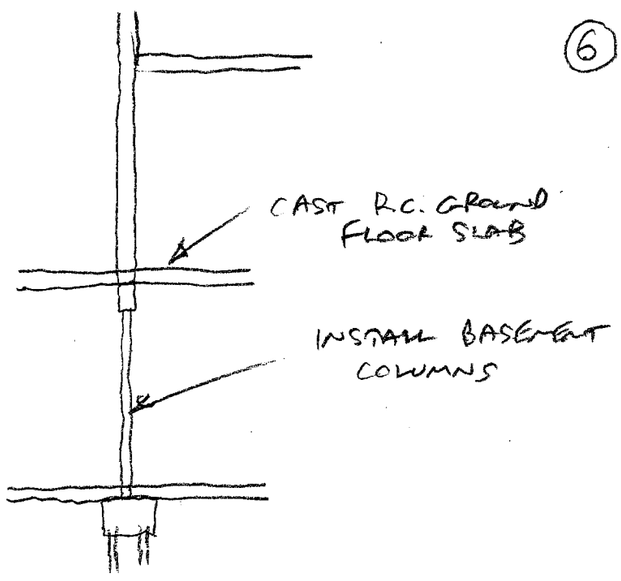
(3)



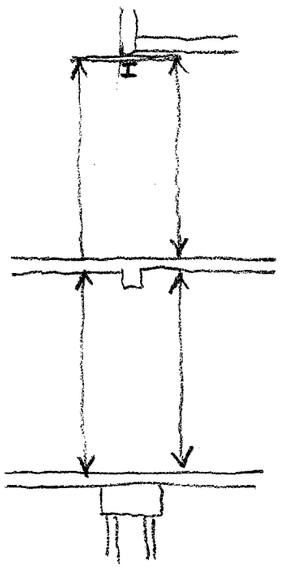
(4)



(5)



(6)



WHERE ALTERATIONS AT GROUND FLOOR THESE TO BE CARRIED OUT AFTER BASEMENT COMPLETE BACK PROPPING TO LOWER LEVEL

conisbee

1–5 Offord St London N1 1DH
Telephone 020 7700 6666
design@conisbee.co.uk
www.conisbee.co.uk

Consulting Structural Engineers
Consulting Civil Engineers

project: 44 FERNCROFT AVE

title: GENERIC SEQUENCE OF CONSTRUCTION

rev.	date	
drawing status		
scale: NTS	date: 19.9.12	drawn: TDA / checked
job no.: 110601	drg no.: SSK003	rev

conisbee

1–5 Offord St London N1 1DH
Telephone 020 7700 6666
design@conisbee.co.uk
www.conisbee.co.uk

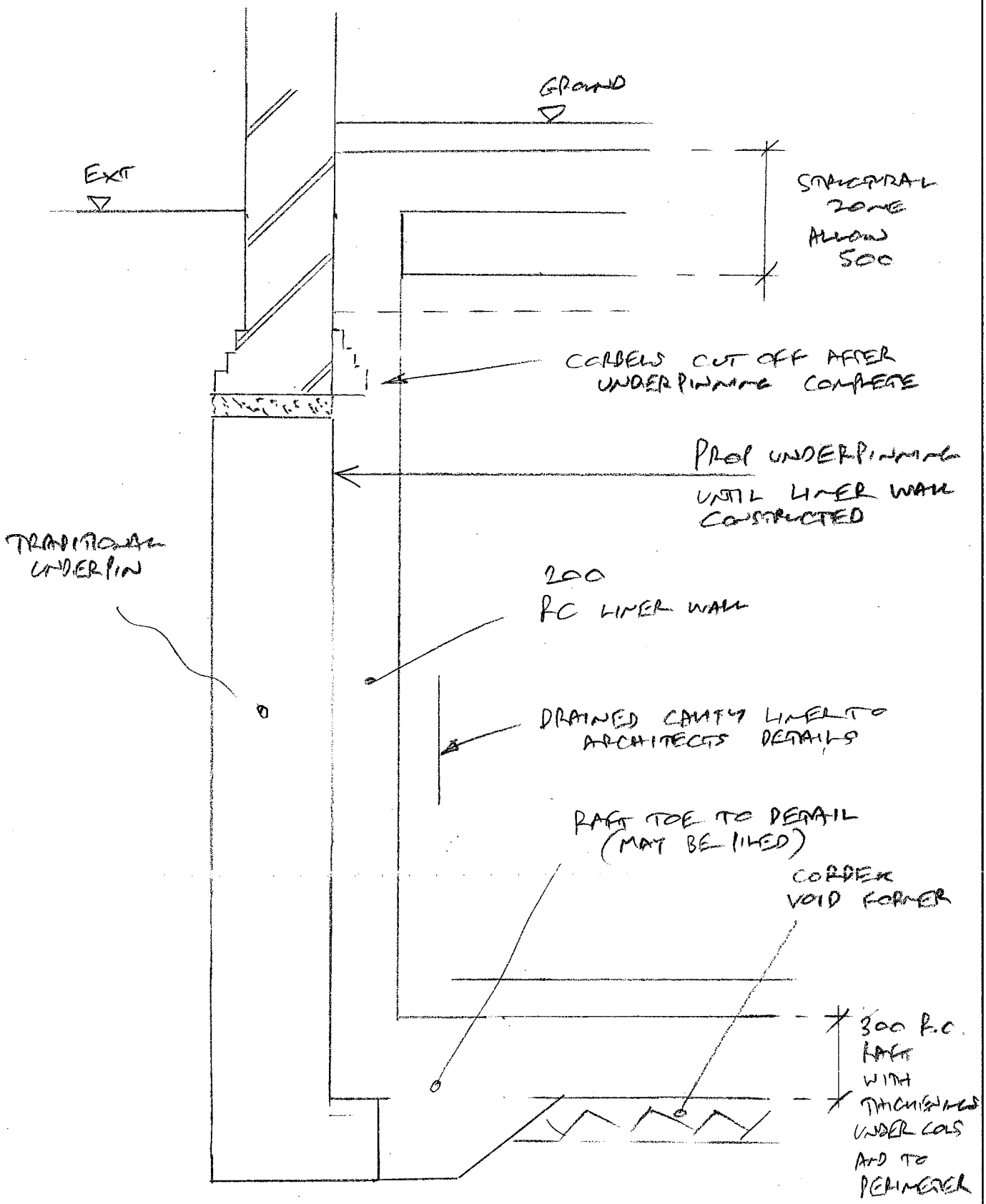
Consulting Structural Engineers
Consulting Civil Engineers

project
44 FERNCROFT AVE

job no. 110610
drg. no. SSK004
scale 1:20
date 19.9.12
drawn TDA
checked

title
TYPICAL UNDERPIN FLANK WALL SECTION

rev.	date	



APPENDIX B

DRAINAGE STRATEGY
FLOOD RISK ASSESSMENT

conisbee

44 Ferncroft Avenue,

London, NW3 7PE

Flood Risk Assessment and Sustainable Drainage Strategy

Consulting Structural Engineers
Consulting Civil Engineers

1–5 Offord St London N1 1DH
Telephone 020 7700 6666
Fax 020 7700 6686

design@conisbee.co.uk
www.conisbee.co.uk

Ref: 110601/TG

Date: 11 March 2013

Rev No: Rev 1.0

Norwich Office
9 – 10 Redwell Street
Norwich NR2 4SN
Telephone 01603 628 074

Table of Contents

1.0 INTRODUCTION

Conisbee have been appointed as Civil Engineering Consultants to undertake a Flood Risk and Sustainable Drainage Assessment for the proposed residential development at 44 Ferncroft Avenue, Camden in London.

1.1.1 This Flood Risk Assessment will be undertaken in accordance with the best practice guidance stated in National Planning Policy Framework (NPPF), PPS 25, pursuant to Environment Agency approval and to informing the design. It is also a requirement for Pol 5 - BRE Ecohomes Assessment. The proposed residential redevelopment has been set a minimum target of "Very Good" under this criteria. This Flood Risk Assessment demonstrates how the Ecohomes Credits under Pol 5 have been met.

2.0 BACKGROUND

This flood risk assessment refers to the following documents.

2.1 General Documentation

2.1.1 National Planning Policy Framework (NPPF) (TSO, March 2012) and Planning Policy Statement 25 (PPS25) Development and Flood Risk (TSO, March 2010)

The National Planning Policy Framework and the PPS 25 set out government policy on development and flood risk. The aim is to ensure that flood risk is taken into account at all stages of the planning process and that inappropriate development is not undertaken within areas of flood risk.

2.1.2 The North London Boroughs Strategic Flood Risk Assessment (Mouchel, August 2008)

This Level 1 SFRA was prepared on behalf of the seven northern boroughs of London consisting of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest. It defines the flood risks within the area and advises on flood risk management in accordance with the requirements of PPS 25.

2.1.3 Camden Core Strategy (2010)

The Ferncroft Avenue development site is located in the Hampstead Heath area of the London Borough of Camden. The Core Strategy for Camden states that the Borough has a target of constructing 12,250 new residential homes between 2010 and 2025.

2.1.4 BRE ECOHomes (BRE, April 2006)

This is an environmental assessment method for rating and certifying the design and construction of existing residential houses conversions with a view of encouraging continuous improvement in sustainable urban development, construction and use. It includes objectives for the management of surface water and flood risk.

2.2 Site Specific Documents

The following documents and drawings have been consulted for the preparation of this flood risk assessment.

- *Appendix A – Site Boundary Plan & Topographical Survey*
- *Appendix B – Geological Maps & Borehole Logs*
- *Appendix C – Thames Water Asset Location Plan*
- *Appendix D – EA Flood Maps & Insurance Claims Flood Data*
- *Appendix E – Preliminary Drainage Layout & Site Proposals*
- *Appendix E – The SUDS Management Train*

3.0 EXISTING SITE

3.1 Location

The site is located at NGR 525582 185910 in Hamsptead Heath, London NW3 7PE. The site is located at 44 Ferncroft Avenue, Hampstead. The site lies in a predominantly residential area and fronts onto Ferncroft Avenue.

3.2 Existing Site Description and Topography

The site has an existing multi-storey residential dwelling with a cellar. The combined site area measures approximately 1,000m².

In terms of topography the site is mostly flat at an average level of approximately 87.750m AOD. The existing topographical site survey is contained in Appendix A.

3.3 Ground Conditions

The North London SFRA indicates that the site is underlain London Clay layer which is overlain by deposits of gravels and silts. These outcrops could potentially be laden with perched groundwater. This geology is confirmed by the Landmark Geological Map details contained in Appendix B.

Aquifer Designation

The Environment Agency has recently amended their aquifer designations so that they are consistent with the Water Framework Directive. The Superficial (Drift) Geology at this location indicates that there is no aquifer at shallow depths. The Bedrock Geological map at this location indicates that this site is underlain by a Secondary A Aquifer. This type Aquifer designation is assigned when permeable geological layers are capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Source Protection Zone

Groundwater provides a third of our drinking water in England and Wales, and it also maintains the flow in many of our rivers. In some areas of Southern England, groundwater supplies up to 80% of the drinking water that you get through your taps. It is crucial that we look after these sources and ensure that your water is completely safe to drink.

The site is not located in a Source Protection Zone.

3.4 Existing Site Drainage

The site drainage currently serves an existing multi-storey residential dwelling together with its cellar, with both foul and surface water connections discharging into the combined Thames Water running along Ferncroft Avenue. The Thames Water records showing drainage within the vicinity of the site are contained in Appendix C.

The locations and conditions of this drainage network have been confirmed by the CCTV drainage survey also contained in Appendix C.

3.5 Existing Site Characteristics

The existing hydrological characteristics for the site are as follows:

- Area of Development Site = 1,000m^2
- Total Existing Impermeable Area assessed to be 30% = 370m^2
- Existing run off rate Q_{WR}= 5,2l/s
- Infiltration rate = Unknown

4.0 PROPOSED DEVELOPMENT

4.1 Description

The proposed development will consist of a basement extension together with a building extension at the ground floor level. External works will include landscaping works to the sunken garden and normal garden.

4.2 Vulnerability Classification

Table D.2: Flood Risk Vulnerability Classification, Annex D of PPS 25 shows that the intended residential use of the proposed housing development has a Vulnerability Classification of "More Vulnerable". However the site lies in Flood Zone 1, of the EA River Flood maps.

Table D.2: Flood Risk Vulnerability Classification

Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.[19] (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'[20]).
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste.[21] • Sites used for holiday or short-let caravans and camping, **subject to a specific warning and evacuation plan**.

4.3 Local Development Documents

The Ferncroft Avenue development site is located in the Hampstead Heath area of the London Borough of Camden. The Core Strategy for Camden states that the Borough has a target of constructing 12,250 new residential homes between 2010 and 2025.

4.4 Sequential Test

The Environment Agency Flood Plain map indicates that this site is located in Flood Zone 1. Flood Zone 1 comprises of land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). Table D.3: Flood Risk Vulnerability and Flood Zone 'Compatibility', Annex D of PPS25, shows that the development is appropriate for this zone and therefore the Exception Test is not required.

Secondly the site is a 'brownfield' site which is being redeveloped and maintaining its current residential use. This site is also primarily in a residential area.

Table D.3[23]: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	✗	Exception Test required	✔
	Zone 3b 'Functional Flood plain'	Exception Test required	✔	✗	✗	✗

Key:

✔ Development is appropriate

✗ Development should not be permitted

5.0 DEFINITION OF THE FLOOD HAZARD

5.1 Sources of Flooding

The North London Strategic Flood Risk Assessment (SFRA) was prepared for the 7 North London Boroughs of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest in order to identify the potential sources of flooding for this area, in accordance with Annex C of PPS25, which may affect the site. These sources are discussed below.

5.1.1 Fluvial Flooding

The North London SFRA states that Camden has no fluvial watercourses within its borough boundaries. The Regents Canal does flow through the borough but the locations of raised canal banks that could pose a flood risk are yet to be identified as attempts to obtain information from British Waterways have been unsuccessful. The Canal could also be considered as a reservoir as in places embankments have been constructed to create the watercourse.

British Waterways are charged with maintaining the Regents Canal. They actively operate a series of sluices and gates along the Canal for navigation and flood risk management purposes. Therefore this site can be considered to be at low risk from fluvial flooding.

5.1.2 Tidal Flooding

This site is remotely located from the Thames therefore it is not at risk from Tidal Flooding.

5.1.3 Overland Flooding

Overland flooding can occur when high intensity rainfall overwhelms man made drainage systems or cannot soak into the ground. Excess water can flow across the ground following the contour gradient and cause flooding downstream. It is exacerbated by steep topography. The site is located midway between Hampstead Heath and West Heath with the topography falling gently towards West Heath.

The North London Strategic Flood Risk Assessment does not state this site is in an area susceptible overland flood. Therefore the site is not at risk from overland flooding.

5.1.4 Groundwater Flooding

For bedrock geology the groundwater profile through London shows relatively little change in elevation, however, the topography of the North London sub-region shows significant variation, with a general fall in an easterly direction from the higher ground in Barnet to the Lee Valley, where much of the area is only a few metres above sea level. As expected, groundwater levels are closest to the surface around watercourses, particularly in the low lying Lee Valley. The groundwater levels in the Lee catchment are significantly closer by approximately 30m to the

surface, whilst those in Camden being at a depth of 90m. GARDIT operate an ongoing abstraction scheme across London to maintain the level of the groundwater table in the Chalk Bedrock which is assisted by the London Clay impermeable geology. Therefore is no risk of groundwater flooding from bedrock geology.

However the groundwater has a different characteristic for the superficial shallower geology. In places the London Clay layer is overlain by deposits of gravels and silts. This is most prominent in the Lee Valley and East of Hackney where alluvium deposits from the River Lee are in evidence. There are also notable outcrops of gravels and silts further to the west in Enfield, Stanmore gravels in Barnet and gravel outcrops on Hampstead Heath. These gravel and silt deposits are much more permeable than the underlying clay layer and flooding can occur at the edges of these deposits and outcrops when the groundwater percolating through the permeable layer meets the impermeable clay layer, causing the water to flow out at surface level, appearing as small springs. Hampstead Heath lies on a silty sand layer on top of the London clay. During rainfall events water drains through the sands before reaching the impermeable layer beneath, causing the formation of springs which feed the Highgate Ponds and form the source of the River Fleet. The nearest ponds to the site are the Leg of Mutton Pond which is located 500m northwest of the site.

For the proposed development permanent waterproofing measures must be put in place to protect the proposed basement extension from the egress of groundwater. Dewatering apparatus should also be provided during the new basement extension works.

5.1.5 Sewer and Surface Water Flooding

Sewer Flooding

Traditionally sewer networks are designed to cope with storm events up to and including the 1 in 30 year storm event. If this storm event is exceeded surface water flooding would occur following the topography of the area subjected to the flooding event.

The North London SFRA states that surface water and sewer flooding poses a moderate flood risk to the Borough. In particular reference to this site if the capacity of sewer networks was exceeded flood waters would discharge through the gullies and manholes accumulating at the low points along the road.

High rainfalls levels and flood events are a recurring feature in Camden due to the nature of summer thunderstorms and the topography of Hampstead. The report suggests that the similarities between floods in 1975 and 2002 and concludes that these flood events have not been recently created by changes in the global climate.

Map 22 in Appendix D shows the roads affected by the 2002 flooding event. Thames Water sewer flood data during the 10 year period from August 1997 to August 2007 indicates that up to 5 flooding events occurred in the vicinity of the site. The map shows a reasonable correlation between the Thames Water records although the Camden floods would appear to be more widespread than is identified on Thames records. This can be attributed to the fact that some of the properties flooded in 2002 will not be included on the Thames Water database unless they flood twice in ten years. Of the two major recorded flooding events in Camden, it is also noted from this flood data that Ferncroft Avenue flooded in 1975 but not in 2002.

The North London SFRA states that following the flood event Thames Water were to make further funding cases to OFWAT to relieve more properties from flooding and they indicated that flooding issues in Camden will be picked up as part of their prioritisation programme. Thames Water are mandated by regulation to identify and resolve any recurrent flooding issues on their network. Therefore reducing the level of flood risk from sewers.

Surface Water Flooding

The areas of West Hampstead, Cricklewood and South Hampstead would appear to be the areas at most risk from pluvial flooding within the North London areas. This flood risk extends to a lesser extent to Church End in the Barnet and also into the east of Camden, which experienced flooding during the 2002 Camden Floods. The extent of the 2002 Camden floods is shown on Map 22. The cause of these floods was attributed to surcharged sewers which could not cope with the volume of run-off. The RMS Flood Map and Insurance Claims data contained in Appendix D also confirm that the site is at a medium risk of surface water flooding. EA topography contours indicate that this area lies in a ‘localised’ depression which makes it susceptible to surface water flooding when sewers are overwhelmed. However if the sewers are upgraded, repaired and regularly maintained by Thames Water then the surface water flood risk would be adequately managed.

5.1.6 Flooding from Artificial Sources

The two small reservoirs in Hampstead Heath are part of a series of ponds owned by the City of London Corporation. These reservoirs lie within the River Fleet catchment. The flood management plans and supporting inundation mapping to manage these reservoirs became a legal requirement from spring 2009.

It is anticipated that the Flood Management Plans and associated inundation mapping will provide a more accurate appraisal and assessment of flood risk presented by the reservoir. As it is a statutory obligation for the City of London Corporation to maintain the reservoirs this ensures that a robust flood risk management strategy is developed for the reservoirs.

5.2 Probability of Flooding

As discussed above the probability of flooding within this site from any source is minimal as long as the onsite drainage for the site is suitably designed and the basement area is adequately tanked. Postcode insurance flood claim data contained in Appendix D also confirms that the site is in a medium flood risk claims area. As previously stated this flood risk is associated with inadequate sewer capacity which the SFRA has indicated that Thames Water applied for funding to OFWAT to address this issue.

6.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

6.1 Site Characteristics

The physical design and hydrological characteristics for the site are as follows;

- Total Catchment Area = 1,000m^2
- Total proposed Impermeable Area including Road = 390m^2
- Increase in impermeable area after development = 20m^2
- Both the London Plan and PPS 25 guidance is to discharge surface water runoff from brownfield development sites at rates below the existing discharge rates. *(The minimum discharge rate for self-cleansing velocity is 5,0l/s.)*

6.2 Proposed Surface Water Strategy

The current discharge rate is 5.2l/s. The London Plan requires the discharge from existing sites to be discharged at 50% the existing discharge rates. This would result in a surface water discharge rates of 2.6l/s. This very low flow would be susceptible to blocking and potential flooding of the basement. Best practice sets the minimum discharge rate at 5.0l/s to allow for efficient hydraulic flow and self cleansing velocity. The increase in impermeable area is negligible. Therefore the applicable discharge rate for surface water is 5.0l/s.

In terms of pollution control all surface water gullies in hard paved areas are to be trapped. The Proposed Drainage Layout drawing can be found in Appendix E.

6.3 Site Design Objectives and Constraints

The requirements for a sustainable surface water drainage strategy at this site are to:

- Limit the peak rate of surface water discharge into the public sewer to the predevelopment level; 5l/s minimum for self cleansing velocity.
- Prevent pollution of the groundwater

Infiltration drainage techniques have been precluded owing to site constraints and the underlying geology.

6.4 Surface Water Disposal Strategy

There is only one viable option available for the disposal of surface water from the site; discharging into the existing sewer. It is recommended that surface water be discharged at 5.0l/s for hydraulic efficiency and self-cleansing velocity.

The proposals for this site would preclude the use any infiltration drainage techniques owing to the prevailing site geology.

7.0 FOUL WATER DRAINAGE

In terms of the foul drainage strategy, it is proposed to discharge at rate less of 1,0 l/s into the Thames Water public sewer network. The foul water discharge from the basement extension and surface water from the light wells will be discharged into a combined Pumping Chamber, from where it will be pumped into the existing outfall manhole in the driveway.

The combined discharge will then drain by gravity from the outfall manhole straight into the combined Thames Water sewer located in Ferncroft Avenue using the existing connection.

8.0 FLOOD RISK MANAGEMENT MEASURES

There is a negligible increase in the impermeable area and the surface water discharge is restricted to 5.0l/s. Therefore there is no increase in surface water discharge generated by the site.

There is also no offsite surface water overflow for all storm events, thus providing a robust flood management regime.

9.0 OFFSITE IMPACTS

It is considered that the proposed drainage designs mean that the surface water and foul flows generated by the proposed development will not have any adverse effect off site.

10.0 RESIDUAL FLOOD RISKS

The only remaining risk following the construction of the proposed systems relates to exceedance of the design criteria. Design flows generated from excess rainfall events will be directed away from buildings. There is perceived to be a very low risk from the development.

11.0 RECOMMENDATIONS

It is recommended that the proposed drainage network contained in Appendix E, be implemented for this site in order to ensure that a robust drainage solution is achieved for this site.

12.0 CONCLUSION

The site is in Flood Zone 1 and is at minimal risk of pluvial flooding. Further, both the SFRA and the site specific flood risk assessment for this development has not identified potential flood risks for the site that cannot be managed. The following flood management measures are recommended:

For the proposed development permanent waterproofing measures must be put in place to protect the proposed basement extension from the egress of groundwater. Dewatering apparatus should also be provided during the new basement extension works.

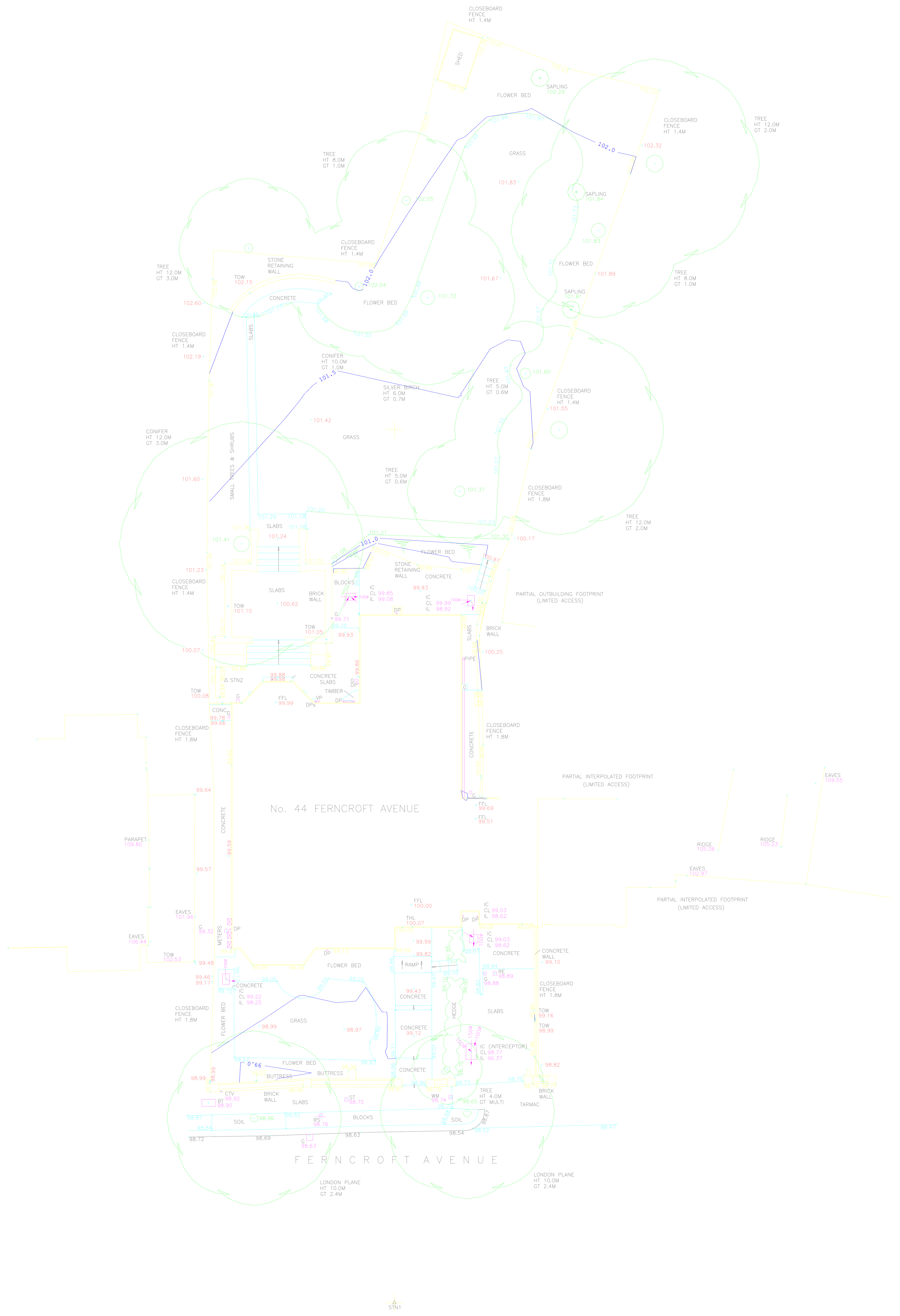
Thames Water are to attend to any recurrent flooding events in the vicinity of the site. Particularly upsizing below capacity sewers with funding from OFWAT under the Asset Management Programme in order to relieve more properties from flooding in Camden.

It is proposed that the proposed surface water drainage scheme be implemented in order to provide a robust and sustainable drainage regime to the proposed residential development.

It is considered that the development of this site will not increase flood risk elsewhere.

APPENDIX A

Survey Plan & Site Boundary Plan



CONTROL INFORMATION

STN	EASTING	NORTHING	LEVEL	DESCRIPTION
1	1000.00	1000.00	98.61	SURVEY NAIL
2	990.35	1035.65	97.55	SURVEY NAIL

NOTES: –

GRID OF LOCAL ORIGIN.

LEVELS NOT RELATIVE TO OSBM
LOCAL DATUM FFL AS SHOWN
VALUE 100.00M.

ALL COVERS SHOWING INVERT LEVELS HAVE BEEN LIFTED. PIPE SIZES, DIRECTION OF FLOW AND TYPE ARE DETERMINED FROM ALL AVAILABLE INFORMATION BUT ARE NOT PROVEN.

KEY: –

BT	BRITISH TELECOM
EP	ELECTRICITY POLE
FH	FIRE HYDRANT
G	GULLY
IC	INSPECTION COVER
LP	LAMPOST
MH	MANHOLE
CL	COVER LEVEL
IL	INVERT LEVEL
RS	ROAD SIGN
ST	STOP TAP
SV	STOP VALVE
TP	TELEPHONE POLE
GV	GAS VALVE
DP	DOWN PIPE
KO	KERB OUTLET
MK	MARKER
WO	WASH OUT
FFL	FINISHED FLOOR LEVEL
WM	WATER METER
BO	BOLLARD
VP	VENT PIPE
CTV	CABLE TV
TOP	TOP OF PIPE
TOW	TOP OF WALL
SP	STAND PIPE

FENCE/BOUNDARY
CHANGE OF SURFACE
CONTOUR
BOTTOM OF BANK
TOP OF BANK
WALL (TO SCALE)
OVERHEAD TELEPHONE
OVERHEAD ELECTRICITY
HEDGE/VEGETATION

SPECIES
HT HEIGHT
GT GIRTH

REVISION A – SEP 2012
ADJACENT BUILDING FOOTPRINTS & GROUND LEVELS ADDED.
IC DATA CORRECTED & DETAIL ADDED TO PREVIOUSLY UNLIFTED IC.

FOR FLOOR PLANS SEE MS–3773A
FOR ELEVATIONS SEE MS–3773B
FOR SECTIONS SEE MS–3773C

BRANDON SURVEYS · LTD
BURLINGTON HOUSE
369 WELLINGBOROUGH ROAD
NORTHAMPTON
NN1 4EU
TEL : 01604 602287

UNION REALTY LTD.
2 NOTTINGHAM STREET
LONDON
W1U 5EF

44 FERNCROFT AVENUE
LONDON
NW3 7PE

TOPOGRAPHICAL SURVEY

1:100@A0

SEP 2012

DRAWN BY:– CJC

DRAWING NUMBER:– MS–3773 REVISION A

APPENDIX B

Geotechnical Maps

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WGR	Worked Ground (Undivided)	Void	Holocene - Holocene
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	TPGR	Taplow Gravel Formation	Sand and Gravel	Wolstonian - Wolstonian
	DHGR	Dollis Hill Gravel Member	Sand and Gravel	Anglian - Cromerian
	STGR	Stanmore Gravel Formation	Sand and Gravel	Pleistocene - Pleistocene

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	LC	London Clay Formation	Clay, Silt and Sand	Eocene - Eocene
	CLGB	Claygate Member	Clay, Silt and Sand	Eocene - Eocene
	BGS	Bagshot Formation	Sand	Eocene - Eocene

Envirocheck® Geology

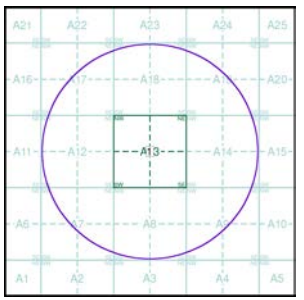
Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.
The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	**1**
Map Sheet No:	**256**
Map Name:	**North London**
Map Date:	**2006**
Bedrock Geology:	**Available**
Superficial Geology:	**Available**
Artificial Geology:	**Available**
Faults:	**Not Available**
Landslip:	**Available**
Rock Segments:	**Not Available**

Geology 1:50,000 Maps - Slice A



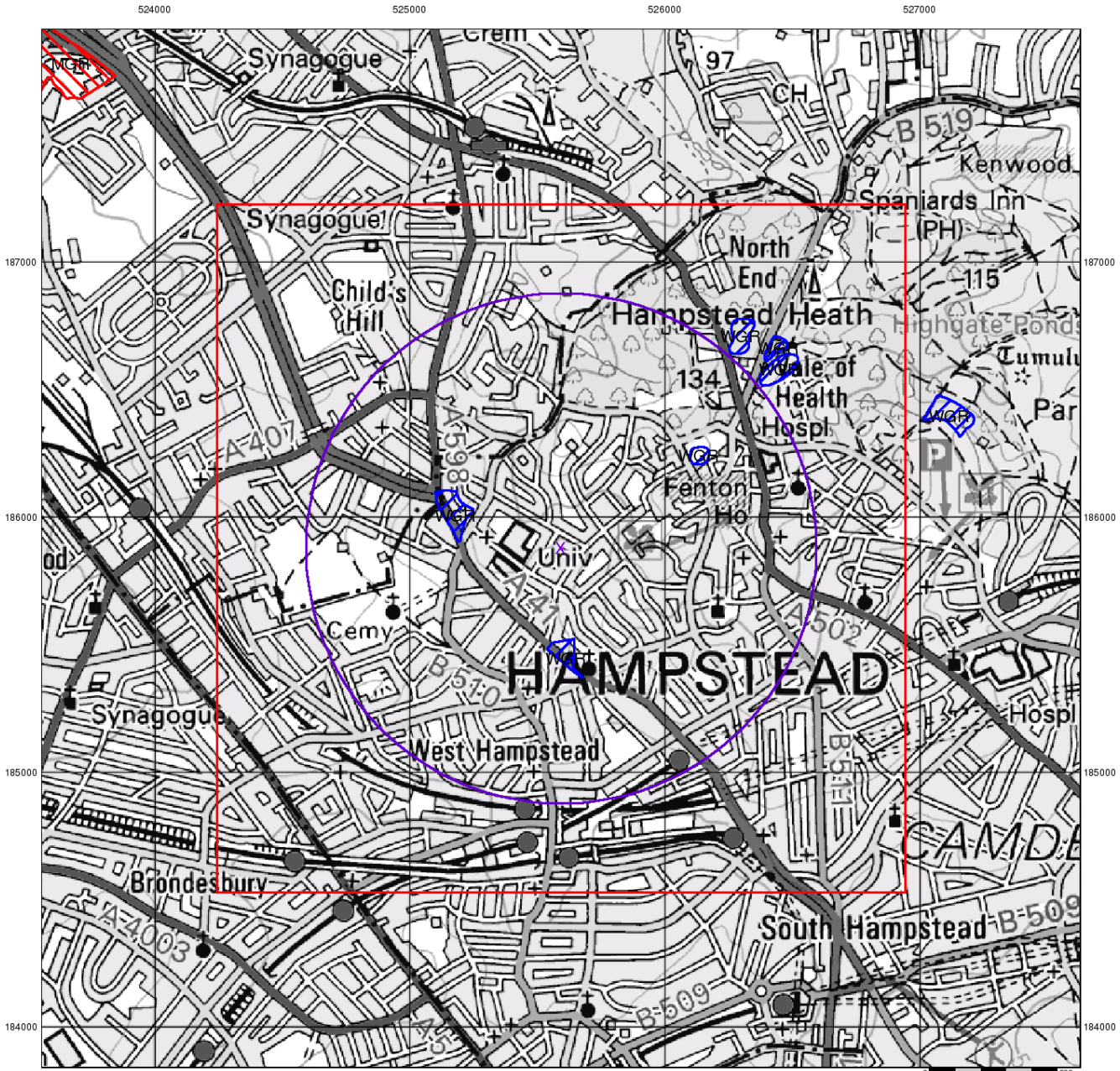
Order Details:

Order Number:	43193165_1_1
Customer Reference:	110601
National Grid Reference:	525590, 185880
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details:

36, Ferncroft Avenue, London, NW3 7PE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Geology

Artificial Ground and Landslip

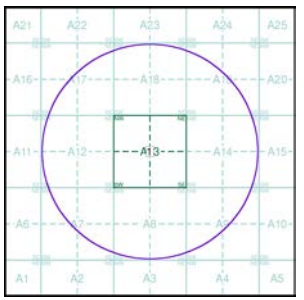
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



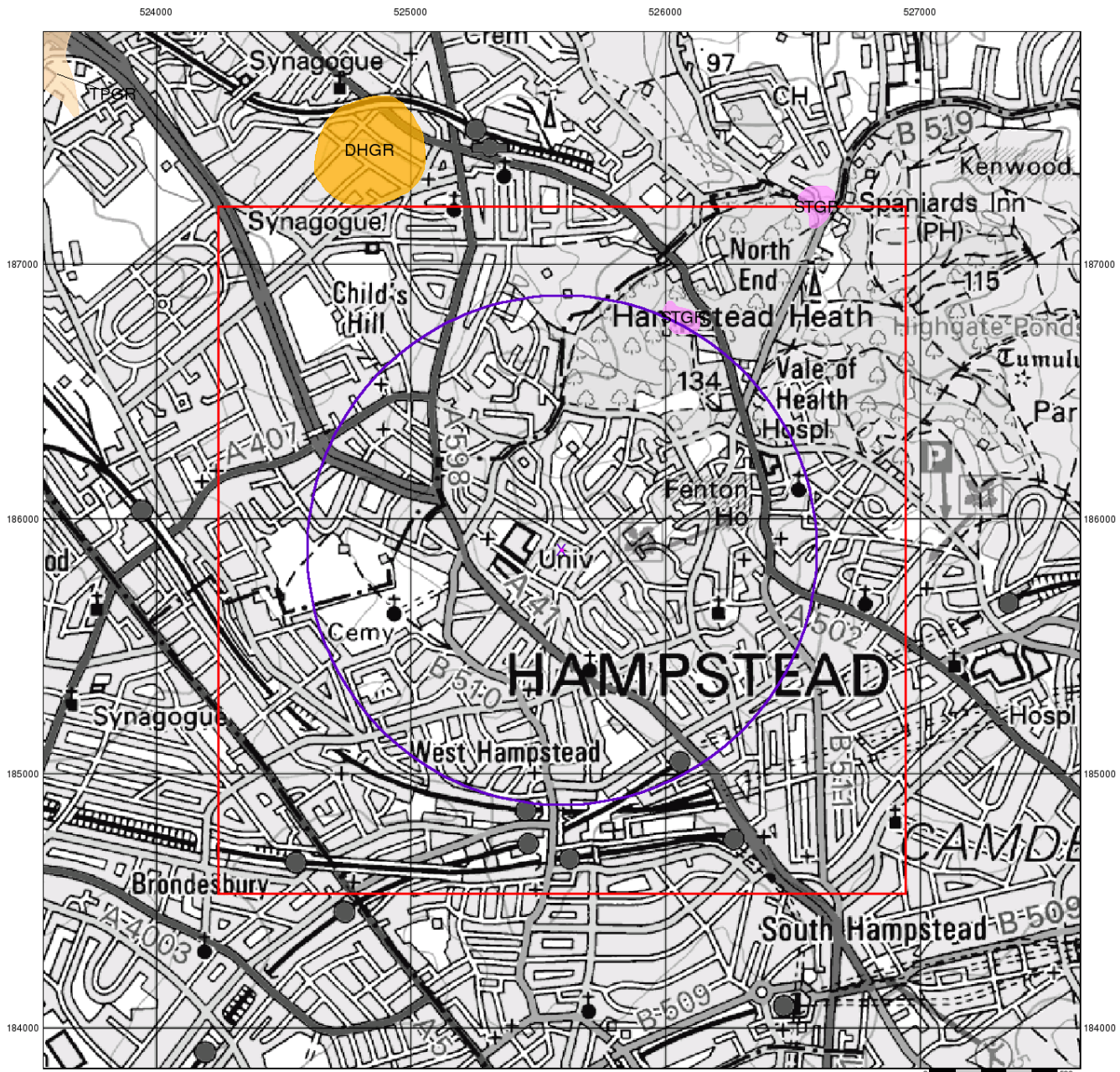
Order Details:

Order Number:	43193165_1_1
Customer Reference:	110601
National Grid Reference:	525590, 185880
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details:

36, Ferncroft Avenue, London, NW3 7PE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Geology

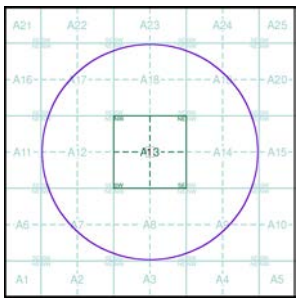
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



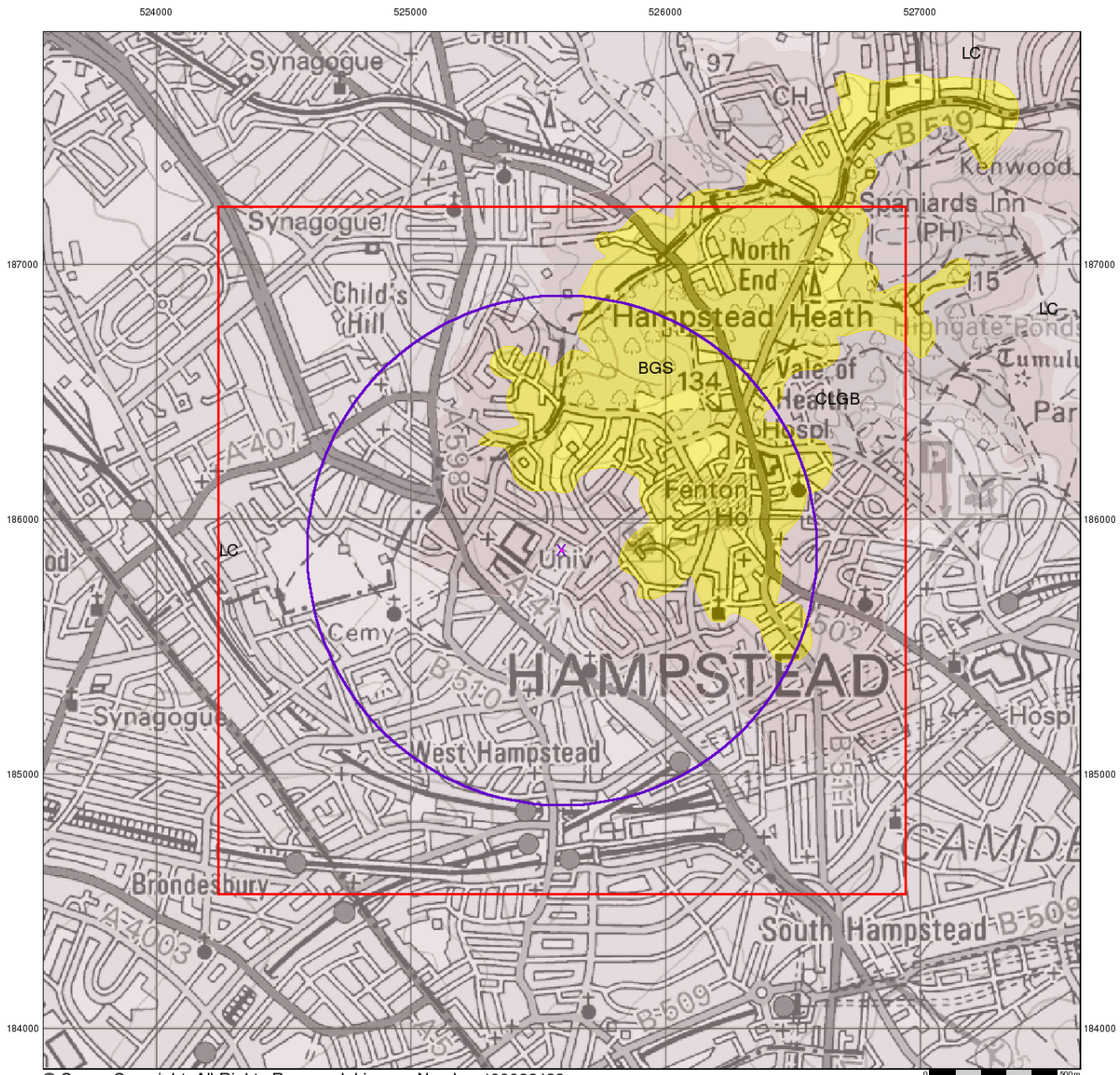
Order Details:

Order Number:	43193165_1_1
Customer Reference:	110601
National Grid Reference:	525590, 185880
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details:

36, Ferncroft Avenue, London, NW3 7PE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Geology

Bedrock and Faults

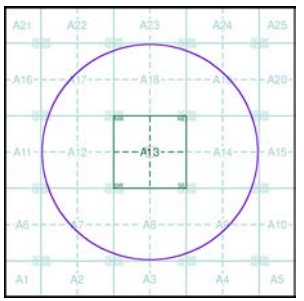
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



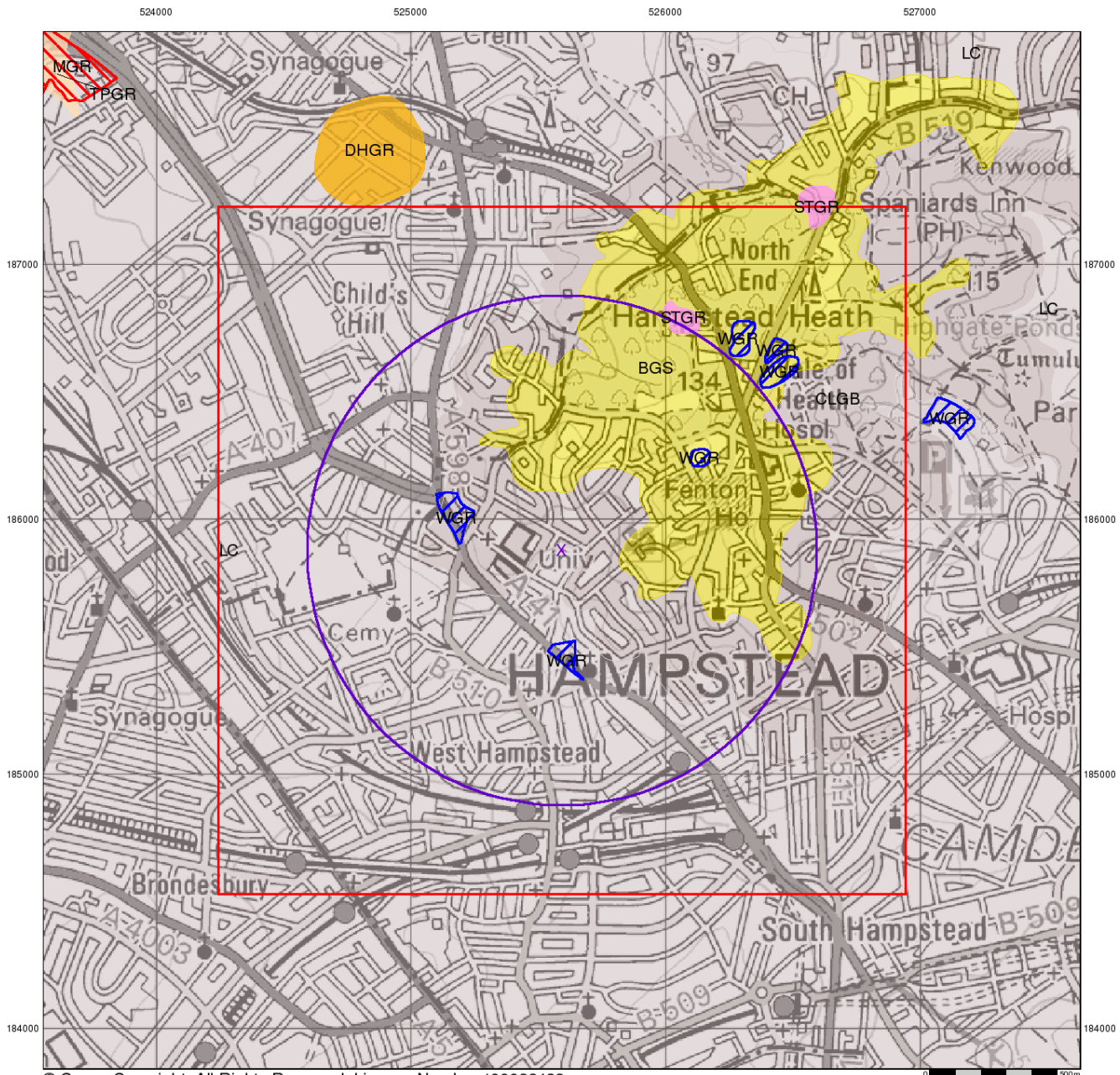
Order Details:

Order Number:	43193165_1_1
Customer Reference:	110601
National Grid Reference:	525590, 185880
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details:

36, Ferncroft Avenue, London, NW3 7PE

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Geology

Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

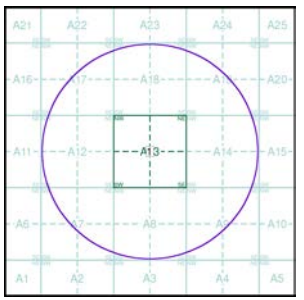
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

Order Number:	43193165_1_1
Customer Reference:	110601
National Grid Reference:	525590, 185880
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details:

36, Ferncroft Avenue, London, NW3 7PE

APPENDIX C

Thames Water Asset Location Plan

Asset Location Search

Thames Water Property Searches
12 Vastern Road
READING
RG1 8DB

Search address supplied 44
Ferncroft Avenue
London
NW3 7PE

Your reference 110601
Our reference ALS/ALS Standard/2012_2304916

Search date 29 August 2012

You are now able to order your Asset Location Search requests online by visiting
www.thameswater-propertysearches.co.uk

Thames Water Utilities Ltd

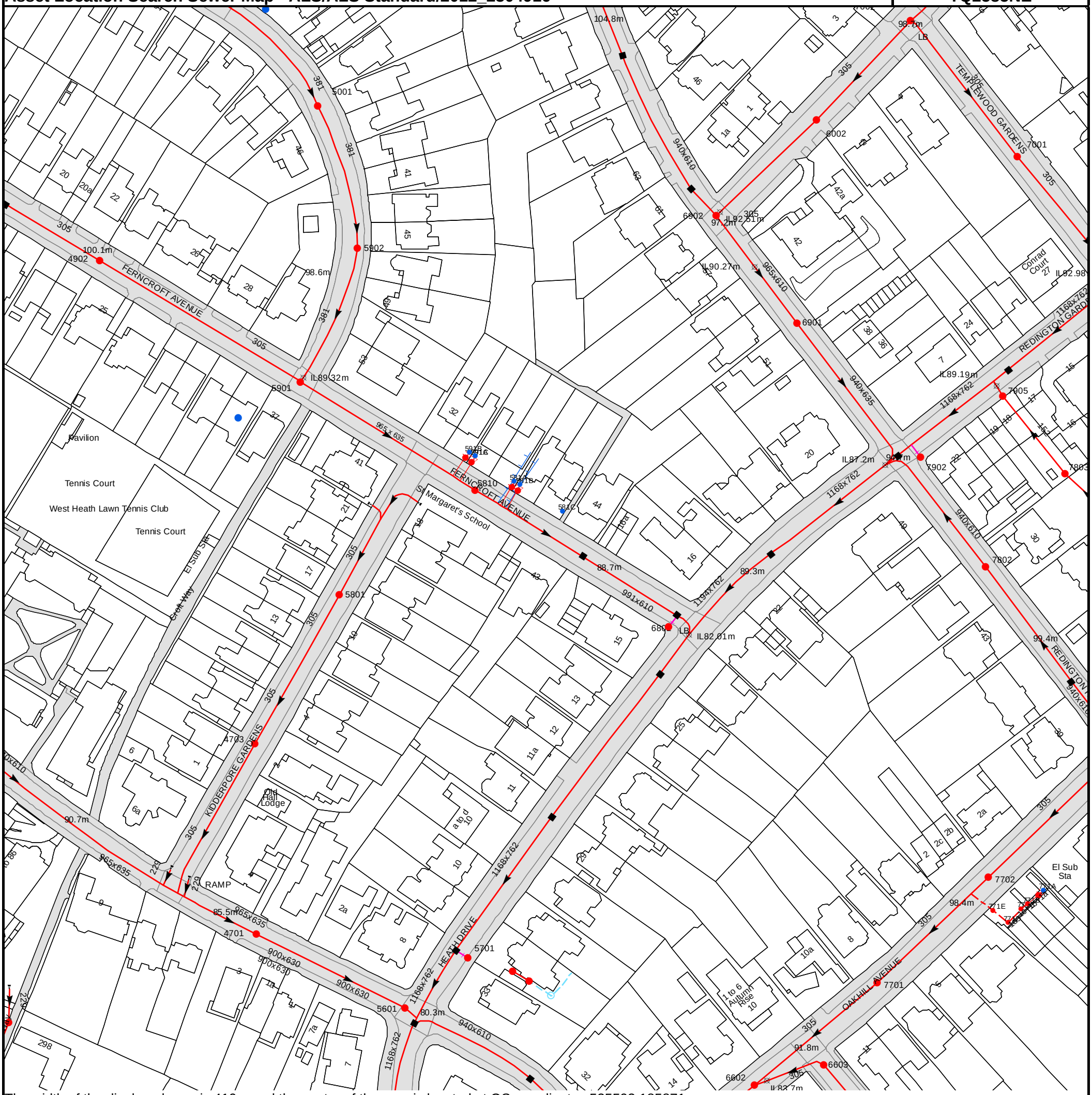
Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148
E searches@thameswater.co.uk
I www.thameswater-propertysearches.co.uk

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Asset Location Search Sewer Map - ALS/ALS Standard/2012_2304916	TQ2585NE



The width of the displayed area is 410m and the centre of the map is located at OS coordinates 525593,185871

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
581C	n/a	n/a
581B	n/a	n/a
581A	n/a	n/a
591C	n/a	n/a
591A	n/a	n/a
591B	n/a	n/a
771D	n/a	n/a
771E	n/a	n/a
771C	n/a	n/a
771B	n/a	n/a
771A	n/a	n/a
7802	96.76	91.2
7702	98.69	92.29
7905	95.22	92.93
7001	97.5	93.19
7803	99.6	98.05
7701	94.38	88.19
7002	99.08	94.25
7902	n/a	n/a
6802	n/a	n/a
6902	97.3	91.98
6602	89.56	83.55
6901	94.97	89.34
6002	98.22	93.36
6603	91.27	84.07
57BE	n/a	n/a
57BF	n/a	n/a
57BG	n/a	n/a
5701	n/a	n/a
5810	90.28	83.69
5601	79.9	76.07
4701	84.53	81.17
4703	87.94	85.04
5801	89.6	85.83
49AE	0	0
5901	95.47	89.09
4902	100.08	95.55
5902	98.97	95.43
5001	102.82	97.96
40AG	n/a	n/a
3602	83.88	82.09

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

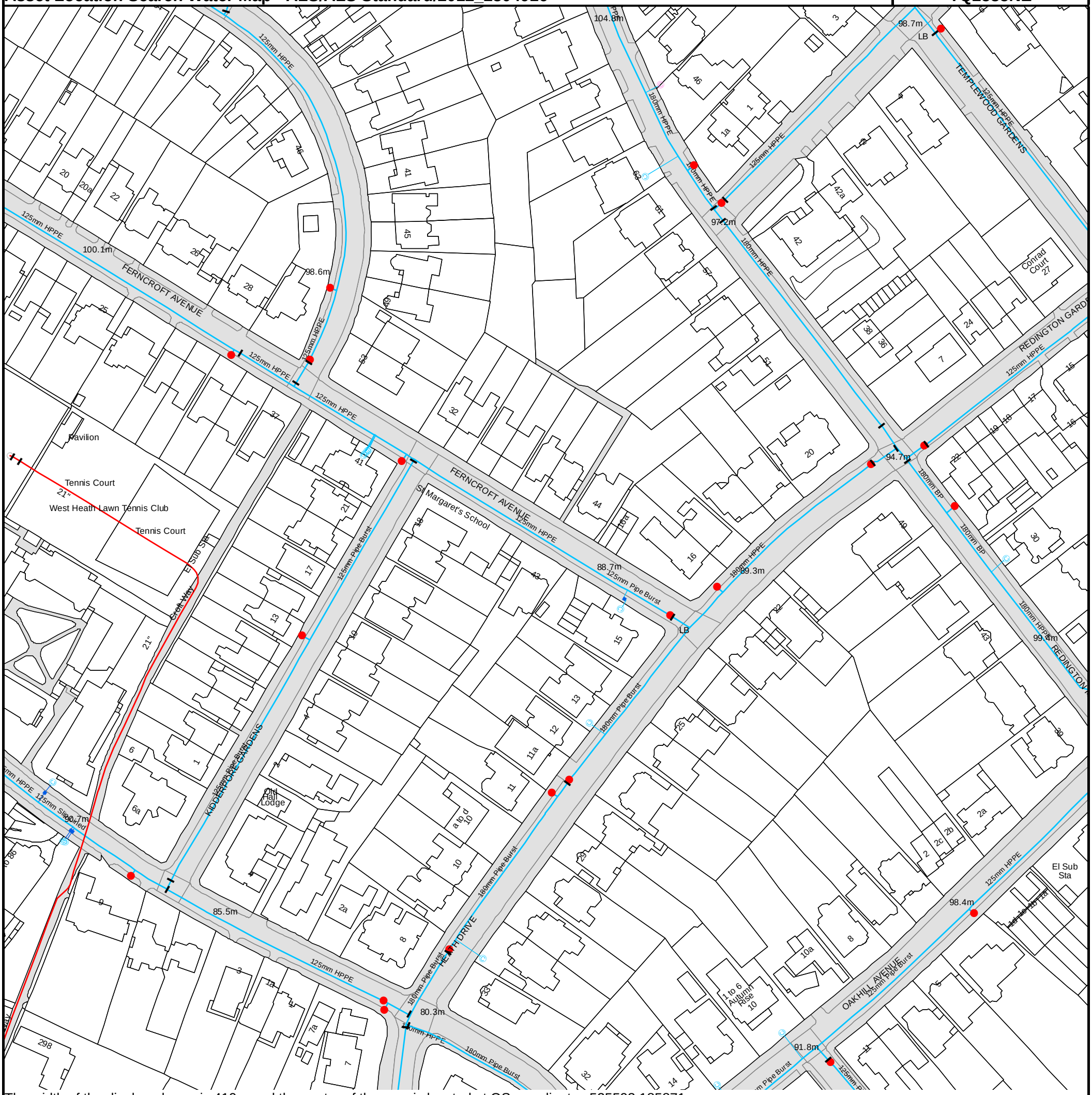
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2012_2304916

TQ2585NE



The width of the displayed area is 410m and the centre of the map is located at OS coordinates 525593,185871

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

APPENDIX D

EA Flood Maps

Insurance Claims Flood Data