Infrastruct CS Ltd
The Stables
High Cogges Farm
High Cogges
Nr Witney
Oxon
OX29 6UN

FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

Scheme name:

LAND ADJACENT TO 39 PRIORY TERRACE, LONDON, NW6 4DG

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Report Prepared By:
Mateo Blanco
M.Eng GMICE

Report Checked By:
David Jeffery
I.Eng FIHE

Report Authorised By:
Tim Trotman
MEng (Hons), CEng, CWem, FIHE, MCIWEM

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Registered Office: Jamesons House, Compton Way, Witney, OX28 3AB
Registered in England and Wales 07521130,

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Prepared By:	**M. Blanco**
Prepared For:	**Old West Hampstead Estates Ltd**
Client Contact:	**G.A. Harris**

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Draft	**DJ**	**12th February 20**	**Initial Issue**
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Foreword

This document has been prepared solely as a Flood Risk Assessment and Drainage Statement for the Client. No responsibility or liability will be accepted for any use that is made of this document other than by the Client for the purpose it was written. The conclusions resulting from this study and contained within this report are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

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Some of the information presented within this report is based on third party information which is believed to be correct; no liability will be accepted for any discrepancies in accuracy, mistakes or omissions in such information. The report also assesses the flood risk in relation to the requirements of the Environment Agency and as such assesses the site for a specific flood event and not all flood events. The contents of this document must not be copied or reproduced in whole or in part without the written consent of Infrastruct CS Ltd.

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1.0 Summary

A Flood Risk Assessment (FRA) and drainage strategy has been undertaken to accompany the planning application for the proposed redevelopment at 39 Priory Terrace, Camden, London. This report has been prepared by Infrastruct CS Ltd on behalf of the Client in accordance with the guidelines set out in the National Planning Policy Framework.

The following table is an overview of the flood risk and drainage strategy for the proposed development of the site, based upon currently available information and finds the following –

ITEM	RESPONSE
Site Location	The site is in vacant land, at the junction of Priory Terrace with Abbey Road, London, NW6 4DG, approximately 800m south of West Hampstead Station and 300m east of Kilburn High Road. The approximate grid reference 525685E, 183965N
Size and Current Land Usage	The current site is approximately 121m2 in plan and currently vacant.
Flood Zone	The development site falls entirely within Flood Zone 1, which is classified as low probability of flooding.
Fluvial Flood Risk	**Low** – Refer to Section 6.1
Overland Flood Risk	**Low** – Refer to Section 6.2
Groundwater Flood Risk	**Medium** – Refer to Section 6.3
Sewerage Flood Risk	**Low** – Refer to Section 6.4
Artificial Flood Risk	**Low** – Refer to Section 6.5
Proposed Development	The architectural proposals are for the construction of a new 3-storey building including a basement, with a total Gross Internal Area of 143m2.
SuDS Features proposed for this scheme	The proposed SuDS features for this site include an attenuation tank and a flow control device to reduce the runoff flows to maximum of 2.0 l/s. A green roof will cover approximately 25% of the total roof area.

Based on this assessment, it is concluded that in accordance with the Flood risk vulnerability and flood zone compatibility table in Section 5.6 from the Planning Practice Guidance document, the report considers the proposed development appropriate.

2.0 Introduction

2.1 Commission

Old West Hampstead Estates Ltd have commissioned Infrastruct CS Ltd, to prepare a Flood Risk Assessment (FRA) and drainage statement to support a planning application for the re-development at a land next to 39 Priory Terrace, NW6 4DG. The proposed planning layout drawings are contained in Appendix A.

2.2 Guidance

This flood risk assessment has been compiled in accordance with the recommendations of the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG).

2.3 Aims and Objectives

The purpose of this flood risk assessment is to assess the potential flood risks by and to the proposed development. It will identify the flood risk zone, potential sources of flood risk, consider the proposed drainage and will be used to support the proposed planning application.

3.0 Site Details

3.1 Location

The site is in vacant land, at the junction of Priory Terrace with Abbey Road, London, NW6 4DG, approximately 800m south of West Hampstead Station and 300m east of Kilburn High Road.

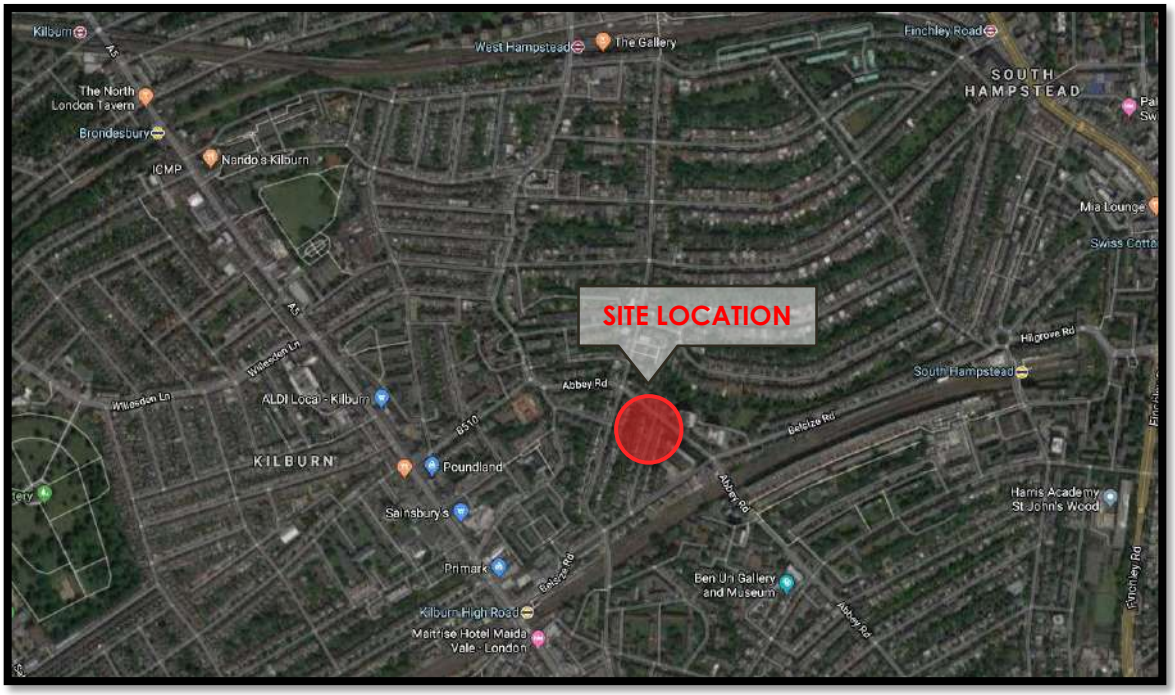


Figure 3.1.1 - Site Context

Figure 3.1.2 - Site location

3.2 Grid Reference

The Ordnance Survey National grid reference for the centre of the site is:

525685E, 183965N (Nat Grid TQ 25685 83965)

3.3 Topography and Site Description

The site covers an approximate brownfield area of 121m^2.

Levels are consistent along the site boundary, approximately between 38.82mADO and 38.99mAOD. Levels on the road are approximately 150mm lower, reducing even further towards the southeast. These levels at the rim of the survey are around 38.35m. See Appendix F for full document.

3.4 Ground Conditions

Reference to the Geological survey of Great Britain indicates the following strata:

Superficial deposits: N/A

Bedrock geology: London Clay Formation - Clay, Silt And Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas. These sedimentary rocks are marine in origin. They are detrital and comprise coarse- to fine-grained slurries of debris from the continental shelf flowing into a deep-sea environment, forming distinctively graded beds.

Intrusive site investigations carried out adjacent/near the development and shown on the British Geological Survey database (BGS ID: TQ28SE380) confirmed the above mentioned.

3.5 Ground Water

Boreholes carried out in the vicinity of the site and shown in the BGS online maps, found no ground water within the trial pits at 15mbgl**.** In-situ testing is required to confirm the depth of groundwater.

A review of the maps within the Camden SFRA indicate that the site is at a low risk flooding.

3.6 Existing Site Drainage

The Thames Water wastewater plans show combined sewers in the vicinity of the site. There is a 1245x813mm sewer in Abbey Road, to the north and a Ø225mm sewer to the east, along Priory Terrace. The head of this latter network will be used, connecting the new system into manhole 6902. See Appendix B for Thames Water sewer records.

3.7 Existing Watercourses

The nearest main river watercourse to the site is the River Brent, a tributary of the River Thames, which is located 5.2 km to the northwest of the site. River Thames itself is 6Km to the southeast.

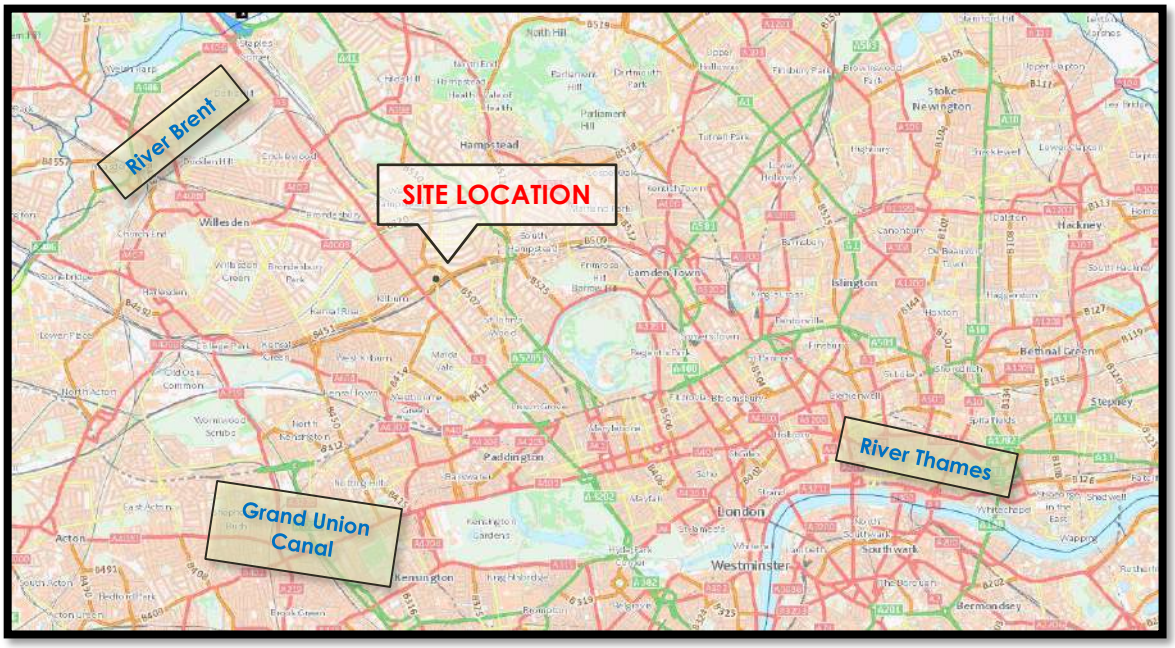


Figure 3.7.1 – Local Rivers

3.8 Environment Agency Groundwater and Aquifer Protection

Reference to the Environment Agency Groundwater protection zone map shows the area is sited outside all groundwater protection zone. The Environment Agency have defined Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes, and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk.

Figure 3.8.1 – Groundwater Protection Zones

The Environment Agency use the zones to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.

A study of the aquifer maps on the Environment Agency website revealed the site to be located outside any superficial or bedrock aquifer.

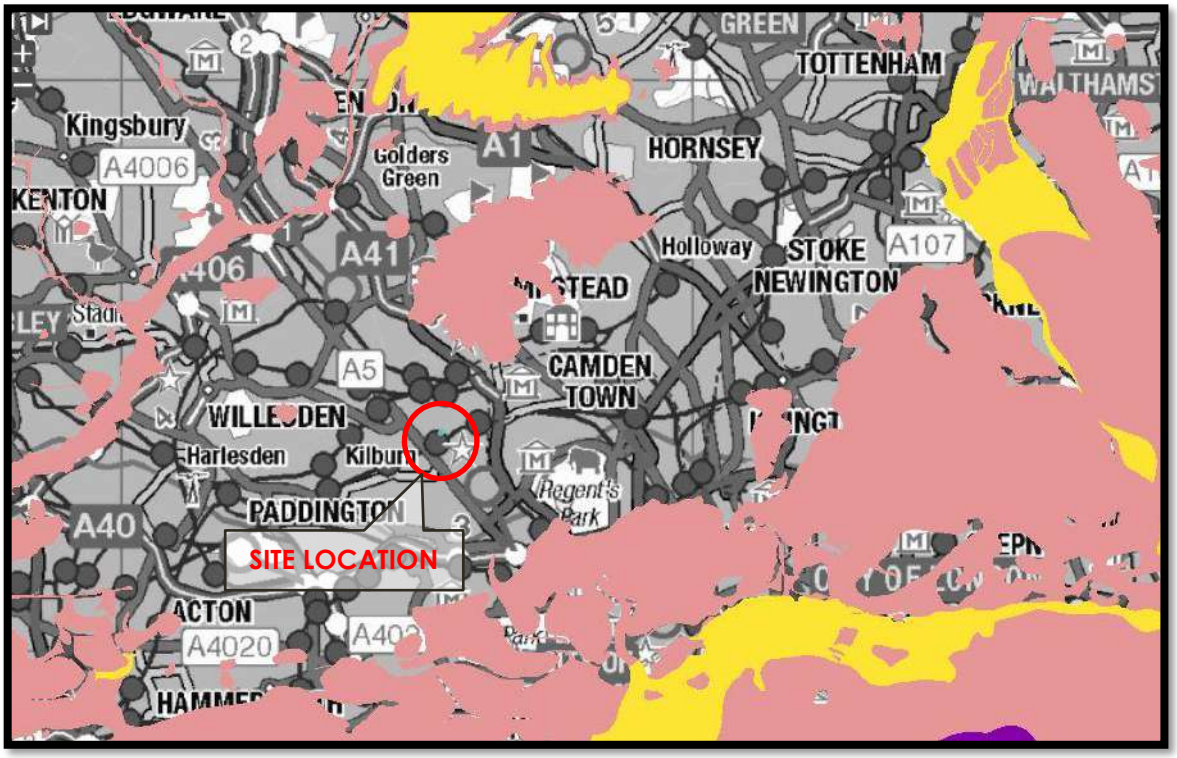


Figure 3.8.2 – Aquifer map from the Natural England MAGIC website.

4.0 Proposed Development

The proposals involve the construction of a 3-storey building including a basement, with a total Gross Internal Area of 143m2. The proposed development plans can be found in Appendix A.

5.0 Flood Risk Policy

5.1 Environment Agency Flood Map

The flood map for the development site shown below suggests that the site wholly falls within flood zone 1, which is defined as land assessed as having a less than 1 in 1000 annual probability of river flooding in any one year.

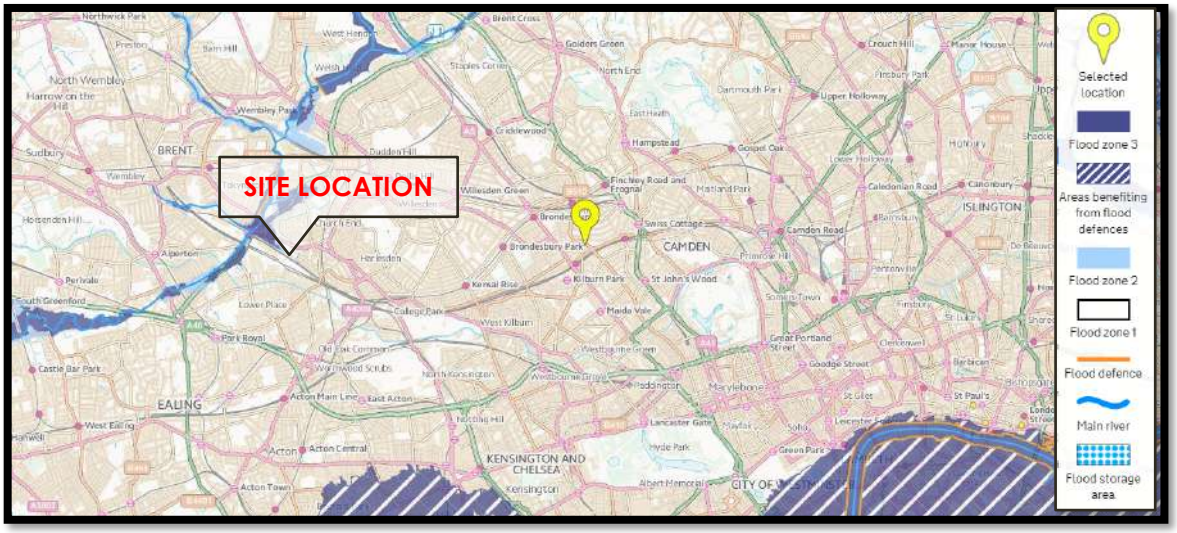


Figure 5.1 - Environment Agency Flood Zone map

5.2 The National Planning Policy Framework

The National Planning Policy Framework (NPPF) and the accompanying Planning Practice Guidance (PPG) gives direction for development with respect to flooding. These documents promote a sequential approach to encourage development away from areas that may be or are susceptible to flooding. In doing so it categorizes flood zones in the context of their probability of flooding, as shown in the table within Section 5.3 below.

5.3 Flood Zone Definition

The National Planning Policy Framework Definition of Flood Zones

Flood zone	Fluvial	Tidal	Probability of flooding
1	< 1 in 1000 year	<1 in 1000 year	Low probability
2	Between < 1 in 1000 year and 1 in 100 year	Between <1 in 1000 year and 1 in 200 year	Medium Probability
3a	> 1 in 100 year	> 1 in 200 year	High probability
3b	Either > 1 in 20 or as agreed between the EA and the LPA	Either > 1 in 20 or as agreed between the EA and the LPA	Functional flood plain

5.4 Flood Zones – Table 1 – Planning Practice Guidance

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - Low Probability
Definition
This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
Appropriate uses
All uses of land are appropriate in this zone.
FRA requirements
For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.
Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

5.5 Flood Risk Vulnerability Classification - Extract from Table 2 - Planning Practice Guidance (PPG)

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.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

5.6 Flood Risk Vulnerability & Flood Zone Compatibility Table

Vulnerability classification flood zone	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
1	√	√	√	√	√
2	√	√	Exception test required	√	√
3a	Exception test required	√	x	Exception test required	√
3b	Exception test required	√	x	x	x

√ Development is appropriate x development is not appropriate

The above table, taken from PPG (table 3), confirms that residential properties within flood zones 1 is appropriate development.

5.7 Other Flooding Mechanisms

In addition to the potential for assessing flooding from fluvial and tidal sources NPPF also requires that consideration is given to other mechanisms for flooding:

- Flooding from land – intense rainfall, often in short duration, that is unable to soak into the ground or enter drainage systems, can run rapidly off land and result in local flooding.
- Flooding from groundwater – occurs when water levels in the ground rise above the surface elevations.
- Flooding from sewers – In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and waste water sewers known as combined sewers. Flooding can result causing surcharging when the sewer is overwhelmed by heavy rainfall.
- Flooding from reservoirs, canals and other artificial sources – Non-natural or artificial sources of flooding can result from sources such as reservoirs, canals lakes etc, where water is held above natural ground levels.

5.8 Local Strategic Flood Risk Assessment SFRA and Local Policy

London Plan:

Policy 5.11- Green Roofs and Development Site Environs: Major development proposals should be designed to include roof, wall and site planting, especially green roofs and walls where feasible, to deliver as many of the following objectives as possible:

1. adaptation to climate change (i.e. Aiding cooling)
2. sustainable urban drainage
3. mitigation of climate change (i.e. Aiding energy efficiency)
4. enhancement of biodiversity
5. accessible roof space
6. improvements to appearance and resilience of the building
7. Growing food.

Policy 5.12 - Flood Risk Management: The Mayor will work with all relevant agencies including the Environment Agency to address current and future flood issues and minimise risks in a sustainable and cost effective way.

Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated technical Guidance on flood risk1 over the lifetime of the development and have regard to measures proposed in Thames Estuary 2100 (TE2100 – see paragraph 5.55) and Catchment Flood Management Plans.

Developments which are required to pass the Exceptions Test set out in the NPPF and the Technical Guidance will need to address flood resilient design and emergency planning by demonstrating that:

- The development will remain safe and operational under flood conditions

- A strategy of either safe evacuation and/or safely remaining in the building is followed under flood conditions

- Key services including electricity, water etc will continue to be provided under flood conditions

- Buildings are designed for quick recovery following a flood.

Development adjacent to flood defences will be required to protect the integrity of existing flood defences and wherever possible should aim to be set back from the banks of watercourses and those defences to allow their management, maintenance and upgrading to be undertaken in a sustainable and cost effective way.

In line with the NPPF and the Technical Guidance, boroughs should, when preparing LDFs, utilise Strategic Flood Risk Assessments to identify areas where particular flood risk issues exist and develop actions and policy approaches aimed at reducing these risks, particularly through redevelopment of sites at risk of flooding and identifying specific opportunities for flood risk management measures.

Policy 5.13 - Sustainable Drainage: It is a key policy with regards to flood risk and water resource management. The policy provides the drainage hierarchy to ensure that reasonable measures are taken to sustainably manage and reduce the overall amount of rainfall being discharged from a development site. Developers should take measures to ensure that surface water management features higher up the drainage hierarchy are incorporated.

The current London Plan drainage hierarchy is as follows:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain7.Discharge rainwater to the combined sewer

Drainage should be designed and implemented in ways that deliver other policy objectives of this Plan, including water use efficiency and quality, biodiversity, amenity and recreation.

Developers should aim to achieve greenfield runoff rates via their proposed SuDS measures and ensure that surface water runoff is managed as close to the source as possible. The proposed measures should be incorporated in line with the Non-statutory technical standards for sustainable drainage systems, prepared by DEFRA in 2015

LB Camden - Local Plan

Policy CC2: Adapting to Climate Change: The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

the protection of existing green spaces and promoting new appropriate green infrastructure;

1. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems
2. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate
3. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

Policy CC3: Water and Flooding: The Council will seek to ensure that development does not increase flood risk and reduces the risk of flooding where possible. We will require development to:

1. incorporate water efficiency measures
2. avoid harm to the water environment and improve water quality
3. consider the impact of development in areas at risk of flooding (including drainage)
4. incorporate flood resilient measures in areas prone to flooding
5. utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible
6. not locate vulnerable development in flood-prone areas.

Where an assessment of flood risk is required, developments should consider surface water flooding in detail and groundwater flooding where applicable. The Council will protect the borough's existing drinking water and foul water infrastructure, including the reservoirs at Barrow Hill, Hampstead Heath, Highgate and Kidderpore.

Policy A5 Basements

The Council will only permit basement development where it is demonstrated to its satisfaction that the proposal would not cause harm to:

- a. neighbouring properties;
- b. the structural, ground, or water conditions of the area;
- c. the character and amenity of the area;
- d. the architectural character of the building; and
- e. the significance of heritage assets.

In determining proposals for basements and other underground development, the Council will require an assessment of the scheme's impact on drainage, flooding, groundwater conditions and structural stability in the form of a Basement Impact Assessment and where appropriate, a Basement Construction Plan.

The siting, location, scale and design of basements must have minimal impact on, and be subordinate to, the host building and property. Basement development should:

- f. not comprise of more than one storey;
- g. not be built under an existing basement;
- h. not exceed 50% of each garden within the property;
- be less than 1.5 times the footprint of the host building in area;
- j. extend into the garden no further than 50% of the depth of the host
- building measured from the principal rear elevation;
- k. not extend into or underneath the garden further than 50% of the depth
- of the garden;
- l. be set back from neighbouring property boundaries where it extends
- beyond the footprint of the host building; and
- m. avoid the loss of garden space or trees of townscape or amenity value.

Exceptions to f. to k. above may be made on large comprehensively planned

sites.

The Council will require applicants to demonstrate that proposals for basements:

- n. do not harm neighbouring properties, including requiring the provision of a Basement Impact Assessment which shows that the scheme poses a risk of damage to neighbouring properties no higher than Burland Scale 1 'very slight';
- o. avoid adversely affecting drainage and run-off or causing other damage
- to the water environment;
- p. avoid cumulative impacts;
- q. do not harm the amenity of neighbours;
- r. provide satisfactory landscaping, including adequate soil depth;
- s. do not harm the appearance or setting of the property or the established
- character of the surrounding area;
- t. protect important archaeological remains; and
- u. do not prejudice the ability of the garden to support trees where they are
- part of the character of the area.

The Council will not permit basement schemes which include habitable rooms and other sensitive uses in areas prone to flooding. We will generally require a Construction Management Plan for basement developments.

Given the complex nature of basement development, the Council encourages developers to offer security for expenses for basement development to adjoining neighbours.

Camden Practise Guidance – Water and Flooding (2019)

Flooding: WHAT DOES THE COUNCIL EXPECT?

- Developments must not increase the risk of flooding, and are required to put in place mitigation measures where there is known to be a risk of flooding (Local Plan policies CC2 and CC3).
- Major developments will be required to constrain runoff volumes for a 1 in 100 year, 6 hour rainfall event, where feasible.
- All sites in Camden of one hectare or more require a Flood Risk Assessment in line with the National Planning Policy Framework
- A drainage report is required for all major applications, basement development, and vulnerable development in areas identified as at risk of flooding (details of what this should include can be found in paragraph 8.67 of the Local Plan). The Council will expect plans and application documents to describe how water will be managed within the development, including an explanation of the proposed SuDS, the reasons why certain SuDS have been ruled out and detailed information on materials and landscaping
- The Council will expect developments to achieve a greenfield surface water un-off rate where feasible once SuDS have been installed.

6.0 Flood Risk to The Development

6.1 Flooding from Fluvial Sources

The proposed development site lies entirely within flood zone 1 which is classified as land assessed as having a less than 1 in 1000 annual probability of river or sea flooding and is appropriate to all uses of land.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding from fluvial sources.

6.2 Flooding from Overland Flows

The risk of flooding due to overland flood flows is considered low by the Environment Agency. The surface water flood data for the site, shown below, indicates that there is medium flood risk immediately to the north of the site, near the garages and along Abbey Road, but very low risk within the site itself. There is currently a wall protection the site from water runoff which will be improved. Surrounding levels fall away from the house and into the road, as explained in section 3.3.

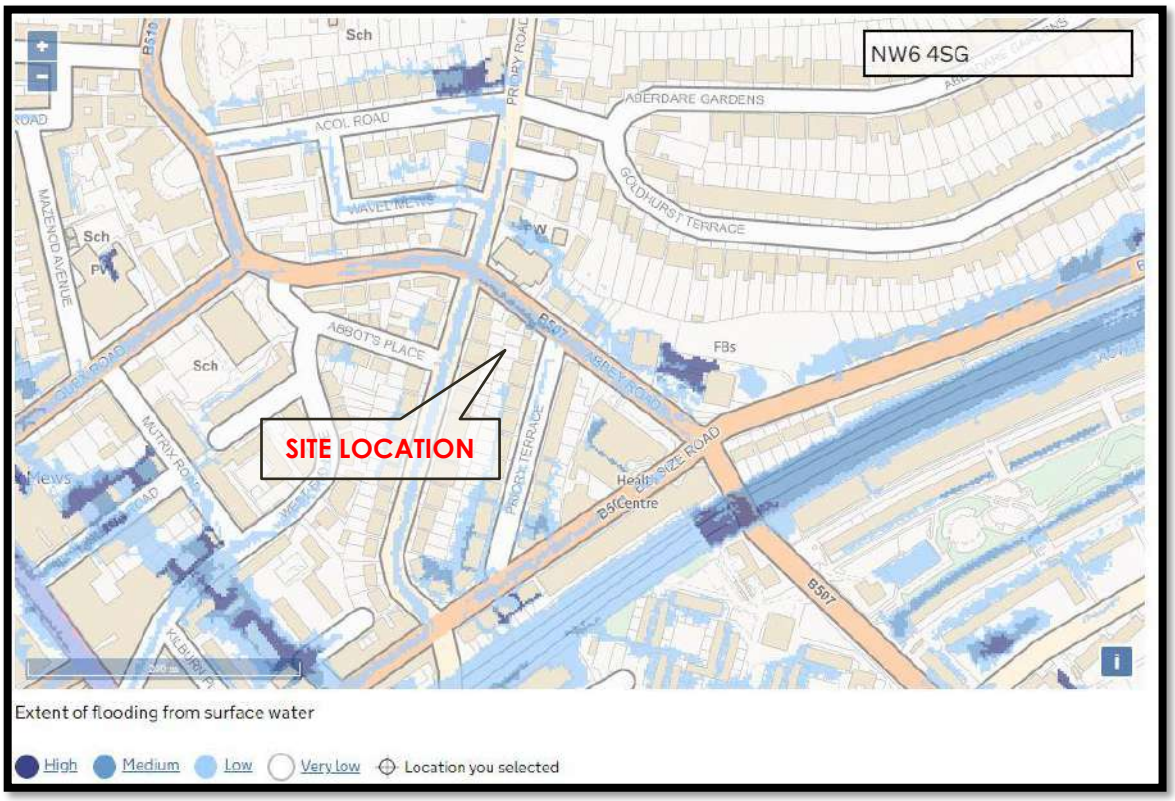


Fig 6.2 – Environment Agency Flood Risk from Surface Water map

It is, therefore, the consideration of this FRA that the site has a low risk of flooding from overland flow.

6.3 Flooding from Rising Groundwater

Groundwater flooding occurs because of the underground water table rising, which can result in water emerging through the ground and causing flooding in extreme circumstances. This source of flooding tends to occur after extensive periods of heavy rainfall. Groundwater flooding can occur in areas where the underlying soil and bedrock can become saturated with water. Therefore, ground composition and aquifer vulnerability are significant influences on the potential rate of groundwater flooding.

A majority of the sub-region is underlain by Thames Group (also referred to as London Clay) bedrock, a composition of silty clay/mudstone, sandy silts and sandy clayey silts of marine origin. This geological unit generally has a low hydraulic conductivity which means water does not easily move through it.

The proposals include a basement and therefore the potential for the water table to raise above the basement level is higher. Since the water table level is unknown, they must be confirmed via groundwater monitoring over a period of time, ideally in winter.

The site is shown outside the "Increased Susceptibility to Elevated Groundwater" area but nearby a location where a groundwater flood incident occurred in the past, identified by the Environment Agency. See map in Appendix E.

It is, therefore, the consideration of this FRA that the site has a medium risk of flooding from rising groundwater levels.

6.4 Flooding from the Local Sewerage Network

Sewer flooding can occur due to sewer infrastructure failure or due to an increased flow and volume of water entering a sewer system which exceeds its hydraulic capacity, causing the system to surcharge. If sewer outfall points are either blocked or submerged due to high water levels, water can back up in a sewer system and cause flooding. These issues can result in water overflowing from gullies and manholes, causing flooding in the local area. Blockages caused by sediment or debris can further exacerbate the probability of sewer flooding.

Drainage in the sub-region is serviced by Thames Water Utilities who provide surface water, foul and combined sewer systems. Modern sewer systems are designed to be separate surface water and foul water systems, typically accommodating up to 1 in 30-year rainfall events. However, sewer system segments across London vary in capacity due to age. Older segments have a smaller capacity and may not be designed to accommodate rainfall events as significant as 1 in 30-year events.

The Thames Water historical sewer flooding dataset provides details on the number of reported sewer flood incidents within a four-digit postcode area. Information on historical sewer flooding is shown in the SFRA indicates no flooding from sewers in the vicinity of the site. Moreover, the site is protected to overland flows with the existing wall, to be retained.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding by surcharging of the local sewer network.

6.5 Flooding from Reservoirs, Canals & Other Artificial Sources

Reservoirs in the UK have an extremely good safety record. The EA is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be inspected and supervised by reservoir panel engineers. It is assumed that these reservoirs are regularly inspected and essential safety work is carried out. These reservoirs therefore present a minimal risk.

Flooding may result from the failure of engineering installations including flood defence, land drainage pumps, sluice gates and floodgates. Hard defences may fail through the slow deterioration of structural components such as the rusting of sheet piling, erosion of concrete reinforcement and toe protection or the failure of ground anchors. This deterioration can be difficult to detect, so that failure when it occurs is often sudden and unexpected. Failure is more likely when the structure is under maximum stress, such as extreme fluvial events when pressures on the structure are at its most extreme.

There are no known reservoirs, canals or other artificial sources in the vicinity of the site.

It is, therefore, the consideration of this FRA that the site has a low risk of flooding by reservoirs, canals or other artificial sources.

7.0 Flood Risk As A Result Of The Development

7.1 Effect of The Development Generally

Development by its nature usually has the potential to increase the impermeable area with a resultant increased risk of causing rapid surface water runoff to watercourses and sewers, thereby causing surcharging and potential flooding. There is also the potential for pollutants to be mobilised and consequently flushed into the receiving surface water system.

Increases in both the peak runoff rate (usually measured in litres per second l/s) and runoff volume (cubic metres m^3) can result.

7.2 Surface Water Drainage & Sustainable Drainage Systems

Sustainable Drainage techniques (SuDS) covers a range of approaches to manage surface water runoff so that-

'Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This should be demonstrated as part of the flood risk assessment.'

7.3 Peak Storm Design Criteria

The proposed sustainable drainage techniques for the development should accommodate the peak rainfall event for a 1 in 100 year storm event with an additional allowance for climate change. Table 5 of NPPG recommends for developments that have a life expectancy beyond 2085 that an additional factor of 40% is applied to the peak volume of runoff.

7.4 Existing Surface Water Runoff Rates

The development site area is approximately 121m2. The site is currently vacant with no visible means of drainage. The existing runoff rates calculated for site are highlighted below:

Return Period	Greenfield Runoff Rate l/s
1 in 1 year	0.1
Qbar	0.1
1 in 30 year	0.2
1 in 100 year	0.2

Table 7.4 Existing Runoff rates

Greenfield runoff rates were calculated using the FSR Method within Microdrainage Software. Calculations can be found in Appendix D.

7.5 Infiltration Testing

It has been assumed, based on local geology information found on the British Geological Survey database, that infiltration is not feasible in this area. Moreover, there is no room for infiltration devices such as soakaways.

7.6 Sustainable Drainage Hierarchy

A hierarchical approach has been undertaken in consideration of the application of SuDS in relation to the development. This is in order to meet the design philosophy of ensuring that surface water run-off is managed as close to its source as possible and the existing situation is replicated as closely as possible.

The following drainage hierarchy has been undertaken with reference to the procedures set out in the SuDS Manual (CIRIA C753, 2015) to assess the viability of the application of SuDS techniques to this scheme:

- **Store rainwater for later use**: Storing rainwater for later use in water butts is recommended but it is not enough to accommodate the runoff volume from the whole development. After a period of continuous rain, these tanks can be full and therefore its efficacy reduced considerably.

- Use infiltration techniques, such as porous surfaces in permeable strata areas: Soakaways cannot be used due to the lack of space.

- Attenuate rainwater in ponds or open water features for gradual release to a watercourse. There are no watercourses in the vicinity of this site.

- Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse. Not feasible because there are no watercourses in the close vicinity.

- Attenuate rainwater by storing in tanks or sealed water features for gradual release to a surface water sewer. There are no surface water sewers in the vicinity.

- **Discharge rainwater to the combined sewer.** Foul and surface water from the new house will be discharged into the main combined sewer in Priory Terrace.

The sustainable drainage hierarchy shown above is intended to ensure that all practical and reasonable measures are taken to manage surface water higher up the hierarchy (1 being the highest) and that the amount of surface water managed at the bottom of the hierarchy is minimised.

Storing rainwater for later use might be an option but it is not sufficient to accommodate the runoff from the whole development.

The site-specific drainage hierarchy checklist considered for the drainage design for this development is detailed in Table 7.6.

SUDS OPTIONS	Comments	Potential for flow	Volume reduction	Maintenance requirement	Space requirement	Cost	Included in final detailed design
Rainwater harvesting	Rainwater from roof runoff collected for re-use. Cost-benefit considerations	L	M	H	L	H	N
Water butts	Rainwater collection from roof runoff. Included in final design	L	L	L	L	L	Pos
Living roofs	Vegetated roofs that reduce runoff volume and rate	M	L	M	L	H	Y
Bio-retention	Shallow vegetated areas to retain and treat runoff.	L	L	M	M	L	N
Constructed wetlands	Waterlogged areas that can support aquatic vegetation. Replicates existing conditions and provides ecological benefit.	M	L	H	H/M	M	N
Swales	Shallow grassed drainage channels. Replicates existing conditions	H	M	L	M/H	L	N
Soakaways	Subsurface structures that dispose of water via infiltration.	H	H	L	L	M	N
Permeable pavements	Surface that infiltrate through surface. Retains pollutants.	H	H	M	L	M	N
Tanked storage systems	Oversized pipes or cellular storage.	H	L	L	M	M/H	Y
Infiltration basins	Depressions in the ground to store and release water through infiltration	H	H	H/M	H	M/L	N
Detention basins	Temporary retention of runoff with controlled discharge	H	L	M	H	M/L	N

Table 7.6 Drainage design hierarchy (SuDS techniques considered for use in this scheme)

It should be noted that where the SuDS techniques are noted as feasible or possible it does not necessarily follow that they will all be used. Reference should be made to the drainage strategy drawing in Appendix C which indicates the drainage proposals.

7.7 SUDS Techniques Employed

Runoff from the roof will be collected and conveyed via a pipe network into cellular attenuation tank, from where it will be discharged into the combined sewer at a limited flow rate of 2l/s. The flow control device can be an orifice plate of Ø34mm diameter or a vortex system. A weir wall is recommended so water can leave the site in case of a blockage.

Runoff from the basement patio will be pumped to ground level. Potential sediments will be trapped using catchpits. Urban creep has not been considered as there is little room for extensions.

Approximately 25% of the total will be green roof, which will help to attenuate and also reduce the runoff. Since the sewer is combined, a non-return valve will be installed before the demarcation chamber to prevent backflows in case the system surcharges.

Calculations for the attenuation device can be found in Appendix D.

Return Period	Existing Runoff Rate l/s	Proposed Runoff Rate l/s
1 in 1 year	0.1	2.0
Qbar	0.1	2.0
1 in 30 year	0.2	2.0
1 in 100 year	0.2	2.0

Table 7.7.A Existing and proposed runoff rates

7.8 Residual Flood Risk & Exceedance

The proposed surface water drainage measures will however be designed to contain the peak storm event that can be expected for a 1 in 100 year situation. A 40% allowance has already been applied to the site to account for future climate change.

7.9 Dry Means of Escape

For basement development it is necessary to provide safe access and egress during a flood. A safe access or exit route must be appropriate for use by occupiers to escape flooding without the intervention of the emergency services.

Based on the Environment Agency flood maps, the main entrance to the building is in Flood Zone 1. Therefore, a safe access/egress will be available through the internal stairs.

8.0 Proposed Foul Water Drainage System

The development proposals will seek to discharge foul water from the development site into the existing combined drainage network running along Priory Terrace, to the east of the property. This will be subject to a Section 106 consents from Local Water Authority, Thames Water. Flows into this system will be via a gravity fed connection.

A pre-development enquiry has been made to Thames Water although at the time of writing no response has been received. No capacity issues are envisaged as it is the head of the line.

9.0 Recommendations and Conclusion

The development proposals together with the site layout have been assessed in relation to the provision of SuDS drainage associated with the works.

The report has assessed the feasibility of implementing the SuDS hierarchal approach and has confirmed that this development is likely to be able to install suitable drainage measures into the design proposals.

Therefore, in line with the recommendations of the National Planning Policy Framework, the development site lies within land classified as Flood Zone 1, which is considered at a low risk of flooding, and therefore appropriate for a development of this nature. Having assessed the other forms of flood risk to and from the development site, this report finds that the site is not considered at high risk from any other sources of flooding. The site is also in line with the Camden Local Plan Policy A5 – Basements, as shown in section 5.8.

9.1 Flood Resistant measures

Provided that the drainage system is appropriately maintained, the risk of flooding from overland flows is low. However, as part of the works associated with the new development it is the recommendation of the report that consideration should be given to flood resistant measures, in particular at the basement level. These are mechanisms which can be implemented by the occupier to provide additional defences against flood water ingress should the drainage system fails. More information can be gained from the CIRIA document 'Improving the flood performance of new buildings'.

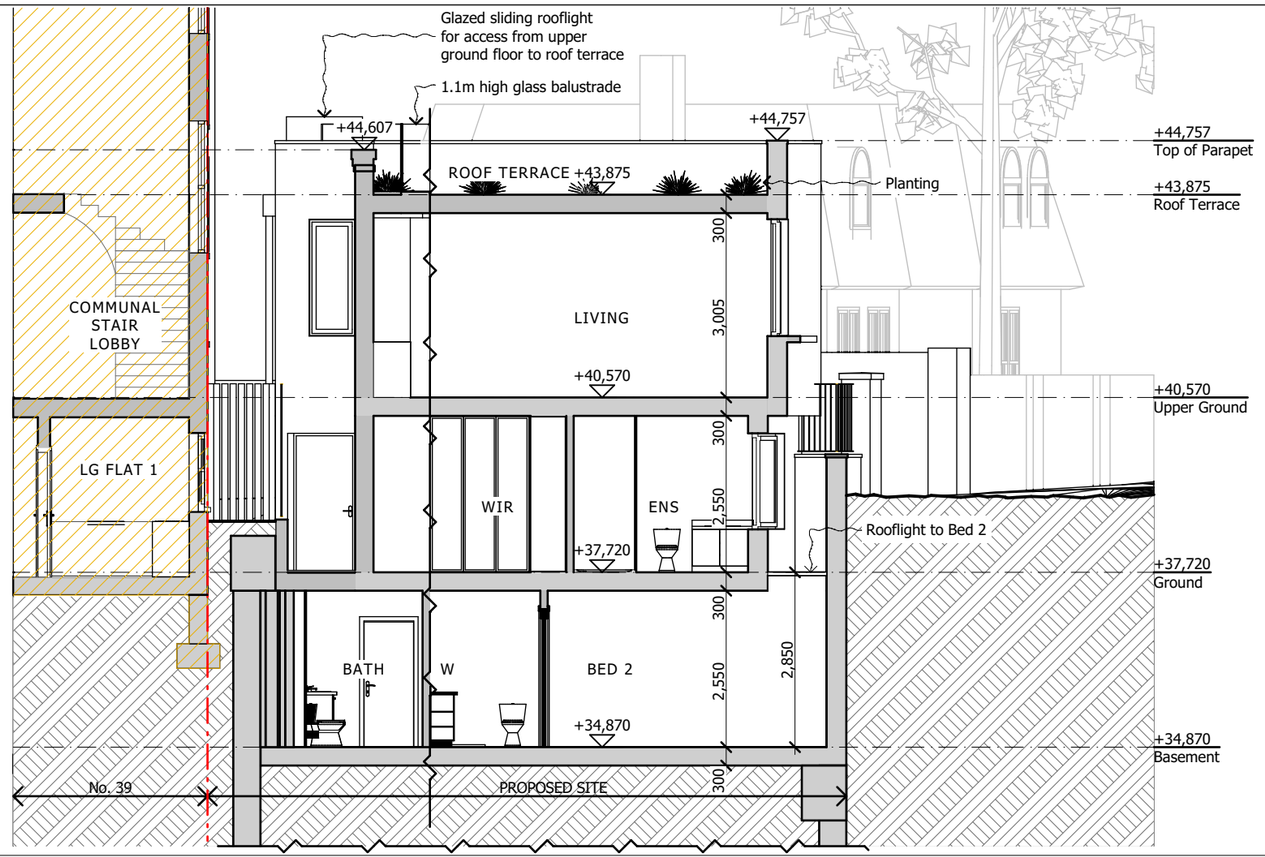
9.2 Flood Resilient measures

It is also the recommendation of the report that flood resilient measures are used within the design to minimize the impact an extreme flood event would have on the property. As these works are associated with the construction of the residential dwelling it would mainly involve the sighting of sockets and fuse boxes away from floor level. More information can be gained from the CIRIA document 'Improving the flood performance of new buildings'.

10.0 References & Bibliography

- The National Planning Policy Framework July 2018
- Planning Practice Guidance.
- Environment Agency - Rainfall-Runoff Management for Developments
- Environment Agency indicative flood maps https://flood-map-for-planning.service.gov.uk/
- Environment Agency indicative groundwater source protection zone maps http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx
- Environment Agency indicative Aquifer designation maps http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx
- CIRIA 2007, The Sustainable Drainage Systems (SUDS) Manual C753
- Sewers for adoption 7th edition
- DEFRA Non-statutory technical standards for sustainable drainage
- The London Plan sustainable design and Construction Supplementary Planning Guidance
- Preliminary FRA for London Borough of Camden – 2011 by Halcrow
- London Borough of Camden SFRA – 2014 by URS
- Managing Flood Risk in Camden – 2013 by Camden Council
- Camden Planning Guidance – Basements – 2018
- Camden Planning Guidance – Water and Flooding - 2019
- Camden Local Plan - 2017
- Flood Estimation Handbook
- Environment Agency - Adapting to Climate Change: Advice for the Flood and Coastal Erosion Management Authorities March 2016

Appendix A - Development Proposals



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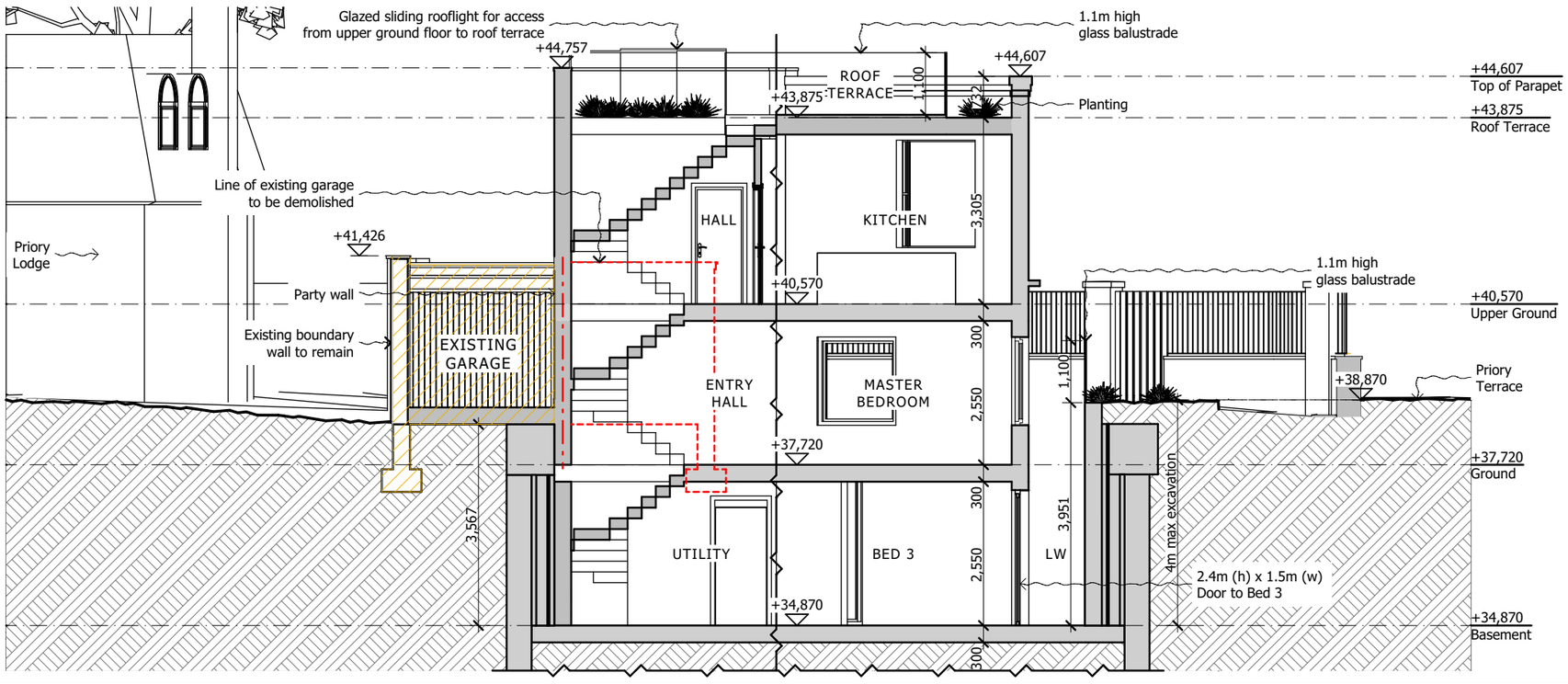
PROPOSED SECTION A-A



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SCALE 1:100 @ A3

PROPOSED SECTION B-B

DO NOT SCALE FROM THIS DRAWING

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any work is put in hand.

If in doubt, ask.

Legends & Notes:

BOUNDARY LINE

NOT IN THE OWNERSHIP OF THE APPLICANT

LW LIGHTWELL

Rev	Date	Descriptor	
P01	04/02/2020	Consultants Issue	BKS

shh
Architecture & Interior Design
RIBA Chartered Practice
MEMBER
1 Vencourt Place, Ravenscourt Park
Hammersmith, London W6 9NU
Phone **+44 (0) 20 8600 4171** Email **info@shh.co.uk**
shh.co.uk

Project:

Abbey Road

Land and garage adjacent to 39 Priory Terrace
London, NW6 4DG

Client:

Old West Hampstead Estates Ltd.

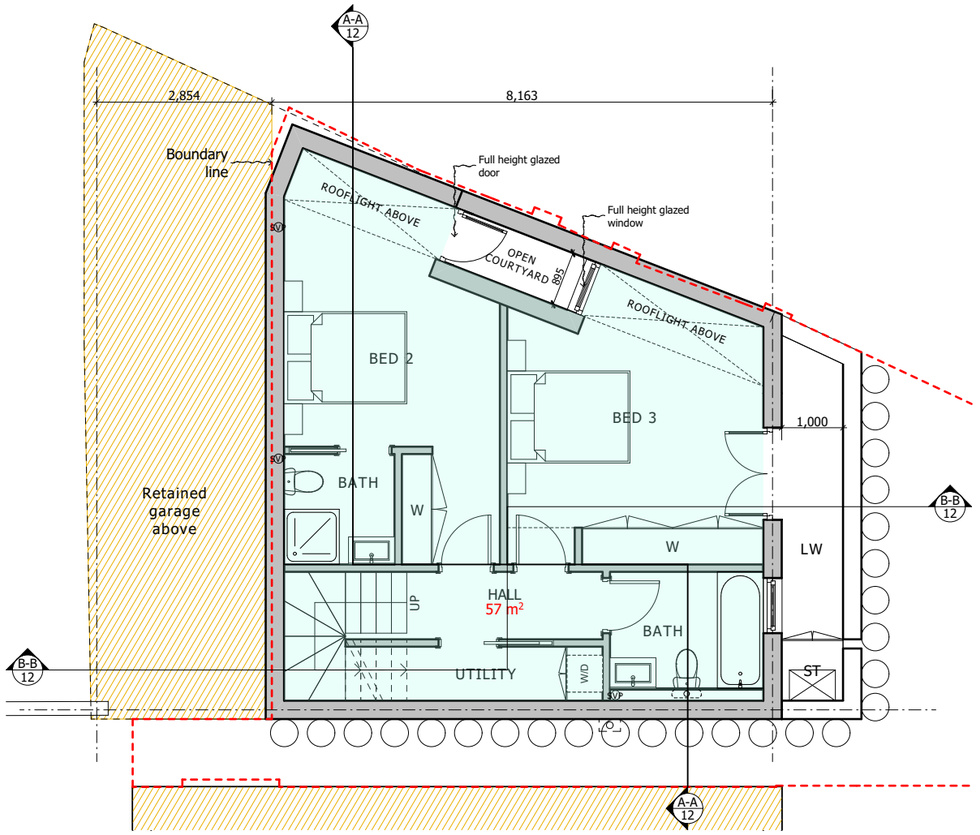
Drawing Title:

Pre Planning Application

Section A-A & B-B

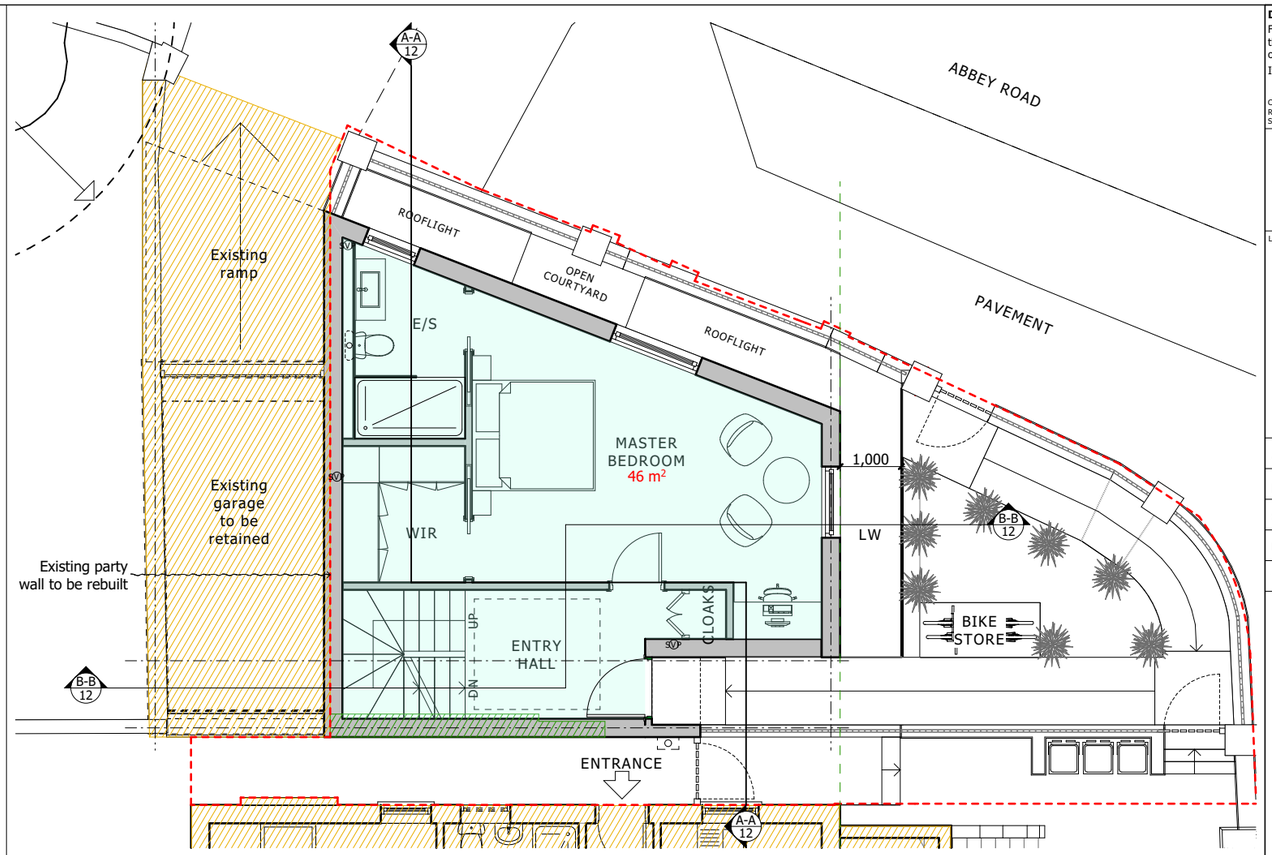
(Project number)DWG number_Revision

(919)310_P01



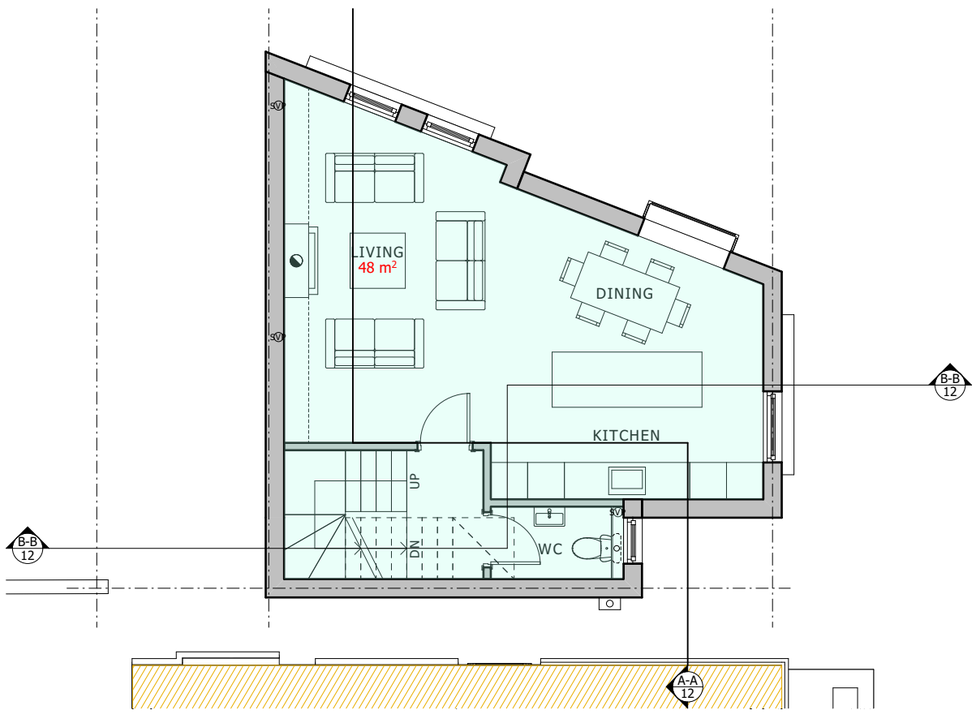
1 SCALE 1:100 @ A3

PROPOSED BASEMENT FLOOR PLAN



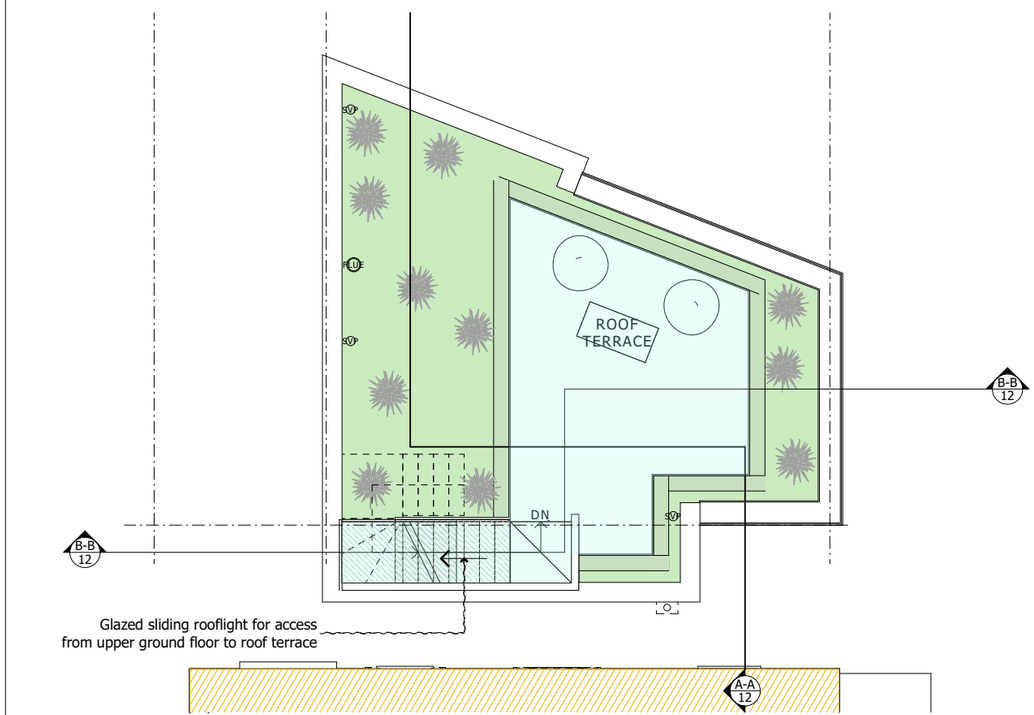
2 SCALE 1:100 @ A3

PROPOSED GROUND FLOOR PLAN



3 SCALE 1:100 @ A3

PROPOSED UPPER GROUND FLOOR PLAN



4 SCALE 1:100 @ A3

PROPOSED ROOF PLAN

DO NOT SCALE FROM THIS DRAWING

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any work is put in hand.

If in doubt, ask.

0 1 2 3m

Legends & Notes:

N

AREA SCHEDULE	
BASEMENT	57m² (614ft²)
GROUND	46m² (495ft²)
UPPER GROUND	48m² (517ft²)
TOTAL GIA	151m² (1625ft²)

BOUNDARY LINE

NOT IN THE OWNERSHIP OF THE APPLICANT

LW LIGHTWELL

Rev	Date	Descriptor	
P01	04/02/2020	Consultants Issue	BKS

shh
Architecture & Interior Design
RIBA Chartered Practice
MEMBER
1 Vencourt Place, Ravenscourt Park
Hammersmith, London W6 9NU
Phone +44 (0) 20 8600 4171 Email info@shh.co.uk
shh.co.uk

Project:

Abbey Road

Land and garage adjacent to 39 Priory Terrace
London, NW6 4DG

Client:

Old West Hampstead Estates Ltd.

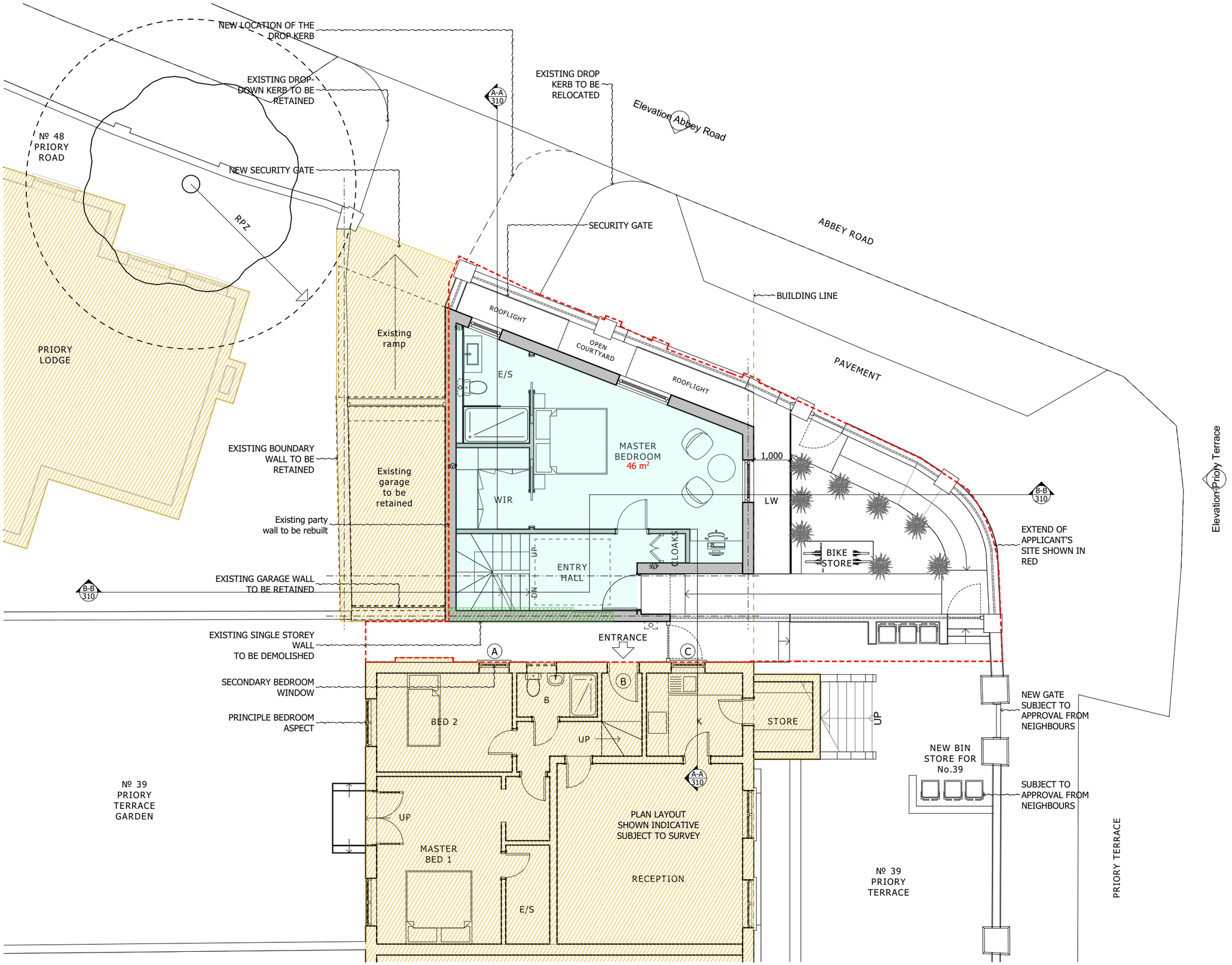
Drawing Title:

Pre Planning Application

Proposed Floor Plans

(Project number)DWG number_Revision

(919)020_P01



DO NOT SCALE FROM THIS DRAWING

Figured dimensions only are to be taken from this drawing. All dimensions are to be checked on site before any work is put in hand.

If in doubt, ask.

0 1 2 3m

Legends & Notes:

N

BOUNDARY LINE

NOT IN THE OWNERSHIP OF THE APPLICANT

LW LIGHTWELL

Rev	Date	Descriptor	
P01	04/02/2020	Consultants Issue	BKS

shh
Architecture & Interior Design
RIBA Chartered Practice
MEMBER
1 Vencourt Place, Ravenscourt Park
Hammersmith, London W6 9NU
Phone +44 (0) 20 8600 4171 Email info@shh.co.uk
shh.co.uk

Project:

Abbey Road

Land and garage adjacent to 39 Priory Terrace
London, NW6 4DG

Client:

Old West Hampstead Estates Ltd.

Drawing Title:

Pre Planning Application

Proposed Site Plan

(Project number)DWG number_Revision

(919)001_P01

1

SCALE 1:100 @ A3

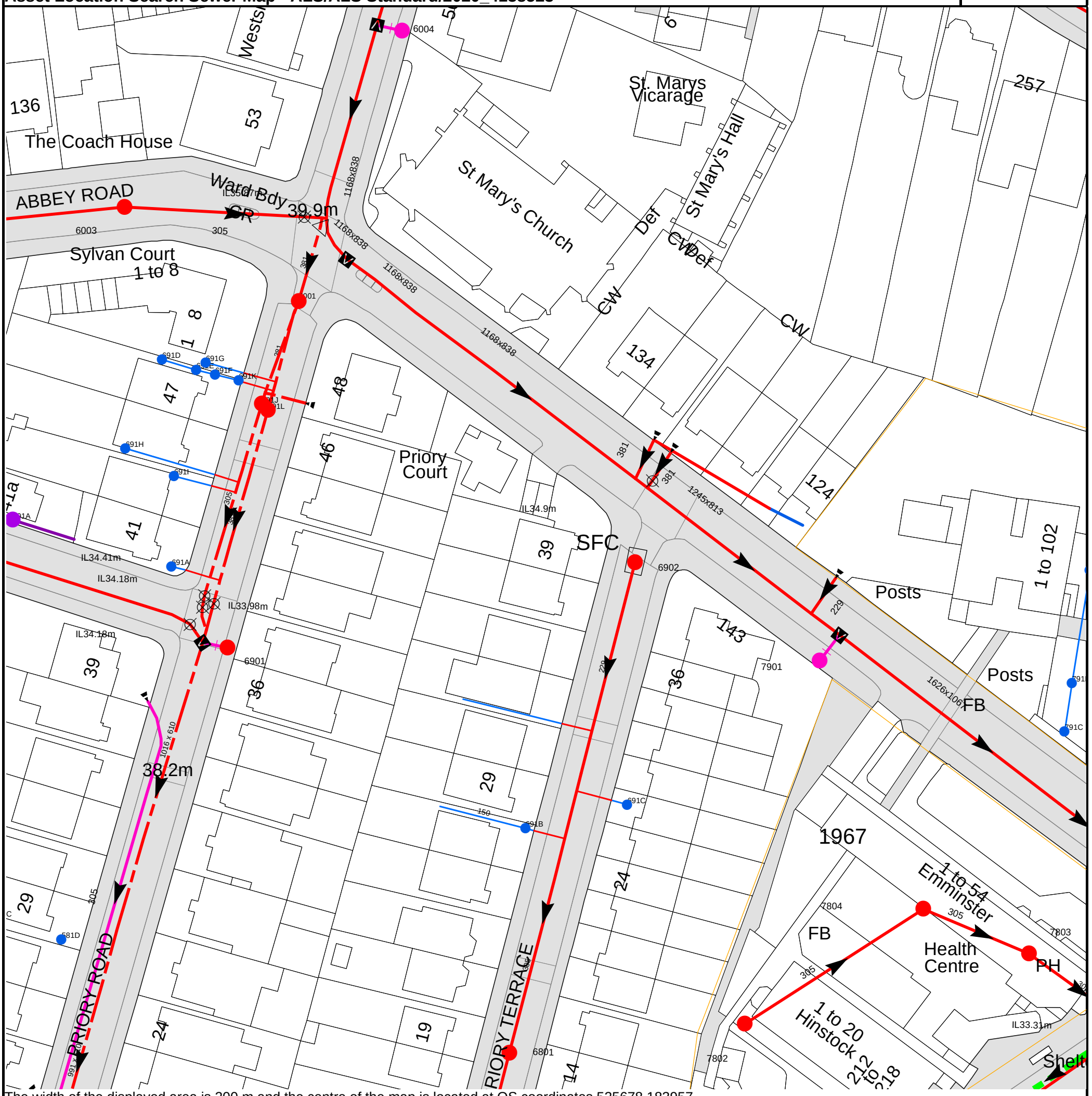
PROPOSED SITE PLAN

Perspective Views

Date: 04/02/2020

Appendix B - Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2020_4138523



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 525678,183957

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
6004	n/a	n/a
6003	40.11	n/a
691E	n/a	n/a
691G	n/a	n/a
691F	n/a	n/a
6901	n/a	n/a
691K	n/a	n/a
691J	n/a	n/a
691L	n/a	n/a
6001	39.34	35.05
6801	36.62	32.66
691B	n/a	n/a
691C	n/a	n/a
6902	38.55	34.35
7802	36.8	34.48
7901	n/a	n/a
7804	36.84	33.81
7803	37.01	33.48
791C	n/a	n/a
791B	n/a	n/a
791A	n/a	n/a
591A	n/a	n/a
581D	n/a	n/a
691H	n/a	n/a
691D	n/a	n/a
691A	n/a	n/a
691I	n/a	n/a

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.

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

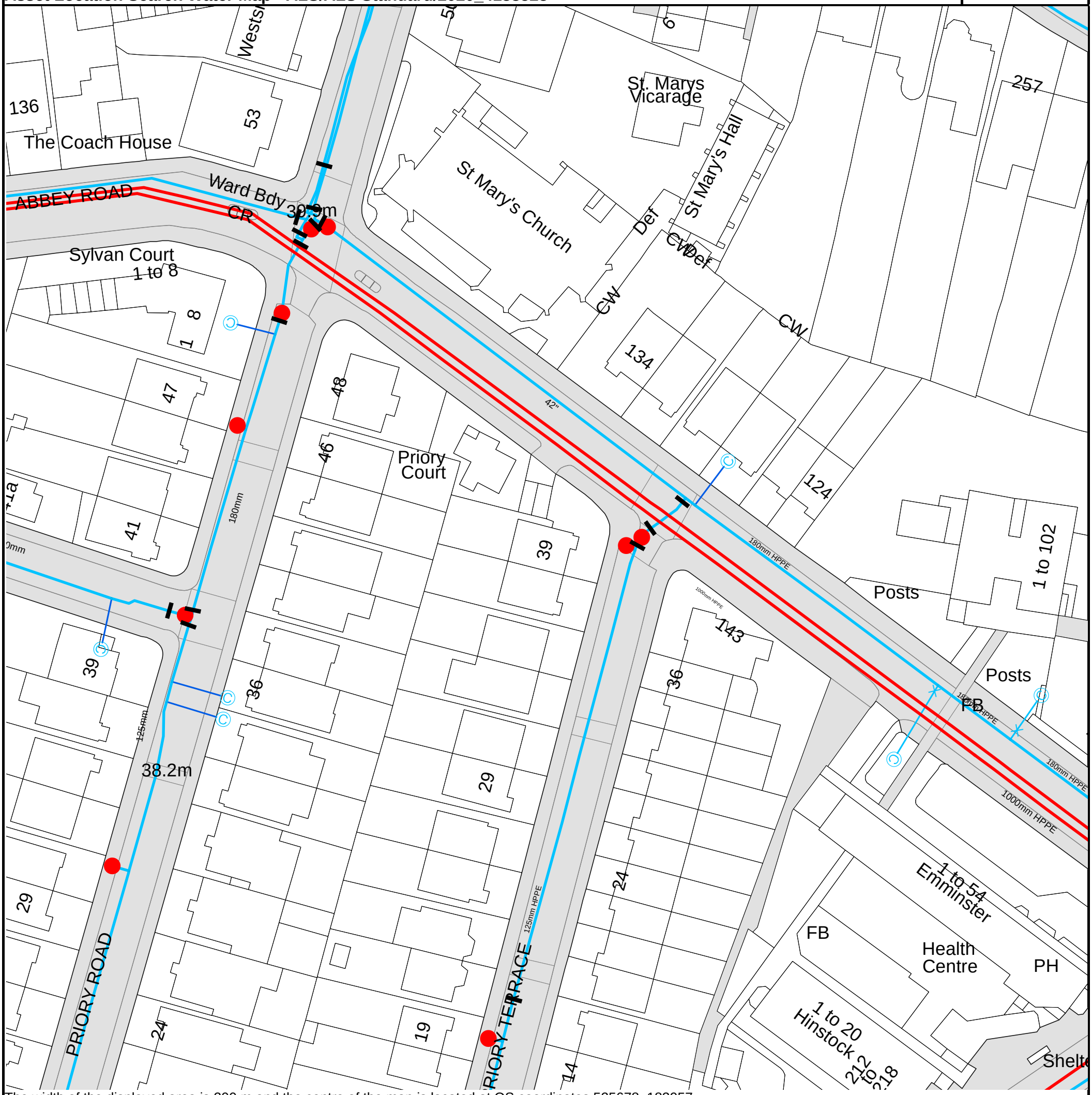
Proposed

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/2020_4138523



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 525678, 183957.

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.

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.

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

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')

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.

Appendix C - Drainage Strategy

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

N

W E

S

NOTE:

1. DO NOT SCALE, IF IN DOUBT ASK.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURAL ENGINEER'S DRAWINGS AND DETAILS, THE SPECIFICATION FOR THE WORKS, THE RELEVANT ARCHITECT'S DRAWINGS AND ANY OTHER SPECIALIST'S DRAWINGS.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

NOTES
- All street lights in verge to have 150mm concrete collar surround
- Tree root barrier required to any tree within 5m of the carriageway/footway
- Permeable paving to be laid at 45° herringbone pattern. Stretcher course should be used when pattern can't be continued. 1 No stretcher course channel either side of road
- No doors or windows are to open onto the highway at any level. No gas boxes or porches are to be located within highway land
- All private footways to be side hung so no runoff into public highway
- No railings or fences to be in highway or 600mm from front face of kerb

Drainage Key
Sewers

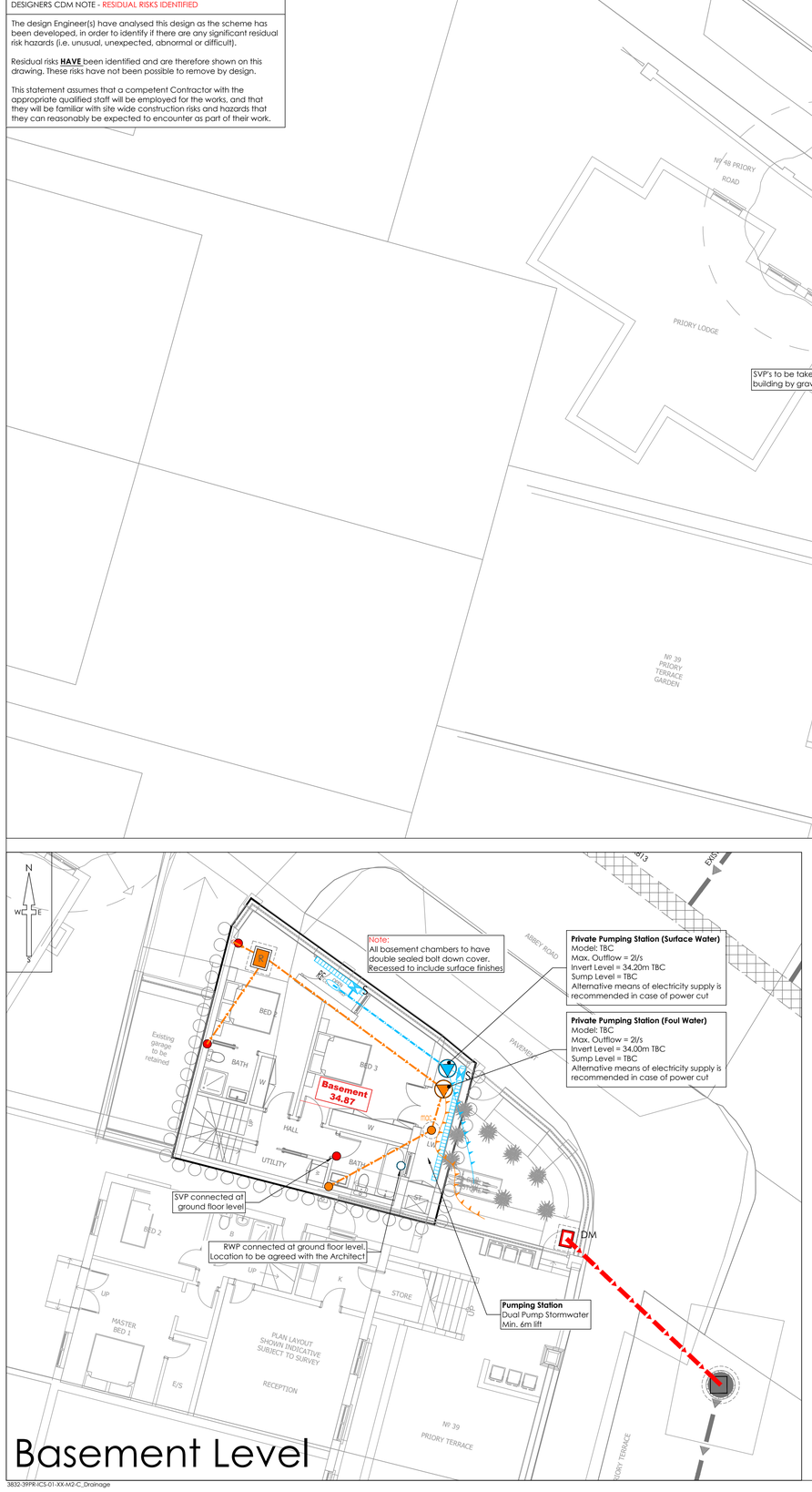
	Foul water drain (private/non adoptable)
	Surface water drain (private/non adoptable)
	Foul water drain - Basement (private)
	Proposed combined water sewer (Adopted)
	Existing combined water sewer (Adopted)
	Surface Water Rising Main (private)
	Foul Water Rising Main (private)

Chamber Key
FW/SW

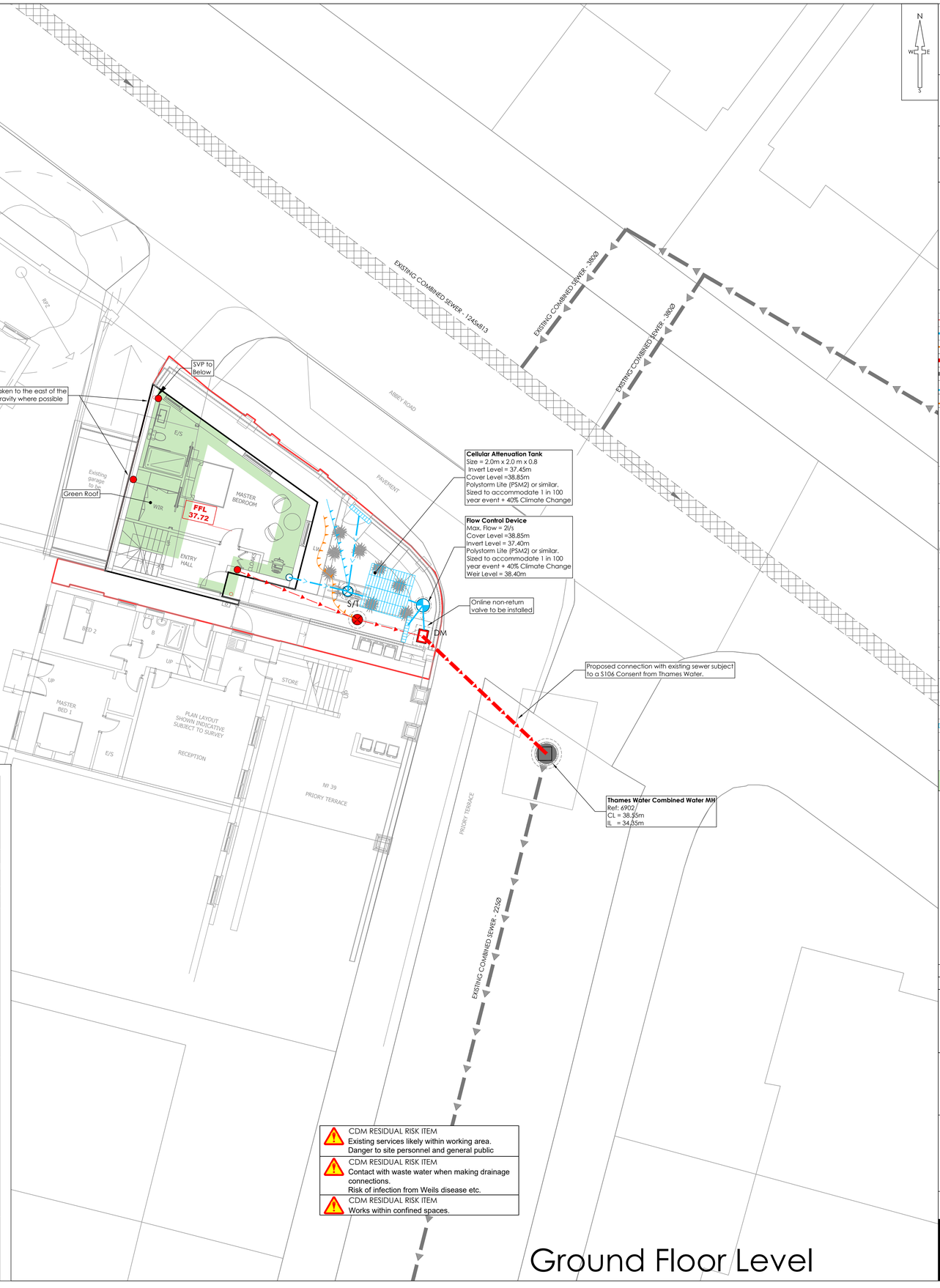
FWC / SWC	Mini access chamber (mac) - 300mmØ
	PPIC - 475mmØ*
DM / DM	Adoptable demarcation manhole within 1m of boundary
	Manhole Depth: 1.25m to 1.5m* Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

RE	Surface water rodding eye
	Rain water down pipe (roddable access)
	Soil vent pipe/soil stack - Ground Floor
	Soil vent pipe/soil stack - Basement
ST	Silt Trap (ST) with removable silt bucket
S1/F1	Manhole reference number
yg	Yard gully (150mm - 200mmØ trapped)
S	Surface water sump unit
	Linear drainage channel
	Cellular storage (refer to drawing for sizes)
FFL XX.XX	Finished Floor Level (FFL)
	Green Roof



Basement Level



Ground Floor Level

CDM RESIDUAL RISK ITEM
Existing services likely within working area.
Danger to site personnel and general public

CDM RESIDUAL RISK ITEM
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.

CDM RESIDUAL RISK ITEM
Works within confined spaces.

Rev	Date	Amendments	By	Chk'd
P01	12/02/20	Initial Issue	MBD	DJ

engineersHRW
London 0207 407 9575 Oxford 01865 251 206 www.ehrw.co.uk

Project:
39 Priory Terrace, London, NW6 4DG

Drawing title:
Drainage Design

Scale at A1:	Drawn by:	Date:	Chk'd by:
1:100	SNN	Feburary 2020	MBD

Status: S2 Purpose For Issue: **PRELIMINARY**

Drawing Number: **2015-HRW-XX-XX-DR-C-0500** Rev: **P01**

Appendix D - MicroDrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.012	Urban	0.250
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	0.0
QBAR Urban	0.1
Q100 years	0.2
Q1 year	0.1
Q30 years	0.1
Q100 years	0.2

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	38.073	0.623	2.0	2.5	O K
30 min Summer	38.123	0.673	2.0	2.7	O K
60 min Summer	38.083	0.633	2.0	2.5	O K
120 min Summer	37.955	0.505	1.8	2.0	O K
180 min Summer	37.852	0.402	1.6	1.6	O K
240 min Summer	37.773	0.323	1.4	1.3	O K
360 min Summer	37.668	0.218	1.2	0.9	O K
480 min Summer	37.604	0.154	1.0	0.6	O K
600 min Summer	37.562	0.112	0.9	0.4	O K
720 min Summer	37.532	0.082	0.8	0.3	O K
960 min Summer	37.496	0.046	0.7	0.2	O K
1440 min Summer	37.461	0.011	0.5	0.0	O K
2160 min Summer	37.450	0.000	0.4	0.0	O K
2880 min Summer	37.450	0.000	0.3	0.0	O K
4320 min Summer	37.450	0.000	0.2	0.0	O K
5760 min Summer	37.450	0.000	0.2	0.0	O K
7200 min Summer	37.450	0.000	0.1	0.0	O K
8640 min Summer	37.450	0.000	0.1	0.0	O K
10080 min Summer	37.450	0.000	0.1	0.0	O K
15 min Winter	38.073	0.623	2.0	2.5	O K
30 min Winter	38.111	0.661	2.0	2.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	147.288	0.0	3.7	14
30 min Summer	95.147	0.0	4.8	23
60 min Summer	58.456	0.0	5.8	40
120 min Summer	34.696	0.0	6.9	72
180 min Summer	25.247	0.0	7.6	104
240 min Summer	20.040	0.0	8.0	134
360 min Summer	14.437	0.0	8.7	194
480 min Summer	11.439	0.0	9.1	254
600 min Summer	9.544	0.0	9.5	314
720 min Summer	8.227	0.0	9.9	372
960 min Summer	6.505	0.0	10.4	492
1440 min Summer	4.665	0.0	11.2	734
2160 min Summer	3.341	0.0	12.0	0
2880 min Summer	2.635	0.0	12.6	0
4320 min Summer	1.883	0.0	13.6	0
5760 min Summer	1.482	0.0	14.2	0
7200 min Summer	1.230	0.0	14.8	0
8640 min Summer	1.057	0.0	15.2	0
10080 min Summer	0.929	0.0	15.6	0
15 min Winter	147.288	0.0	3.7	15
30 min Winter	95.147	0.0	4.8	24

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	38.038	0.588	1.9	2.4	O K
120 min Winter	37.866	0.416	1.6	1.7	O K
180 min Winter	37.746	0.296	1.4	1.2	O K
240 min Winter	37.664	0.214	1.2	0.9	O K
360 min Winter	37.569	0.119	0.9	0.5	O K
480 min Winter	37.519	0.069	0.8	0.3	O K
600 min Winter	37.491	0.041	0.7	0.2	O K
720 min Winter	37.473	0.023	0.6	0.1	O K
960 min Winter	37.453	0.003	0.5	0.0	O K
1440 min Winter	37.450	0.000	0.3	0.0	O K
2160 min Winter	37.450	0.000	0.2	0.0	O K
2880 min Winter	37.450	0.000	0.2	0.0	O K
4320 min Winter	37.450	0.000	0.1	0.0	O K
5760 min Winter	37.450	0.000	0.1	0.0	O K
7200 min Winter	37.450	0.000	0.1	0.0	O K
8640 min Winter	37.450	0.000	0.1	0.0	O K
10080 min Winter	37.450	0.000	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	58.456	0.0	5.8	42
120 min Winter	34.696	0.0	6.9	76
180 min Winter	25.247	0.0	7.6	108
240 min Winter	20.040	0.0	8.0	138
360 min Winter	14.437	0.0	8.7	196
480 min Winter	11.439	0.0	9.1	256
600 min Winter	9.544	0.0	9.5	314
720 min Winter	8.227	0.0	9.9	374
960 min Winter	6.505	0.0	10.4	492
1440 min Winter	4.665	0.0	11.2	0
2160 min Winter	3.341	0.0	12.0	0
2880 min Winter	2.635	0.0	12.6	0
4320 min Winter	1.883	0.0	13.6	0
5760 min Winter	1.482	0.0	14.2	0
7200 min Winter	1.230	0.0	14.8	0
8640 min Winter	1.057	0.0	15.2	0
10080 min Winter	0.929	0.0	15.6	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	20.600	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)
0	4	0.010

Time Area Diagram

Total Area (ha) 0.000

Time (mins) From:	To:	Area (ha)
0	4	0.000

Model Details

Storage is Online Cover Level (m) 38.850

Tank or Pond Structure

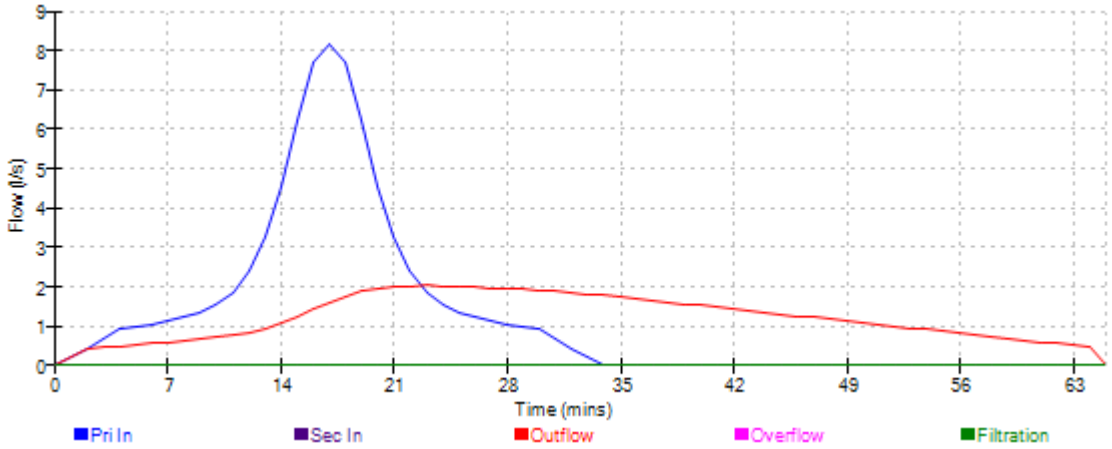
Invert Level (m) 37.450

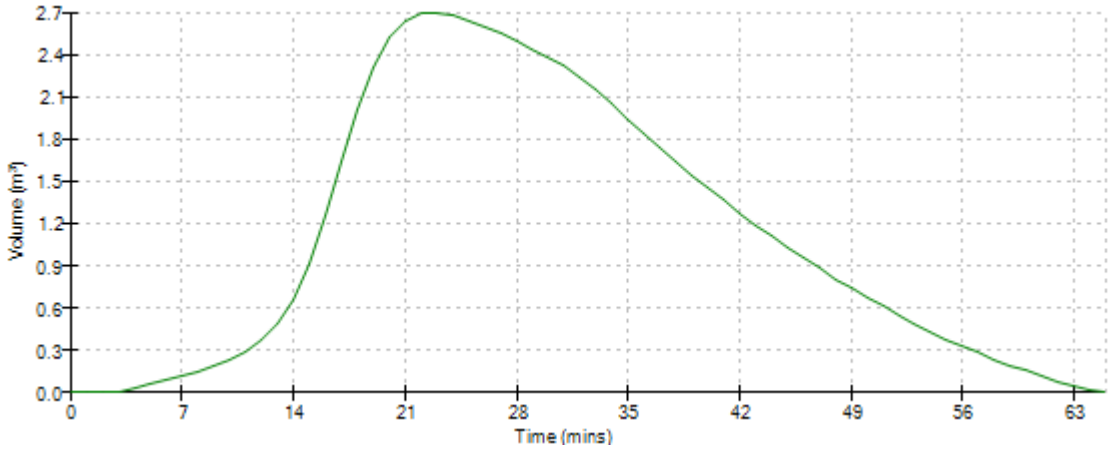
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4.0	0.800	4.0	0.801	0.0

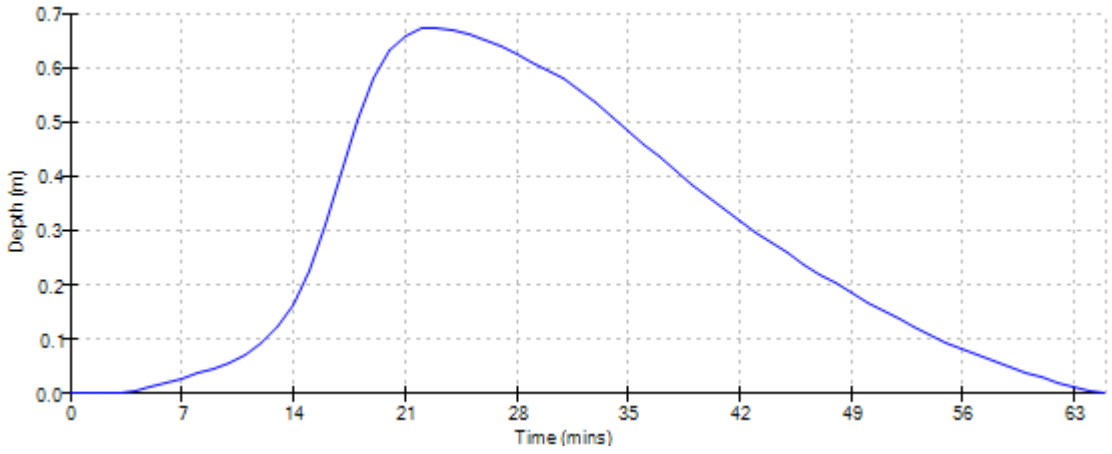
Orifice Outflow Control

Diameter (m) 0.034 Discharge Coefficient 0.600 Invert Level (m) 37.400

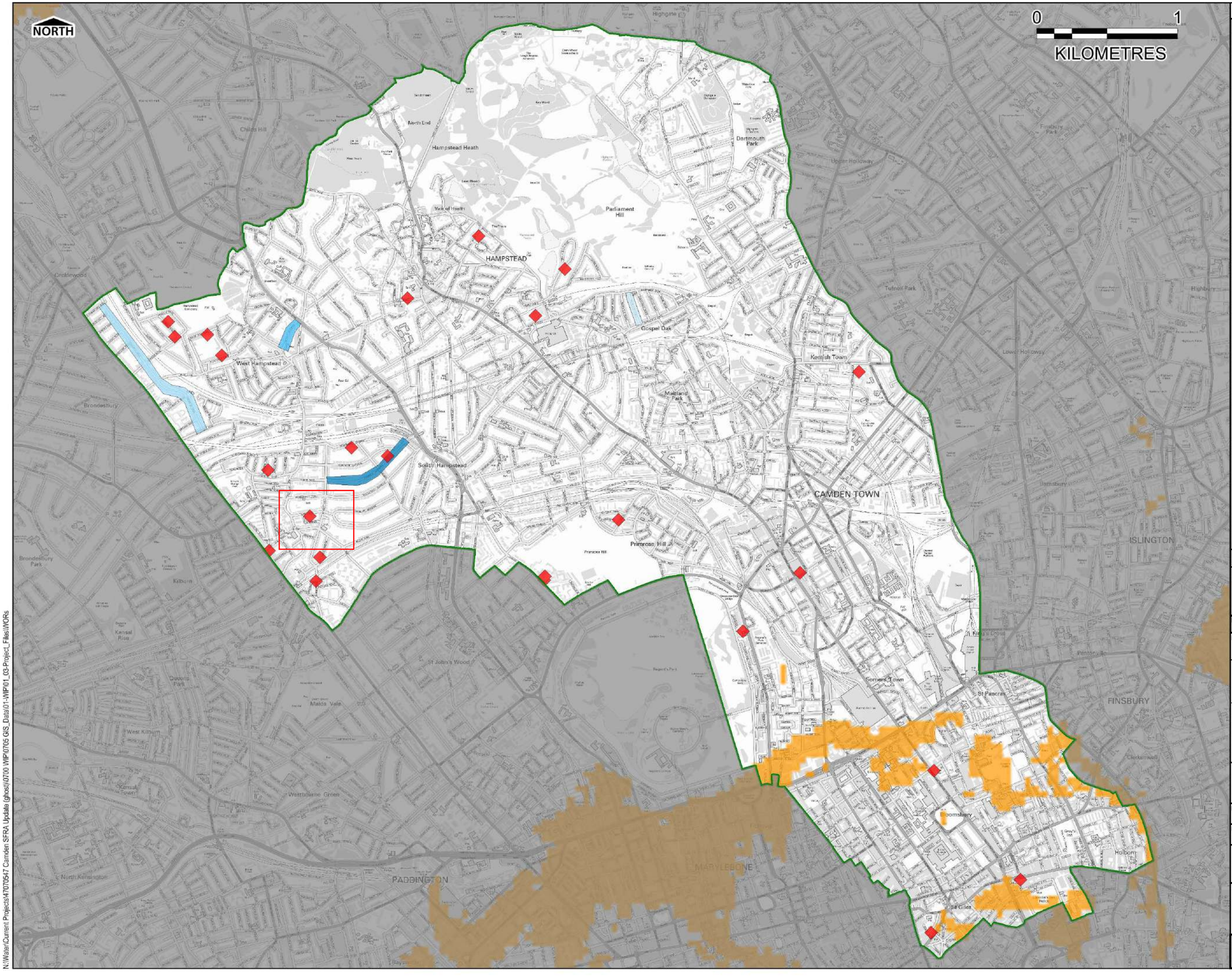
Event: 30 min Summer







Appendix E - L.B. of Camden - Susceptibility to Elevated Groundwater Map



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- London Borough Camden Boundary
- LBC Historic GW Flooding Record
  No. Properties affected
  - 1
  - 6
  - 7
  - 8
- Increased Susceptibility to Elevated Groundwater
- Environment Agency groundwater flood incidents

Revision Details	By / Check	Check Date	Suffix

Purpose of Issue: FINAL

Client: Camden

Project Title: LONDON BOROUGH OF CAMDEN STRATEGIC FLOOD RISK ASSESSMENT

Drawing Title: Increased Susceptibility to Elevated Groundwater

Drawn	Checked	Approved	Date
CB	JS	MT	03/07/2014

URS Internal Project No.	Scale at A3
47070547	1: 40,000

URS Infrastructure & Environment UK Limited
6 - 8 Greencoat Place
London
SW1P 1PL
Telephone +44 (0)207 7866000
Fax +44 (0)207 7985001
www.ursglobal.com

Drawing Number	Rev
FIGURE 4e	Rev 1

N:\Water\Current Projects\47070547 Camden SFRA Update (ghost)\0700 WIP\0705 GIS_Data\01-WIP\01_03-Project_Files\WORs

Appendix F - Topographic Survey

N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
S1	525693.6260	183963.4450	38.906
S2	525676.2047	183976.1534	39.126

OS Note:

The Ordnance Survey tile is to be used as a guide only.

OS Buildings *Surveyed Buildings*

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigational Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36(15) points established to create a true O.S. bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid.

Building Survey Legend:

SHt 1.00 HHt 2.12	Sill Height from FFL. Head Height from FFL.
SL 51.03m HL 52.82m	Sill Level from defined datum. Head Level from defined datum.
Susp CHt: 2.00 Struct CHt: 3.00	Suspended Ceiling Height from FFL. Structural Ceiling Height from FFL.
Susp Ceil: 30.00m Struct Ceil: 31.00m	Suspended Ceiling Level from datum. Structural Ceiling Level from datum.
IFL: 100.00m +100.00m	Internal Floor Level (General). Internal Floor Level (Specific).
Insertion Point	Insertion Point for overlay drawings of other floors or details.

Incoming Services

Elec Gas Water

Topographical Survey Legend:

Buildings; Overhead Cable; Wall; Concrete edge; Kerb line; Tarmac edge; Line marking; Grass verge; Drop kerb; Canopy/Overhang; Centre line; Verge; Station and Name; Station Level; Tree / Bush / Sapling; Area of Undergrowth; Woodland; Ridge Level; Eaves Level; Flat Roof Level; Gate

Fence types: Hedgerow; Iron Railings; Wire Mesh; Post & Rail; Post & Wire; Chain Link; Wooden Panels; Concrete Panels; Steel Palisade

IC	Inspection chamber	BollI	Bollard		
PInv	Pipe invert	IB	Illuminated bollard		
Gy	Gully	Bin	Rubbish bin		
Bg	Back gully	Vp	Vent pipe		
Dp	Down pipe	Grl	Ground light		
Pipe	Pipe above ground	Lbox	Letter box		
MH	Manhole	Ldr	Ladder		
WL	Water level	Sty	Stile		
FI	Flood light	FFL	Internal floor level		
Lp	Lamp post	THL	Threshold level		
Tp	Telegraph post	Sp	Sign post		
Ep	Electricity post	TH	Trishole		
Tl	Traffic light	BH	Borehole		
Bollt	Bus stop	ELC	Electric		
Sv	Stop valve	BT	British Telecom		
St	Stop tap	Cbox	Control box		
Er	Earth rod	TT	Tactile		
Wm	Water meter	BP	Brick paved		
Gas	Gas valve	CPS	Concrete paving slabs		
Av	Air valve	CVR	Cover		
ICU	Unidentified inspection	IC	Inspection chamber		
Wv	Wash out	Rwall	Retaining wall		
Re	Rodding eye	UTL	Unable to lift		
BB	Belisha beacon	TCL	Tree canopy level		
CTV	Cable tv	G	Girth		
Mkr	Marker post	MG	Multi girth		
Gmkr	Gas marker post	Stmp	Tree Stump		
Sv	Soffit	CL	Cover level		
		IL	Invert level		

Rev	Date	Description	Drawn	Q. Rev

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Rowan House
Duffield Road
Little Eaton
Derby
DE21 5DR
Tel (01332) 830044 Fax (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

St Albans: Unit B,The Courtyard, Alban Park, St Albans, Hertfordshire, AL4 0LA, t. (01727) 854481
Newcastle: 24 Riverside Studios, Amethyst Road, Newcastle Bus. Park, Newcastle-U-Tyne, NE4 7YL, t. (01912) 736391
Central London: 27 Cornwall Terrace Mews, Regents Park, London, NW1 5LL, t. (0207) 2241806

CLIENT
Shh Architects

PROJECT
Land & Garages
No. 39 Priory Terrace
NW6 4DG

TITLE
Existing
Site Plan

SCALE	DATE
A1@ 1: 100	14.06.19
DRAWN: SP	QUALITY REF: GH5270

Level datum	See OS notes above
Grid orientation	See OS notes above
Job number	33847
Drawing No.	Rev.
33847_01_P	0

Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

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Some services may have been omitted due to parked vehicles.

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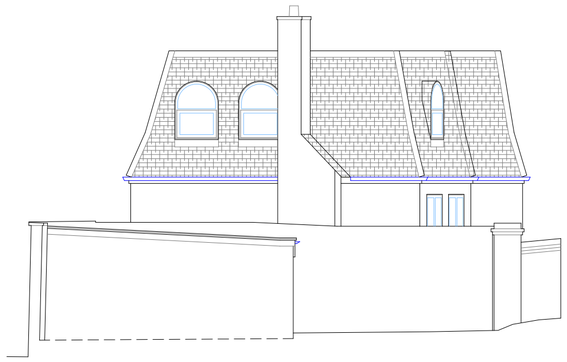
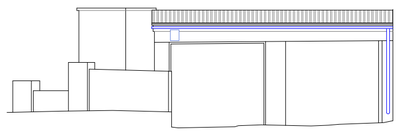
Notes:

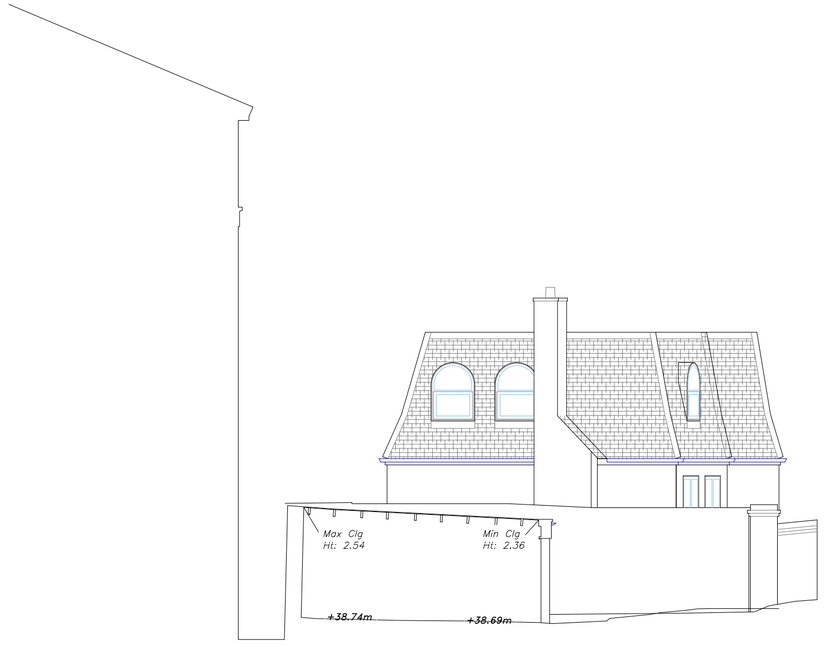


Datum: 37.00m.
Elevation 3.



Datum: 37.00m.
Elevation 4.

Datum: 37.00m.
Elevation 5.



Datum: 37.00m.
Section A.

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WL	Water level	Sly	Stile		
Fl	Flood light	IFL	Internal floor level		
Lp	Lamp post	THL	Threshold level		
Tg	Telegraph post	Sp	Sign post		
Ep	Electricity post	TH	Trailhole		
Ti	Traffic light	BH	Borehole		
Bus	Bus stop	ELC	Electric		
Sv	Stop valve	BT	British Telecom		
St	Stop tap	CBox	Control box		
Er	Earth rod	TT	Tactile		
Wm	Water meter	BP	Brick paved		
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Mkr	Marker post	MG	Multi girth		
Gmkr	Gas marker post	Stmp	Tree Stump		
So	Soffit	CL	Cover level		
		IL	Invert level		

Rev	Date	Description	Drawn	Q. Ref

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Rowan House
Duffield Road
Little Eaton
Derby
DE21 5DR
Tel (01332) 830044 Fax (01332) 830055
admin@greenhatch-group.co.uk
www.greenhatch-group.co.uk

St Albans
Unit B,The Courtyard
Alban Park
St Albans
Hertfordshire
AL4 0LA
t. (01727) 854481

Newcastle
24 Riverside Studios
Amethyst Road
Newcastle Bus. Park
Newcastle-U-Tyne
NE4 7YL
t. (01912) 736391

Central London
27 Cornwall Terrace Mews
Regents Park
London
NW1 5LL
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PROJECT
Land & Garages
No. 39 Priory Terrace
NW6 4DG

TITLE
Existing
Elevations & Section

SCALE	DATE
A2@ 1: 100	14.06.19
DRAWN	QUALITY REF
MF	GH5270

Level datum	See OS notes above
Grid orientation	See OS notes above
Job number	33847

Drawing No.	Rev.
33847_03_ES	0

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