ARDENT | CONSULTING ENGINEERS

# IDM LAND LTD

# 1A HIGHGATE ROAD, LONDON, NW5 1JY

# FLOOD RISK STATEMENT

**REPORT REF NO Z180-04**
**PROJECT NO. Z180**
**MARCH 2016**

# 1A HIGHGATE ROAD, LONDON, NW5 1JY

# FLOOD RISK STATEMENT AND SURFACE WATER DRAINAGE STRATEGY

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**REPORT REF. Z180-01**
**PROJECT NO. Z180**
**MARCH 2016**

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## APPENDICES

## DOCUMENT CONTROL SHEET

| REV | ISSUE PURPOSE | AUTHOR | CHECKED | APPROVED | DATE |
|---|---|---|---|---|---|
| - | Draft for Client Review | JD/JC | SJH | BC | 10.02.16 |
| - | Final | JD/JC | SJH | BC BC. | 11.03.16 |

## 1. INTRODUCTION

1.1 Ardent Consulting Engineers (ACE) has been appointed by IDM Land Ltd to provide a Flood Risk Statement to support a full planning application for demolition of existing buildings and redevelopment to provide 9 residential units and 454sqm commercial (B1) floorspace at 1A Highgate Road, London, NW5 1JY (hereafter referred to as the 'Site') in the London Borough of Camden (LBC).

1.2 This Flood Risk Statement (FRS) has been prepared in accordance with the National Planning Policy Framework (NPPF) and the relevant Planning Practice Guidance (PPG).

1.3 During the preparation of the FRS, consultation with Thames Water (TW) has been undertaken. Please refer to **Appendix A** for correspondence with Thames Water.

### *Site Location*

1.4 **Table 1-1** describes the general site characteristics whilst a site location plan is shown in **Figure 1-1**.

**Table 1.1 – Characteristics of the Site**

| | | |
|---|---|---|
| Area | Extent of existing B8 warehousing is 0.059ha whilst the overall Site boundary 0.068ha | |
| Existing Surfacing | The site comprises existing warehousing and associated hardstanding. The site is 100% impermeable | |
| Current Use | Brown Field – B8 Usage | |
| Boundaries | North | Mixed use properties and Foresters Hall |
| | South | Bull and Gate Public House |
| | East | Mixed use properties and the Bull and Gate Public House |
| | West | Kentish Town Junction rail line |
| Access | Access to Highgate Road via an existing track between the mixed use properties and the Bull and Gate | |
| Site Postcode and Grid Reference | NW5 1JY/TQ289852 | |

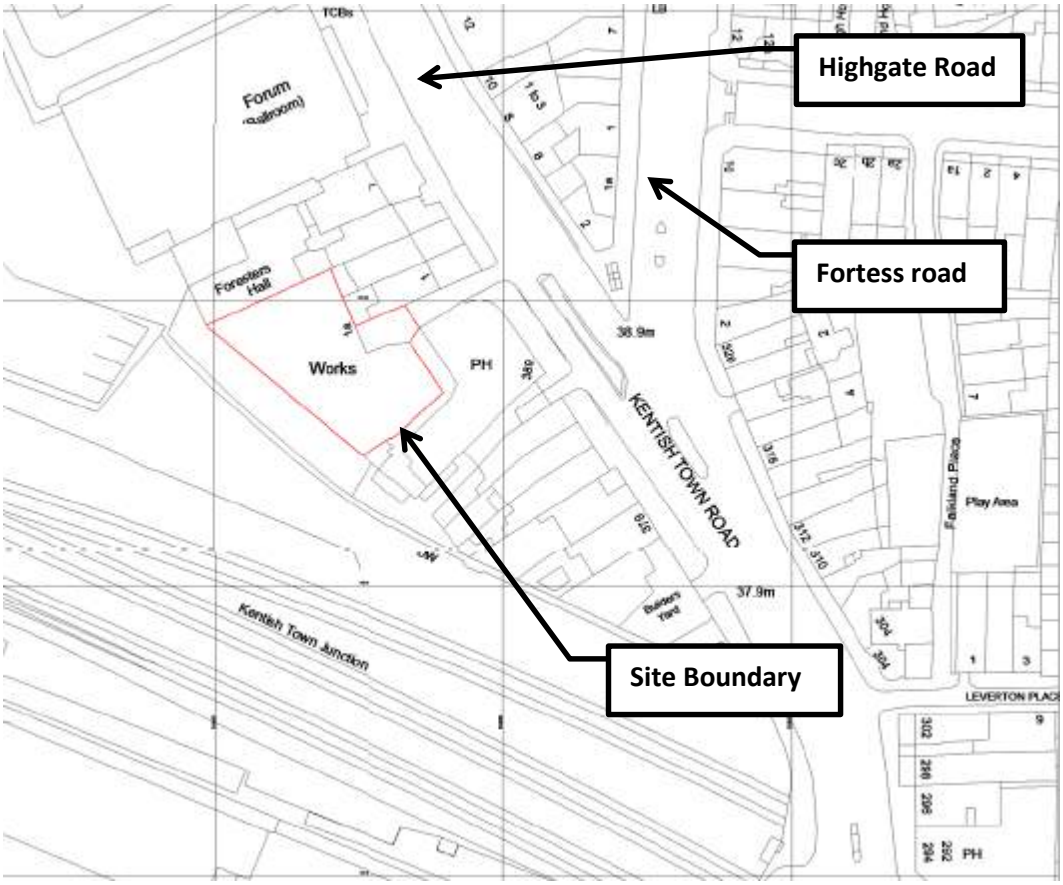


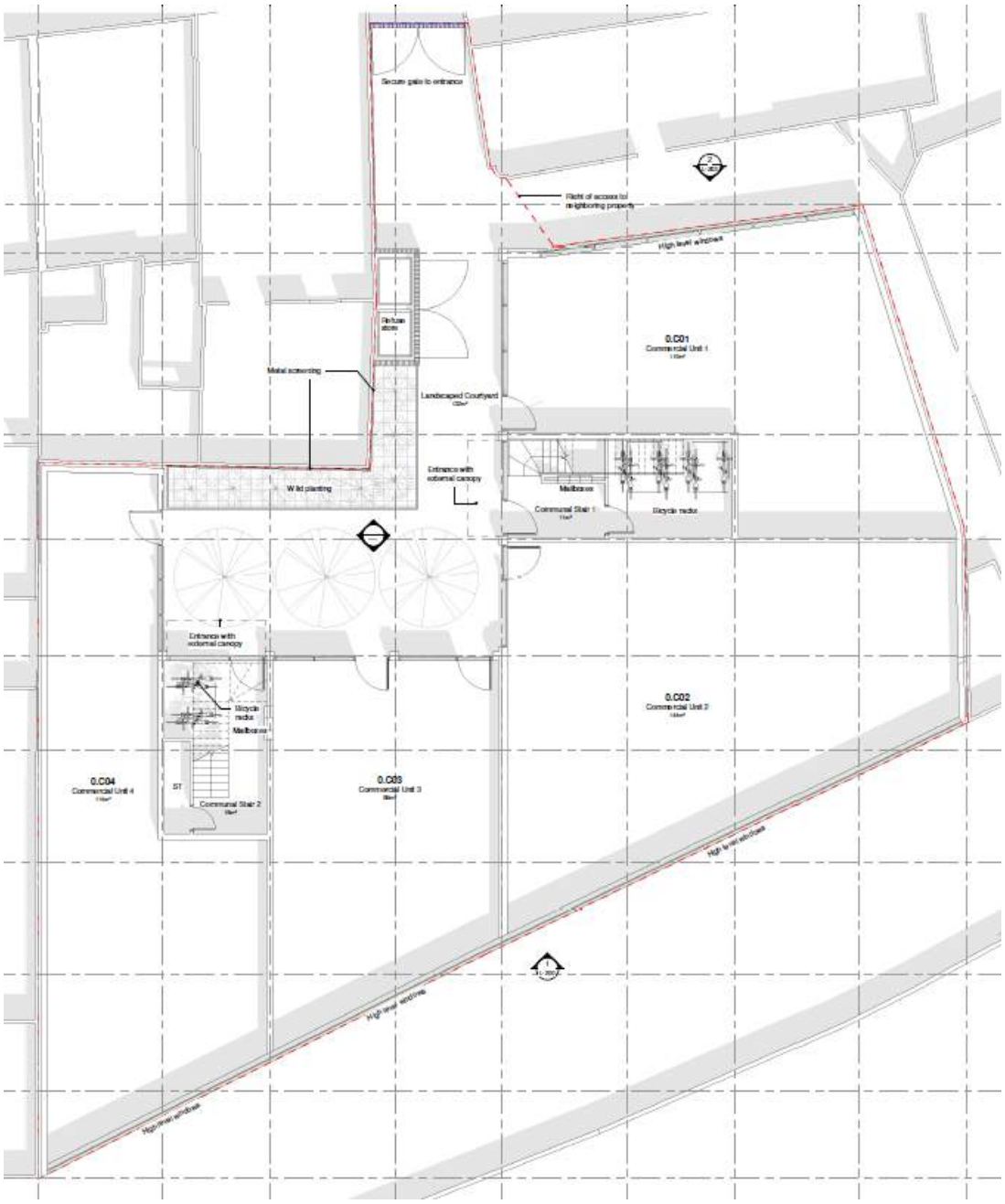

**Figure 1-1 Site Location**

***Proposed Development***

1.5 The proposed development comprises demolition of existing buildings and redevelopment to provide 9 residential units and 454sqm commercial (B1) floorspace, with associated landscaping, refuse and recycling storage, and cycle parking.

1.6 **Figure 1-2** below shows the ground floor plan for the proposed development. Floor plans for the different levels are included in **Appendix B**.

**Figure 1-2 Site Ground Floor Layout Plan**



## 2. POLICY CONTEXT

### *National Planning Policy Framework*

2.1 The National Planning Policy Framework (NPPF) was enacted on 27 March 2012; paragraph 100 to 108 inclusive, establishes the Planning Policy relating to flood risk management. The Technical Guide to the NPPF has been superseded by the Planning Practice Guidance (PPG) in March 2014. However, there are no changes to any policies relating to flood risk.

2.2 The main focus of the policy is to direct development towards areas of the lowest practicable flood risk and to ensure that all development is safe, without increasing flood risk elsewhere.

### *The London Plan & Supplementary Planning Guidance (SPG)*

2.3 London Plan policy 5.13 outlines the Mayor's approach to sustainable drainage, stating that, "Development should utilise sustainable urban drainage systems (SuDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible". In addition, on previously developed sites, runoff rates should not be more than three times the calculated greenfield rate.

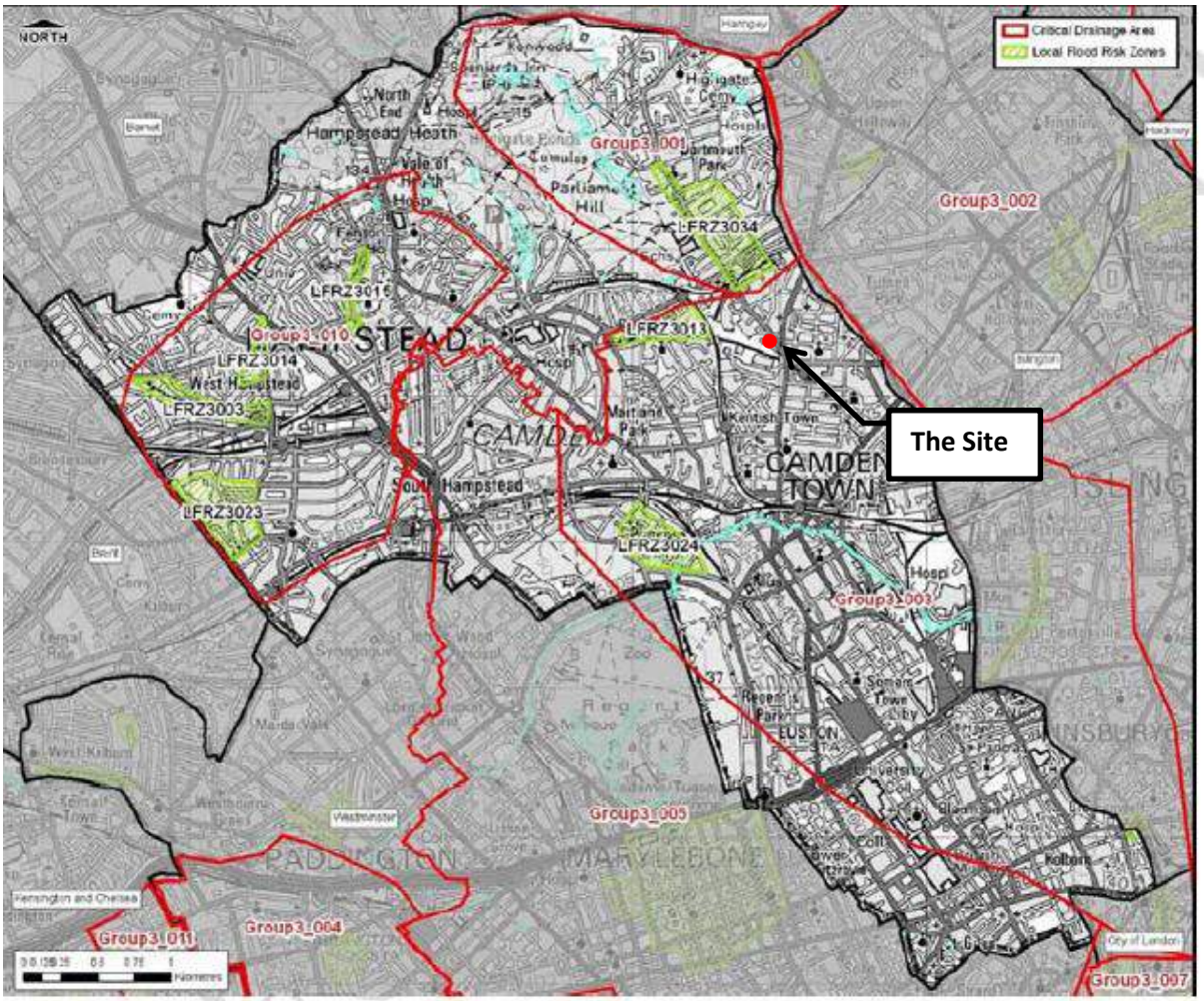
2.4 The London Plan's Supplementary Planning Guidance (Sustainable Design and Construction, 2006, latest revision updated in April 2014) states that new developments should use SuDS where practicable and as a minimum, should achieve a 50% attenuation of the undeveloped site's surface water run off at peak times. The preferred standard is to achieve 100% attenuation of the undeveloped site's surface water runoff at peak times.

### *London Borough of Camden Surface Water Management Plan (SWMP), July 2011*

2.5 The SWMP outlines the preferred surface water management strategy for flooding from sewers, drains, groundwater and runoff from land, ordinary watercourse and ditches, that occurs as a results of heavy rainfall.

2.6 Critical Drainage Areas (CDAs) and Local Flood Risk Zones were identified as part of the risk assessment however, the Site does not fall into either of these designations. **Refer to Figure 2-1 below.**

**Figure 2-1 SWMP CDAs and Local Flood Risk Zones**




***London Borough of Camden Strategic Flood Risk Assessment (SFRA), July 2014***

2.7 The SFRA for LBC was prepared together with six other North London Boroughs.

2.8 The London Borough of Camden is shown to be entirely located within Flood Zone 1 and therefore the most significant source of flood risk is surface water.

2.9 The SFRA shows that the north of the borough is most at risk from sewer, overland flow and groundwater flooding associated with superficial gravel deposits. However, the Site is shown to be located outside of areas of 'Surface Water Flood Risk' and 'Increased Susceptibility to Elevate Groundwater'. Refer to **Figures 2-2 and 2-3** below for details.

**Figure 2-2 SFRA Surface Water Flood Risk Mapping**

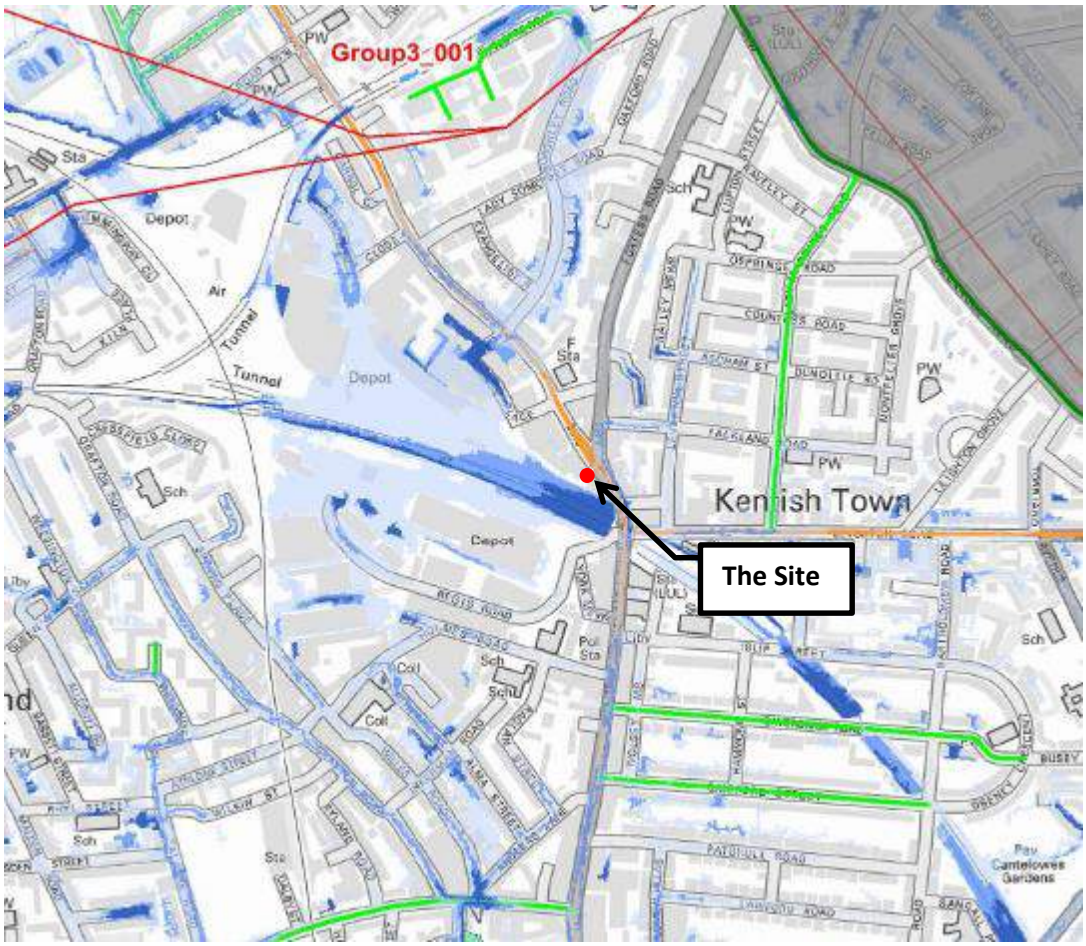


**Figure 2-3 SFRA Groundwater Susceptibility Mapping**


### *Sequential and Exception Tests*

2.10 Residential and commercial use for the proposed development is classified as 'More Vulnerable' and 'Less Vulnerable' respectively according to the Flood Risk Vulnerability Classification in accord with Table 2 (Flood risk vulnerability classification) of the Planning Practice Guidance (PPG).

2.11 The Sequential and Exception Tests are not required for 'More Vulnerable' or 'Less Vulnerable' sites located in Flood Zone 1, where development of all uses is considered appropriate. In addition the site is a minor development and is not subject to the sequential test.

### *Adopted London Borough of Camden Core Strategy 2010-2025*

2.12 The following applicable flood risk and drainage polices for the Site are as follows:

- Policy CS 13 (Tackling climate change through promoting higher environmental standards);
- Policy DP 22 (Promoting sustainable design and construction); and
- Policy DP 23 (Water);

## 3. BASELINE CONDITIONS

### *Existing Site*

3.1 The existing site is currently occupied by a single building containing B8 warehousing.

### *Topography*

3.2 A topographical survey for the Site to local datum was procured by Green Architecture in January 2012. An annotated survey complete with high and low points can be viewed within **Appendix C** and Key Feature Map can be viewed in **Figure 3-1** below.

3.3 The following information from the survey is summarised below:

- Highgate Road to the east of the Site falls in a southerly direction away from the site access;
- The access track incorporates a highpoint within the alignment between the Bull and Gate (Public House) and existing residential development of approximately 10.412m. From the highpoint the track falls towards Highgate Road and the existing third party access track with forms the immediate eastern and southern boundary of the site;
- The third party access track has a low point along its alignment of 9.989m. This low point incorporates a highway gully to manage flows. The track rises to a level of 10.130m to the south of the site whereby it is assumed to join the existing third party access track alongside the railway;
- Part of the aforementioned track has been surveyed immediately west of the site with levels falling in a northerly direction to a level of 9.125m;
- The existing internal courtyard of the site ranges in level between 10.283m –

10.146m and falls towards the existing third party access track; and

- The existing warehousing finished floor levels range between 10.080m and 10.275m.

**Figure 3-1 Key Feature Mapping**

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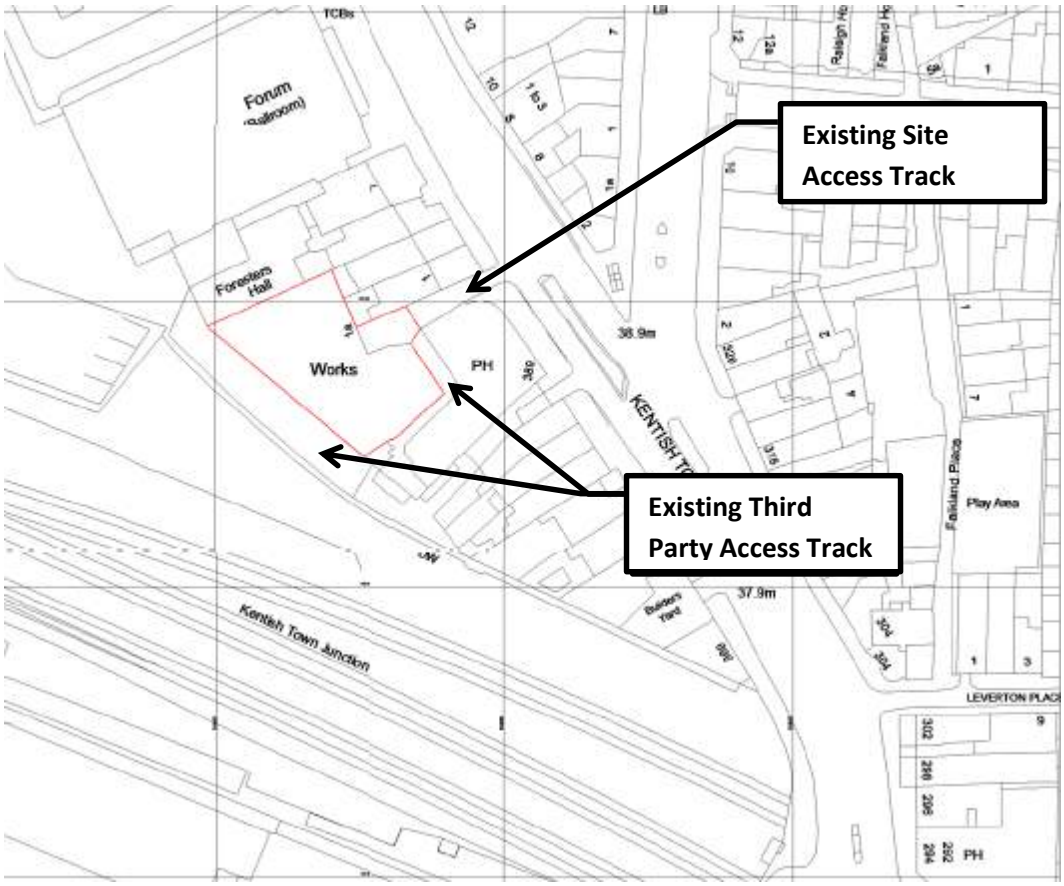


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***Existing Sewer Infrastructure***

3.4 Thames Water has provided a sewer record plan as shown in **Figure 3-2**.

3.5 The plan indicates that there is a 1549x991mm combined sewer located within Highgate Road which flows in a southerly direction. The depth of this sewer is currently unknown.

3.6 There is also a 1219mm diameter surface water flood relief sewer located in Highgate Road at an approximate depth of 14mbgl. The flood relief details/mechanism of the sewer are unknown at this stage.

3.7 Following review of the topographical survey, the site is served by an existing

private combined sewer network. The details of this network will be confirmed via a drainage connectivity survey post planning however is anticipated that the existing onsite drainage connects to the public combined sewer within Highgate Road.

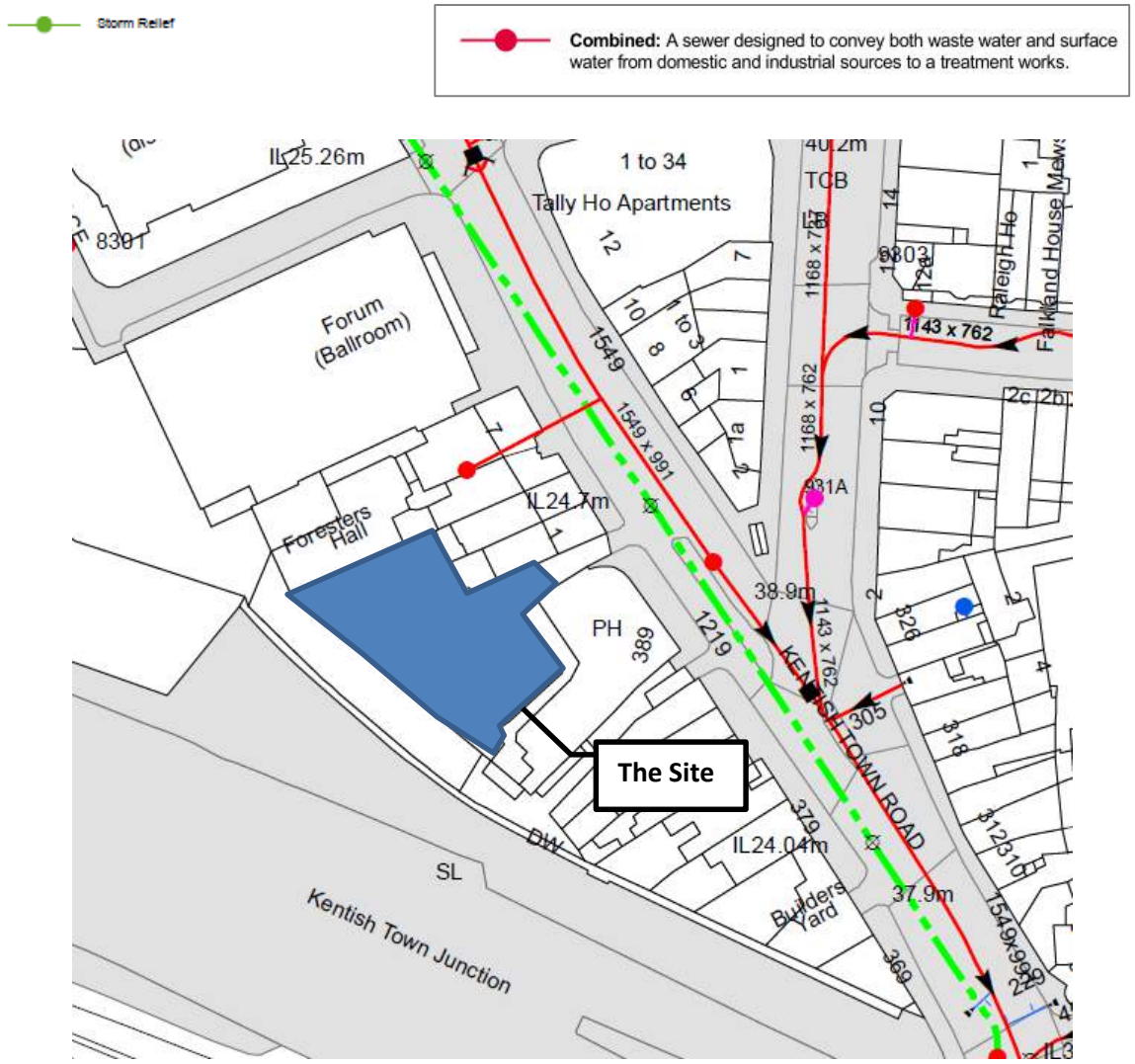
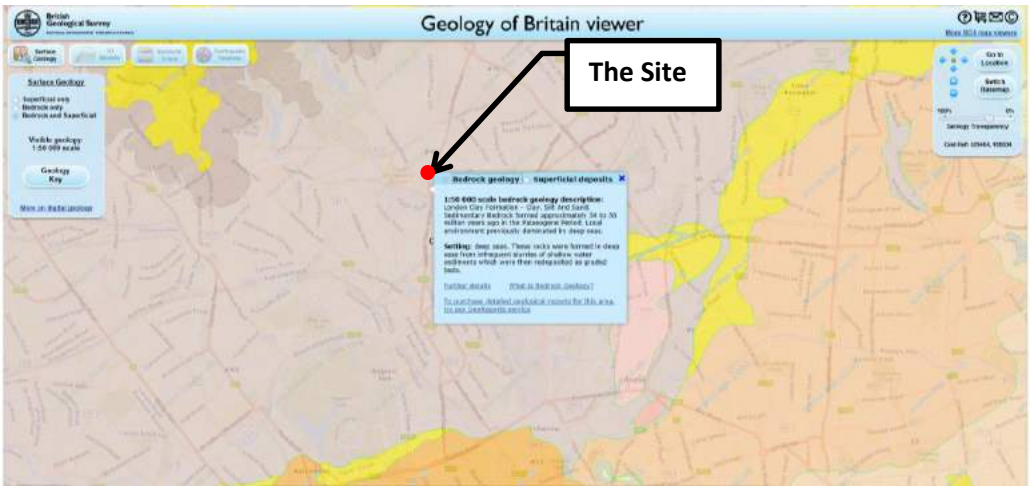



**Figure 3-2: Thames Water Asset Location Sewer Map**

### *Ground Conditions*

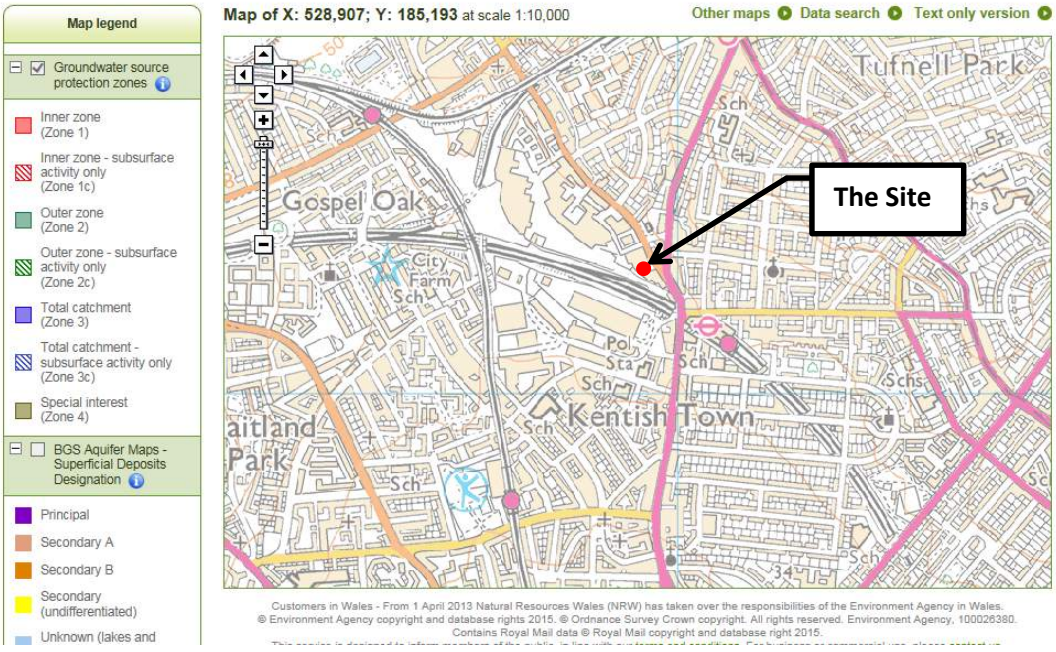
3.8 According to the British Geological Society (BGS) online datasets, the bedrock geology is London Clay Formation (clay and silt). There are no recorded superficial soil deposits. Refer to **Figures 3-3** for details.

**Figure 3-3: BGS Records – Bedrock Data**




3.9 The Site is not located within a Groundwater Source Protection Zones (SPZ). Refer to **Figure 3-4** for details:

**Figure 3-4: Environment Agency SPZ Mapping**




***Hydrology***

3.10 The nearest watercourse is the River Thames located 2 km to the south of the Site.

# 4. SOURCES OF FLOODING

## *Fluvial and Tidal Flooding*

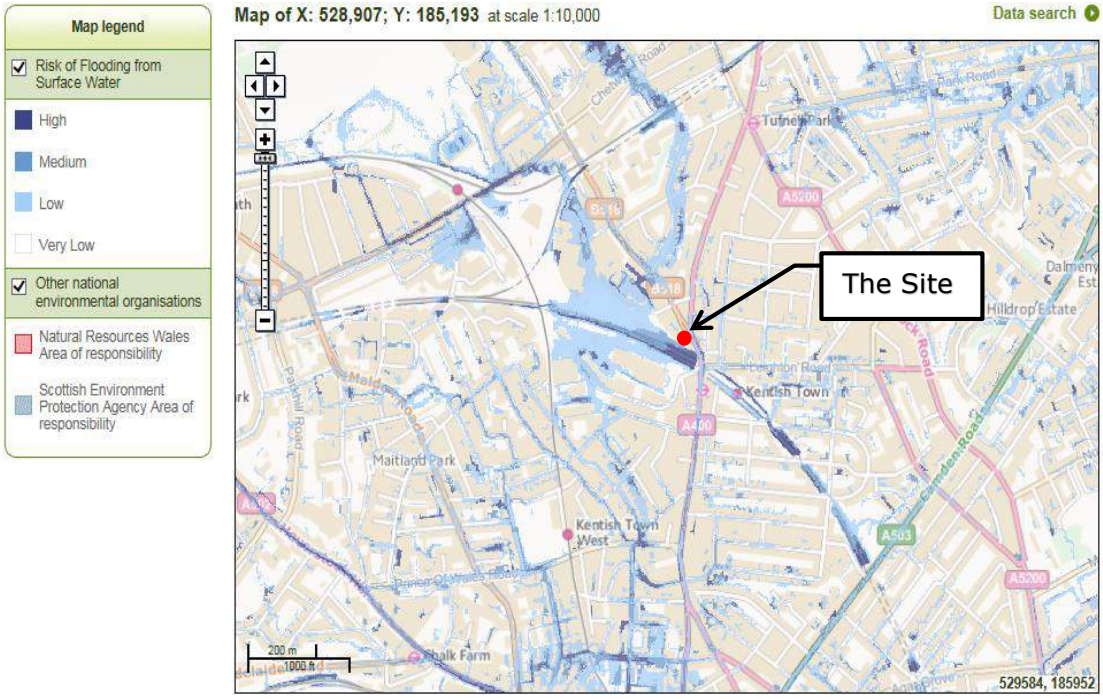
4.1 The Environment Agency's online Flood Maps (**Figure 4-1**) indicate that the site is located within in Flood Zone 1 ("Low" probability of flooding), identified as comprising land assessed as having a less than 0.1% (1 in 1000 year) chance of flooding in any given year from river sources.


**Figure 4-1 EA Online Fluvial Flood Mapping**

## *Surface Water Flooding*

4.2 The EA Surface Water Flood Map and London Borough of Camden Surface Water Management Plan mapping shows that the site has a "Very Low" risk of surface water flooding. This area has a chance of flooding of less than 1 in 1000 (0.1%). Refer to **Figures 2-2 and 4-2**.

**Figure 4-2 EA Online Surface Water Flood Mapping**




***Groundwater Flooding***

4.3 Mapping within the SFRA show the site to be located outside of areas of 'Increased Susceptibility to Elevate Groundwater'. Refer to **Figure 2-3** for details.

4.4 From review of the BGS online borehole data the nearest publically available borehole record is located approximately 100m north of the site (ref no. TQ28NE43). Groundwater was recorded at a level of approximately 27 ft below ground level.

4.5 In light of the data available at the time of writing this report there is no record to show that the Site has been affected by groundwater flooding in the past. The risk from groundwater flooding to the Site is therefore considered very low.

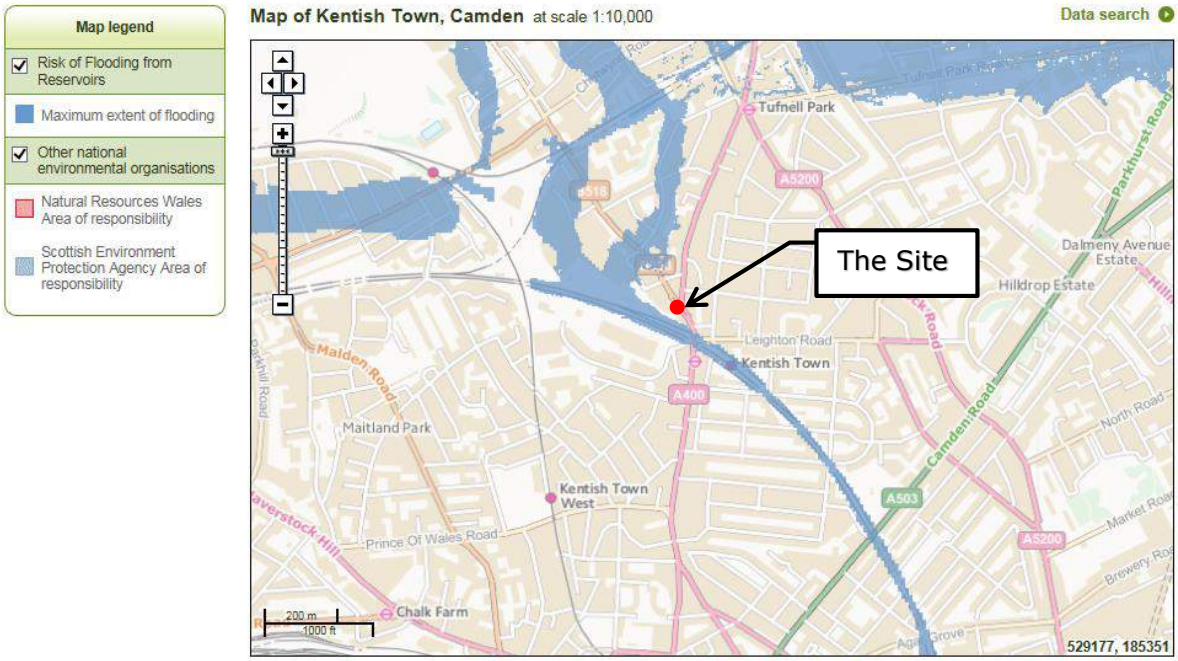
***Sewer Flooding***

4.6 Thames Water has confirmed that there have been no incidents of flooding in the requested area as a result of surcharging public sewers according to Thames Water flood incident records. Refer to Thames Water correspondence in **Appendix A**.

### *Flooding from Artificial Sources*

4.7 The EA flood mapping shows that the site does not fall within the maximum extent of flooding from the reservoir. Refer to **Figure 4-3**.

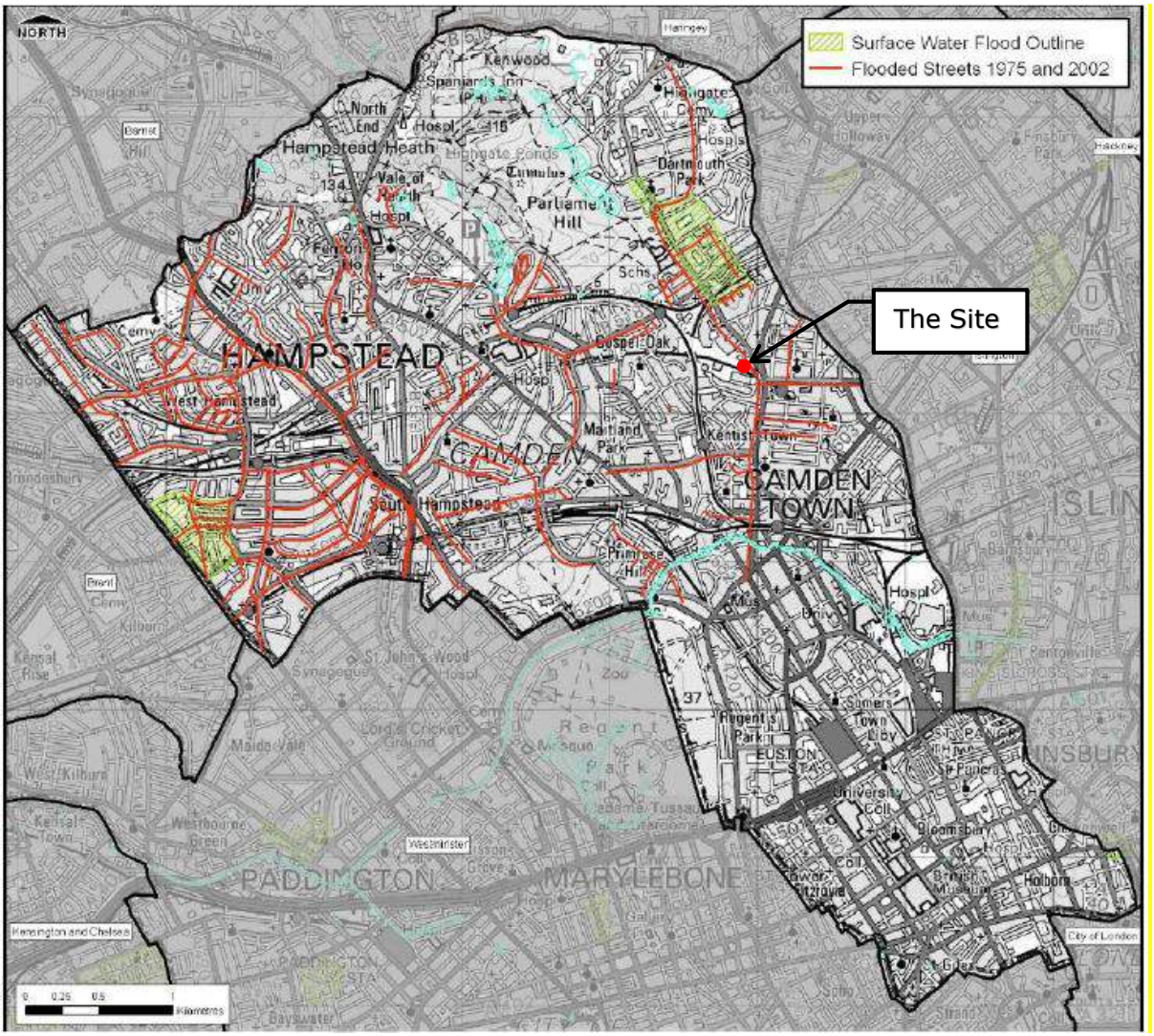
**Figure 4-3 EA Online Risk of Flooding from Reservoirs**



### *Historical Flooding*

**4.8** The London Borough of Camden Surface Water Management Plan flood mapping shows that the site has not been subject to any historical flooding. Refer to **Figure 4-4** below.

**Figure 4-4 SWMP Historical Flood Mapping**



## 5. SURFACE WATER MANAGEMENT

### *Discharge and Storage Calculations*

5.1 The SuDS manual and Part H of the Building Regulations sets out the drainage disposal hierarchy; soakaways or other infiltration systems should be used where possible, drainage to a watercourse is preferred to a sewer. However, due to the underlying soil conditions, spatial constraints and the Site's proximity to a watercourse it is the intention to discharge the proposed development to the Thames Water public combined sewer in Highgate Road.

5.2 As noted in Paragraph 2.4, satisfaction of the London Plan requirements will entail the restriction of proposed surface water discharge rates to only 50% of existing. Existing runoff rates have been calculated using the Modified Rational Method for the current impermeable area of the site and are shown in **Table 5-1**. The calculations are shown in **Appendix D**.

5.3 **Table 5-1** also shows the proposed discharge rates in accordance with the requirements of the London Plan. In the case of the 1 in 1-year return period, five litres per second represents the lowest practicable rate that can be achieved without creating a blockage risk. The proposed discharge rate restriction will result in a 47% to 81% peak flow reduction in comparison with the existing situation. The discharge restriction will require a maximum storage volume of approximately 24m³ during the 1 in 100-year return period plus 30% allowance for climate change.

**Table 5-1: Existing and Proposed Run-Off Rates**

| | Return Period | | | |
|---|---|---|---|---|
| | **1 in 1 year** | **1 in 30 Year** | **1 in 100 year** | **1 in 100 year + 30%** |
| **Greenfield Runoff Rates (l/s)** | 0.1 | 0.2 | 0.3 | - |
| **Pre Development (l/s)** | 9.35 | 20.80 | 26.48 | - |
| **Post Development (l/s)** | 5 | 5 | 5 | 5 |
| **Reduction in the Post Development Scenario compared with Pre-Dev (%)** | 47% | 76% | 81% | - |
| **Min. and Max. Storage Requirement ($m^3$)** | 0.3-3.2 | 6.1-12 | 9.9-17 | 15-24 |

5.4 Following development of the site, 667$m^2$ (98%) of the surface area will be impermeable in the form of roofs and courtyard area with the rest of the site comprised of planting areas. A comparison between the existing and proposed scenarios is given in **Table 5-2**.

**Table 5-2: Comparison between Pre and Post Development Areas**

| Site Status | Total Impermeable Area ($m^2$) | Total Permeable Area ($m^2$) | Percentage Impermeable |
|---|---|---|---|
| Pre-Development | 678 | 0 | 100% |
| Proposed Development | 667 | 11 | 98% |

### *Drainage Strategy*

5.5 Current best practice is to use the CIRIA SuDS Manual C753 and the London Plan in order to inform the decision making process, when selecting appropriate SuDS devices as part of the development strategy.

5.6 **Table 5-3** below summarises the possible use of various SuDS features on-site based on the SuDS hierarchy from informed by The SuDS Manual.

**Table 5-3: SuDS Selection Matrix**

| Type | Description |
|---|---|
| **Living Roofs** | Extensive green roofs will be incorporated into the design at roof level. They will provide an element of source control whilst also providing bio-diversity enhancement. |
| **Blue Roof** | The majority of this roof type is located underneath the green roof system. The Blue Roof system will provide extensive at source attenuation of surface waters prior to release of water to the below ground surface water drainage system at a restricted rate. |
| **Permeable Paving** | Due to the spatial constraints within the courtyard area when taking into consideration building regulation criteria, likely utility corridors, tree pits and drainage componentry, permeable paving has not been considered further at this stage. Furthermore the underlying cohesive soil does not lend itself to infiltration techniques being implemented. |
| **Rainwater Harvesting** | Due to spatial constraints onsite rainwater harvesting has not been considered as part of the surface water management strategy |
| **Tree pits** | Tree pits are proposed within the courtyard to receive surface water runoff from the adjacent paved surfaces and subsequently provide attenuation of flows whilst reducing the requirement for irrigation. |
| **Swales** | Due to spatial constraints onsite swales have not been considered as part of the surface water management strategy |
| **Attenuation Basins** | Due to spatial constraints onsite basins and ponds have not been considered as part of the surface water management strategy |
| **Underground Storage** | A attenuation tank has been proposed within the courtyard to achieve the London Plan requirement of 100% site storage. |

5.7 The proposed courtyard area will drain via combination of yard gullies and tree pits whilst the roof will be drained via a combination of traditional methods and a

green / blue roof system. The roof and courtyard drainage will connect into a proposed private, on-site, below ground surface water drainage system. Discharge from the blue roof will be restricted but an additional flow control will be incorporated within the below ground surface water drainage system to ensure that the proposed discharge rate restriction of five litres per second is met.

5.8 The proposed private surface water drainage system will either connect into the retained existing private combined drainage network or connect directly into the Thames Water combined sewer via a new combined connection under Section 106 or 98 of the Water Industry Act. This will be confirmed during the detailed design stages following a drainage connectivity survey.

5.9 As per **Table 5-1**, up to 24m³ of storage will be required to cater for the 1 in 100-year return period plus 30% allowance for climate change. This storage volume will be provided via a combination of the 80mm deep, 195m² blue roof (providing approximately 15m³), tree pits (providing approximately 0.75m³) and a geocellular storage tank (providing 8.75m³) resulting in a total storage volume of 24.5m³.

5.10 The proposed drainage strategy drawing is included in **Appendix E**.

**Long Term Storage**

5.11 Long term storage is the additional volume of runoff generated by the developed area compared to the volume of runoff before development. The 100 year 6 hour event is used to estimate the runoff volumes both before and after development, the difference of the volume needs to be accommodated within the site.

5.12 As there is a net decrease in impermeable area therefore Long Term Storage is not required for the Site.

**Water Quality**

5.13 The implementation of green blue roofing in conjunction with trapped gullies, tree pits and catch-pit manholes within the traditional drainage network will provide an adequate level of treatment for roof and courtyard runoff. It should be noted that the courtyard is not subject to vehicular access.

**Exceedance Routes**

5.14 To assess the impact of surface water exceedance routing, a plan has been

prepared which is based on the proposed layout. Refer **Appendix F** for details. It is shown that any exceedance flows would follow the internal courtyard and off site access track and flow towards the south.

**Urban Creep**

5.15 This is the conversion of permeable surfaces to impermeable over time e.g. impermeable surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. However, in this case an allowance for urban creep has been ignored due to the fact the proposals comprise a mixed use development within the same built footprint (commercial/residential). Therefore there is little opportunity for urban creep

**Stages of Treatment**

5.16 The proposals provide a suitable level of water quality treatment for surface water, this includes the use green and blue roofs, tree pits and planted areas in the courtyard and trapped yard gullies and catchpit manholes.

**Foul Water**

5.17 The existing foul flow for B8 warehousing is estimated to be 0.16l/s whilst the proposed development foul flow is estimated to be 0.41l/s based on both Surveyor and Sewers for Adoption methodology. See **Appendix D** for calculations.

5.18 The proposed private foul water drainage network will either connect into the retained existing private combined drainage network or connect directly into the Thames Water combined sewer via a new combined connection under Section 106 or 98 of the Water Industry Act. This will be confirmed during the detailed design stages following a drainage connectivity survey.

5.19 The increase in peak foul flow is deemed negligible however the flows will be subject to Thames Water approval post planning.

**Adoption and Maintenance**

5.20 The proposed onsite drainage network and green and blue roofing will be maintained throughout the lifetime of the development by a third party management and maintenance company. Details of maintenance schedule will be

provided by the management company once appointed.

**Flood Risk Management**

5.21 The proposed development finished floor levels will be set at or close to that of the existing warehousing levels, therefore the risk of flooding to the Site is considered low. It is therefore considered that the proposed ground level is deemed suitable for sleeping accommodation.

5.22 Safe access and egress is available to the east via Highgate Road if needed.

## 6. CONCLUSION AND RECOMMENDATIONS

6.1 Ardent Consulting Engineers has been appointed by IDM Properties LLP to provide a Flood Risk Statement (FRS) and surface water drainage strategy to support a planning application for a mixed use development in Highgate, London Borough of Camden.

6.2 The Site is located wholly in Flood Zone 1 and is not deemed to be at risk from any other sources of flooding, therefore demonstration of the Sequential and Exception Tests are not required.

6.3 The London Borough of Camden Surface Water Management Plan flood mapping shows that the site has not been subject to any historical flooding.

6.4 The proposed reduction in impermeable area will provide a volumetric reduction for the critical 100 year 6 hour event over and above the existing situation.

6.5 Where feasibly practicable, SuDS are proposed in the form of green and blue roofing, tree pits and geocellular storage. Flow restrictions have been proposed at roof level and within the courtyard to manage surface water discharge from the site up to and including the 100 year plus 30% allowance for climate change rainfall event. The proposals will provide significant betterment over and above the existing situation.

6.6 The increase in peak foul flow is deemed negligible as this is offset by the significant reduction in surface water runoff. However, the flows will be subject to Thames Water capacity check which is awaited.

6.7 The proposed foul and surface water drainage network will either connect into the retained existing private combined drainage network or connect directly into the Thames Water combined sewer via a new combined connection under Section 106 or 98 of the Water Industry Act.

6.8 The onsite drainage network and green and blue roofing will be maintained throughout the lifetime of the development by a third party management and maintenance company.

6.9 There is deemed to be a suitable level of water quality treatment for surface water, this includes the use green and blue roofs, tree pits and planted areas in the courtyard and trapped yard gullies and catchpit manholes.

6.10 The Site therefore, will not be at significant risk of flooding, or increase the flood risk to others whilst improving the overall drainage system downstream by reducing the volume of surface water runoff discharged from the site.

6.11 The proposed development finished floor levels will be set at or close to that of the existing warehousing levels, therefore the risk of flooding to the Site is considered low. It is therefore considered that the proposed ground level is deemed suitable for sleeping accommodation.

6.12 Safe access and egress is available to the north via Highgate Road if needed.

6.13 In conclusion, this FRS demonstrates that the proposals are consistent with the aims of the NPPF and its PPG, the London Plan and Local Planning Policy.

**Appendix A**

**Thames Water Asset Plan and Correspondence**

# Asset Location Search

Ardent Consulting Engineers
Suite 207

LONDON
E1 8DE

**Search address supplied** 3
Highgate Road
London
NW5 1JY

**Your reference** Z180 Highgate Camden

**Our reference** ALS/ALS/24/2015_3215925

**Search date** 11 December 2015

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

searchcode

# Asset Location Search

**Search address supplied:** 3, Highgate Road, London, NW5 1JY

Dear Sir / Madam

**An Asset Location Search is recommended when undertaking a site development.**It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

**Contact Us**

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

# Asset Location Search

## Waste Water Services

**Please provide a copy extract from the public sewer map.**

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

## Clean Water Services

**Please provide a copy extract from the public water main map.**

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and

pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

**Payment for this Search**

A charge will be added to your suppliers account.

# Asset Location Search

## Further contacts:

### Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

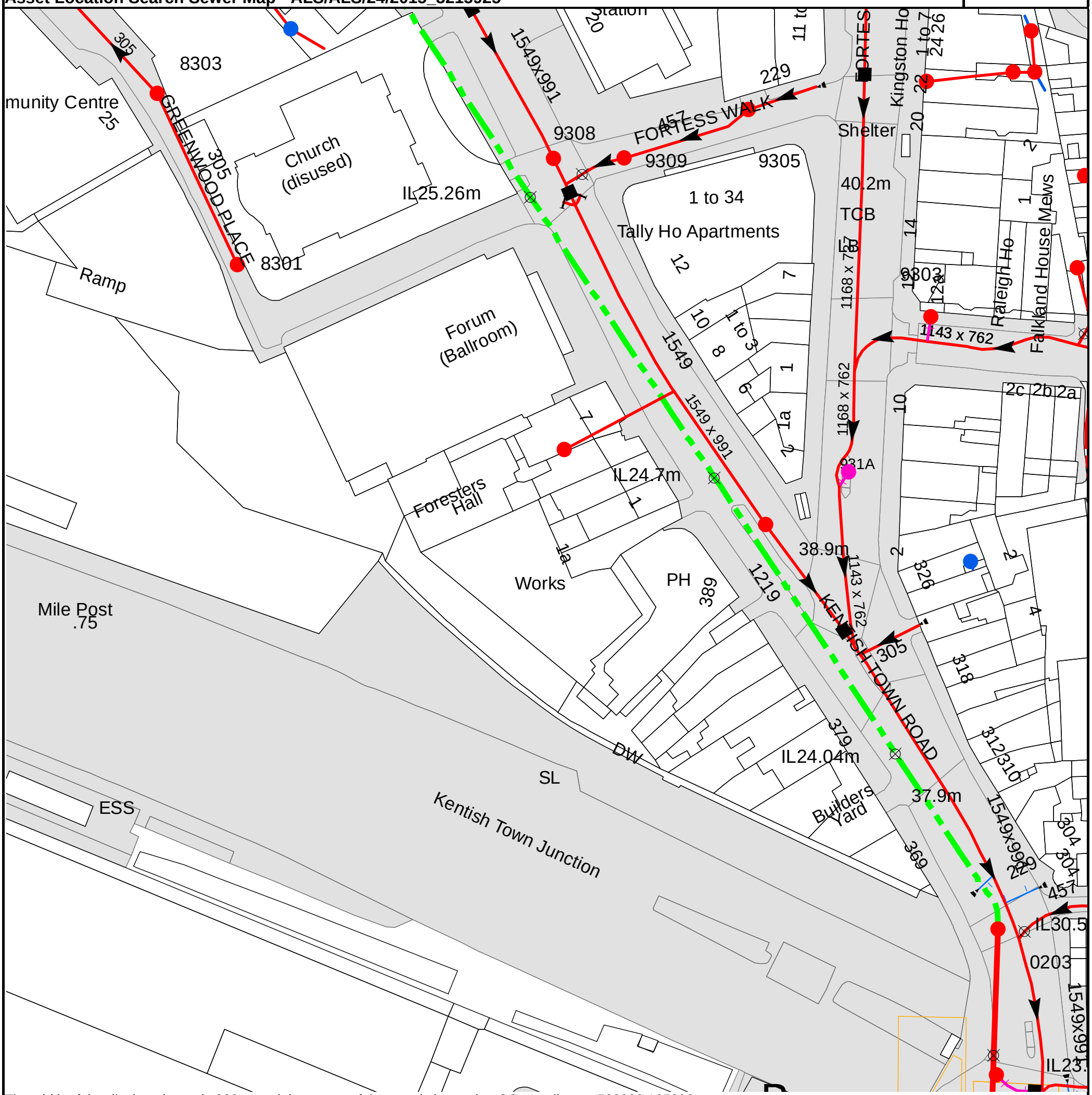
### Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

**Asset Location Search Sewer Map - ALS/ALS/24/2015_3215925**




The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 528922,185296

**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 |
|---|---|---|
| 03FC | n/a | n/a |
| 03DJ | n/a | n/a |
| 0101 | n/a | n/a |
| 0203 | 37.35 | 23.64 |
| 02AG | n/a | n/a |
| 931B | n/a | n/a |
| 931A | 38.9 | n/a |
| 93DD | n/a | n/a |
| 9303 | n/a | n/a |
| 8301 | 36.97 | 35.34 |
| 9308 | n/a | n/a |
| 9309 | n/a | n/a |
| 9305 | 39.67 | 37.42 |
| 8303 | 36.54 | 34.92 |
| 93DA | n/a | n/a |
| 03AG | n/a | n/a |
| 03AH | n/a | n/a |
| 03AI | n/a | n/a |
| 83AG | 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.

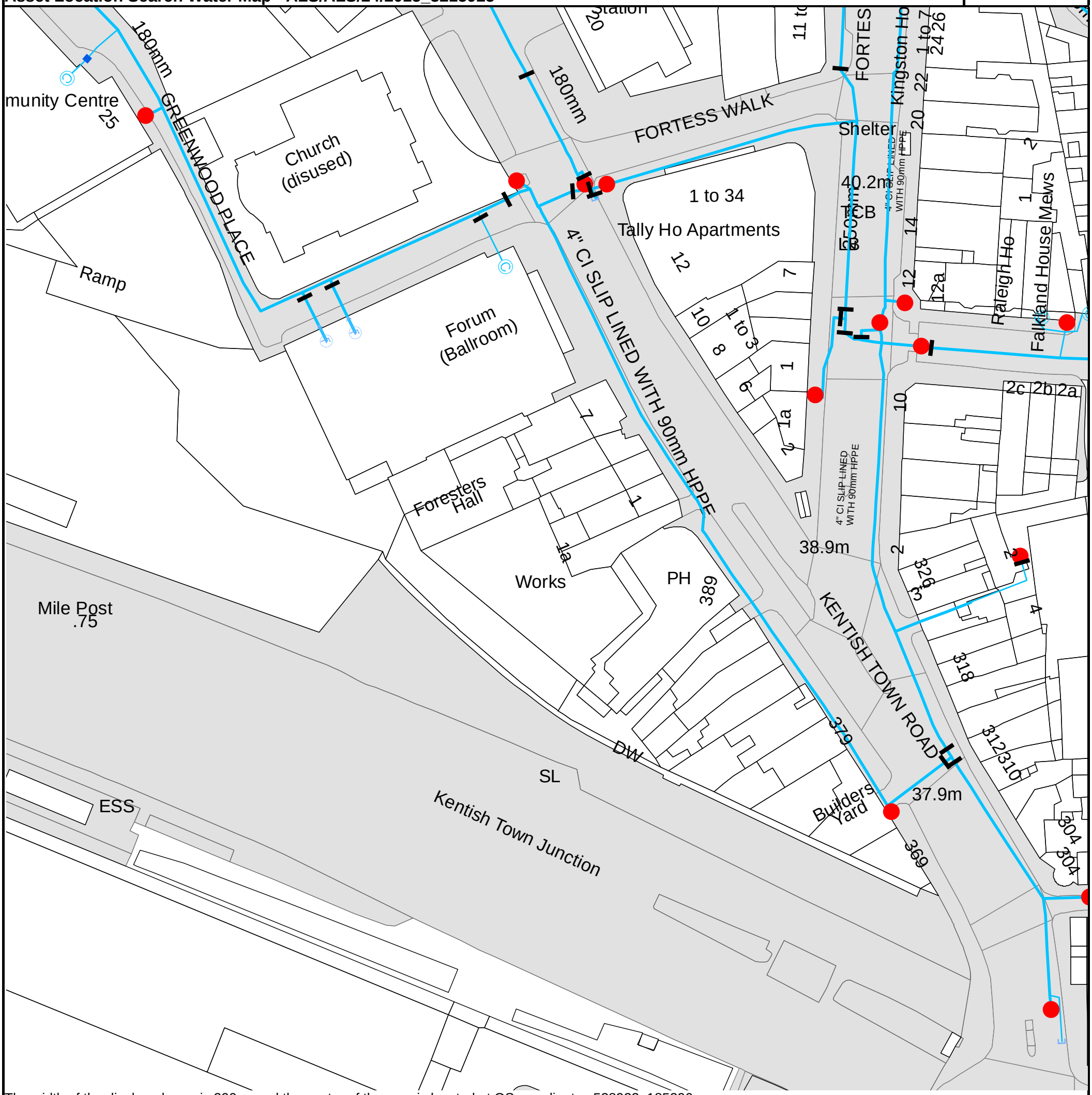
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

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/24/2015_3215925**




The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 528922, 185296.

**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.

## Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to him at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

### Ways to pay your bill

| **Credit Card** | **BACS Payment** | **Telephone Banking** | **Cheque** |
|---|---|---|---|
| Call **0845 070 9148** quoting your invoice number starting CBA or ADS. | Account number **90478703**<br>Sort code **60-00-01**<br>A remittance advice must be sent to:<br>**Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.**<br>or email **ps.billing@thameswater.co.uk** | By calling your bank and quoting:<br>Account number **90478703**<br>Sort code **60-00-01**<br>and your invoice number | Made payable to '**Thames Water Utilities Ltd**'<br>Write your Thames Water account number on the back.<br>Send to:<br>**Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW**<br>or by DX to **151280 Slough 13** |

## 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**

# Sewer Flooding
## History Enquiry

Ardent Consulting Engineers

**Search address supplied**

3
Highgate Road
London
NW5 1JY

**Your reference** Z180

**Our reference** SFH/SFH Standard/2015_3215937

**Received date** **11 December 2015**

**Search date** **12 December 2015**

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
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

# Sewer Flooding

## History Enquiry

**Search address supplied:** 3,Highgate Road,London,NW5 1JY

**This search is recommended to check for any sewer flooding in a specific address or area**

TWUL, trading as Property Searches, are responsible in respect of the following:-

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

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T 0118 925 1504
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

# Sewer Flooding

## History Enquiry

**History of Sewer Flooding**

**Is the requested address or area at risk of flooding due to overloaded public sewers?**

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
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

**Appendix B**

**Proposed Plans**


REVISIONS

| | | |
|---|---|---|
| - | Pre App Meeting | 151104 |
| A | For Comment | 151113 |
| B | For Information | 151119 |
| C | For Information | 151203 |

NOTES

DOMESTIC WASTE
1 Bed: Number in development (3) x Projected weekly waste per household (100 litres) = Waste produced from all households (300 litres)
2 Bed: Number in development (13) x Projected weekly waste per household (170 litres) = Waste produced from all household (2210 litres)

Total weekly waste Arising: 300 + 2210 = 2510 litres

Total Domestic Provision:

2 no. 1100 litre Eurobins (1 refuse and 1 recycling)

COMMERCIAL WASTE
1 cubic meter storage space (1000 litres) per 300-500sqm of commerical space
94 + 58 sqm = 153 sqm (both refuse and recycling)

- Volume of waste generated is ultimately dependant on the use of the building
- Waste and recyclables from residential and commercial must be stored separately, but same container tyle to facilitate ease of collection.

All commercial waste to be contained within commercial demise.


Ellis Miller

**EllisMiller**
Gainsborough Studios
1 Poole Street
London N1 5ED

Phone +44 (0)208 880 6450
Email: london@ellis-miller.com
www.ellis-miller.com


Client
IDM Land Ltd

Project Number: 180
Highgate Road
1A Highgate Road
London NW5 1JY

Sheet
Proposed Ground Floor Plan

SCALE @ A1= 1 : 75
SCALE @ A3= 1: 150

**ARCHITECTURAL**

Drawing Number: **180 - L-110** Revision: **C**


REVISIONS

| | | |
|---|---|---|
| - | Pre App Meeting | 151104 |
| A | For Comment | 151113 |
| B | For Information | 151119 |
| C | For Information | 151203 |

NOTES


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1 Poole Street
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Phone +44 (0)208 880 6450
Email: london@ellis-miller.com
www.ellis-miller.com


Client
IDM Land Ltd

Project Number: 180
Highgate Road
1A Highgate Road
London NW5 1JY

Sheet
Proposed Level 1

SCALE @ A1= 1 : 75
SCALE @ A3= 1: 150

N

**ARCHITECTURAL**

Drawing Number: 180 - L-111
Revision: C

DO NOT SCALE OFF THIS DRAWING

CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK


REVISIONS

| | | |
|---|---|---|
| - | Pre App Meeting | 151104 |
| A | For Comment | 151113 |
| B | For Information | 151119 |
| C | For Information | 151203 |

NOTES


Ellis Miller

**EllisMiller**
Gainsborough Studios
1 Poole Street
London N1 5ED

Phone +44 (0)208 880 6450
Email: london@ellis-miller.com
www.ellis-miller.com


Client
IDM Land Ltd

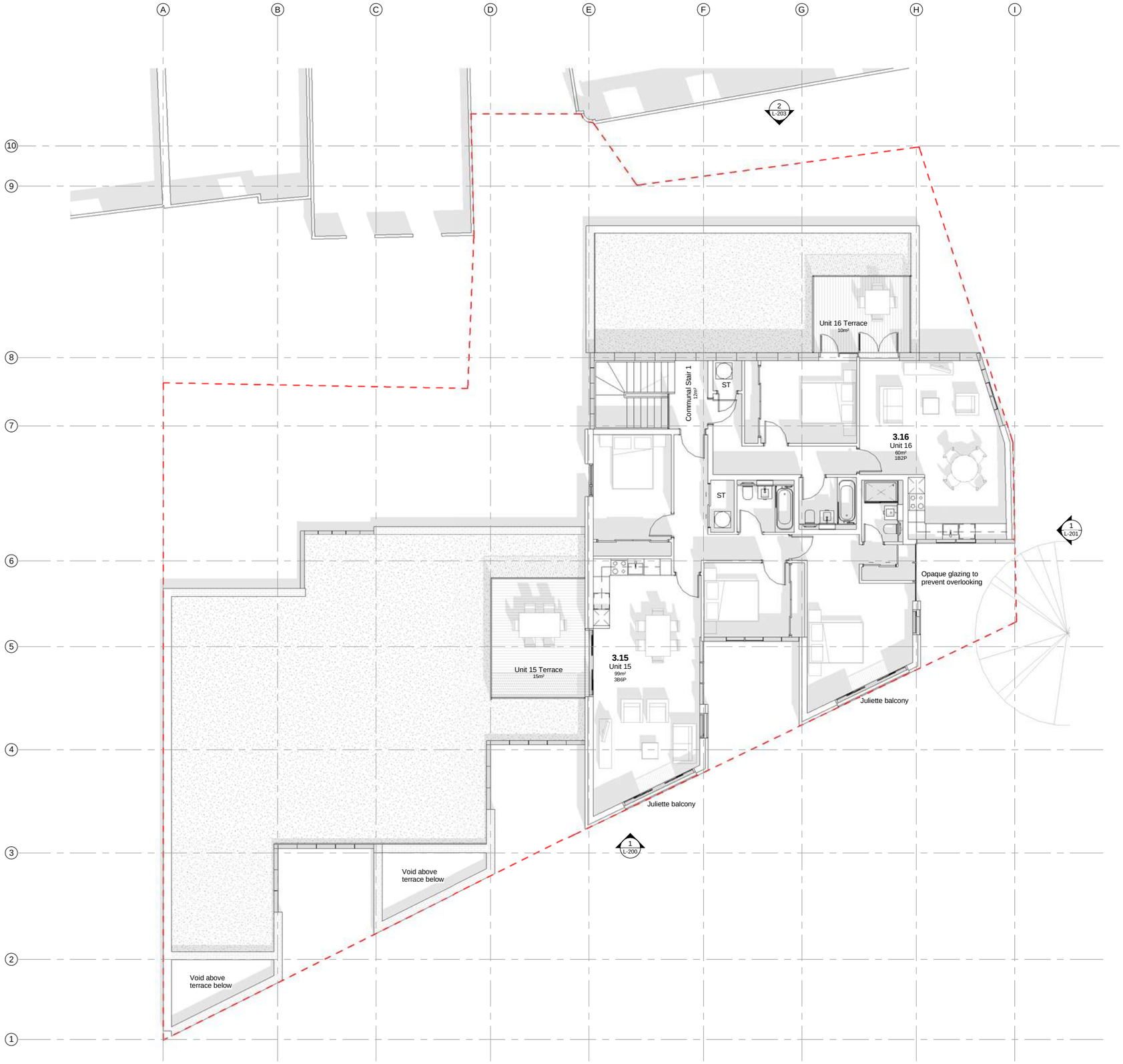
Project Number: 180
Highgate Road
1A Highgate Road
London NW5 1JY

Sheet
Proposed Level 2

SCALE @ A1= 1 : 75
SCALE @ A3= 1: 150

**ARCHITECTURAL**

Drawing Number: 180 - L-112
Revision: C




REVISIONS

| | | |
|---|---|---|
| - | Pre App Meeting | 151104 |
| A | For Comment | 151113 |
| B | For Information | 151119 |
| C | For Information | 151203 |

NOTES


Ellis Miller

**EllisMiller**
Gainsborough Studios
1 Poole Street
London N1 5ED

Phone +44 (0)208 880 6450
Email: london@ellis-miller.com
www.ellis-miller.com


Client
IDM Land Ltd

Project Number: 180
Highgate Road
1A Highgate Road
London NW5 1JY

Sheet
Proposed Level 3

SCALE @ A1= 1 : 75
SCALE @ A3= 1: 150

**ARCHITECTURAL**

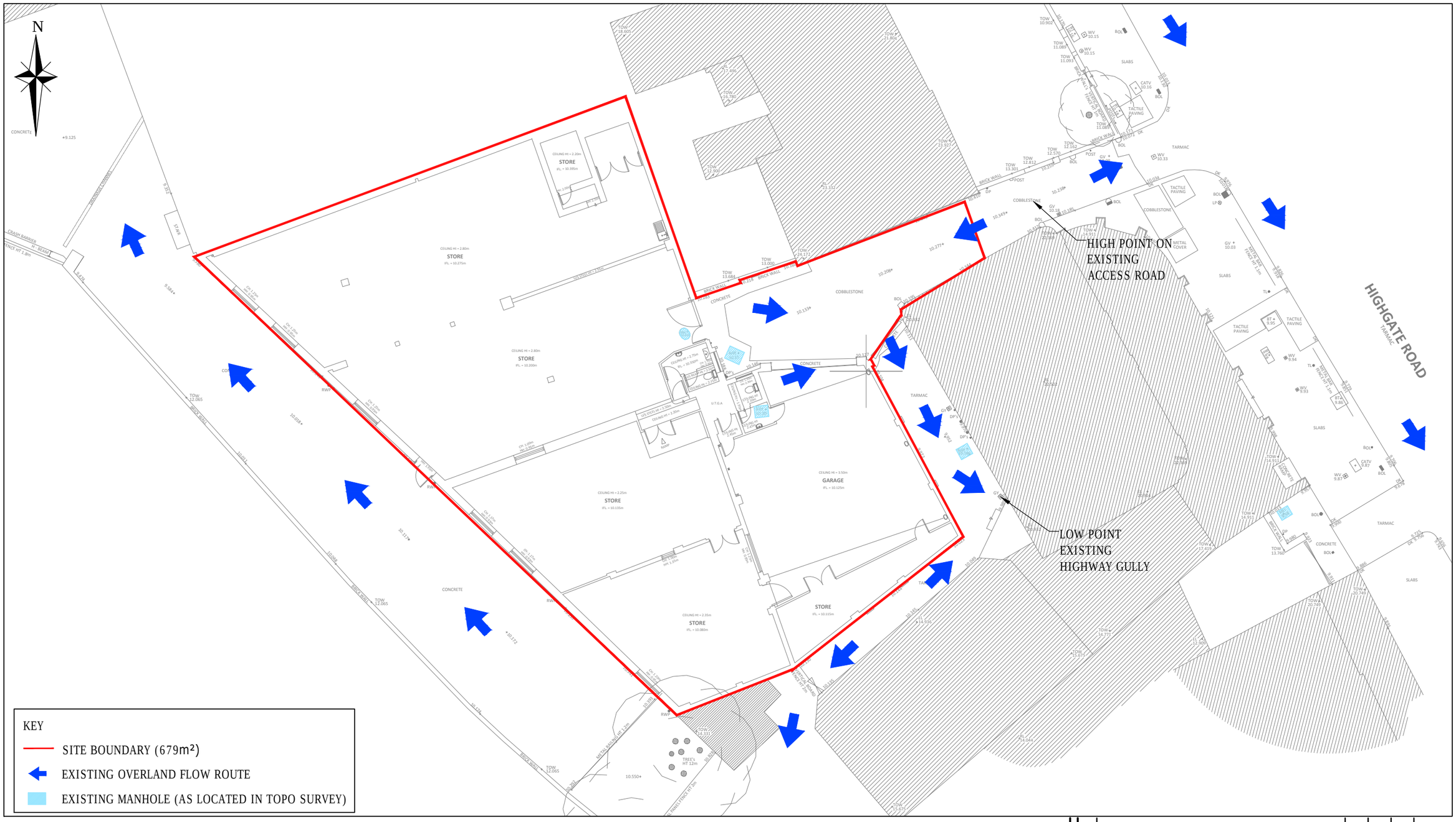
Drawing Number: **180 - L-113**
Revision: **C**

DO NOT SCALE OFF THIS DRAWING

CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING ANY WORK

**Appendix C**

**Annotated Topographical Survey**




NOTES:

1. TOPOGRAPHICAL SURVEY IS BASED ON DRAWING PRODUCED BY GREEN ARCHITECTURE DATED 16.11.12
2. ALL LEVELS ARE TO LOCAL DATUM UNLESS OTHERWISE STATED

FOR PLANNING

| REV. | AMENDMENTS | DRN | CHK | APP | DATE |
|---|---|---|---|---|---|

ARDENT CONSULTING ENGINEERS
Suite 207, One Alie Street, London, E1 8DE
t 020 7680 4088 f 020 7488 3736
w www.ardent-ce.co.uk e enquiries@ardent-ce.co.uk

PROJECT TITLE: HIGHGATE ROAD CAMDEN

DRAWING TITLE: EXISTING SITE LAYOUT AND LEVELS

CLIENT: IDM PROPERTIES LLP

| SCALE: | DATE: | DESIGNED: |
|---|---|---|
| 1:200 | 14/12/15 | - |
| DRAWN: | CHECKED: | APPROVED: |
| KC | JD | LI |

DRAWING NO. Z180-001 REV: -

**Appendix D**

**Foul and Surface Water Calacuations**

# Z180 - Highgate Road, Camden

16 December 2015

## Existing Surface Water Runoff - Modified Rational Method

**Existing site information:**

| | |
|---|---|
| Site Boundary Area (Ha): | 0.0679 |
| Impermeable Area (Ha): | 0.0679 |

**Modified Rational Method Equation:**

$$Q_n = 2.78\ CiA$$

*where:*

| | |
|---|---|
| *C* | *Runoff Coefficients (in this case 1 as using impermeable area)* |
| $i_n$ | *Rainfall Intensity for n return period (mm/hr)* |
| *A* | *Impermeable Area (Ha)* |
| $Q_n$ | *Runoff for n return period (l/s)* |

**Rainfall Intensity:**

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. for the 5 min duration.

| | | |
|---|---|---|
| $i_1$ | 50.8 | mm/hr |
| $i_{30}$ | 113.02 | mm/hr |
| $i_{100}$ | 143.9 | mm/hr |
| $i_{100+30\%}$ | 187.1 | mm/hr |

**Existing Surface Water Runoff:**

Therefore:

$Q_1 = 2.78 \times 1 \times 50.8 \times 0.0679 =$ 9.59 l/s

$Q_{30} = 2.78 \times 1 \times 113.02 \times 0.0679 =$ 21.33 l/s

$Q_{100} = 2.78 \times 1 \times 143.9 \times 0.0679 =$ 27.16 l/s

$Q_{100+30\%} = 2.78 \times 1 \times 187.1 \times 0.0679 =$ 35.32 l/s

# Blue Roof Calculation

## Project Details

| | | | |
|---|---|---|---|
| Location: | London | Outlet Type: | Harmer BR10 |
| Drainage Area: | 27 $m^2$ | No. Of Outlets: | 1 no. |
| Blue Roof Area: | 27 $m^2$ | Max. Upstand: | 80 mm |

## Design Storm Inputs

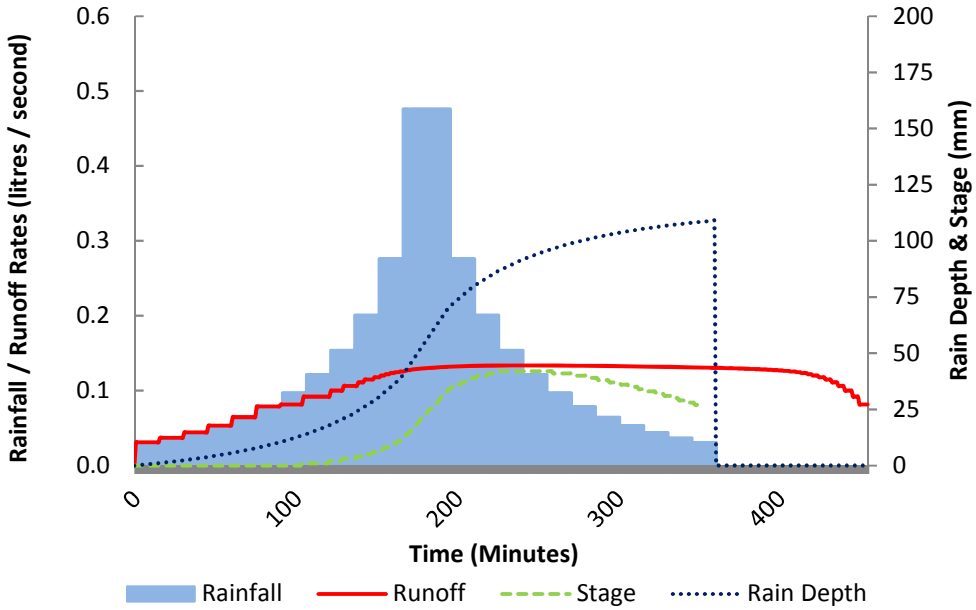
| | | | |
|---|---|---|---|
| Return Period: | 100 years | Intensity Profile: | 50% Summer |
| Duration: | 6 hours | Climate Change Factor: | 30% |

## Design Storm Characteristics

| | | | |
|---|---|---|---|
| Rainfall Depth: | 109.04 mm | Peak Rainfall Intensity: | 0.018 l/s/$m^2$ |
| Peak Rainfall Rate: | 0.48 l/s | | |

## Blue Roof Response

| | | | |
|---|---|---|---|
| Peak Runoff Rate: | 0.13 l/s | Peak Runoff Reduction: | 71.94% |
| Attenuation Time: | 2 hours | Max. Stage: | 42 mm |
| Detention Volume: | 1 m3 | Overflow Volume: | 0 m3 |



# Blue Roof Calculation

**Blue Roof Calculations – Terms & Conditions of Use**

**BASIS OF MODEL**

1. The model derives a design storm profile based on the principles of a Depth-Duration-Frequency (DDF) Model. This utilises coefficients published in the Institute of Hydrology's Flood Estimation Handbook (FEH, 1999) to estimate the design rainfall profile for a given return period and duration at any UK location.
2. Runoff characteristics are based on a totally flat roof surface. Once storage reaches its maximum volume, overflow is deemed to occur instantaneously. In order to ensure that the roof's integrity is preserved, sufficient overflow capacity is a requirement. The sizing of this facility should be designed cognisant of the probability of overflow and of all resulting risks of detriment to the building.
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**GOVERNING LAW AND JURISDICTION**

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# Blue Roof Calculation

## Project Details

| | | | |
|---|---|---|---|
| Location: | London | Outlet Type: | Harmer BR10 |
| Drainage Area: | 13 $m^2$ | No. Of Outlets: | 1 no. |
| Blue Roof Area: | 13 $m^2$ | Max. Upstand: | 55 mm |

## Design Storm Inputs

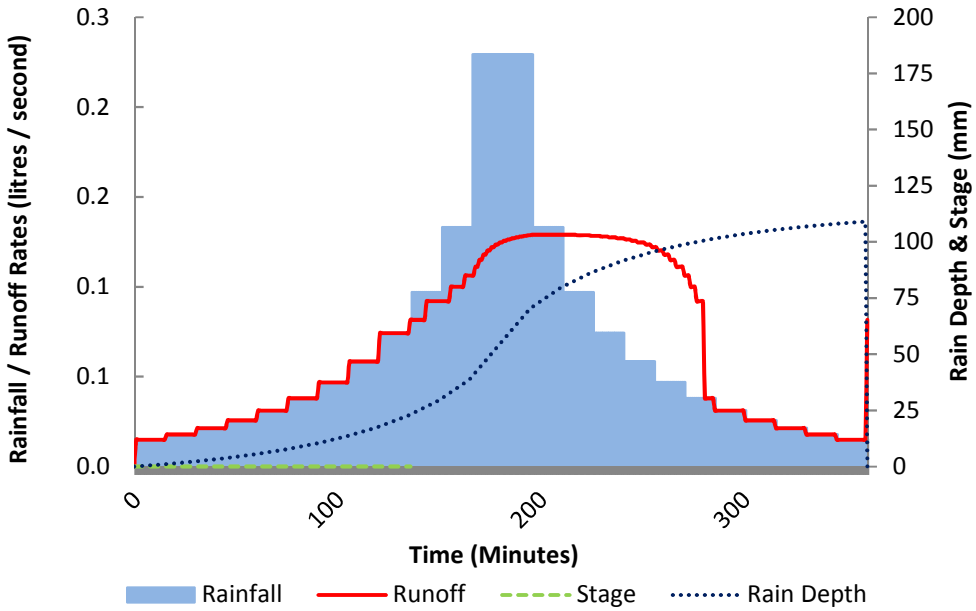
| | | | |
|---|---|---|---|
| Return Period: | 100 years | Intensity Profile: | 50% Summer |
| Duration: | 6 hours | Climate Change Factor: | 30% |

## Design Storm Characteristics

| | | | |
|---|---|---|---|
| Rainfall Depth: | 109.04 mm | Peak Rainfall Intensity: | 0.018 l/s/$m^2$ |
| Peak Rainfall Rate: | 0.23 l/s | | |

## Blue Roof Response

| | | | |
|---|---|---|---|
| Peak Runoff Rate: | 0.13 l/s | Peak Runoff Reduction: | 43.75% |
| Attenuation Time: | 0 hours | Max. Stage: | 18 mm |
| Detention Volume: | 0 m3 | Overflow Volume: | 0 m3 |



# Blue Roof Calculation

**Blue Roof Calculations – Terms & Conditions of Use**

**BASIS OF MODEL**

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**GOVERNING LAW AND JURISDICTION**

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# Blue Roof Calculation

## Project Details

| | | | |
|---|---|---|---|
| Location: | London | Outlet Type: | Harmer BR15 |
| Drainage Area: | 180 $m^2$ | No. Of Outlets: | 2 no. |
| Blue Roof Area: | 69 $m^2$ | Max. Upstand: | 120 mm |

## Design Storm Inputs

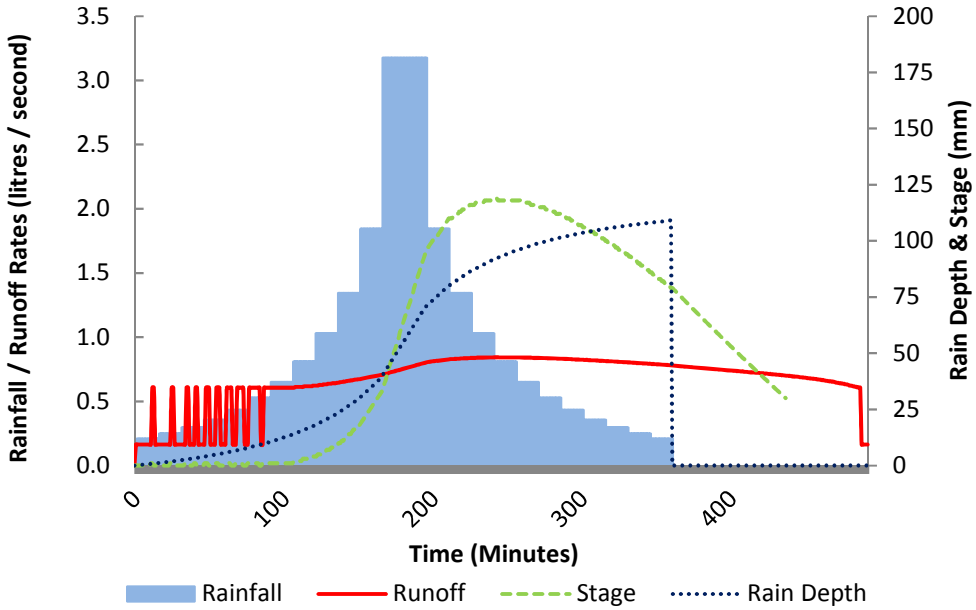
| | | | |
|---|---|---|---|
| Return Period: | 100 years | Intensity Profile: | 50% Summer |
| Duration: | 6 hours | Climate Change Factor: | 30% |

## Design Storm Characteristics

| | | | |
|---|---|---|---|
| Rainfall Depth: | 109.04 mm | Peak Rainfall Intensity: | 0.018 $l/s/m^2$ |
| Peak Rainfall Rate: | 3.17 l/s | | |

## Blue Roof Response

| | | | |
|---|---|---|---|
| Peak Runoff Rate: | 0.84 l/s | Peak Runoff Reduction: | 73.43% |
| Attenuation Time: | 2 hours | Max. Stage: | 119 mm |
| Detention Volume: | 5 m3 | Overflow Volume: | 0 m3 |



# Blue Roof Calculation

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**BASIS OF MODEL**

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# Blue Roof Calculation

## Project Details

| | | | |
|---|---|---|---|
| Location: | London | Outlet Type: | Harmer BR10 |
| Drainage Area: | 40 $m^2$ | No. Of Outlets: | 1 no. |
| Blue Roof Area: | 40 $m^2$ | Max. Upstand: | 80 mm |

## Design Storm Inputs

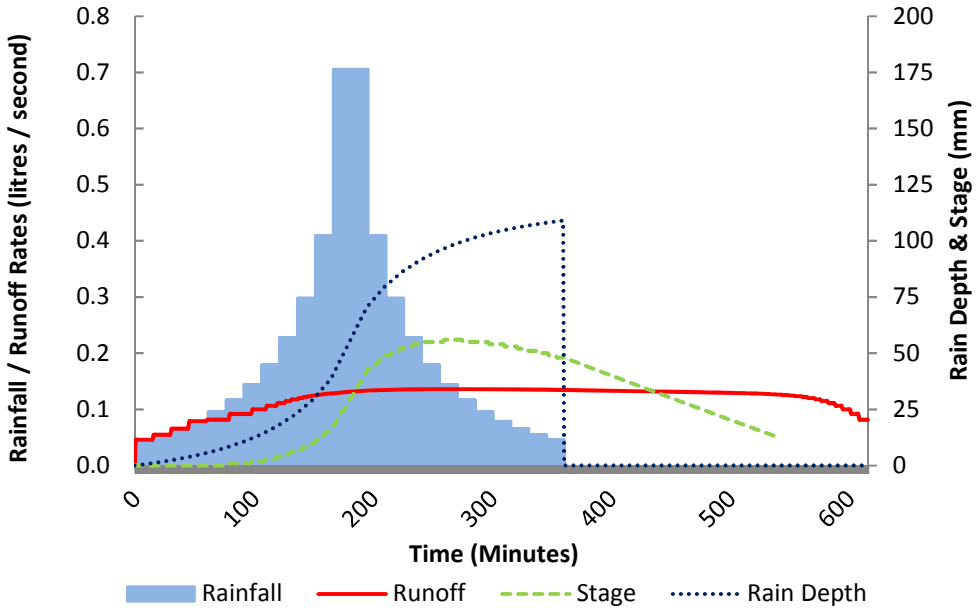
| | | | |
|---|---|---|---|
| Return Period: | 100 years | Intensity Profile: | 50% Summer |
| Duration: | 6 hours | Climate Change Factor: | 30% |

## Design Storm Characteristics

| | | | |
|---|---|---|---|
| Rainfall Depth: | 109.04 mm | Peak Rainfall Intensity: | 0.018 $l/s/m^2$ |
| Peak Rainfall Rate: | 0.71 l/s | | |

## Blue Roof Response

| | | | |
|---|---|---|---|
| Peak Runoff Rate: | 0.14 l/s | Peak Runoff Reduction: | 80.70% |
| Attenuation Time: | 4 hours | Max. Stage: | 56 mm |
| Detention Volume: | 2 m3 | Overflow Volume: | 0 m3 |



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BluRoof
STORMWATER MANAGEMENT SYSTEMS

ALUMASC
ROOFING SYSTEMS

# Product Datasheet
# BluRoof VF50 Void Former

| | |
|---|---|
| Sheet No: | PD211FR |
| Issued: | March 2014 |
| Pages: | 1 of 1 |

**Description**
BluRoof VF50 is an open structured, rigid polypropylene, interlocking void former with a 96% void ratio.

**Use**
For use as a heavy duty void former for the temporary attenuation and filtration of rainwater in Alumasc BluRoof roofing systems prior to controlled discharge to the surface water drainage system or to holding tanks for use as recycled rainwater run-off. Typically overlaid with a 225gm/$m^2$ filtration geotextile.

**Features**
- Three times the water storage capacity of the equivalent depth of stone/gravel drainage layer.
- Heavy duty – very high load bearing capacity.
- Lightweight – 96% void.
- Unique interlocking connection.
- No loss of drainage capacity over time.

**Application**
- The product can be stacked to create voids in multiples of 50mm depth.
- Each board is clipped to the adjacent board by the interlock feature creating a continuous void space.
- Use with a non-clogging geotextile filter.
- Can be used under green roofs or permeable hard landscaping on a sand bedding layer.

| | |
|---|---|
| **Size** | 480 x 260 x 50mm (i.e 8 pieces/$m^2$) |
| **Colour** | Light Grey |
| **Water storage Capacity** | 48 litres/$m^2$ per 50mm depth |
| **Compressive Strength to ASTM D1621** | 125t/$m^2$ |
| **Flow rate per unit width to ASTM D1621** | 180 litres/min |
| **Weight** | 4 kg/$m^2$ |

**Health and Safety**
- Safety Datasheets can be downloaded directly from www.alumascroofing.co.uk

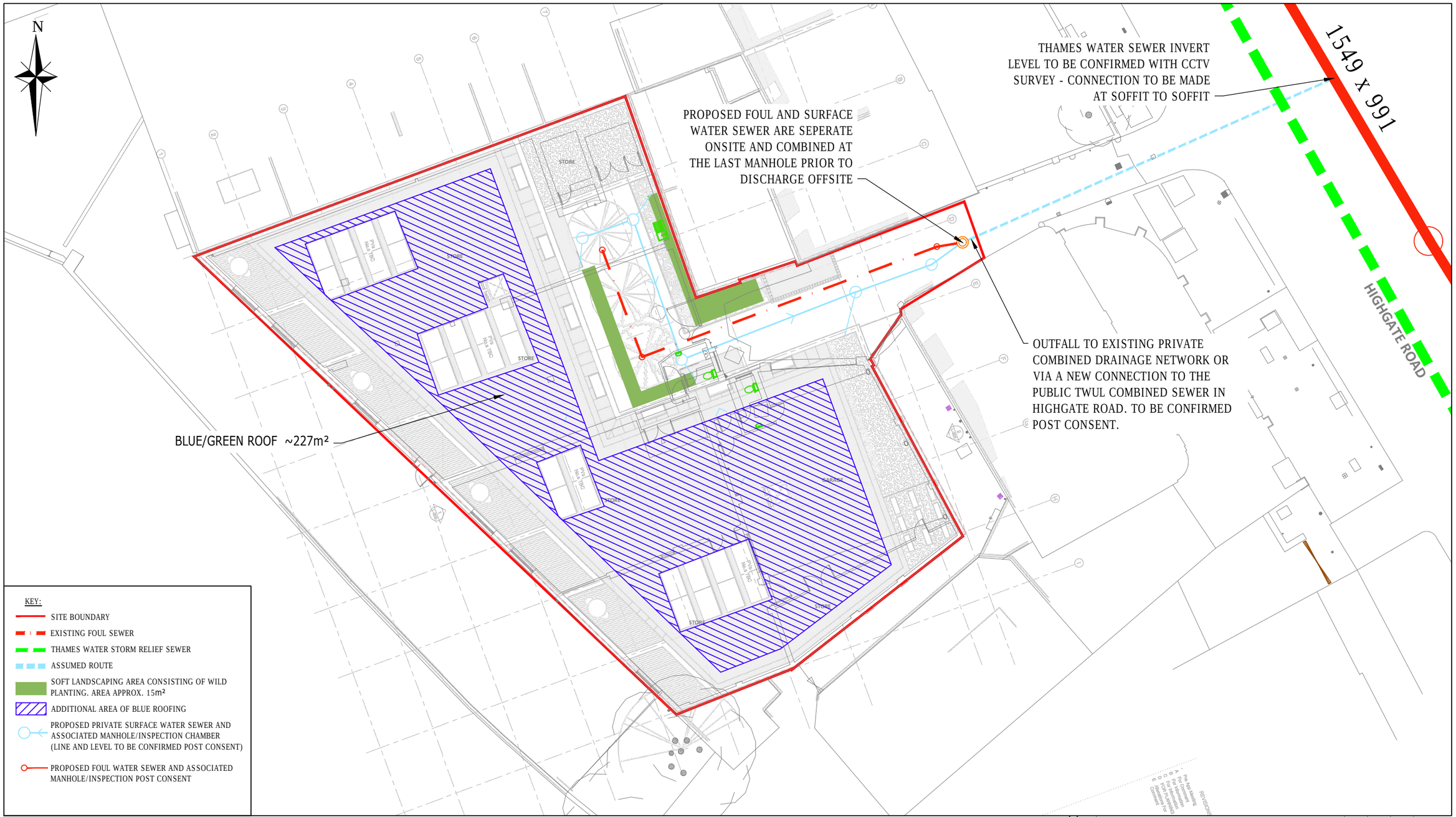
**Technical Support**
- Technical advice is available from Alumasc Technical Services at:
  Telephone: +44 (0)1744 648400
  Email: roofing@alumasc-exteriors.co.uk

**NB: Current versions of Alumasc Product Datasheets can be downloaded directly from:** www.alumascroofing.co.uk

*The company pursues a policy of constant product development and information contained in this publication is therefore subject to change without notice. The customer is responsible for ensuring that each product is fit for its intended purpose and that the conditions for use are suitable. All quoted data is nominal and subject to production tolerances.*

**Appendix E**

**Surface Water Drainage Stratgey**




NOTES:

1. TOPOGRAPHICAL SURVEY IS BASED ON DRAWING PRODUCED BY GREEN ARCHITECTURE DATED 16.11.12
2. PROPOSED DEVELOPMENT LAYOUT IS BASED ON THE GROUND FLOOR LAYOUT (REF: 180-X-100) BY ELLIS MILLER RECEIVED ON 14.12.15.
3. ALL LEVELS ARE IN A LOCAL DATUM UNLESS OTHERWISE STATED.
4. GREEN/BLUE ROOFING GENERAL ARRANGEMENT TO BE CONFIRMED DURING DETAILED DESIGN STAGE. INITIAL BLUE ROOF STORAGE ASSESSMENT UNDERTAKEN BY ALUMASC. REFER TO CALCULATIONS CONTAINED WITHIN APPENDIX C OF ARDENT FRS.

FOR PLANNING

| REV. | AMENDMENTS | DRN | CHK | APP | DATE |
|---|---|---|---|---|---|

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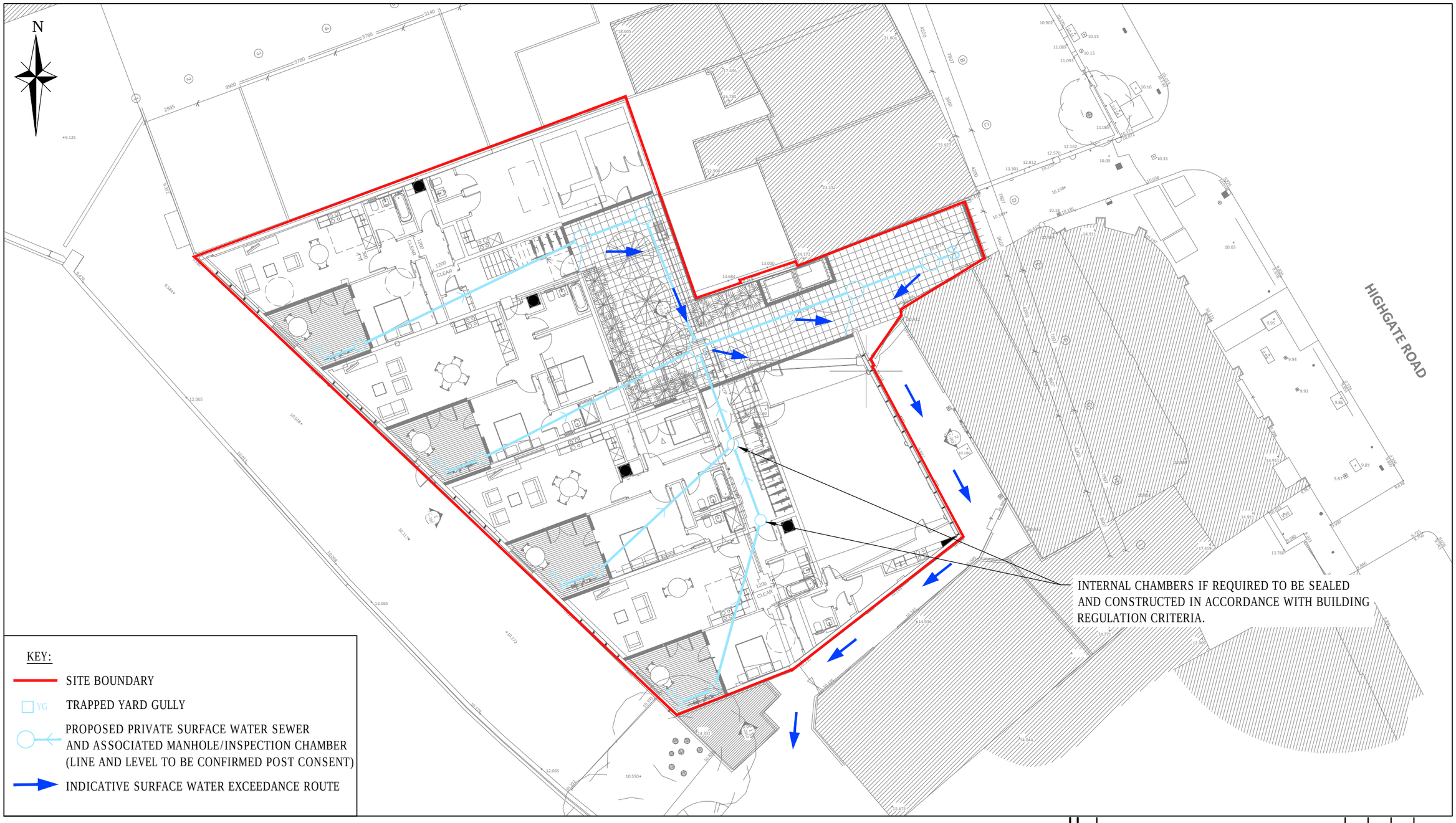
Suite 207, One Alie Street, London, E1 8DE
t 020 7680 4088 f 020 7488 3736
w www.ardent-ce.co.uk e enquiries@ardent-ce.co.uk

| | |
|---|---|
| PROJECT TITLE: | HIGHGATE ROAD CAMDEN |
| DRAWING TITLE: | PROPOSED SURFACE WATER DRAINAGE STRATEGY |
| CLIENT: | IDM PROPERTIES LLP |

| | | | |
|---|---|---|---|
| SCALE: 1:200 | DATE: 14/12/15 | DESIGNED: JD | |
| DRAWN: KC | CHECKED: JD | APPROVED: LI | |
| DRAWING NO. Z180-002 | | | REV: - |

# Appendix F

# Surface Water Exceedance Plan

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| REV. | AMENDMENTS | DRN | CHK | APP | DATE |
|---|---|---|---|---|---|

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| | |
|---|---|
| PROJECT TITLE: | HIGHGATE ROAD CAMDEN |
| DRAWING TITLE: | PROPOSED SURFACE WATER EXCEEDANCE STRATEGY |
| CLIENT: | IDM PROPERTIES LLP |

| | | | |
|---|---|---|---|
| SCALE: 1:200 | DATE: 14/12/15 | DESIGNED: - | |
| DRAWN: KC | CHECKED: JD | APPROVED: LI | |
| DRAWING NO. Z180-003 | | | REV: - |