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109 Fortis Green
London

Civil Engineering
Sustainable Drainage Report

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Acronyms	
AOD	Above Ordnance Datum
CIRIA	Construction Industry Research and Information Association
EA	Environment Agency
FRA	Flood Risk Assessment
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
SWMP	Surface Water Management Plan
TW	Thames Water

1 Introduction

This Sustainable Drainage Strategy has been prepared to support the planning application for the redevelopment of 109 Fortis Green in the London Borough of Haringey. This report is a revision to a Sustainable Drainage Strategy that was submitted and approved in 2015 (Planning ref: HGY/2015/3813).

This drainage strategy has been carried out in accordance with the National Planning Policy Framework (NPPF) and DEFRA's Non-Statutory Technical Standards for Sustainable Drainage Systems (NTSSUDS). Haringey's policies and guidance have also been referred to, including the Haringey Drainage Sustainable Evaluation, SuDS Design Requirements for LLFA Technical Assessment and the London Borough of Haringey Surface Water Management Plan (SWMP). This report also incorporates advice and guidance from the Environment Agency and CIRIA documents.

This report will outline the proposed drainage strategy for the site including a detailed SUDS assessment. The NTSSUDS states that *"for developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event*".

This report aims to adopt the most sustainable drainage solution for the proposed development, aiming to reduce the run-off from the proposed development to Greenfield rates.

2 Site Description and Location

The site is located within the London Borough of Haringey on the southern side of the A504.
The site currently comprises two single storey buildings located to the front and rear at the site in use as a car wash and MOT Centre. It is located within an urban area of North London and currently is surrounded by existing developments.

The site has approximate OS coordinates of 527918/189570 at Grid Reference TQ279895, and the postcode is N2 9HR.

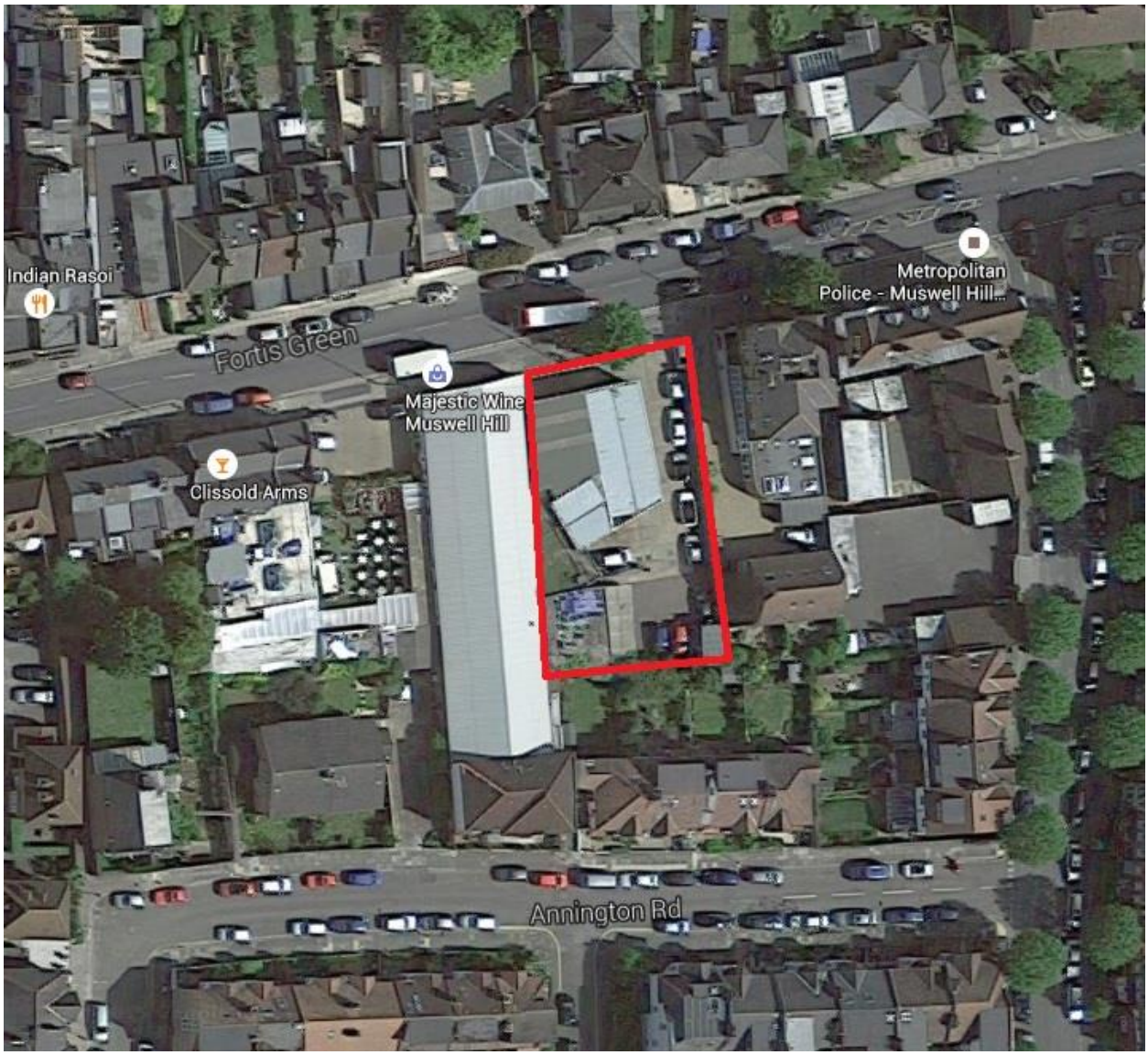

Figure 2.1: Existing site, showing site boundary

2.1 Existing Drainage

Survey information for the existing drainage arrangements on site were not available at the time of writing this report. There are currently channel drains alongside the site's boundary with Fortis Road, preventing surface water from the site from flowing onto the road. The British Geological Survey Maps show that superficial deposits of sand and gravel underlie the site. However, the nature of the existing development indicates that surface water drains to the public sewers. Any proposals for soakaways should be prevented by the relevant approving authorities due to the risk of contaminating the groundwater.

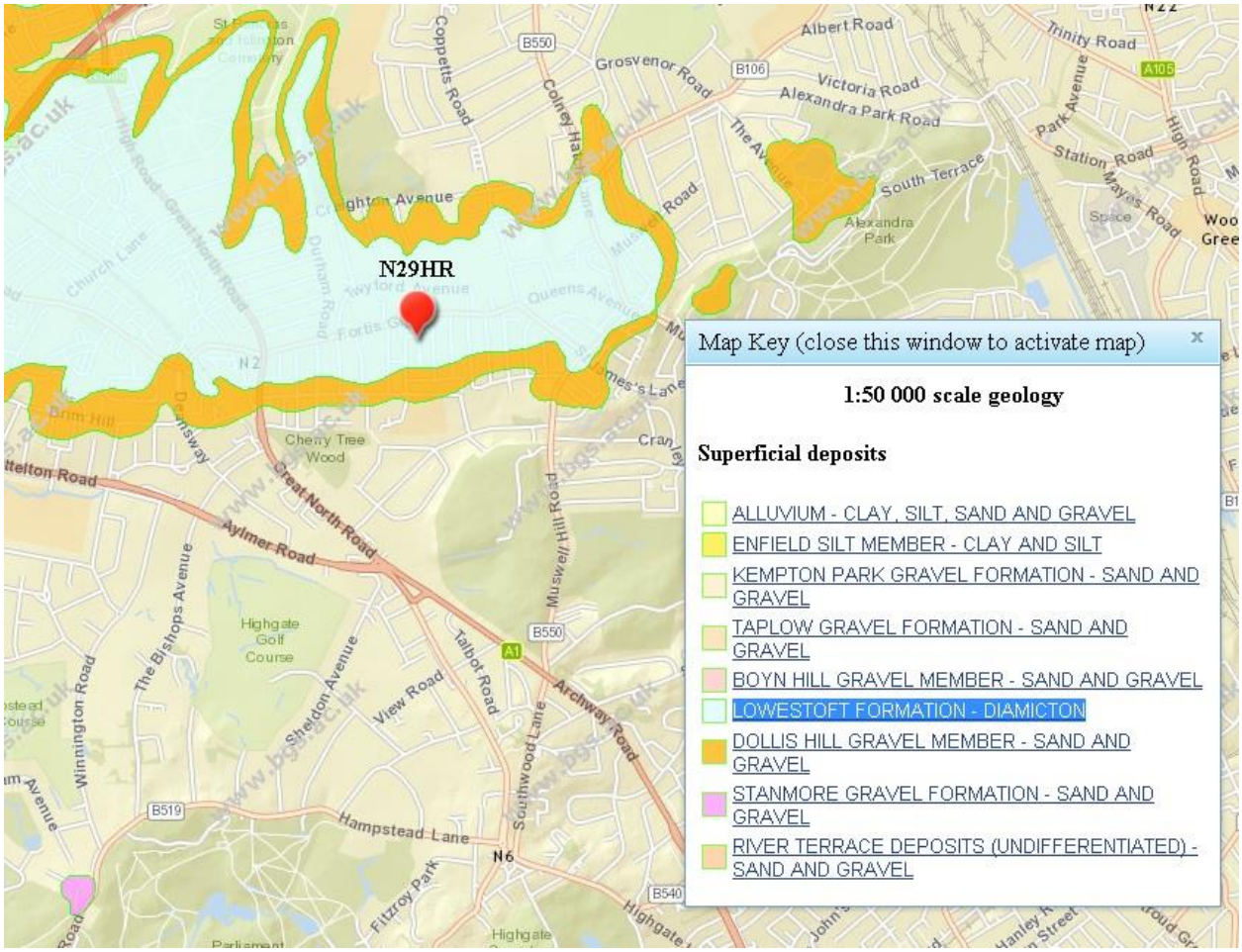

Figure 2.2: British Geological Maps.

It is thought that foul water from the proposed development drains to the 229mm diameter foul water public sewer in Fortis Green. There are various manholes covers on site. However, a drainage CCTV survey is required in order to identify their use and assess the condition of the drainage system.

Figure 2.3: Thames Water Sewer Records

3 Development Proposal

A new mixed-use (commercial/residential) development will be constructed on the site. Landscaped areas will be provided at ground floor level with a new car park at basement level (lower ground floor).

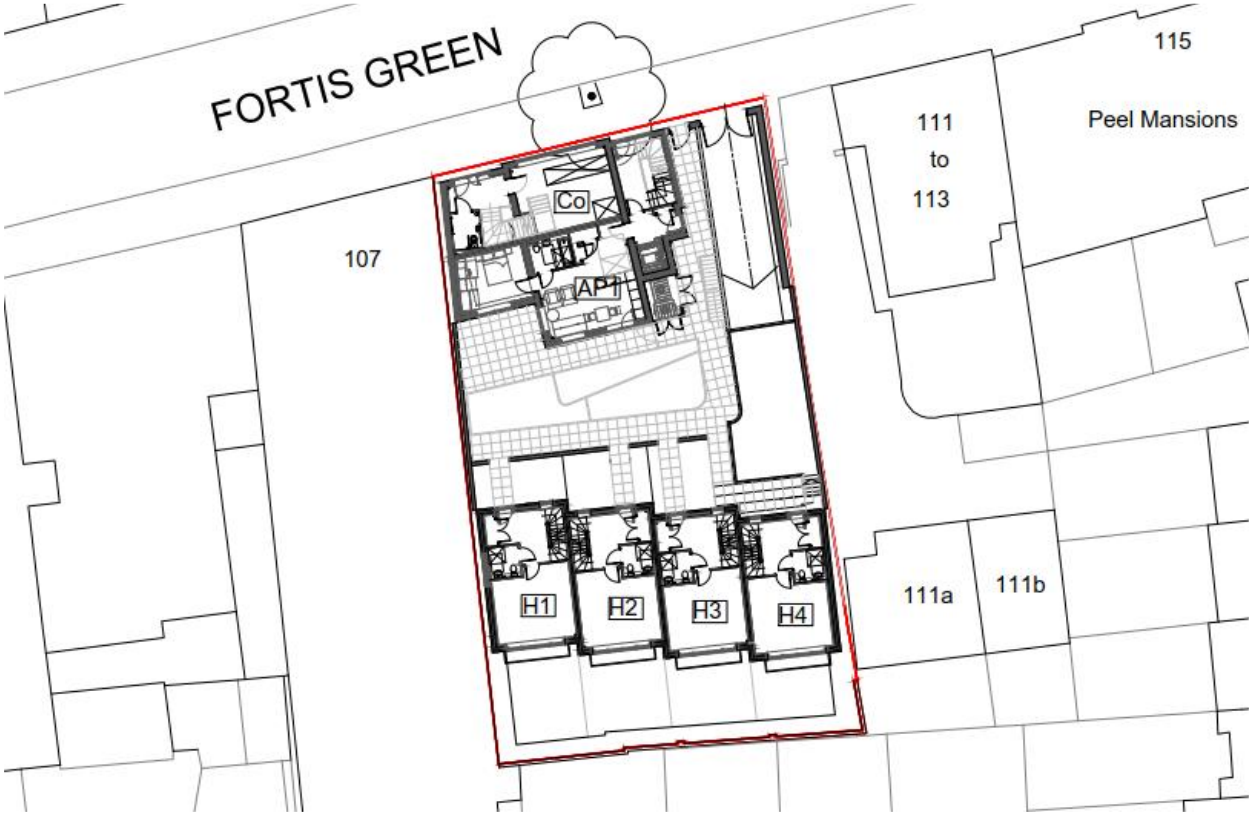

Figure 3.1: Proposed Ground Floor layout

4 Flood Risk Assessment

4.1 Flood Risk from Watercourses and Tidal Flooding

The EA's indicative floodplain map shows that the site is located within Flood Zone 1 and is not at risk of tidal and or fluvial flooding. Developments in this flood zone do not have any restrictions, provided they do not increase the risk of flooding elsewhere. Therefore, the impact of the proposed development on watercourses should be assessed to ensure that the surface water drainage proposals will not increase the flood risk elsewhere.

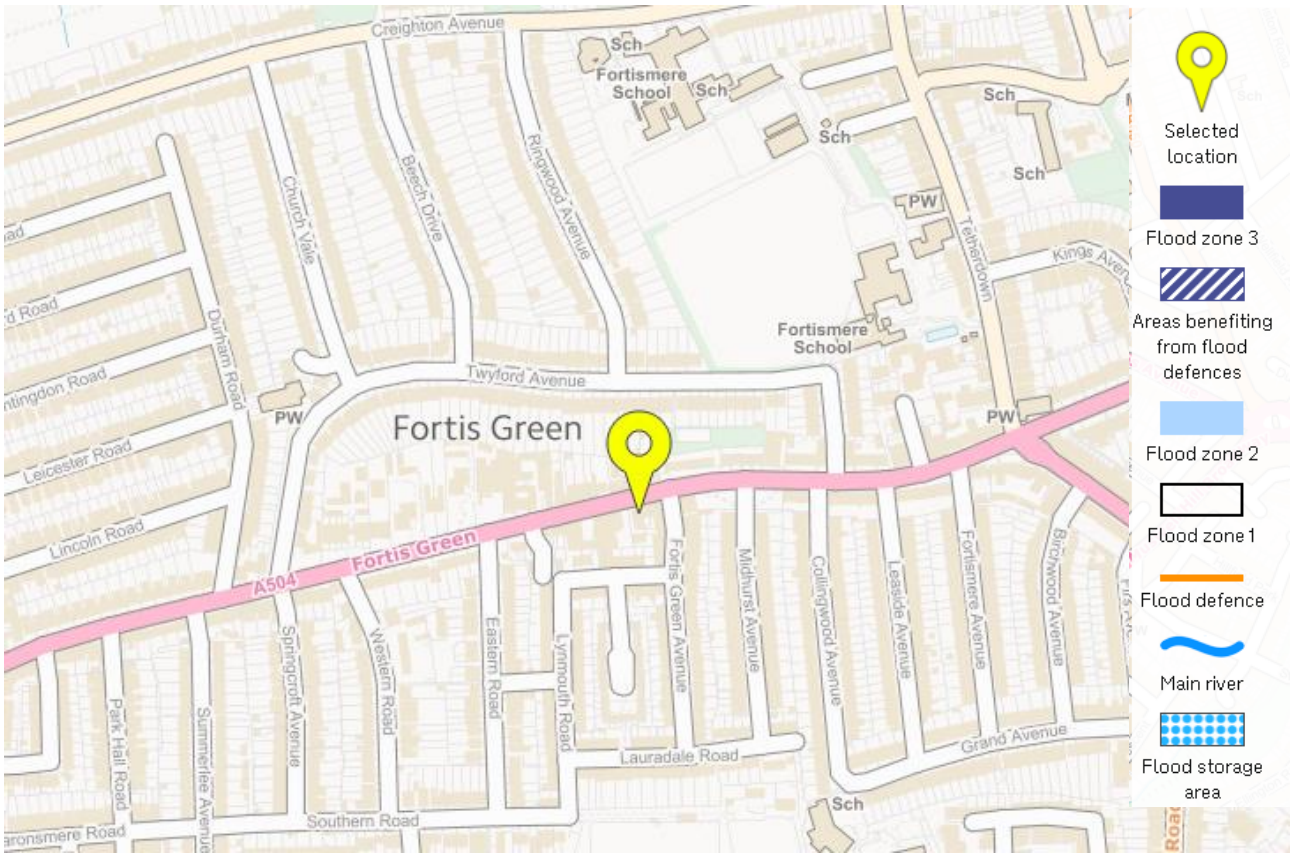

Figure 4.1: from EA Flood Map for Planning

4.2 Flood Risk from Groundwater

Groundwater flooding occurs when water originating from sub-surface permeable strata emerges from the ground, typically after prolonged rainfall.

A ground investigation report was not available at the time of writing this report. The British Geological Survey (BGS) Map shows that superficial deposits of Lowestoft Formation underlay the site. London Clay Formation (clay, silt and sand form the bedrock geology.

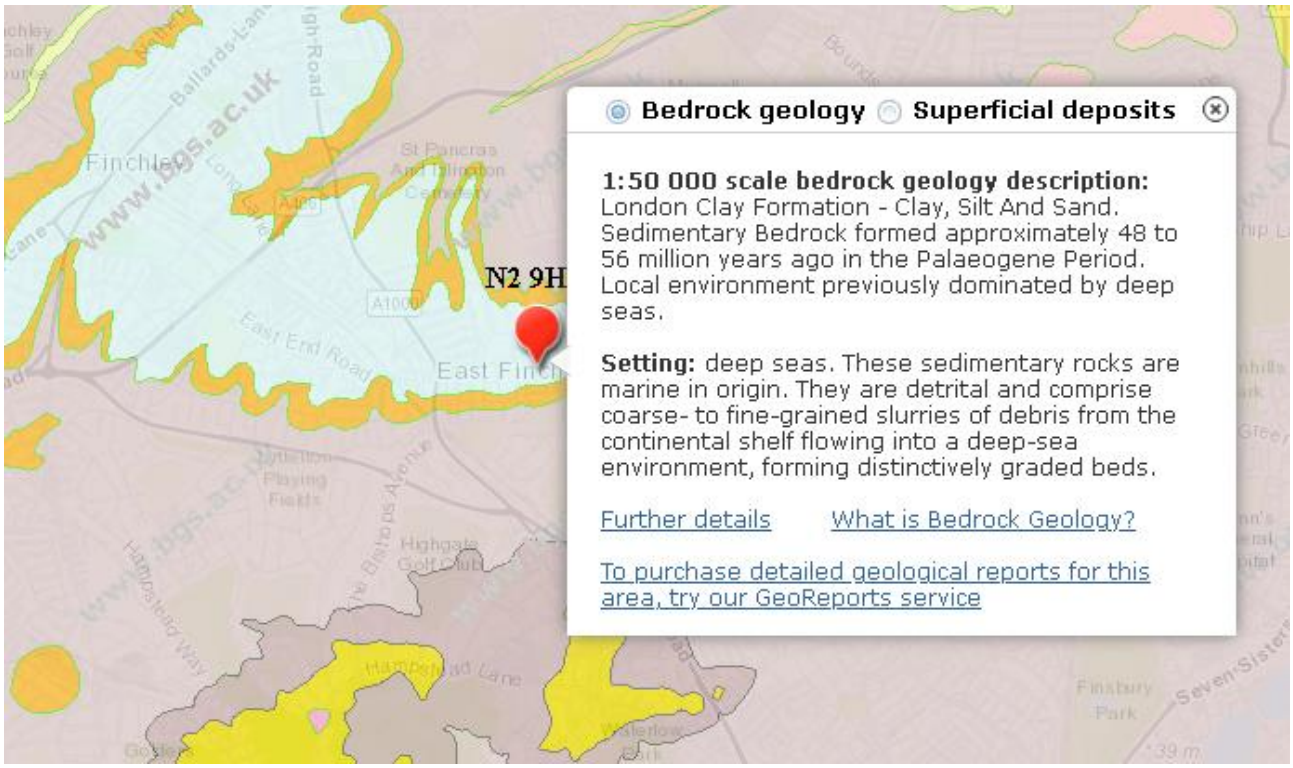

Figure 4.2: British Geological Maps.

Figure 4.2 shows that the site is underlain by bedrock of London clay (clay, silt and sand). London Clay restricts the free movement of groundwater and therefore the site is at low risk of ground of groundwater flooding.

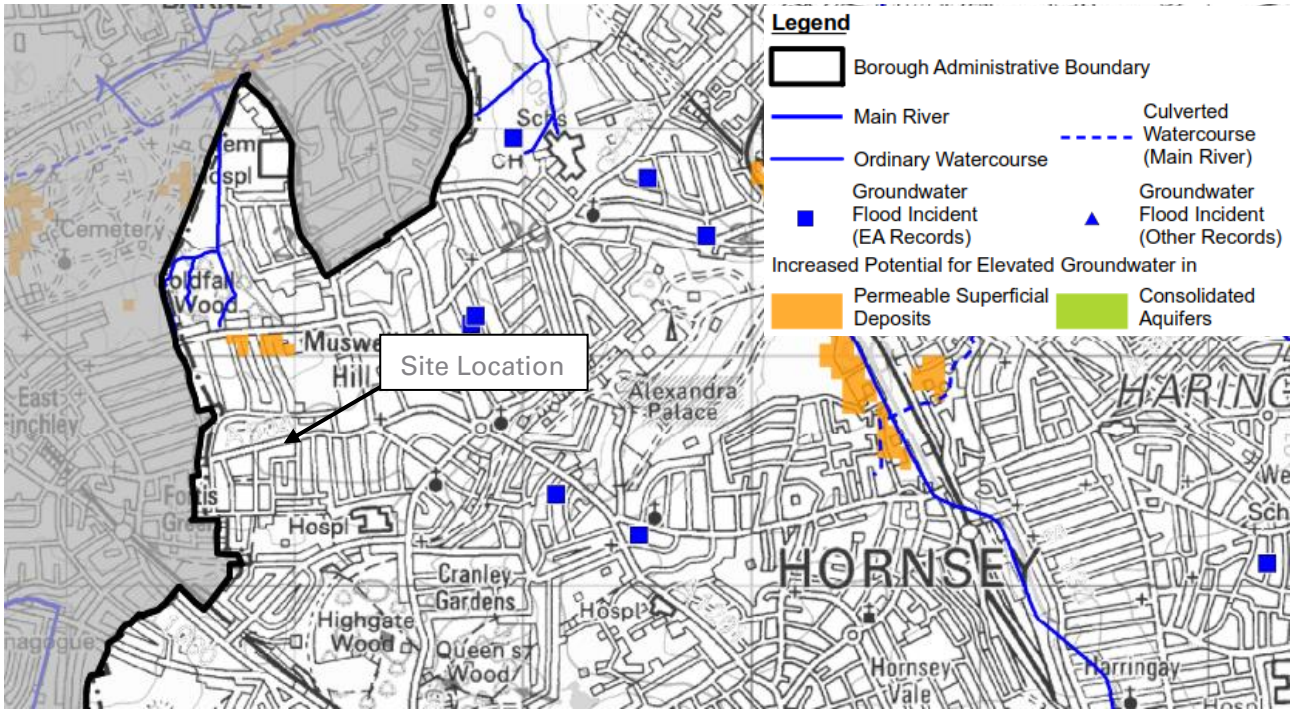

Figure 4.3 Groundwater vulnerability map (SWMP, 2011)

It can also be seen from Figure 4.3 that there is no history of groundwater flooding at the site location. Therefore, the risk posed to the development due to groundwater flooding is considered low and the proposed development will not have a negative effect on the local hydrology.

4.3 Flood Risk from Surface Water and Overland Flows

Surface water flooding occurs when intense rainfall is unable to soak into the ground or enter a drainage system due to blockages or the capacity of the system being exceeded. Overland flows can also be generated by burst water mains, failed dams and any failure in a system storing or transferring water.

The EA's indicative Surface Water Flooding Map, Figure 4.4, shows that the site is at very low risk of surface water flooding.

Figure 4.4 Environment Agency Surface Water Flood Risk Map

Therefore, the risk posed to the development due to surface water flooding is considered low.

4.4 Flood Risk from Reservoir and Infrastructure Failure

The EA provides information on flood risk from reservoirs. Figure 4.5 below shows that the site is at very low risk of flooding from reservoir failure.

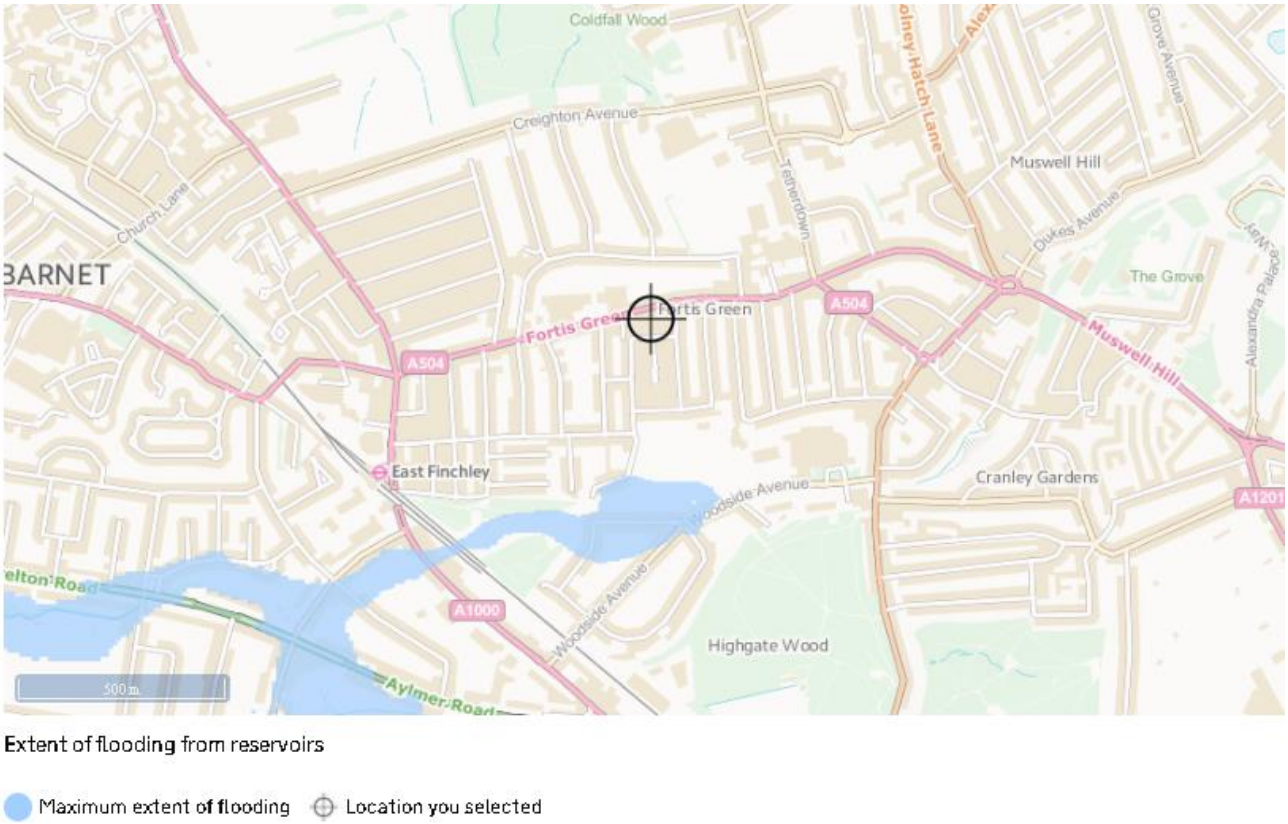

Figure 4.5 Environment Agency Risk of Reservoir Flooding Map

Figure 4.6 shows data provided by Thames Water on postcodes where properties are known to have experienced internal or external flooding prior to June 2010. The site is located in the postcode N2 9 which indicates 11 incidents of internal flooding. To protect the proposed development from sewer flooding non-return valves will be fitted to all connections to the public sewer.

Post Code Sector	2 in 10 external	2 in 10 internal	1 in 10 external	1 in 10 internal	1 in 20 external	1 in 20 internal	Severe	Total Properties
N10 1	0	0	0	0	0	2	0	2
N10 2	0	0	0	0	5	1	0	6
N10 3	0	1	0	3	0	3	1	8
N11 2	0	0	1	0	0	3	0	4
N15 3	0	0	0	0	0	1	0	1
N15 4	0	6	7	8	0	6	2	29
N15 5	0	0	0	0	0	1	2	3
N17 0	0	0	0	1	0	0	0	1
N17 7	0	0	1	0	1	0	0	2
N17 9	0	0	1	0	0	0	1	2
N2 0	0	0	2	1	0	11	0	14
N2 9	0	0	0	1	0	10	0	11
N22 5	0	0	1	0	0	3	0	4
N22 6	0	0	0	0	0	1	2	3

Figure 4.6 Thames Water Sewer Flood Records

Therefore, the risk from Reservoirs and Infrastructure failure is considered low.

5 Surface Water Run-off Assessment

5.1 Existing Run-off

The total site area is approximately 810m^2 or 0.081 ha and all of this is impermeable.

The existing run-off rate for the design storm events was calculated using the modified rational method as shown below:

$Q_x = 2.78 \times i \times A$

Where 'x' is the return period in years, 'A' is the catchment area in ha and 'i' is the rainfall intensity in mm/hr as estimated from MicroDrainage software.

$Q1_{ex}$ = 2.78 x 0.081 x 33.50 = 7.54 l/s
$Q30_{ex}$ = 2.78 x 0.081 x 82.20 = 18.51 l/s
$Q100_{ex}$ = 2.78 x 0.081 x 107 = 24.10 l/s

5.2 Proposed Run-off

The proposed development will not change the impermeable area on site. As such, the proposed peak run-off will match the existing rates.

Using the Climate change allowance (+40%) given in Section 5.3, the proposed peak run off rates for the 1 in 100 year storm event were calculated using the modified rational method.

$Q100_{pr} = 2.78 \times 0.81 \times 107 = 24.10$ l/s
$Q100_{+40\%} = 24.10 \times 1.4 = 33.74$ l/s

5.3 Climate Change

The current EA guidance states that for the years 2070 to 2115 there is a 50% chance the peak rainfall intensity will increase by 20% or more and that there is a 10% change it will increase by 40% or more. For this building, which is classed as More Vulnerable with a design life of 100 years an allowance of an additional 40% is considered appropriate. The climate change allowance is included in the volume calculations for the design of SuDS measures, which are given in Section 6.

6 SUDS Assessment

In accordance with the London Plan, EA guidelines, the SFRA, and CIRIA documents, surface water run-off should be managed as close to its source as possible. The London Plan states that all new developments should aim to reduce run-off to greenfield rates "utilising SUDS unless there are practical reasons for not doing so".

The possibility of implementing SUDS at the site was assessed using a hierarchy of preferred surface water management methods. The following paragraphs discuss the various methods in order of that hierarchy and evaluate the site's suitability for each method.

6.1 Store Rainwater for Later Use

This can be achieved by connecting rainwater pipes from the roof to the rainwater harvesting system. While rainwater harvesting can be full with water prior to a storm event, providing no attenuation benefits, these systems reduce the water demand and therefore must be considered in the design. The capacity in the rainwater harvesting tank depends on water use within the buildings that it serves. If there is no activity in the building during a rainfall event, the tank will be filled providing no attenuation benefits for a subsequent storm event.

6.2 Infiltration

Soakaways, ponds, swales, permeable pavement, porous asphalt and gravel trenches. These systems are all external and must be located away from buildings. The site layout shows that it is not practical to accommodate these systems on site, as the new basement level (lower ground floor) covers the entire site area.

6.3 Attenuation

The site layout shows that there is insufficient space onsite to accommodate a pond, or other open SuDS.

However, tanked storage can be accommodated in the basement (lower ground floor) area. As the tank will be installed below the basement level (lower ground floor), a pump will be required. The joint DEFRA/EA R and D rainfall runoff management for development report – SC030219 states that "a practicable minimum limit on the discharge rate from a flow attenuation device is often a compromise between attenuating to a satisfactorily low flow rate while keeping the risk of blockage to an acceptable level". Building Regulations Part H states that a minimum pipe size of 75mm must be provided for surface water drainage. A minimum self-cleansing velocity of 0.7 m/s should be provided in pumps. Therefore, a minimum flow of 3.1 l/s is required in order to achieve the minimum self-cleansing velocity in a 75mm diameter rising main.

Initial calculations in MicroDrainage software determined that a modular attenuation tank with a volume of 33m^3 and a void ratio of 0.95 would be required to achieve the desired discharge rate.

The drainage strategy drawings are available in Appendix E and the MicroDrainage calculations are available in Appendix F.

6.4 Discharge to Public Sewer

As there are no nearby watercourses, it is proposed that the site discharges to the local sewers network in Fortis Green.

The impermeable areas are not increased post development. Aattenuation has been proposed below the access roads and carparking areas which will provide a 91% betterment on the existing 1 in 100 year plus climate change storm event. Green roofs will be provided at ground floor level (all landscaped areas in Figure 3.1). Furthermore, a rainwater harvesting tank will be provided. The size of the rainwater harvesting tank will be decided later, as it will have no effect to the drainage proposals.

The below ground drainage strategy layout can be found in Appendix

7 Surface Water Maintenance and Management Strategy

This long-term *Maintenance and management plan* of the Sustainable Drainage System (SuDS) should be implemented at 109 Fortis Green, London, N2 9HR to ensure that the drainage network functions as designed. This plan is intended to cover all on-site drainage structures. The site users possess the primary responsibility for overseeing and implementing the maintenance and management plan and designating an organisation or person who will be responsible for the proper operation and maintenance of the stormwater drainage structures.

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants. Catch pit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas. Maintenance and cleaning of gullies, stormwater manholes, and the attenuation tank will assure adequate performance. This maintenance program is outlined below.

7.1 Maintenance Program

The designated company or person will conduct the operation and maintenance program set forth in this document. The designated company or person will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms (attached) should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file.

Concurrent with inspection and cleaning, all litter shall be picked up and removed from the parking areas, external bin store and soft landscaping.

7.1.1 Regular Maintenance

1. Inspect channel and gully inlet grates and remove any debris every 3 months or as determined to be reasonable based on experience with the installed systems to ensure that the gullies are working in their intended fashion and that they are free of debris; quarterly, inspect gully sumps and bottom of drain manholes; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.

2. Inspect all vegetated areas and remove litter and debris as necessary. Replant bare areas or areas with sparse growth.

3. Inspection of external bin store for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the stormwater management system.

4. Attenuation tank inlets, outlet and vents and overflows should be checked every 3 months and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 3 months after.

5. Pump stations should be inspected by a specialist annually and maintained in accordance with manufacturer guidelines. Surface water pumps should be checked during dry periods with no rainfall to ensure that they are in good condition - Water should be poured into the surface water sump chamber up to the pump operating level to activate the pump and prevent seizures/failure.

7.1.2 Winter Maintenance Program

Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

7.1.3 Fertiliser Use

Only slow-release organic low-phosphorous fertilisers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system.

8 Foul Water Assessment

As outlined in Section 2, the site has an existing foul drainage network, foul water from the site will outfall via the existing connection to the public foul water sewer in Fortis Green.

All proposed networks will be designed to Adoptable Standards as outlined in Sewers for Adoption – 7th Edition and in accordance with Building Regulations Part H.

The proposed peak foul water flows from the site are calculated using the figure of 4000 l/dwelling/day as outlined in Sewers for Adoption 7th Edition.

Using Building Regulations Part H, Table 5, based on 10 dwellings the peak flow rate from the proposed development is estimated to be 4.1 l/s.

A Section 106 application will be made to the Water Authority for consent to connect to the public sewer.

9 Conclusions

I. It has been demonstrated that the site is at low risk of flooding from watercourses and the sea, groundwater, surface water and overland flows, and reservoir failure;

II. The site is in a postcode that has several internal flood events recorded, to protect the site from sewer flood risk, non-return valves will be fitted in connections to the public sewer;

III. Existing manholes and channel drains indicate that foul and surface water from the site currently drains to the public sewers in Fortis Green;

IV. Published information shows the site is underlain by superficial deposits which could be suitable for infiltration techniques. However, the new prevents the use of infiltration techniques on site;

V. The proposed development will not increase the impermeable areas and subsequently the run-off rates. However, surface water will be attenuated to Greenfield run-off rates as per the London Plan requirements;

VI. Attenuation will be provided in below ground tanks and will be restricted via surface water pump to 3.1 l/s. Green roofs and a rainwater harvesting system will be also provided;

VII. Both surface water and foul water will re-use the existing connections on site. A CCTV drainage survey will confirm the condition and the connection point to the public sewers;

VIII. Foul water from the site will drain by gravity to the public sewers via the existing connections.

Appendix A
Topographical Survey

Appendix B
Thames Water Sewer Records

Appendix C
Development Proposals

Appendix D
SuDs Greenfield Run-off Calculations

Appendix E
Below Ground Drainage Strategy Layout

Appendix F
MicroDrainage Calculations