

Brunel Walk Redevelopment and Turner Avenue Estate Improvements Flood Risk Assessment

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PREPARED FOR:
London Borough of Haringey

BRUNEL WALK REDEVELOPMENT AND TURNER AVENUE ESTATE IMPROVEMENTS

FLOOD RISK ASSESSMENT

ISSUED FOR COMMENT

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Executive Summary

Meinhardt UK has been appointed by the London Borough of Haringey (LBH) to prepare a site-specific a Flood Risk Assessment (FRA) for the proposed development at 1-36 Brunel Walk, Tottenham, London, N15 5HQ.

This FRA 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). LBH policies and guidance have also been referred to, including the LBH Drainage Sustainable Evaluation, SuDS Design Requirements for LLFA Technical Assessment and the LBH Surface Water Management Plan (SWMP). This report also incorporates advice and guidance from the Environment Agency (EA) and CIRIA documents.

The Environment Agency (EA) flood prediction maps show that the site is located in Flood Zone 1. The proposed buildings usage is classified as 'More Vulnerable' in the NPPF which is suitable for the construction within Flood Zone 1 and therefore passes the sequential test outlined in the NPPF guidance.

Following the assessment within the FRA, the site is deemed to be at low risk of flooding from all sources of flooding and will not increase the risk of flooding off site. Although the site is located in a Critical Drainage Area, the online surface water flood maps indicate that surface water flooding is concentrated along the eastern part of the site, where the proposed new dwelling is raised above existing flood levels, additionally the surface water drainage strategy will ensure surface water is reduced off site to greenfield rates and designed to cater for the 1:100 year + 40% Climate change event and therefore there will be no detrimental impact off site. Therefore, no additional flood mitigation measures (such as flood barriers) have been proposed for the development.

Overall the scheme complies with National and local policy requirements in terms of flood risk by ensuring areas where surface water flooding is known, FFL for residential dwellings are raised above this predicted flood level to mitigate this risk. All other forms of flooding is deemed low risk.

Flood Source	Risk Category			Comments	Off-site Impact
	High	Medium	Low		
Tidal/fluvial			X	Site situated within Flood Zone 1 an area with a low probability of flooding (less than 1-in-1000 annual probability of river or sea flooding in any year).	The proposed development will not increase the risk of tidal/ fluvial flooding to offsite developments.
Surface Water Run-off from Heavy Storm Events			X	The site is at low risk of surface water flooding as identified by the EA flood maps. The proposed surface water drainage design will mitigate the risk of surface water flooding onsite and no buildings will be located in areas of medium or high risk.	Off-site flood risk will decrease post-development, as the surface water run-off will be attenuated on site (for all events up to the 1 in 100 year storm event +40% climate change) & discharged at a restricted rate of 2.5 l/s
Groundwater			X	The LB of Haringey's SWMP states that there are no recorded incidents of groundwater flooding in close proximity to the site and BGS maps show the site is underlain by London Clay which restricts the movement of groundwater. The groundwater flood risk is therefore thought to be low.	The proposed development will not increase the risk of groundwater flooding to offsite developments.
Sewers			X	LB of Haringey's SWMP did not identify the area as having significant historical flooding from sewers. The site levels will remain above the levels of the existing drainage structures.	Surface water flood risk will be reduced due to onsite attenuation and restricted discharge rates into the surface water sewers.
Reservoirs			X	The site is in an area not at risk from reservoir flooding. Therefore the risk is deemed to be low.	The proposed development will not increase the risk of reservoir flooding to offsite developments.

The table above outlines that the proposed development is at low risk of flooding from all sources of flooding and will not increase the risk of flooding off site. Although the site is located adjacent to a Critical Drainage Area, the EA flood maps indicate that surface water flooding will be concentrated outside of the areas proposed for new buildings and a new positive surface water drainage system will be installed that can accommodate up to the 1 in 100 year plus climate change storm event. The site levels will remain above the highway levels adjacent to the site in the south-east corner and therefore the area will not drain towards the site. Therefore, no additional flood mitigation measures (such as flood barriers) have been proposed for the development.

Therefore, the proposed redevelopment has an acceptable flood risk within the terms and requirements of NPPF.

1 Planning Policy and Relevant Guidance

1.1 Introduction

The purpose of this section is to give an overview of key flood risk and planning policy matters in England. There is particular emphasis on the flood risk issues given in the National Planning Policy Framework (NPPF) document and accompanying Technical Guidance document.

Consequently, this section is not site-specific. Whilst some issues covered may not be directly relevant to the specific development they do provide the overall context for assessing flood risks in England.

1.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was published in February 2019 (updated in July 2021) with the aim of protecting the environment and to promote sustainable growth. There is an overarching objective to strive towards sustainable development and ensuring that this is a key element in every proposal.

The following paragraphs from the NPPF are considered relevant to this assessment:

Paragraph 159: Requires that “Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”;

Paragraph 162: Explains that “the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source”;

Paragraph 167: Explains that “When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere.[...]; and

Paragraph 169: Recommends that “major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- a) take account of advice from the lead local flood authority;
- b) have appropriate proposed minimum operational standards;
- c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
- d) where possible, provide multifunctional benefits”.

1.3 The London Plan

The London Plan: Spatial Development Strategy for Greater London (March 2021):

The London Plan sets out the new spatial development strategy for Greater London and it sets out an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The following policies are considered relevant to this assessment:

Policy SI 5 Water Infrastructure - “Development proposals should seek to improve the water environment and ensure that adequate water infrastructure capacity is provided. Development plans should promote the protection and improvement of the water environment in line with the Thames River Basin Management Plan, and should take account of Catchment Plans whilst supporting wastewater treatment infrastructure investment to accommodate London’s growth and climate change impacts. Development proposals should minimise the use of mains incorporating measures such as smart metering, water saving and recycling measures, including retrofitting, to help to achieve a maximum mains consumption of 105 litres or less per head per day”

Policy SI 12 Flood Risk Management - "Development proposals must comply with the flood risk assessment and management requirements set out in the NPPF and the associated technical Guidance on flood risk"; and

Policy SI 13 Sustainable Drainage - "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 whilst ensuring that surface water run-off is managed as close to its source as possible in line with the below drainage hierarchy:

- 1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
- 2) rainwater infiltration to ground at or close to source
- 3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
- 4) rainwater discharge direct to a watercourse (unless not appropriate)
- 5) controlled rainwater discharge to a surface water sewer or drain
- 6) controlled rainwater discharge to a combined sewer.

Development proposals for impermeable paving should be refused where deemed inappropriate such as in small areas of front gardens and driveways.

Drainage should be designed and implemented to address water use efficiency, water quality, biodiversity, amenity and recreation."

1.4 Strategic Flood Risk Assessment

NPPF guidance refers to Strategic Flood Risk Assessments (SFRAs), which provide an assessment of all types of flood risk in a defined area, which is then used to inform land use planning decisions. They are the responsibility of the Local Planning Authority (LPA). An SFRA may cover part or all of an LPA's area, or even an area that includes several LPAs. It should primarily be used to support the development of Local Plans, prepared in consultation with the EA. The SFRAs must consider the effects of climate change.

1.5 Climate Change Guidance

The EA guidance "Flood risk assessments: climate change allowances" was issued in 2016 (last updated 27th May 2022) and provides the most recent information on expected changes in rainfall, river flows and sea levels as a consequence of climate change.

Sea level allowances by river basin district for each epoch is provided in Table 2 of the guidance document.

The guidance provides peak river flow allowances by management catchments, the sub-catchments of the river basin districts. The peak flows are based on percentiles, a percentile is a measure used to describe the proportion of possible scenarios that fall below an allowance level (e.g. a 50% percentile means that the allowance has 50% chances of not being exceeded).

The most recent updates for Peak Rainfall Allowances, which takes into account UKCP Local 2.2km projections and supporting research FUTURE-DRAINAGE. These are also now provided by management catchments instead of at a national scale and an online "Peak Rainfall Allowances Map" is now provided. Peak rainfall allowances are provided for 1% annual exceedance probability (AEP) events and for 3.3% AEP events.

The guidance states how to apply peak rainfall allowances has changed, using the central allowance for development with a lifetime up to 2100 and the upper end allowance for development with a lifetime from 2100 to 2125. Residential development to have a minimum lifetime of a 100 years, whilst commercial a minimum of 60 years.

The following approach should be used for drainage design:

- Development with a lifetime beyond 2100 - Design your development so that for the upper end allowance in the 1% annual exceedance probability event:
 - There is no increase in flood risk elsewhere
 - Your development will be safe from surface water flooding
- Development with a lifetime of between 2061 and 2100 - For development with a lifetime between 2061 and 2100 take the same approach but use the central allowance for the 2070s epoch (2061 to 2125).
- Development with a lifetime up to 2060 - For development with a lifetime up to 2060, take the same approach but use the central allowance for the 2050s epoch (2022 to 2060).

Exceptions:

In some locations the allowance for the 2050s epoch is higher than that for the 2070s epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances.

2 Site

2.1 Site Description and Location

The site is Brownfield and is located at 1-36 Brunel Walk, Tottenham, London, N15 5HQ. Brunel Walk is bound by the wider Turner Avenue estate both of which are owned by LBH. Brunel Walk and Turner Estate are bound by West Green Road to the north, Elmar Road to the west, residential properties to the south, and Kirkton Road and Braemar Road to the east. Brunel Walk and Turner Avenue Estate are access via Elmar Road and Kirkton Road. The Brunel Walk site is currently occupied by five two-storey buildings including 35 single person flats, 1 family house and communal facilities, along with associated soft landscaping and paths. Parking for Brunel Walk is available from Braemar Road to the south east. The Brunel Walk planning application (red line) covers an area of approximately 1.45 ha, the majority of which is hard landscaping.

The site has approximate OS coordinates of 533110, 189010 at Grid Reference TQ331890.

The Brunel Walk development area is shown by a red line and the wider site Turner Estate Improvements boundary by a blue line, and the green boundary is shown as the areas of new build development which has been considered as part of the drainage strategy, in Figure 2.1 below.

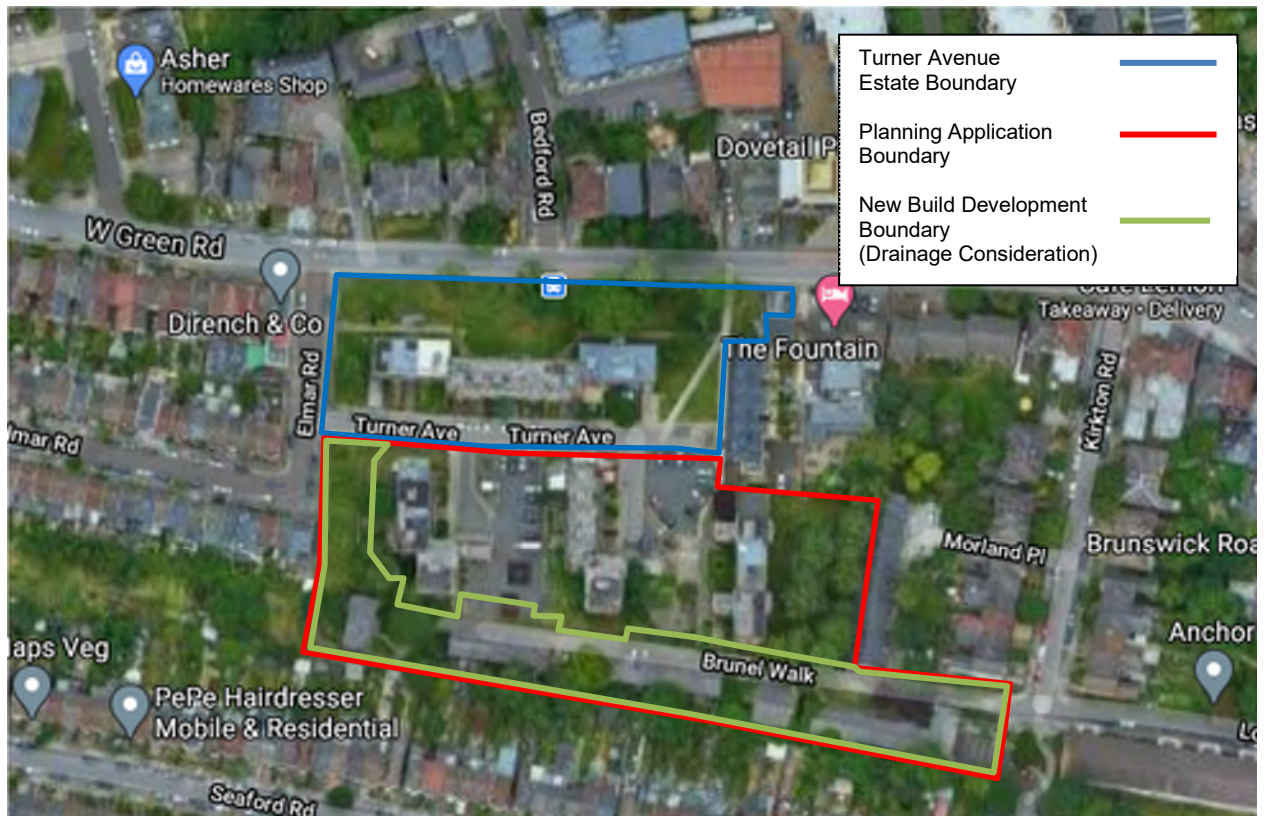


Figure 2.1: Site Location Plan

The site is relatively flat, falling slightly northwest-southeast, from approximately 13.50m AOD to 12.22m AOD, with a step down to the carpark in the east portion of the site with a level of approximately 10.53m AOD.

2.2 Development Context

Development proposals include the Redevelopment of Brunel Walk to provide 45 new Council rent homes in four buildings ranging from 3 to 4-storeys high including 39 apartments and 6 maisonettes. Provision of associated amenity and play space, cycle and refuse/recycling stores and 4 wheelchair parking spaces.

Reconfiguration and enhancement of existing parking areas and outdoor communal areas and play spaces on the Turner Avenue Estate.

2.3 Hydrological Setting

The closest main watercourse is the River Lea, which is located approximately 1.3km to the east of the site.

2.4 Hydrogeological Setting

The EA/Defra (Department for Environment, Food and Rural Affairs) has developed Groundwater Source Protection Zones (SPZ) to assist in the assessment of risk to groundwater supplies taken from an abstraction point. Details of the zones are as follows:

Inner zone (Zone 1) - Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres;

Outer zone (Zone 2) - Defined by a 400 day travel time from a point below the water table. The previous methodology gave an option to define SPZ2 as the minimum recharge area required to support 25 per cent of the protected yield. This option is no longer available in defining new SPZs and instead this zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction;

Total catchment (Zone 3) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75 . There is still the need to define individual source protection areas to assist operators in catchment management;

Special interest (Zone 4) - A fourth zone SPZ4 or 'Zone of Special Interest' was previously defined for some sources. SPZ4 usually represented a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream). In the future this zone will be incorporated into one of the other zones, SPZ 1, 2 or 3, whichever is appropriate in the particular case, or become a safeguard zone.

The subject site is located within SPZ2 as shown in Figure 1.2 below.

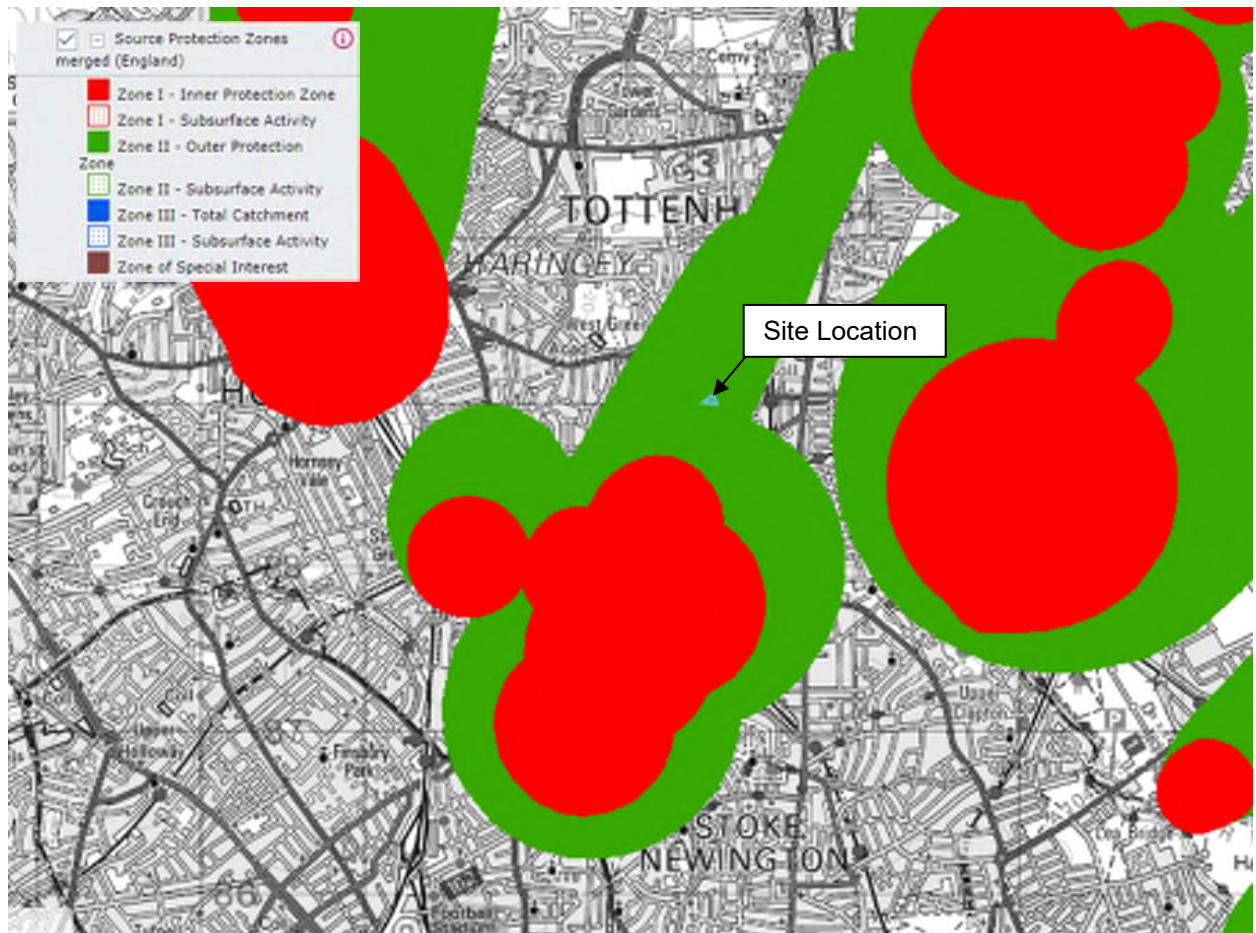


Figure 1.2: Extract from EA/Defra Source Protection Zone Maps

The EA/Defra has developed aquifer designations which are in line with the Water Framework Directive and are based on maps produced by the British Geological Survey (BGS). Definitions for the aquifer types are provided below based on the EA website:

Principal Aquifer: “These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.”

Secondary A aquifer: “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.”

Secondary B aquifer: “predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.”

Secondary Undifferentiated aquifer: “assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.”

Unproductive Strata: “rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.”

The EA has produced groundwater vulnerability maps to illustrate the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a square kilometre.

The simplified groundwater vulnerability map defines five risk categories:

High: “high priority groundwater resources that have very limited natural protection.”

Medium-high: “high priority groundwater resources that have limited natural protection”

Medium: “medium priority groundwater resources that have some natural protection.”

Medium-low: “lower priority groundwater resources that have some natural protection.”

Low: “low priority groundwater resources that have a high degree of natural protection.”

Groundwater is unlikely to be at risk where only unproductive strata are present due to the low permeability of these deposits which offer protection to any aquifers that may be present beneath. For this reason these areas have not been assigned a vulnerability class.

It can be seen from the maps in Figure 2.3 and Figure 2.4 that the site is located over unproductive strata. The proposed surface water drainage strategy is to discharge surface water at a restricted rate to the public surface water sewer within the surrounding roads. Infiltration into the ground will not be used as a drainage solution and therefore there will be no pollutant pathways introduced by the development that could possibly pose a threat to groundwater below site.

For details refer to Meinhardt’s Below Ground Drainage Strategy Report 2844-MHT-CV-RP-002.

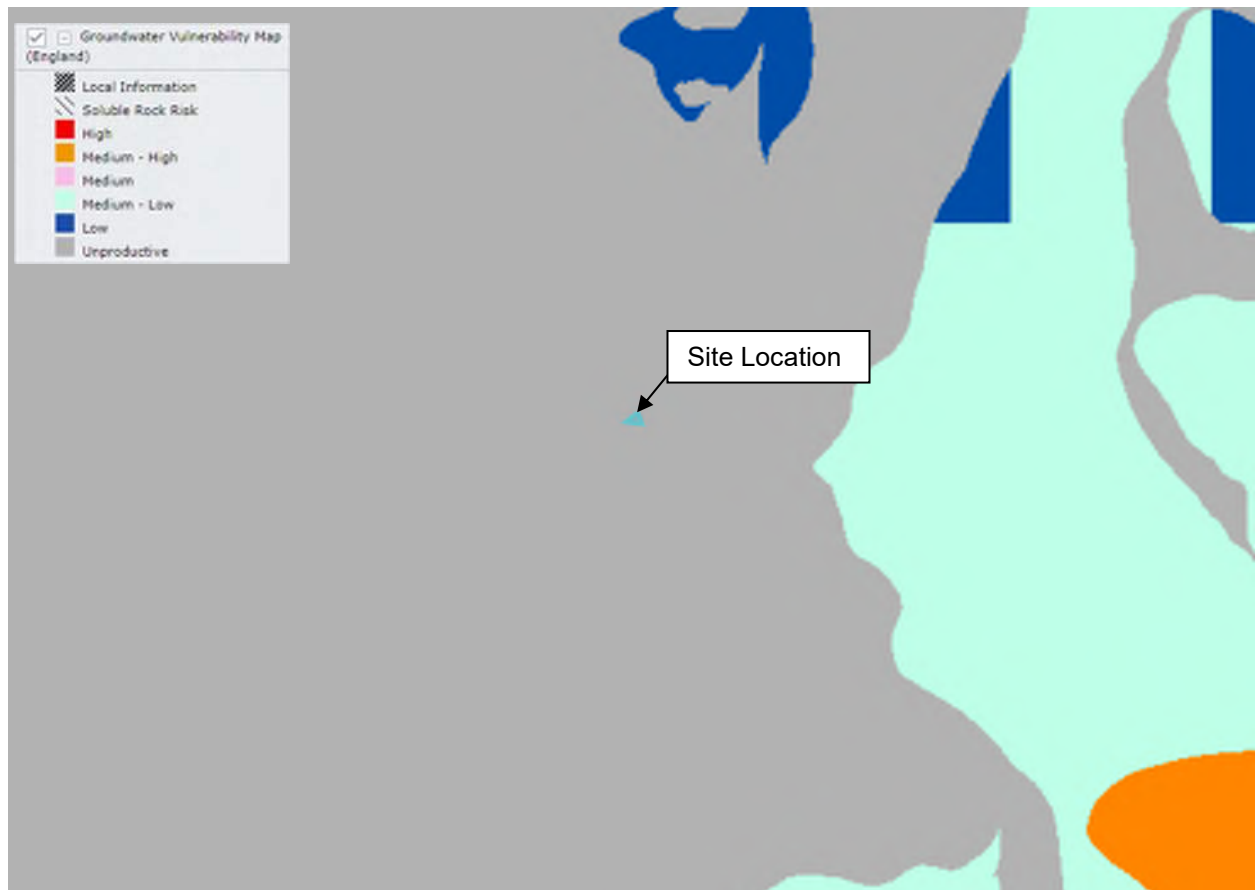


Figure 2.3: EA Groundwater Vulnerability Map



Figure 2.4: EA Bedrock and Superficial Drift Aquifer Designation Map

3 Flood Risk Analysis

3.1 Flood Risk Sources

Upon review of the site characteristics, development proposals and available information, the potential sources of flooding that could pose a risk to the site are presented in Table 3.1 below.

Flood Source	Mechanism	Site Impact
Tidal/fluvial	Extreme flood water levels from river or sea sources.	Flood waters entering buildings via thresholds or other openings. Flooding of external areas etc.
Surface Water Run-off from Heavy Storm Events	Surcharging/inundating of existing drainage networks with overland flows to the site.	Flood water entering site from adjacent highways/properties. Affecting basements and/or external areas.
Groundwater	Rising groundwater within underlying aquifers.	Rising groundwater levels could affect basements if pathway available.
Sewers	Blockages/failure of drainage or water distribution systems on or adjacent to the site.	Backing up into the site of surface/foul water flows. The risk is to property and low lying areas.
Flooding from Reservoirs	An uncontrolled release of water from a reservoir.	Site could be inundated with water.

Table 3.1: Flood Risk Sources

3.2 Tidal and Fluvial

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 the surface water drainage proposals will not increase the flood risk elsewhere.

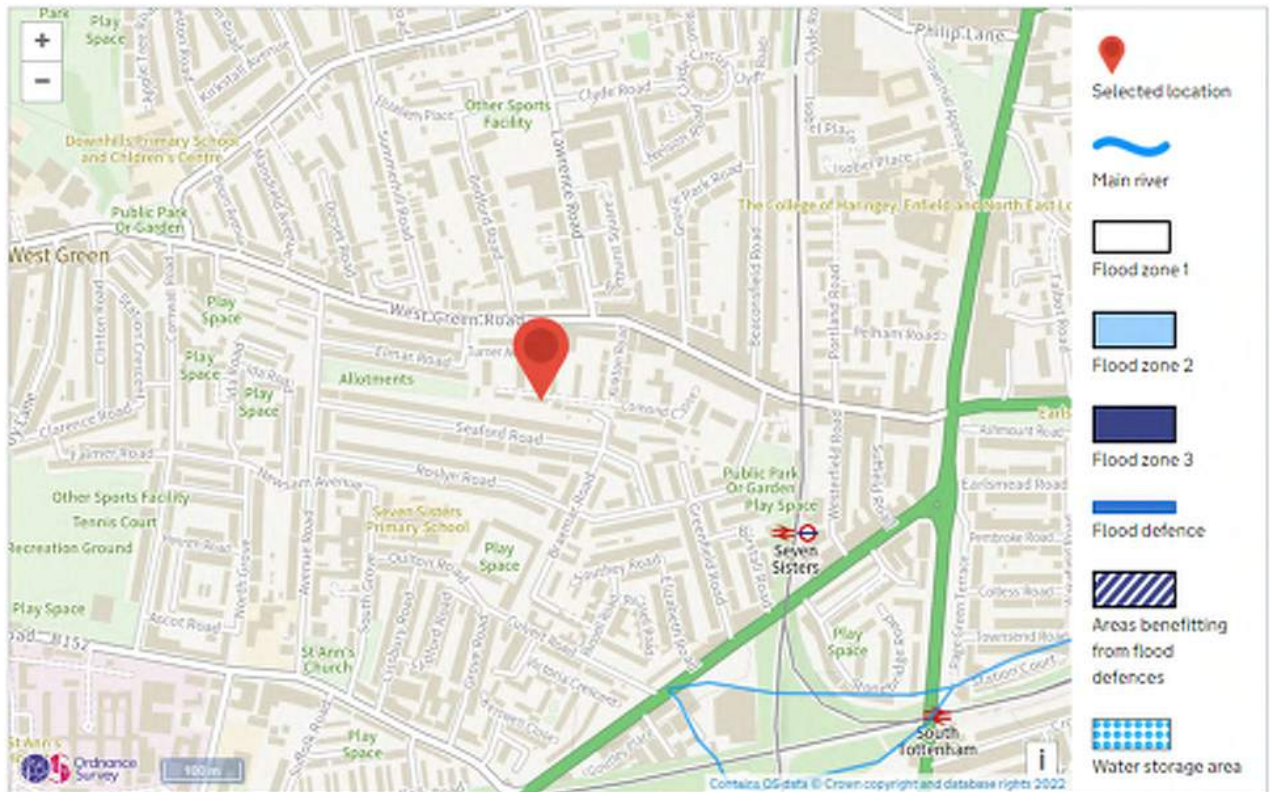


Figure 3.1: EA Flood Map for Planning

3.3 Surface Water Flooding

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 London Borough of Haringey's Surface Water Management Plan (SWMP) has identified 9 Critical Drainage Areas (CDAs) within the Borough, representing areas at the highest risk of surface water flooding. The south-east corner of site is located adjacent to Critical Drainage Area Group4_057, as indicated in Figure 3.2.

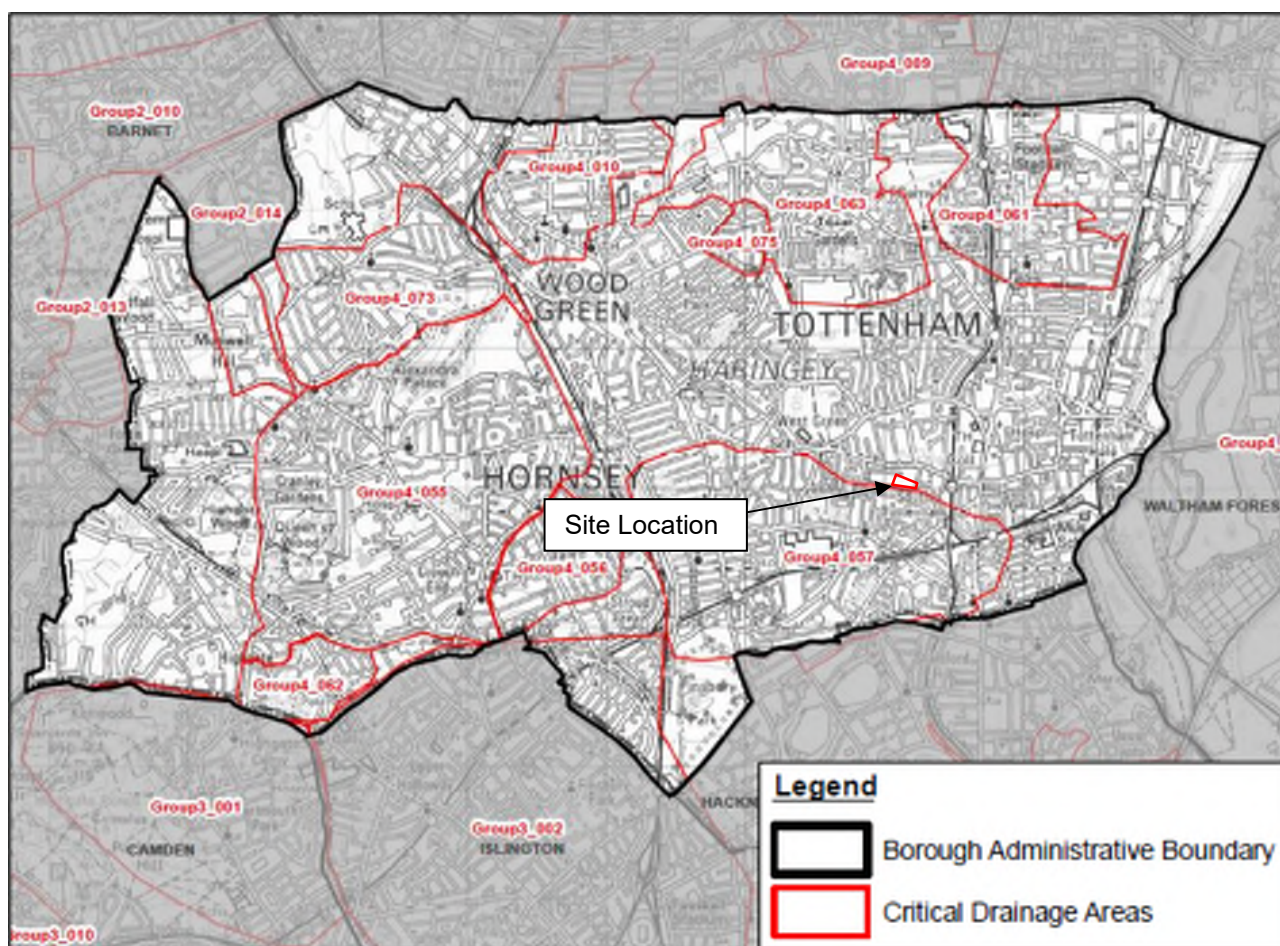


Figure 3.2: Critical Drainage Areas (SFRA, 2014)

There are several Critical Drainage areas identified covering large areas, the flood warning information service shows more detailed surface water flood risk maps.



Figure 3.3: EA Surface Water Flood Maps – Extent of Flooding



Figure 3.4: EA Surface Water Flood Maps – Low Risk Depth

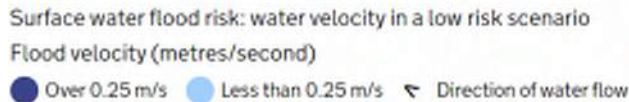


Figure 3.5: EA Surface Water Flood Maps – Low Risk Velocity

The EA's indicative flood risk from surface water map, Figure 3.3, shows that the majority of the site is at very low risk of surface water flooding, with areas of low risk to the middle of the site and a small area of medium and high risk at an existing low point along the south east boundary that is currently used as a carpark. The levels in this car park area are circa 10.8m AOD falling to 10.49m AOD

Figure 3.4 and Figure 3.5 indicate that if surface water flooding was to occur on site, the depth of floodwater would be less than 300mm and would have a velocity less than 0.25m/s for the majority of the site area. Small areas of higher risk are present along Turner Avenue and the carpark at south east site boundary.

In this south eastern location a proposed new dwelling is being placed, however FFL for this ground floor apartment is set at 11.580m AOD and therefore significantly raised above the area at risk from a high degree of flooding. Moreover, a new positive surface water drainage system will be installed that can accommodate up to the 1 in 100 year plus climate change storm event. Therefore, the risk posed to the development due to surface water flooding is considered low. For details refer to Meinhardt's Below Ground Drainage Strategy Report 2844-MHT-CV-RP-002.

3.4 Groundwater Flood Risk

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. However, Figure 3.6 shows that the site is underlain by bedrock of London clay (clay, silt and sand) with no recorded superficial deposits. London Clay restricts the free movement of groundwater and therefore the site is likely to be at low risk of ground of groundwater flooding.

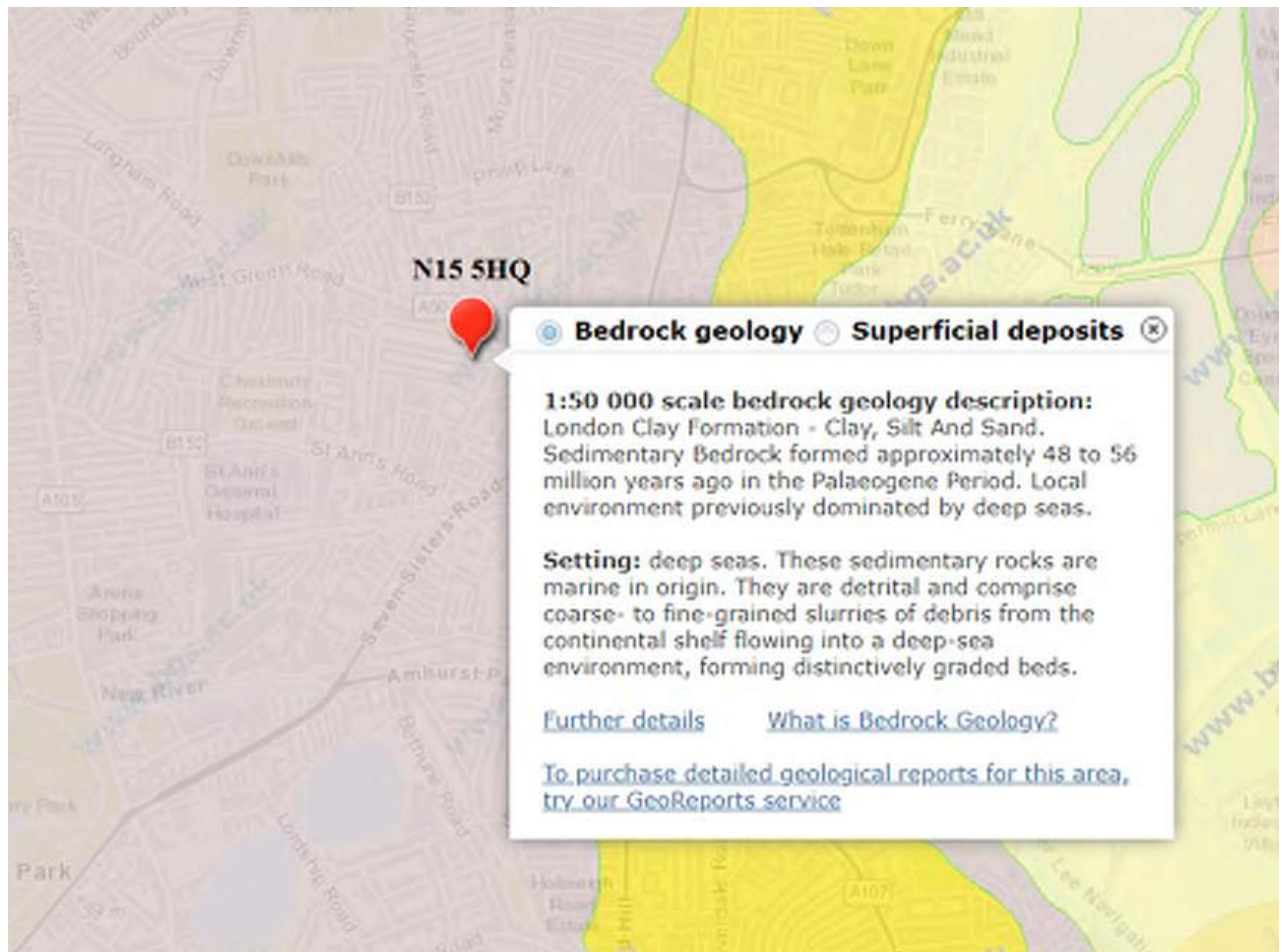


Figure 3.6: Local Geology (BGS, 2021)

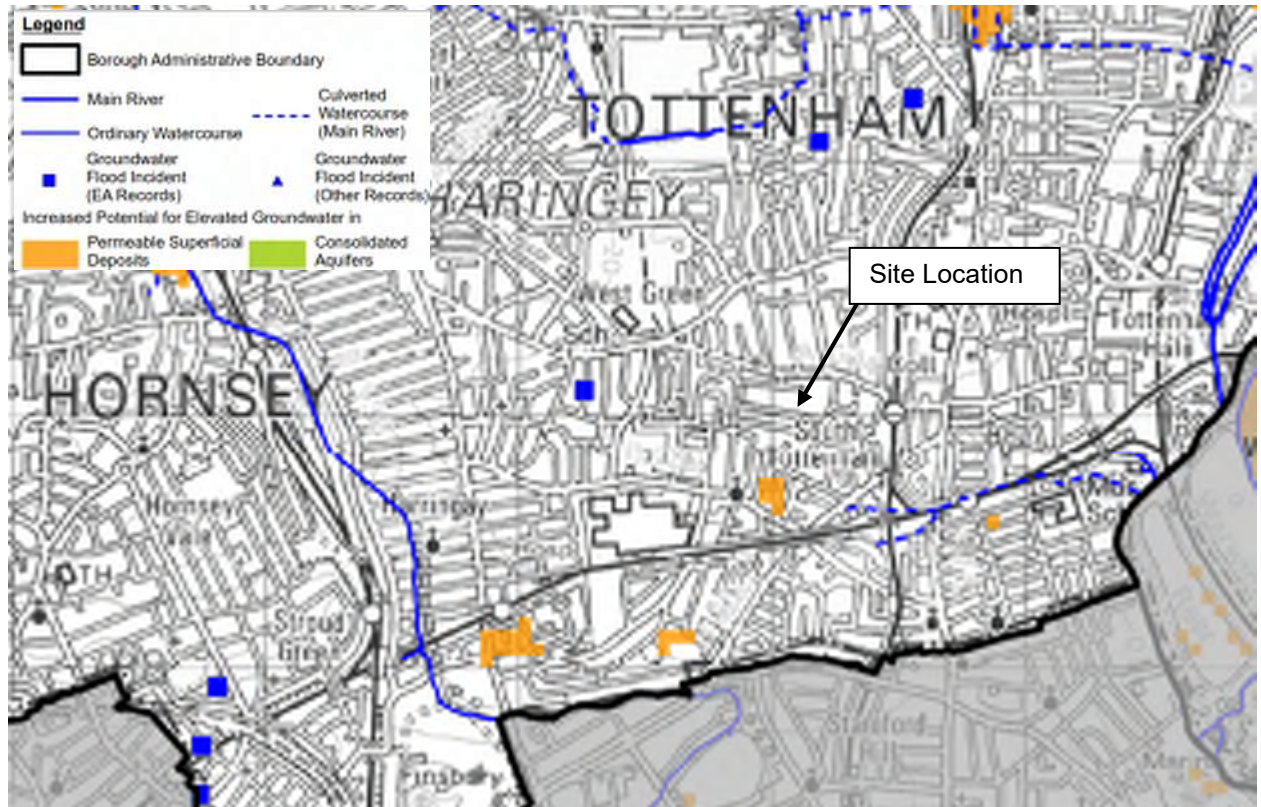


Figure 3.7: Groundwater Flood History (SFRA, 2014)

It can also be seen from Figure 3.7 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.

3.5 Sewer Flood Risk

Figure 3.8 below 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 N15 5 which indicates a single incident of internal flooding. Therefore, the risk from sewers is also considered low.

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 3.8: Thames Water Sewer Flood Records

3.6 Reservoir Flood Risk

The EA provides information on flood risk from reservoirs. Figure 3.9 below shows that the site is at very low risk of flooding from reservoir failure.

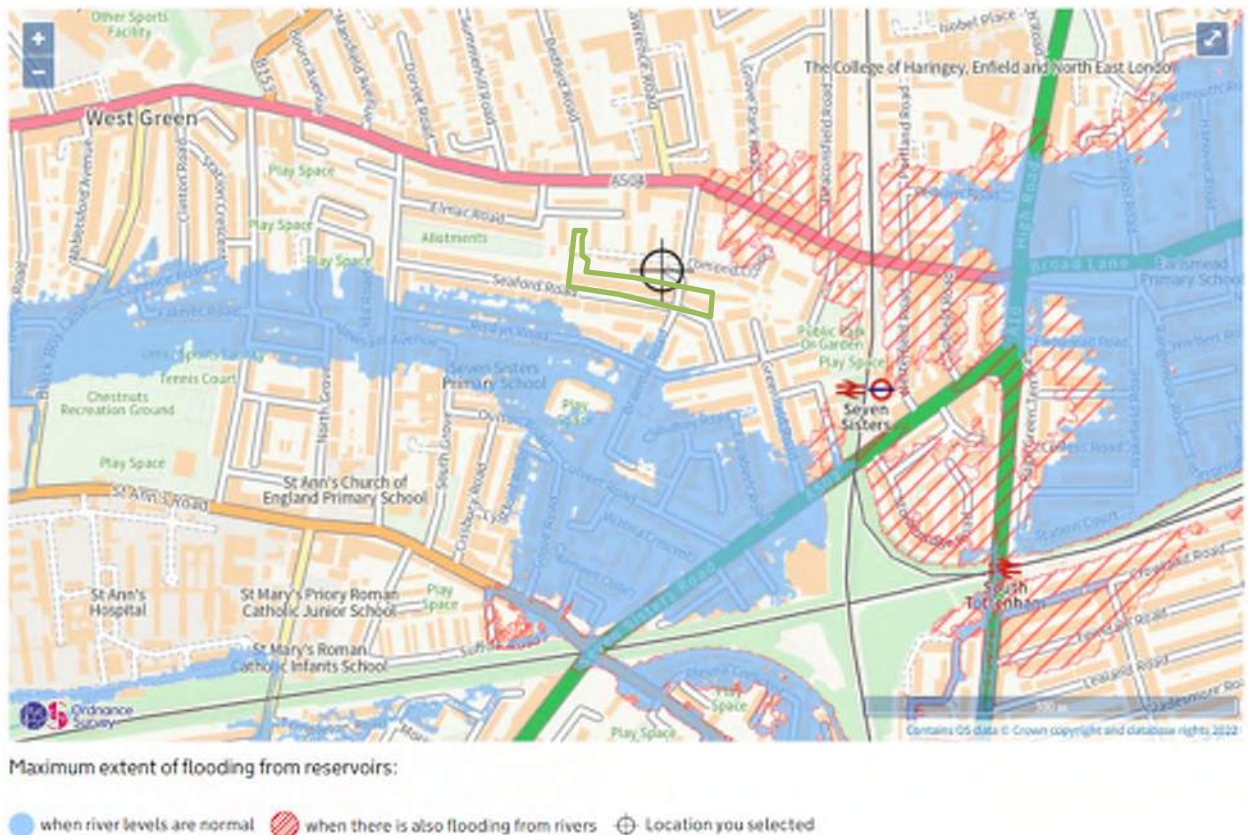


Figure 3.9: EA Risk of Reservoir Flooding Map

3.7 Flood Risk & Mitigation Summary

The flood risk from the assessed sources is summarized in Table 1.2 below:

Flood Source	Risk Category			Comments	Off-site Impact
	High	Medium	Low		
Tidal/fluvial			X	Site situated within Flood Zone 1 an area with a low probability of flooding (less than 1-in-1000 annual probability of river or sea flooding in any year).	The proposed development will not increase the risk of tidal/ fluvial flooding to offsite developments.
Surface Water Run-off from Heavy Storm Events			X	The majority of the site is at a very low risk of surface water flooding as identified by the EA flood maps. There is some medium/high risk areas of flooding towards the east of the site however the proposed new unit is being placed will have a FFL set at upper level of 11.900m, with the wheelchair unit at 11.580m AOD and therefore significantly raised above the area at risk from a high degree of flooding. Moreover, a new positive surface water drainage system will be installed that can accommodate up to the 1 in 100 year plus climate change storm event. Therefore, the risk posed to the development due to surface water flooding is considered low.	Off-site flood risk will decrease post-development, as the surface water run-off will be attenuated on site (for all events up to the 1 in 100 year storm event +40% climate change) & discharged at a restricted rate.
Groundwater			X	The LB of Haringey's SWMP states that there are no recorded incidents of groundwater flooding in close proximity to the site and BGS maps show the site is underlain by London Clay which restricts the movement of groundwater. The groundwater flood risk is therefore thought to be low.	The proposed development will not increase the risk of groundwater flooding to offsite developments.
Sewers			X	LB of Haringey's SWMP did not identify the area as having significant historical flooding from sewers. The site levels will remain above the levels of the existing drainage structures.	Surface water flood risk will be reduced due to onsite attenuation and restricted discharge rates into the surface water sewers. Thames Water will confirm if the local sewers have sufficient capacity for the proposed development.
Reservoirs			X	The site is in an area not at risk from reservoir flooding. Therefore the risk is deemed to be low.	The proposed development will not increase the risk of reservoir flooding to offsite developments.

Table 1.2: Flood Risk Summary for Development

Table 1.2 outlines that the proposed development is at low risk of flooding from all sources of flooding and will not increase the risk of flooding off site. Although the site is located in a Critical Drainage Area, the EA flood maps indicate that surface water flooding is concentrated along the eastern part of the site, where the proposed new dwelling is raised above existing levels, additionally the surface water drainage strategy will ensure surface water is reduced off site to greenfield rates and designed to cater for the 1:100 year + 40% Climate change event and therefore there will be no detrimental impact off site. Therefore, no additional flood mitigation measures (such as flood barriers) have been proposed for the development