Eckersley O'Callaghan

Branch Hill House
Coal House
Flood Risk Assessment

Issue P01

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Document History

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1 Introduction

1.1 Background

The Flood Risk Assessment has been prepared by Eckersley O'Callaghan on behalf of Almax Group in support of a planning application for the development of the land adjacent to Branch Hill House, London, NW3 7LS.

The purpose of this assessment is to demonstrate that the development proposal can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding, as per National guidance provided within the National Planning Policy Framework document (NPFF) and in line with the requirements of Camden Council.

1.2 Site Location

The site location is the land adjacent to Branch Hill House, Hampstead Heath, London, NW3 7LS.

The boundary of the site is shown in figure 1.0 and the site area is approximately 0.35 Ha in size.

For the purposes of the assessment of the impact of climate change the design life for the development has been assumed to be 60 years in line with criteria set by the NPPF.

Figure 1.0 – Aerial Image showing the footprint of the proposed development and site boundary.

1.3 Existing Site

The current site arrangement comprises a 3-storey (+1 storey basement) residential manor house constructed circa 1860s, with an abutting 2-storey residential block constructed circa 1960s. The site has formerly been used as a residential facility for senior citizens but is currently occupied by building guardians. The site is set back from the main Branch Hill road, with access via Spedan Close. Planning permission has been obtained in relation to a proposed development comprising of the construction of a new 3-5-storey block of residential dwellings with single storey basement on the site of the existing residential 1960s structure abutting the other side of the original Branch Hill Manor House.

Figure 2.0 – Branch Hill Manor House (left) with abutting 1960s structure (right)

1.4 Proposed Development

The proposed development comprises the construction of a new 3 storey dwelling with a single storey basement. The proposed development is abutting the left-hand side of original Branch Hill Manor House, which is to be preserved and renovated.

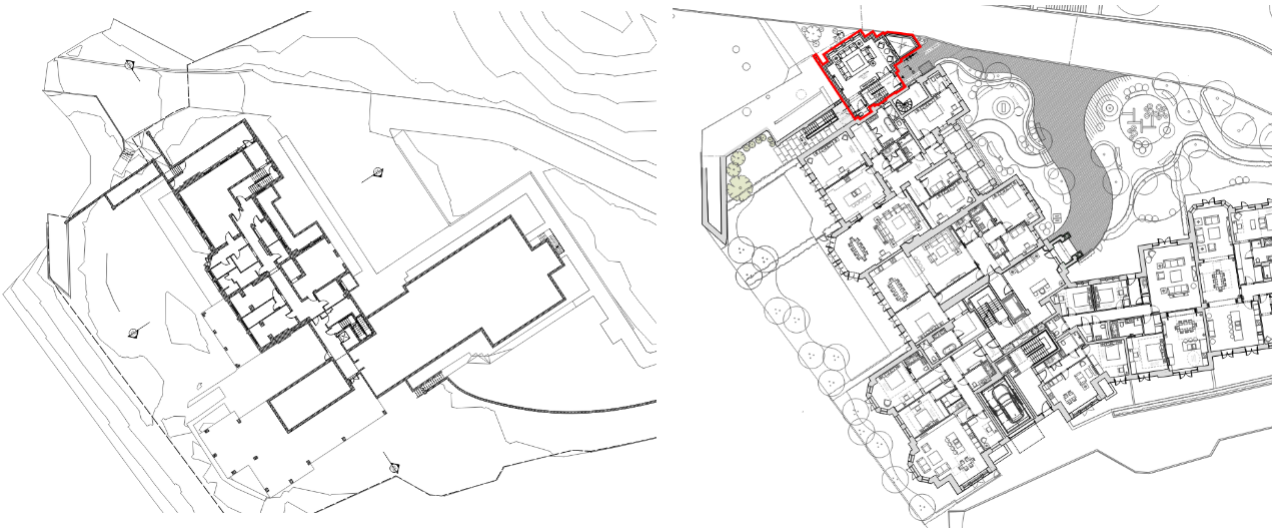

Figure 3.0 – Existing site footprint (left) proposed site footprint (right)

Figure 4.0 – Proposed east elevation

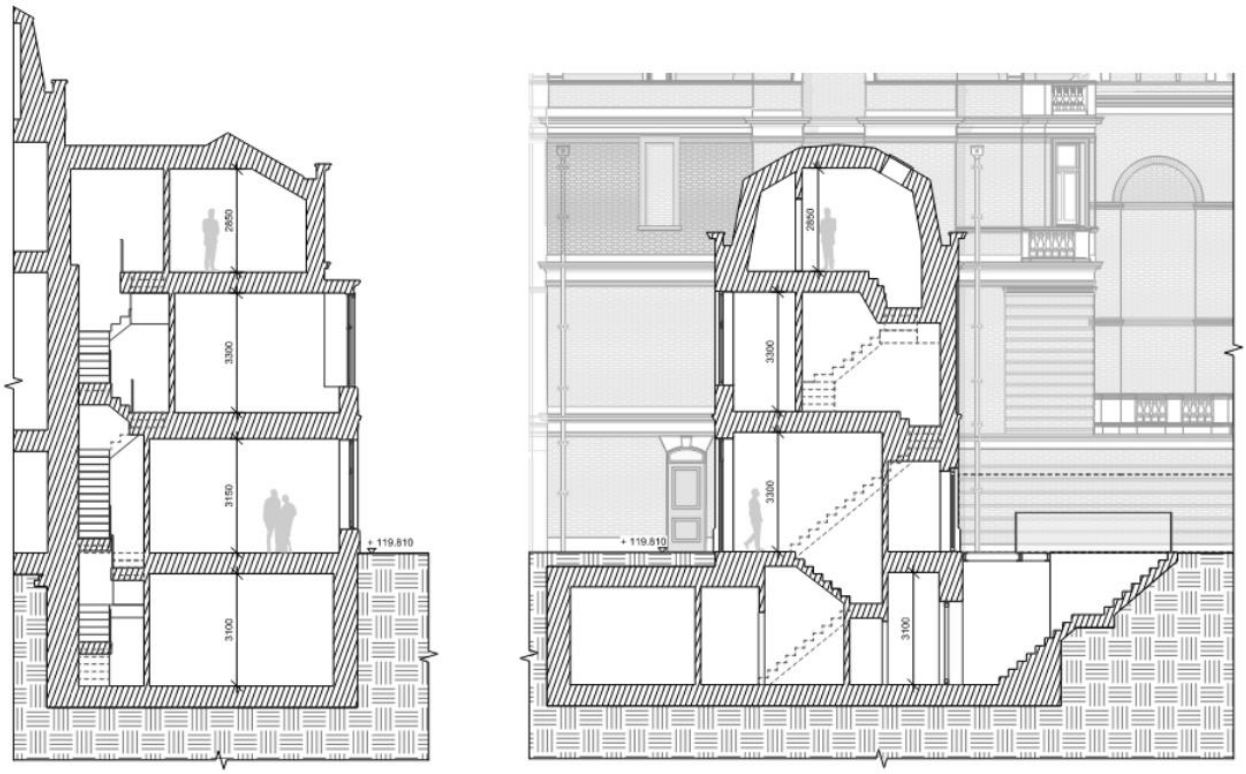

Figure 5.0 – Proposed sections

1.5 Geology

Ridge and Partners LLP undertook a Phase II intrusive site investigation (5008338-RDG-XX-ST-DOC-C-00-GCA-01, May 2019) on the site of the consented scheme with the proposed site to be of a very similar build-up to not require further investigation.

The following soil conditions were encountered during their investigation works at various locations.

Soil Type	Approximate Strata Level
Topsoil	0m – 0.3m below ground level.
Macadam & Made Ground	From 0.1m – 1.65m below ground level,
Bagshot Formation	From 0.3m – 15m below ground level,
Claygate Member	From 14.5m – 30m below ground level,

Table 1.0 – Soil Conditions Summary

1.6 Topography

The site is at an elevation of approximately 120m above sea level, and slopes from north east to south west. A topographic survey has been carried out for the site, with an extract shown in Figure 6.0.

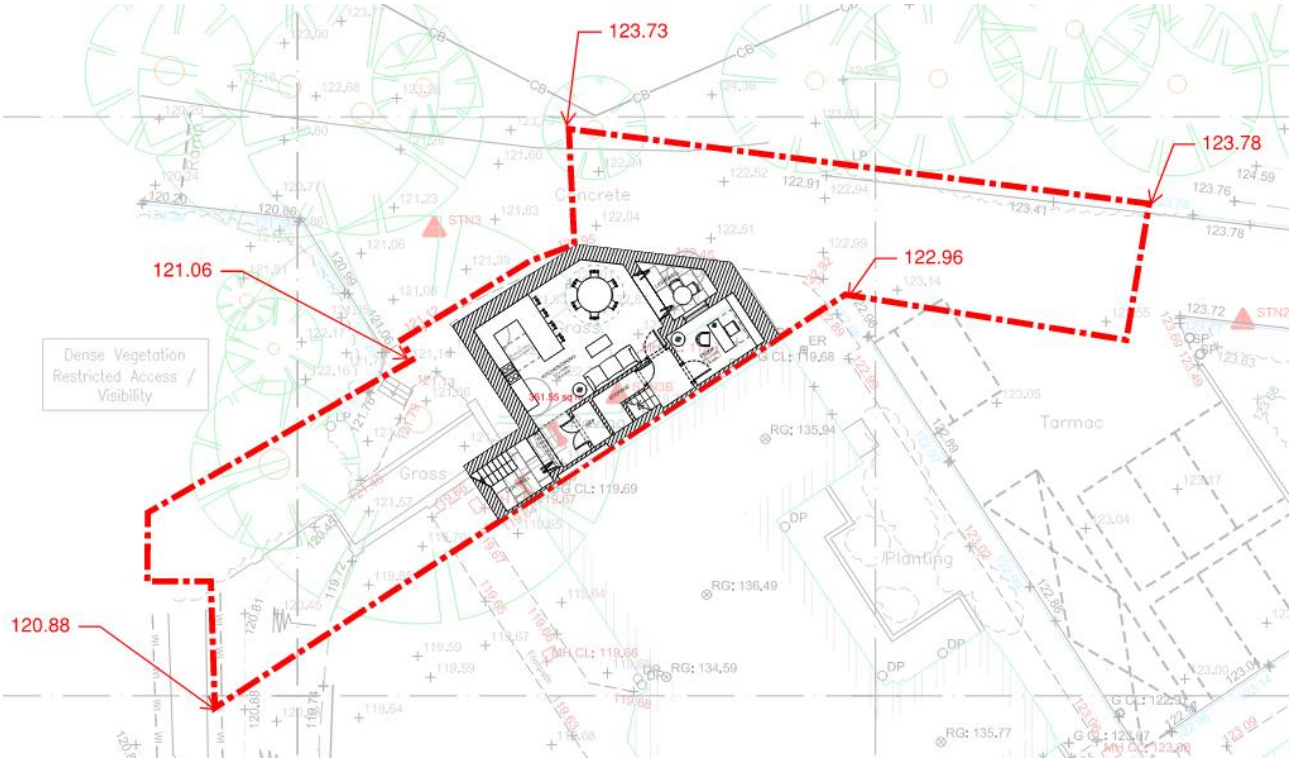

Figure 6.0 – Topographical Survey

2 Level of Study

The National Planning Policy Framework (2018) states that where a site-specific Flood Risk Assessment is required, the level of detail of the study should be proportionate to the scale and nature of the development in conjunction with its vulnerability classification.

The levels of study are outlined as follows, in accordance with CIRIA. Publication C624. Development and Flood Risk – Guidance for the Construction Industry. (2004):

2.1 Level 1 Screening Study

The purpose of the study is to identify whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information and will be used to ascertain whether an FRA level 2 or 3 is required.

The above information is typically obtained via 'open source' Government and Environment Agency records and in conjunction with liaison with the appropriate bodies.

2.2 Level 2 Scoping Study

The study is typically progressed to Level 2 if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding, or the site may increase flood risk off-site due to increased run-off. At this stage, the purpose of the study is to confirm the sources of flooding which may affect the site and should include:

- An appraisal of the availability and adequacy of existing information;
- A qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere; and
- An appraisal of the scope of possible measures to reduce flood risk to acceptable levels.

Typically, information to complete this study can be obtained via record searches in conjunction with liaison with appropriate Government and Statutory bodies in addition to undertaking site-based investigations and research.

2.3 Level 3 Detailed Study

If there is insufficient qualitative information to conclude an appropriate FRA for the scale and nature of the proposed development, then the study must progress to Level 3. As part of this, full qualitative analysis is undertaken to assess flood risk issues related to the development estate and should include:

- Quantitative appraisal of the potential flood risk to the development;
- Quantitative appraisal of the potential impact of the development site on flood risk elsewhere; and
- Quantitative demonstration of the effectiveness of any proposed mitigation measures.

As part of this study, it is likely that site specific hydrological and hydraulic modelling analyses would be required to demonstrate the full magnitude of flood risk on the development and that any proposed development mitigates flood risk both on and off-site.

2.4 Objectives of the Flood Risk Assessment

Based on the requirements of Camden Council Eckersley O'Callaghan believe it is necessary to undertake a Level 2 Scoping Study to evaluate the impact of flooding on the site, with consideration for plans for future development.

This FRA has been undertaken for the Branch hill House – Coalhouse project. In accordance with the requirements of the National Planning Policy Framework (NPPF, see Section 2.1.1) this FRA:

- Includes an assessment of the flood risk to the proposed development, demonstrating that the intended use is appropriate in terms of flood risk;
- Includes an assessment of the predicted impact of the development upon flood risk;
- Demonstrates that the development will not have a deleterious impact upon flood risk to other parties; and
- Summarises any mitigation measures required to achieve this outcome.

The approach used within this FRA involves a desk-based review of available information to establish:

The likely flooding sources;

- The potential flooding pathways, or mechanisms of flooding;
- The probability of a flood event occurring; and
- The severity and impact of a flood event to the site.

3 Flood Risk Policy

3.1 National Level Policy

3.1.1 Revised National Planning Policy Framework (2019)

The Revised National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how they are expected to be applied. The policy aims to avoid inappropriate development by directing it away from the areas that are at highest risk. Where development is necessary within an area designated as floodplain, it must be demonstrated to be safe without increasing the risk of flood elsewhere.

Planning policy states that a site-specific FRA is required for development proposals:

- That are located within Flood Zones 2 or 3;
- That are located within Flood Zone 1 but are greater than 1 hectare (ha) in area;
- Are located within Flood Zone 1, but are less than 1 ha in area but include a change of use in development type to a more vulnerable class (i.e. changing from commercial to residential);
- Are located within 20 m of a watercourse; and/or
- Where requested by the Local Planning Authority.

A site-specific FRA should identify and assess the risks of all sources of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe for its lifetime, taking into account climate change.

3.1.2 Flood Zone Definition

The Technical Guidance to the NPPF defines the flood risk zones that are published by the EA, which are as follows:

- Flood Zone 1 – The low probability zone which is defined as having less than 0.1 % (or a 1 in 1000 year) probability of flooding each year;
- Flood Zone 2 – The medium probability zone which is defined as having between 0.1 % - 1.0 % (or between 1 in 1000 and 1 in 100 year) probability of fluvial flooding or between 0.1 % and 0.5 % (or between 1 in 1000 and 1 in 200 year) probability of flooding from the sea each year;
- Flood Zone 3a – The high probability zone which is defined as having a 1 % or greater (or a 1 in 100 or greater) probability of fluvial flooding, or a 0.5 % or greater (1 in 200 or greater) probability of flooding from the sea each year;
- Flood Zone 3b – Functional Floodplain which is defined as land where water must flow or be stored in times of flood.

3.1.3 Sequential Test

In accordance with the NPPF, London Borough of Camden (LBC) use the Strategic Flood Risk Assessment to complete their Sequential Test process to inform their spatial strategies and development proposals for each of their strategic locations. The process identifies the flood risks and development vulnerability in order to assess the suitability of each development location and where possible, steers more vulnerable developments to areas of lowest flood risk, matching vulnerability of land use to flood risk.

The sequential test is undertaken in accordance with the following matrix:

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**Zone 1**	Permitted	Permitted	Permitted	Permitted	Permitted
	Zone 2	Permitted	Permitted	Exemption Test Required	Permitted	Permitted
	Zone 3A	Exemption Test Required	Permitted	Not Permitted	Exemption Test Required	Permitted
	Zone 3B	Exemption Test Required	Permitted	Not Permitted	Not Permitted	Not Permitted

Figure 7.0 – Vulnerability Matrix

In accordance with the NPPF the proposed development falls in line with the Flood Risk Vulnerability Classification of **Highly Vulnerable** as it is a dwelling with a basement.

3.1.4 Exception Test

Where new development is necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and where possible, reducing flood risk overall through the application of the NPPF's Exception Test. The Exception Test allows consideration of the wider sustainability benefits of a development to be considered to justify development in a higher risk flood zone.

To ensure that the proposed development meets the requirements of the Exception test (NPPF):

- It must be demonstrated that the development provides wider sustainability benefits for the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared;
- A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime taking into account the vulnerability of its users, without decreasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.2 Local Level Policy

3.2.1 Local Plan

The entirety of the LBC is located within Flood Zone 1, which comprises land outside the extent of fluvial flooding in a 0.1% annual exceedance probability (AEP) event. As set out in the NPPF all types of development are considered appropriate within Flood Zone 1. Proposals for new development greater than 1 hectare in Flood Zone 1 will require a site-specific FRA to ensure that surface water generated by the site is managed in a sustainable manner and does not increase the burden on existing infrastructure and/or flood risk to neighbouring property. Due to the majority of the borough being located within a Critical Drainage Area as defined by the LBC SWMP, all opportunities should be taken during development to reduce existing runoff rates post-development. Policy 5.13 of the London Plan 55 states that all development should aim to achieve greenfield runoff rates, and where this is not possible, runoff rates post-development should not exceed those pre-development, as per the NPPF. The SWMP Critical Drainage Areas and Local Flood Risk Zones, and the Environment Agency's uFMfSW (updated flood map for surface water) dataset should be used as a starting point to indicate broad areas with a potential for surface water flood risk in the borough. In the absence of fluvial flood risk within the borough, a clear focus for new development should be a reduction in surface water runoff rates post-development, wherever practicable.

3.2.2 Strategic Flood Risk Assessment (SFRA)

In July 2014, URS, on behalf of the London Borough of Camden, produced Level 2 Strategic Flood Risk Assessment (SFRA) – Revision 2 for all populated areas at risk of flooding and locations being considered for future development (identified by a Level 1 SFRA). The SFRA flood maps indicate flood zones (including functional floodplain and effect of climate change on flood zones), flood incident records and localised flooding areas. The maps also illustrate watercourses. These maps have been consulted to inform this FRA and are referred to in this document.

4 Existing Flood Risk

4.1 Basis of the Assessment

In accordance with the NPPG an assessment of the flood risk to the development site has been completed based on the following sources of information:

- Flood risk information available of the Environment Agency's website;
- London Borough of Camden – Flood Risk Management Strategy;
- London Borough of Camden – Strategic Flood Risk Assessment.

4.2 Existing Flood Risk Assessments

4.2.1 Fluvial Flood Risk

The entirety of LBC is located within Flood Zone 1 and as such is classified as '**Very Low**' fluvial risk. As such, floodplain compensation will not be required.

Given the distance of the site from the nearest area of Flood Zone 2 (approximately 3km) and with reference to point C3 of CBC SFRA guidance, it is reasonable to anticipate that the site will remain within Flood Zone 1 when climate change is taken into consideration.

4.2.2 Tidal Flood Risk

The site is located within Flood Zone 1 and circa 4.5mi from the sea, therefore a **Very Low** risk from tidal flooding.

4.2.3 Pluvial (Surface Water) Flood Risk

Figure 8.0 highlights the risk of surface water flooding at the development. The map shows some small areas of low risk flooding in the in adjacent sites and roads corresponding to 1 in 1000 year. The excerpt highlights the historic record of surface water flooding in the Hampstead region of London. This indicates historic flooding in nearby streets back in 2002 but nothing within the redline boundary of the site and is therefore considered a **Very Low** risk.

Figure 8.0 – Surface water flood risk and historic LBC flooding

4.2.4 Sewer Flooding

Figure 9.0 highlights the risk of sewer flooding at the development. The excerpt highlights post code areas that may be prone to flooding as have experienced flooding in the last 10 years due to hydraulic incapacity. As can be seen the site does not lie within a postcode area which may be prone to sewer flooding.

The majority of LBC is served by a combined surface and foul water sewer system. Modern (post 1970) Thames Water Utilities Limited (TWUL) sewer systems are typically designed and constructed to accommodate rainfall events with a 3.3% AEP or less. Therefore, rainfall events with a return period of frequency greater than 3.3% AEP would be expected to result in surcharging of some of the sewer system. However, the North London SFRA27 identified the sewer network within Camden as being particularly old, with some sections of sewer potentially designed to only convey storms up to the 10% AEP event, as stated in the LBC SFRA.

Upon review of the available information the risk of sewer flooding on the site is considered to be **Low**.

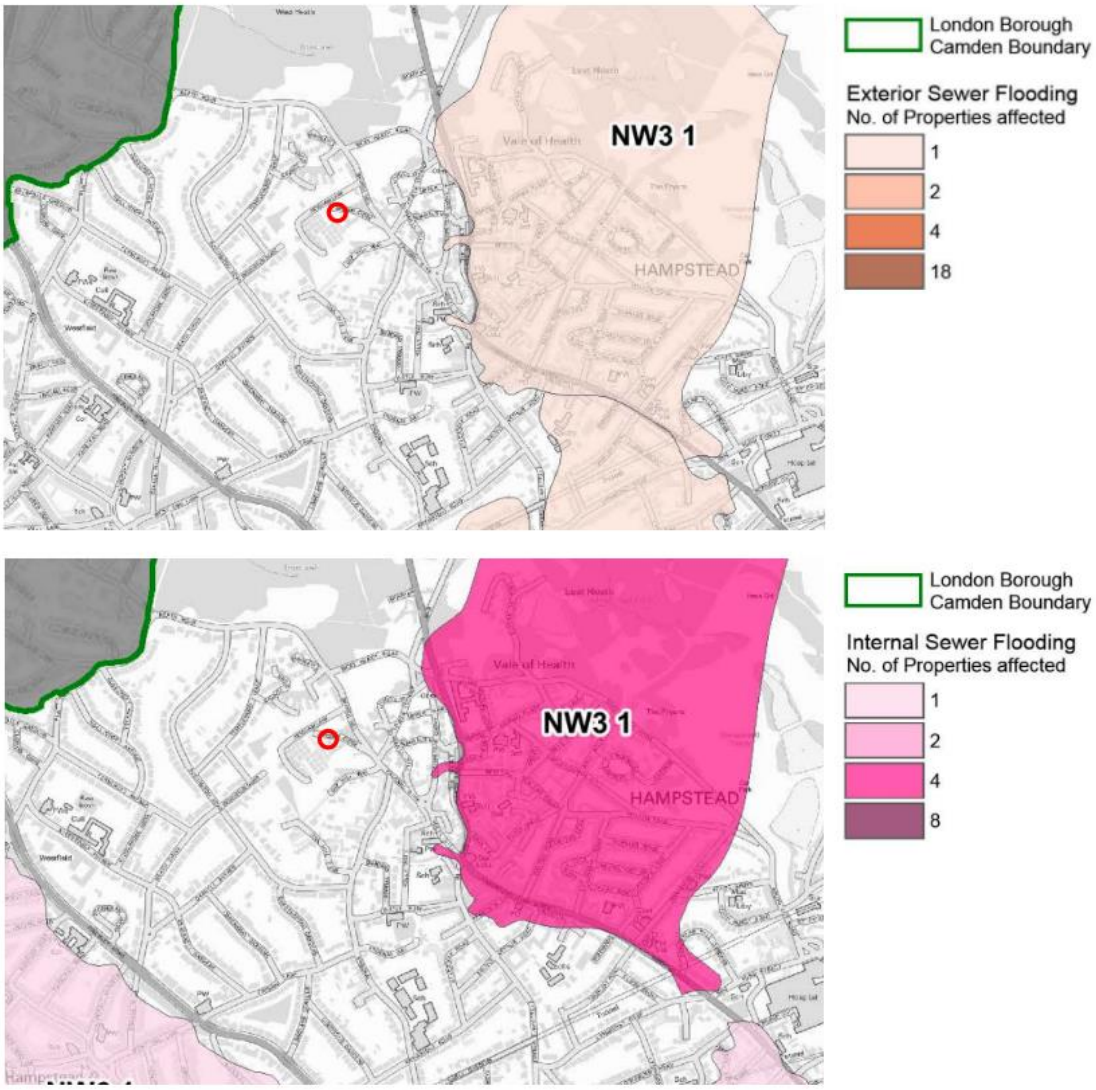

Figure 9.0 – Sewer Flooding

4.2.5 Groundwater Flood Risk

The SFRA includes historic flood records with excerpt provided below in Figure 10.0, some of which have been attributed/partly attributed to groundwater flooding. There are historically recorded incidents within the surrounding area of the site. However as there is no history of flooding to the site, the likelihood of groundwater flooding is considered **Low**.

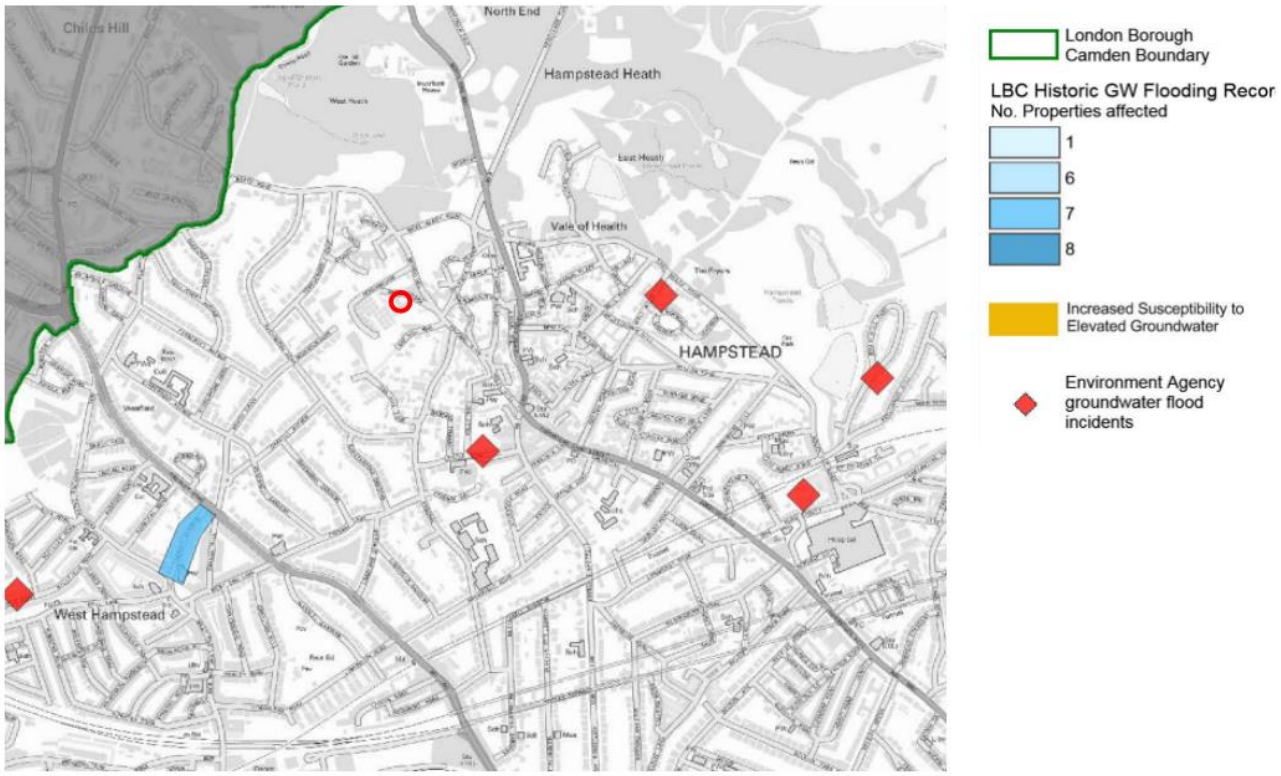

Figure 10.0 – Groundwater Flooding

4.2.6 Artificial Sources

Using online resources provided by the Environment Agency an excerpt of the risk of flooding from reservoirs map has been provided below in Figure 11.0

The development is not located within an area at risk of reservoir flooding and as such the risk is **Very Low**.

Figure 11.0 – Reservoir Flooding

4.2.7 Summary

- The risk of fluvial flooding is considered to be **very low**;
- The risk of tidal flooding is considered to be **very low**;
- The risk of pluvial (surface water) flooding is considered to be **very low**;
- The risk of sewer flooding to be **low**;
- The risk of groundwater flooding is considered to be **low**;
- The risk of flooding from artificial sources flooding is considered to be **very low**.

5 National Planning Policy Framework Classification

5.1 Vulnerability Classification

Table 2 of the Flood Zone and Flood Risk Tables section of the NPPF classifies the flood risk vulnerability of all land uses. The development has been classified as 'highly vulnerable' in accordance with Paragraph 066, Table 2 of the NPPG.

5.2 The Sequential Test

Table 3 of the NPPG (reproduced here as Figure 12.0 defines appropriate land uses for each flood zone. This development is considered appropriate within Flood Zones 1.

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**Zone 1**	Permitted	Permitted	Permitted	Permitted	Permitted
	Zone 2	Permitted	Permitted	Exemption Test Required	Permitted	Permitted
	Zone 3A	Exemption Test Required	Permitted	Not Permitted	Exemption Test Required	Permitted
	Zone 3B	Exemption Test Required	Permitted	Not Permitted	Not Permitted	Not Permitted

Figure 12.0 – Highlighted vulnerability matrix

5.3 The Exception Test

The development is not required to comply with the Exception Test as it is located within Flood Zone 1.

6 Flood Risk from The Development

The risk of flooding from fluvial, tidal and groundwater has been shown to be low and as such mitigation methods are not required.

6.1 Development Considerations

In accordance with NPPF guidance, the development will need to demonstrate that it will:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage; and
- Not impede water flows and not increase flood risk elsewhere

The following sections indicate how these requirements have been met.

6.1.1 Safe Access

NPPF paragraph 103, states that the development must provide safe access and egress during times of flood. The entirety of the development is located within fluvial Flood Zone 1 which will ensure safe access and egress for flood events up to the 0.1% (1 in 1000) AEP event.

6.1.2 Loss of Floodplain Storage

The development is located outside of Flood Zone 3 and there is no loss of floodplain storage. As such, floodplain compensation is not required.

7 Drainage Strategy

The drainage strategy for the proposed development will be based on the following considerations. The drainage strategy will be provided separately.

7.1 Surface Water Drainage

Further study would be required to facilitate the development of a sustainable urban drainage (SuDS) scheme which reduces the overall off-site surface water discharge.

In accordance with current policy guidance and the local plan, any SuDS scheme should look to dispose of surface water on site, wherever practicable. In the case of the study site, it is likely that the underlying soils are sand and gravels and therefore the surface water generated by the proposed development could be disposed on-site.

Any SuDS proposals would need to incorporate an allowance for climate change and urban creep throughout the anticipated lifetime of the development.

Possible SuDS options for use on the site would include:

- **Infiltration Based Drainage Options**

Pending results from detailed percolation testing, a number of potential options could be considered:

  - Permeable Paving where runoff is filtered through paving and directly into the ground;
  - Swales / Infiltration Basins which can replace conventional pipework and typically consist of vegetated strips with a permeable base, to allow runoff to be collected and discharged into the ground; and
  - Soakaways which are typically small excavations filled with gravel, a similar porous medium or formal soakaway chamber surrounded by granular backfill which collect runoff through a conventional piped system which is subsequently discharged at an attenuated rate.

- **Attenuation Based Drainage Options**

Should infiltration techniques prove unfeasible, the installation of an attenuation SuDS system would be desirable:

  - Permeable Paving which can be installed with a sub-base which temporarily stores surface water runoff.
  - In this instance, the paving would typically be lined with a geotextile membrane to prevent loss of storage volume due to infiltration of silts and debris;
  - Swales where used in this context would require a flow control device at the downstream end of the network whereby the swale allows backing up of excess surface water into the system to fill the open landscaped features to provide a storage volume; and

- Attenuation Basins where there is sufficient fall to the outlet level to allow free drainage via gravity which can again be throttled via provision of a downstream flow control device.
- Below Ground Storage Tanks with a downstream flow control device, functioning similar to attenuation basins.

- **Source Control Drainage Options**

In combination with infiltration and/or attenuation strategies, source control methods would include:

- Green Roofs / Rain Gardens / Planters to reduce the volume of runoff via natural evaporation and by retarding the time taken for runoff to enter the surface water system.
- Rainwater Harvesting via the use of water butts and other storage tanks, or bespoke systems which retain rainwater to prevent ingress to the surface water system. The harvested water can then be used for non-potable uses, such as irrigation, toilet flushing etc.

Any such surface water systems would also need to be designed to account for any future flooding events, to mitigate surcharging and possible failure of the system.

8 Conclusions and Recommendations

8.1 Development Suitability

The new development has been classified as 'highly vulnerable' development in accordance with the NPPG. The proposed site is located within Flood Zone 1 and therefore is considered appropriate in accordance with Table 2 of the NPPG.

8.2 Flood Risk to the Site

- The risk of fluvial flooding is considered to be **very low**;
- The risk of tidal flooding is considered to be **very low**;
- The risk of pluvial (surface water) flooding is considered to be **very low**;
- The risk of sewer flooding to be **low**;
- The risk of groundwater flooding is considered to be **low**;
- The risk of flooding from artificial sources flooding is considered to be **very low**.

8.3 Planning Requirements

In accordance with the NPPF this FRA demonstrates that the development will:

- not affect existing levels of flood risk from all sources;
- not increase flood risk elsewhere through the provision of mitigation measures such as attenuation of additional runoff to greenfield rates prior to discharge to the receiving watercourse/sewer; and
- be safe for users for its lifetime (100 years).

8.4 Recommendations

Following the assessment of flood risk as a consequence of the proposed scheme, it can be concluded that the site is appropriate for the intended use from a flood risk perspective.

To mitigate, as much as reasonably practicable, the risk of sewer flooding, the proposed discharge from the site will be less than that of the existing. A 50% betterment of surface water (to be confirmed by Thames Water) will be achieved, reducing the discharge into the existing combined sewer network.

The low risk of surface water flooding can be incorporated into the surface water drainage design to mitigate the risk.

For any adverse impacts on flood risk to the surrounding area, mitigation measures to address the increase in surface water runoff from the development will be included within the drainage design.