190 GOLDHURST TERRACE LONDON BOROUGH OF CAMDEN

SURFACE WATER AND FLOODING RISK ASSESSMENT

Shuqi and Hai Lin

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Water Environment Limited 6 Coppergate Mews Brighton Road Surbiton London KT6 5NE

Tel: 020 8545 9720

www.WaterEnvironment.co.uk



This report was commissioned by Shuqi and Hai Lin in March 2022 to update an original Surface Water and Flooding Risk Assessment report, which was issued as final in July 2019. This was commissioned to investigate the risks and assess the consequences of flooding to the future development site.

Prepared by: Christopher Garrard

BSc Eng (Civil)

Claire Burroughs

Reviewed by: MSc DIC, MEng (Hons)

MCWIEM `

Guy Laister

Approved by:

MSc Eng BSc Eng (Civil)

CEng CEny C WEM MCIMEN

CEng CEnv C.WEM MCIWEM

for and on behalf of Water Environment Limited

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CONTENTS

1	Introduction	
	General Information	2
	Planning Policy	
	Location	
	Existing Development	
	Proposed Development	
2	Surface Water and Flooding Impact Assessment	
	Stage 1: Screening	
	Stage 2: Scoping	6
3	Flood Risk Statement	
•	Historical Flooding	
	Tidal and Fluvial Flooding	
	Flooding from Surface Water and Sewers	
	Flooding from Groundwater	
	Flooding from Reservoirs, Canals and Other Artificial Sources	
	Planning Considerations	
4	Conclusions and Recommendations	12
	ppendix A – Surface Flow and Flooding Screening Flowchart	
Appendix B – Photographs		
•		17
ΔI	nnendix C – Plans	1 /



LIST OF FIGURES

Figure 1: Site Location	3
Figure 2: GOV.UK Flood Map for Planning	8
Figure 3: GOV.UK Updated Flood Map for Surface Water	9
Figure 4: Long Section of Goldhurst Terrace taken from LiDAR	9



EXECUTIVE SUMMARY

The site located at 190 Goldhurst Terrace is currently occupied by a residential building, with a small cellar and associated landscaped garden area. The proposal is to convert the existing cellar to a residential dwelling and construct a lightwell in front of the existing house. This will require excavation under the front of the property to construct the proposed lightwell. The hard-surfaced area will slightly increase, which will increase runoff from the site.

The Environment Agency's Flood Map for Planning indicates that the site is located in Flood Zone 1 (Low Risk). In accordance with the Flood Risk and Coastal Change Guidance¹ to the National Planning Policy Framework, this zone comprises land assessed as "having a less than 1 in 1000 annual probability of river or sea flooding" (<0.1%). Local planning guidance on basement development specifies that all new basement developments located in borough-defined areas at risk of surface water or sewer flooding need to be accompanied by a Flood Risk Assessment. Furthermore, the London Borough of Camden Strategic Flood Risk Assessment indicates that the site is located within a "Local Flood Risk Zone" in an identified Critical Drainage Area, and paragraph 8.58 of the London Borough of Camden Local Plan requires a Flood Risk Assessment in this instance.

All sources of flooding have been assessed in accordance with the National Planning Policy Framework. Goldhurst Terrace is known to have flooded in 1975 and 2002 from surface water, however, the site itself is raised above the adjacent road levels in Goldhurst Terrace. Therefore, the risk of surface water and sewer flooding to the site are considered to be low.

The new basement development is at low risk of flooding from all sources and is considered acceptable in the context of flood risk. As surface water runoff will slightly increase as a result of an increase in impermeable area, mitigation will need to be provided.

¹ https://www.gov.uk/guidance/flood-risk-and-coastal-change Accessed 16/03/2022

1 INTRODUCTION

General Information

- 1.1 The site is located at 190 Goldhurst Terrace in the London Borough of Camden (LBC) and is currently occupied by a residential house. The site is less than 1ha in size and in its existing state comprises the building footprint, consisting of residential accommodation, and associated gardens.
- 1.2 The Environment Agency's Flood Map for Planning indicates that the site is located in Flood Zone 1. This zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding (<0.1%).
- 1.3 The LBC policy dictates that surface water and flood risk is considered in this case primarily due to basement construction. Furthermore, the site is located within a CDA in an area identified as a "Local Flood Risk Zone" (LFRZ), therefore, a Flood Risk Assessment is required. The London Borough of Camden SFRA² defines a LFRZ as:
 - "...discrete areas of flooding that do not exceed the national criteria for a 'Flood Risk Area' but still affect houses, businesses or infrastructure. A LFRZ is defined as the actual spatial extent of predicted flooding in a single location"
- 1.4 This Surface Water and Flooding Risk Assessment has been produced to assess the risks of flooding from other potential sources such as overland flow, groundwater, artificial water bodies and underground sewers. The impact of the proposed development on surface water infrastructure is considered, to supplement information provided in the Basement Impact Assessment³ (BIA).
- 1.5 In addition, according to The Town and Country Planning (Development Management Procedure) (England) Order 2015, the Lead Local Flood Authority (LLFA) is now the statutory consultee regarding surface water drainage of a major development. The LLFA for the site is LBC.
- 1.6 This development involves the conversion and excavation of an existing cellar to a form an additional residential dwelling.

Planning Policy

1.7 The Camden Local Plan⁴ was adopted in 2017 and replaces the Core Strategy and Development Policies previously in effect. Policy CC3 and Policy A5 apply to this site, and of most note are the following phrases from Policy CC3:

"We will require the development to ...

d. Incorporate flood resilient measures in areas prone to flooding; and

f. not locate vulnerable development in flood-prone areas."

1.8 Policy A5 simply lists all the policies that apply to basement developments, of which policy CC3 is the only one that applies to flooding.

² London Borough of Camden, Strategic Flood Risk Assessment – URS, July 2014

³ Gabriel Geo-Consulting (April 2018), Basement Impact Assessment, 190 Goldhurst Terrace

⁴ London Borough of Camden (2017), Camden Local Plan



- 1.9 The LBC has strict policies with regard to basement development within the Borough and have provided guidelines for new basement developments and extensions to existing basement accommodation⁵. The formal planning guidance, which sets out specific criteria for assessing the impact of basement construction, is also available for reference in the LBC's Planning Portal. The guidance refers to the following areas, relating to basement dwellings;
 - The principal impacts of basements, planning and design considerations; and
 - How basement dwellings maybe affected in streets at risk of flooding.
- 1.10 As part of the overarching BIA, it is necessary to consider 'Surface Flow and Flooding'. A screening flowchart (Appendix A) addresses individual sources of potential flooding, and where a risk of flooding is present, a scoping and impact assessment need to be undertaken as appropriate to provide further information. This report covers this component of the BIA.
- 1.11 In conjunction with ARUP, the LBC produced a 'Geological, Hydrogeological and Hydrological Study Guidance for Subterranean Development⁶'.

Location

1.12 The site is situated on Goldhurst Terrace in the LBC as shown in Figure 1 below.



Figure 1: Site Location⁷

Existing Development

- 1.13 The existing site has an area of $343m^2$ (0.0343ha).
- 1.14 The existing development at the site has a small cellar and several flats in the property, plus associated garden and hard standing areas.

⁵London Borough of Camden, Camden Planning Guidance Basements, January 2021

⁶ ARUP Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development, November 2010

⁷ © Crown copyright and database rights 2016 Ordnance Survey

Surface Water and Flooding Risk Assessment



Proposed Development

1.15 The proposed development is to convert the existing cellar into a basement residential dwelling and construct a lightwell in front of the current entrance to the house. Access to the basement development will be through the main entrance of the property.



2 SURFACE WATER AND FLOODING IMPACT ASSESSMENT

Stage 1: Screening

- 2.1 The Camden Planning Guidance on Basements includes a Surface Flow and Flooding screening flowchart for assessing the impact of potential sources of flooding, as well as the impact of the development on flood risk elsewhere.
- 2.2 The flow chart is set out with six questions. These questions are addressed with reference to the site and proposed development at 190 Goldhurst Terrace as follows:
 - **Question 1**: Is the site within the catchment of the pond chains on Hampstead Heath?

Answer: No – The site is approximately 3km south-west of the Hampstead Heath ponds and is not shown within the catchment area of the pond chains.

• **Question 2:** As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak runoff) be materially changed from the existing route?

Answer: No – The current proposal will not change the levels of the ground significantly. The basement will be positively pumped, as per paragraph 6.13 of the Camden Basements document:

- "...the council will ensure that all basement and other subterranean development is protected from sewer flooding by the installation of a positive pumped device."
- **Question 3:** Will the proposed basement development result in a change in the proportion of hard surfaced/paved external areas?

Answer: Yes- The proposed front lightwell is likely to increase hard surfaced area slightly

 Question 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourse?

Answer: No – SuDS are proposed to ensure that the surface water runoff from site is maintained at the existing rate and thus there will be no changes to the profile of the inflows of surface water being received by adjacent properties or downstream watercourse.

 Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?

Answer: No – The proposed new building and associated new basement will not result in any changes to the quality of surface water being received by adjacent properties or downstream watercourses.

 Question 6: Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or the Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?



Reference: The principles outlined in the NPPF and Planning Practice Guidance: Flood Risk and Coastal Change8 should be followed to ensure that flood risk is not increased.

Answer: Yes – The site is in a LFRZ. See Chapter 3 for details.

2.3 According to Camden Planning Guidance, it is necessary to carry forward to the scoping stage of the BIA those matters of concern where the response is 'yes'. Question 3 and 6 were answered yes, and so the scoping stage follows.

Stage 2: Scoping

- 2.4 Increasing the area of hard standing on site as a result of development will increase the volume and peak flow rate of surface water generated. To ensure that development does not increase flood risk elsewhere, mitigation needs to be provided in the form of SuDS on site to attenuate the peak rate and volume of surface water runoff, or the soft surfacing needs to be increased elsewhere onsite.
- 2.5 Confirmation of the required SuDS strategy will be provided at detailed design stage post-planning. We request this to be conditioned.
- 2.6 As the site is located in a LFRZ, the flood risk needs to be specifically investigated and suitable flood prevention measures should be put in place (if required). This analysis follows in Chapter 3.

⁸ The screening flow chart in Camden Basements Planning Guidance references that the principles outlined in PPS25 should be followed to ensure that flood risk is not increased. This document has since been superseded by "Flood Risk and Coastal Change" Guidance, which should now be referred to alongside the NPPF, to ensure that flood risk is not increased.



3 FLOOD RISK STATEMENT

Historical Flooding

- 3.1 The LBC SFRA states that the Environment Agency's Historic Flood Map shows that flooding from fluvial or tidal sources within LBC has not occurred.
- 3.2 Appendix 4 of the "Floods in Camden Report of the floods Scrutiny Panel" document states that Goldhurst Terrace was affected by surface water flooding during both the 1975 and the 2002 events. "Map 6: Historic Flooding and Local Flood Risk Zones" of the Camden Local Plan¹⁰ illustrates the extent of both flooding events. In both instances, the floods that occurred are understood to have been the result of high intensity rainfall inundating the main sewer, causing manholes and gullies to surcharge.
- 3.3 Figure 3v of the LBC SFRA, indicates that Goldhurst Terrace was affected by surface water flooding in 1975 and 2002 and that two properties were affected along the street. Figure 15 of the ARUP study also confirms that Goldhurst Terrace is recorded to have flooded in 2002.
- 3.4 Appendix B: Figure 5a of the LBC SFRA shows that Goldhurst Terrace is located within NW6 3, which is an area identified by Thames Water as containing eight properties that have been affected by internal sewer flooding within the 10 years prior to 2014. Figure 5b indicates that Goldhurst Terrace is located within an area identified by Thames Water as containing 18 properties that have been affected by external flooding within the 10 years prior to 2014.
- 3.5 Figure 4a of the LBC SFRA indicates an "Environment Agency groundwater flood incident" approximately 300m north of the site.
- 3.6 A Sewer Flooding History Enquiry was made to Thames Water in 2019 which stated that Thames water hold no records of incidents of flooding because of surcharging public sewers in the area of the proposed development. The current owners of the property have not experienced any sewer flooding in the property.

Tidal and Fluvial Flooding

- 3.7 Figure 2 below shows the Environment Agency's "Flood Map for Planning" as shown on the GOV.UK website.
- 3.8 The site is located in Flood Zone 1 and is approximately 6 km northwest of the River Thames at its nearest location. As stated in the NPPF, "this zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial and tidal flooding (<0.1%)". Therefore, the risk of flooding from tidal and fluvial sources is considered low.

Page 7

⁹ Floods in Camden – Report of the floods Scrutiny Panel, June 2003

¹⁰ Camden Local Plan, July 2017



Figure 2: GOV.UK Flood Map for Planning¹¹

Flooding from Surface Water and Sewers

- 3.9 Surface water flooding is typically the result of high intensity rainfall that is unable to infiltrate into the ground or enter the drainage system, ultimately following overland flow paths. In an urban environment such as Camden, surface water runoff is disposed of almost entirely via formal drainage systems, and consequently sewer flooding and surface water flooding (overland flow) need to be considered in tandem in this instance.
- 3.10 It is reasonable to assume that adopted sewers have been designed to the 30-year return period (in accordance with Design and Construction¹²), which is considerably lower than the 100-year standard considered for fluvial flooding. As such, sewer flooding is often more frequent but less severe than fluvial flooding.
- 3.11 The North London SFRA collected data from flooding events in 1975 and 2002 which have been used by LBC to map areas of the borough that are more susceptible to surface water flooding. This information was subsequently used to inform Camden's supplementary guidance document on basement development. In this document, roads having flooded in 1975 and 2002 are known as 'primary areas' and those that flooded in only the 1975 or 2002 are known as 'secondary areas'. Any proposals for a basement development located in a primary or secondary area must include a flood risk assessment.
- 3.12 The site is located in a 'primary area' and therefore this surface water and flood risk assessment has been prepared to assess all the risks. The LBC experienced flooding in 1975 and 2002, which was attributed to overland flow and sewer flooding. Goldhurst Terrace is recorded as having flooded during both events; however, the records are not detailed, and entire roads have been highlighted without reference to specific locations or to which properties were flooded on these roads. Figure 3(v) in the LBC SFRA indicates that two properties were flooded on Goldhurst Terrace.
- 3.13 The Environment Agency "updated Flood Map for Surface Water" (uFMfSW), shown in Figure 3, indicates that the site is at a "very low" risk of flooding. This means that, according to the model used to develop the map, it will not flood in events smaller than the 1000-year flood.

https://flood-map-for-planning.service.gov.uk/summary?easting=525956&northing=184056 Retrieved 16/03/2022

¹² Water UK, May 2021, Design and Construction Guidance for foul and surface water sewer offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England for Developers, Adopted Version 2.1.

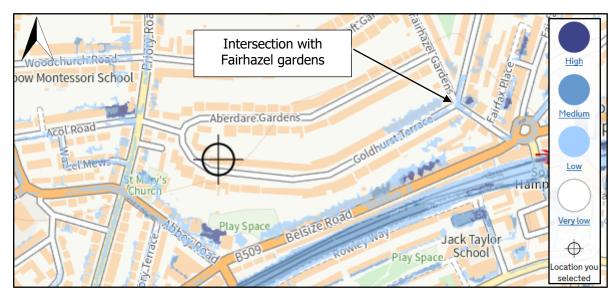


Figure 3: GOV.UK Updated Flood Map for Surface Water

- 3.14 The design event for flooding is the 100-year plus climate change event. As the uFMfSW does not take climate change into account, the "low risk" event is used as a proxy. This indicates that the site is not susceptible to flooding in the design event including an allowance for future climate change.
- 3.15 The Thames Water asset plan indicates that there is a combined sewer running eastwards down the centre of Goldhurst Terrace. No connections are indicated, but it is assumed that the site connects to this sewer.
- 3.16 Figure 4 shows a long section of Goldhurst Terrace, taken from publicly available LiDAR data, ranging from the site location to the intersection with Fairhazel Gardens. Although there are a few spikes due to the imprecision of the LiDAR, a general trend can be seen in the ground levels of the road. The site is located on ground approximately two metres higher than levels at the intersection with Fairhazel Gardens.



Figure 4: Long Section of Goldhurst Terrace taken from LiDAR

- 3.17 Goldhurst Terrace slopes towards the east, and the low point of the road is located slightly before the intersection with Fairhazel Gardens. This is shown on the topographic maps of the area and was confirmed by a site visit in 2019. The uFMfSW indicates that the section of Goldhurst Terrace adjacent to Fairhazel Gardens is at a "low risk" of flooding, with an isolated low spot at a "high risk" of flooding. The Camden Flood Risk Management Strategy¹³ indicates that the 2002 flood was the 100-year event and that the 1975 flood was the largest event on record. It is therefore likely that it was the lower-lying section of Goldhurst Terrace adjacent to Fairhazel Gardens which flooded in these two events.
- 3.18 In addition to the long section showing the fall of Goldhurst Terrace away from the site to the east, a site visit confirmed that the entrance to the building is above the road level. In addition, the ground slopes up from the pavement towards the building and there is a raised threshold.

¹³ London Borough of Camden (2013), Managing Flood Risk in Camden: The London Borough of Camden Flood Risk Management Strategy



Relevant photographs can be found in Appendix B. According to the topographic survey, undertaken by Omega Geomatics in October 2015, the road crest is at a height of 40.45m Above Ordnance Datum (AOD), while the top of the driveway is set at 40.55m AOD. The finished floor level of the building is set at 40.70m AOD, meaning the threshold is raised by 150mm.

3.19 As the site is situated approximately 450m away and approximately 2m above the low point at the intersection with Fairhazel Gardens, it is unlikely that it will flood even in the 1000-year event, and this is supported by the uFMfSW.

Flooding from Groundwater

- 3.20 The online 1:50,000 British Geological Surveys (BGS) map indicates the site to be underlain by the London Clay formation. No superficial deposits were recorded at the site.
- 3.21 DEFRA's Magic Map shows that the site does not lie in a Source Protection Zone (SPZ), nor does it lie above any aquifer.
- 3.22 Figure 4a from the LBC SFRA indicates a historic groundwater flood incident, obtained from Environment Agency records, approximately 250m west of the site, but no incidents on Goldhurst Terrace itself.
- 3.23 A ground investigation was conducted by Chelmer Consultancy Services in May 2016. There were two 8 metre deep boreholes included in the investigation. BH1, drilled in the back garden, struck water at 0.80m below ground level (bgl) and BH2, in the front driveway, did not strike water.
- 3.24 Groundwater monitoring standpipes were installed at both boreholes. During return visits, groundwater was recorded between 0.56m and 0.67m bgl in BH1, and between 5.43m and 5.91m bgl in BH2. Groundwater within BH1 appears to be contained within Made Ground, located above the London Clay and assumed to be perched.
- 3.25 A trial pit taken within the existing cellar struck groundwater at 0.40m bgl, where ground level was the floor level of the cellar, at 38.68m AOD.
- 3.26 The above data indicates that the level of groundwater varies across the site, with the highest point recorded under the garden perched in Made Ground over the London Clay. None of the surrounding BGS boreholes¹⁴ struck groundwater, with the shallowest at 7.62m.
- 3.27 Whilst typically the London Clay is an unproductive stratum, perched pockets of groundwater may be found within the bed and can also be encountered within disturbed or altered ground, as found on site. Nevertheless, the London Clay is not expected to be subject to significant groundwater flow and the risk of displacement of groundwater as a result of the proposed basement extension is considered to be low.
- 3.28 The proposed developed site and surrounding area is largely hard paved, which reduces the emergence of groundwater at the surface. Groundwater emergence at the site or elsewhere in the area would follow localised flow paths, therefore, any flooding should mimic that indicated on the surface water flood risk map and discharge to the local sewer system.
- 3.29 The risk of groundwater flooding was therefore considered to be low. It is advised that groundwater may be encountered during construction and the basement should be tanked, using appropriate waterproofing system compliant with current standards and good practice, to prevent potential groundwater seepage into the proposed basement.

¹⁴ BGS IDs: 15948038, 15948036, 591906, 591794



Flooding from Reservoirs, Canals and Other Artificial Sources

- 3.30 The Environment Agency "Risk of Flooding from Reservoirs" map indicates that the site is not located within an area that is at direct risk by the failure of a reservoir or the combined effects of a failure with fluvial flooding.
- 3.31 Figure 11 "Camden, Geological, Hydrogeological and Hydrological Study Watercourses" of the ARUP¹⁵ study shows that a tributary of the lost Westbourne River is located approximately 150m east of the site. The study states that the river is, through the use of manmade culverts, artificially channelled and discharges into the local storm drainage. As such, any flooding from the Westbourne River would follow overland flow routes and protection of the site is provided by virtue of higher ground levels, as covered by the Surface Water assessment section of this report.
- 3.32 Figure 14 of the ARUP study¹⁵ shows the Hampstead Heath Surface Water Catchments and Drainage including the pond chains, in greater detail. The site is not located within the catchment of the pond chains on Hampstead Heath.
- 3.33 The risk of flooding from artificial water bodies is therefore considered low.

Planning Considerations

- 3.34 A previous planning application for a basement dwelling was granted permission in 2019. This application was also audited by Campbell Reith. They provided comments which confirmed agreement with the conclusions of our previous Surface Water and Flooding Risk assessment.
- 3.35 The updated planning application makes no changes to the previous assessment.
- 3.36 As the site is not in a flood-prone area, there is no mitigation required, and the development is considered safe from a flood risk perspective.

¹⁵ ARUP Geological, Hydrogeological and Hydrological Study – Guidance for Subterranean Development, November 2010



4 CONCLUSIONS AND RECOMMENDATIONS

- 4.1 The site is located at 190 Goldhurst Terrace in LBC. The existing site consists of a residential dwelling with a small cellar. The proposal is to convert the cellar into a separate residential dwelling and to construct a lightwell in front of the current entrance. This will slightly increase hard surfacing, which must be mitigated through use of SuDS.
- 4.2 The Environment Agency's Flood Map for Planning indicates that the site is located in Flood Zone 1 (Low Risk). In accordance with the Flood Risk and Coastal Change Guidance to the National Planning Policy Framework (NPPF), this zone comprises land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding (<0.1%). However, local planning guidance on basement developments specifies that all new basement developments located in borough-defined areas at risk of surface water flooding need to be accompanied by a Flood Risk Assessment.
- 4.3 The North London SFRA has collected data from flooding events in 1975 and 2002 which have been used by Camden to map areas of the borough that are more susceptible to surface water flooding. This information was subsequently used to inform Camden's supplementary guidance document on basement developments. Any proposals for a basement development located in a primary or secondary area must include an FRA. In addition, the LBC required than an FRA is carried out for any site located within a "Local Flood Risk Zone" (LFRZ).
- 4.4 The site is located in a "primary area" and LFRZ, and therefore this Surface Water and Flooding Risk Assessment has been prepared to assess the risk of flooding from all sources. LBC experienced flooding in 1975 and 2002, which was attributed to overland flow and sewer flooding. Goldhurst Terrace is recorded as having flooded during both events; however, the records are not detailed, and entire roads have been highlighted without reference to specific locations or to which properties were flooded on these roads.
- 4.5 All sources of flooding have been assessed in accordance with the NPPF and are considered to pose a low risk to the site. Whilst Goldhurst Terrace flooded in 1975 and 2002, local topography means that the site is on higher ground than the area at risk and the property itself is further raised above the adjacent road level of Goldhurst Terrace, with additional step up to the threshold level. Further mitigation from surface water flooding is therefore not required.
- 4.6 On site ground investigation and monitoring concluded that groundwater levels beneath the site are variable, and it is accepted that further variability may occur because of seasonal fluctuations and following periods of heavy rainfall. The site is underlain by London Clay, a predominantly unproductive bedrock, and whilst significant groundwater flows are not expected to be typical, local or perched pockets of groundwater may be encountered during construction. To prevent ingress of groundwater the proposed basement should be waterproofed to current standards and best practice.
- 4.7 The proposed basement is at low risk of flooding from all sources and is considered acceptable in the context of flood risk. The proposal does slightly increase the hard-surfaced area, which will lead to an increase in surface water runoff and so a SuDS proposal will need to be developed at post-planning stage to ensure that flood risk is not increased to neighbouring sites.



APPENDIX A – SURFACE FLOW AND FLOODING SCREENING FLOWCHART

The Developer should consider each of the following questions in turn, answering either "yes", "unknown" or "no" in each instance.

Consideration should be given to both the temporary and permanent works, along with the proposed surrounding landscaping and drainage associated with a proposed basement development.

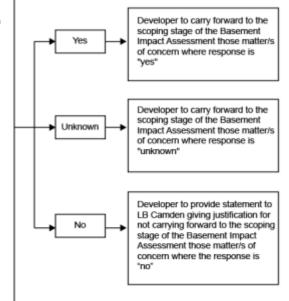
Question 1: Is the site within the catchment of the pond chains on Hampstead Heath?

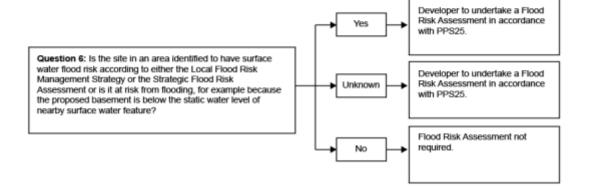
Question 2: As part of the proposed site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially changed from the existing route?

Question 3: Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?

Question 4: Will the proposed basement result in changes to the profile of the inflows (instantaneous and long-term) of surface water being received by adjacent properties or downstream watercourses?

Question 5: Will the proposed basement result in changes to the quality of surface water being received by adjacent properties or downstream watercourses?







APPENDIX B - PHOTOGRAPHS



Photograph 1: Front view of house, showing upwards slope and raised threshold





Photograph 2: View toward the east of Goldhurst Terrace from site





Photograph 3: View from site to the west along Goldhurst Terrace



APPENDIX C - PLANS

Existing and proposed plans