



**PROPOSED EXTENSIONS
AND CONVERSION TO
CREATE NEW DWELLING,
AT NUMBER 395 ST
MARGARETS ROAD,
TWICKENHAM, LONDON**

FLOOD RISK ASSESSMENT

NOVEMBER 2023

REPORT REF: 3331/RE/11-23/01

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CONTRACT

Evans Rivers and Coastal Ltd has been commissioned by Zussman Bear to carry out a Flood Risk Assessment for proposed extensions and conversion to create a new dwelling at number 395 St Margarets Road, Twickenham, London.

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This project comprises various stages including data collection; hydrological and hydrogeological assessments; surface water drainage designs; and reporting. Quality will be maintained throughout the project by producing specific methodologies for each work stage. Quality will also be maintained by initiating internal quality procedures including the validation of third party deliverables; creation of an audit trail to record any changes made; and document control using a database and correspondence log file system.

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The project will follow the commitment and objectives outlined in the Health and Safety Policy operated by Evans Rivers and Coastal Ltd. All employees will be equipped with suitable personal protective equipment prior to any site visits and a risk assessment will be completed and checked before any site visit. Other factors which have been taken into consideration are the wider safety of the public whilst operating on site, and the importance of safety when working close to a water source and highway. Any designs resulting from this project and directly created by Evans Rivers and Coastal Ltd will also take into account safety measures within a "designers risk assessment".

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1. INTRODUCTION

1.1 Project Scope

1.1.1 Evans Rivers and Coastal Ltd has been commissioned by Zussman Bear to carry out a Flood Risk Assessment for proposed extensions and conversion to create a new dwelling at number 395 St Margarets Road, Twickenham, London.

1.1.2 Specifically, this assessment intends to:

- 1) Consider the impacts of tidal flood events in accordance with NPPF;
- 2) Review any literature and guidance specific to this area such as the SFRA and SWMP;
- 3) Assess the risks to people and property and propose mitigation measures accordingly;
- 4) Review existing evacuation and warning procedures for the area;
- 5) Carry out an appraisal of flood risk from any other sources such as groundwater as required by NPPF;
- 6) Report findings and recommendations.

1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) dated 2023. Other documents which have been consulted include:

- DEFRA/EA document entitled *Framework and guidance for assessing and managing flood risk for new development Phase 2 (FD2320/TR2)*, 2005;
- Communities and Local Government 2007. *Improving the Flood Performance of New Buildings*. HMSO.
- DEFRA/EA document entitled *The flood risks to people methodology (FD2321/TR1)*, 2006;
- EA *Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose*, 2008;
- National Planning Practice Guidance – Flood Risk and Coastal Change.
- UK Government’s climate change allowances guidance.
- Environment Agency guidance entitled *Flood risk assessments: Climate change allowances – Kent and South London Area*.
- London Borough of Richmond Upon Thames Strategic Flood Risk Assessment Level 1 update (SFRA) dated 2021.
- London Borough of Richmond Upon Thames Strategic Flood Risk Assessment dated 2016.
- London Borough of Richmond Upon Thames Surface Water Management Plan (SWMP) dated 2011.

- Further Groundwater Investigations report Prepared for the London Borough of Richmond Upon Thames, Version 1.3 dated March 2021.

2. DATA COLLECTION

2.1 To assist with this report, the data collected included:

- 1:250,000 *Soil Map of South Eastern England* (Sheet 6) published by Cranfield University and Soil Survey of England and Wales 1983.
- 1:625,000 *Hydrogeological Map of England and Wales*, published in 1977 by the Institute of Geological Sciences (now the British Geological Survey).
- British Geological Survey Online Geology Viewer.
- LIDAR data at 1m resolution.
- Ordnance Survey 1:10,000 street view map (Evans Rivers and Coastal Ltd OS licence number 100049458).
- Product 6 flood breach data for the Thames provided by the Agency as GIS files (Thames_Upriver_Breach_Model_P6).
- Product 6 flood data provided by the Agency as GIS files for the River Crane 2008 model.

3. SITE CHARACTERISTICS

3.1 Existing Site Characteristics and Location

3.1.1 The site is located at number 395 St Margarets Road, Twickenham, London. The approximate Ordnance Survey (OS) grid reference for the site is 516548 175285 and the location of the site is shown on Figure 1.



Figure 1: Site location plan (Source: Ordnance Survey)

3.1.2 The site is rectangular in shape and is located within a residential area. The site comprises a two-storey building used for commercial purposes. The existing site layout can be seen on Drawing Number PL_02, PL_03, PL_04, PL_05, PL_06, PL_07, PL_08 and PL_09.

3.1.3 The site is accessed from St Margarets Road located adjacent to the eastern frontage of the site.

3.1.4 Filtered LIDAR at 1m resolution has been obtained in order to determine the topography across the site and wider area (Figure 2).

3.1.5 Inspection of the survey data together with on-site measurements indicate that the ground floor of the building is set 210mm higher than external ground levels and at 5.51m AOD. The first floor is set at 8.17m AOD.

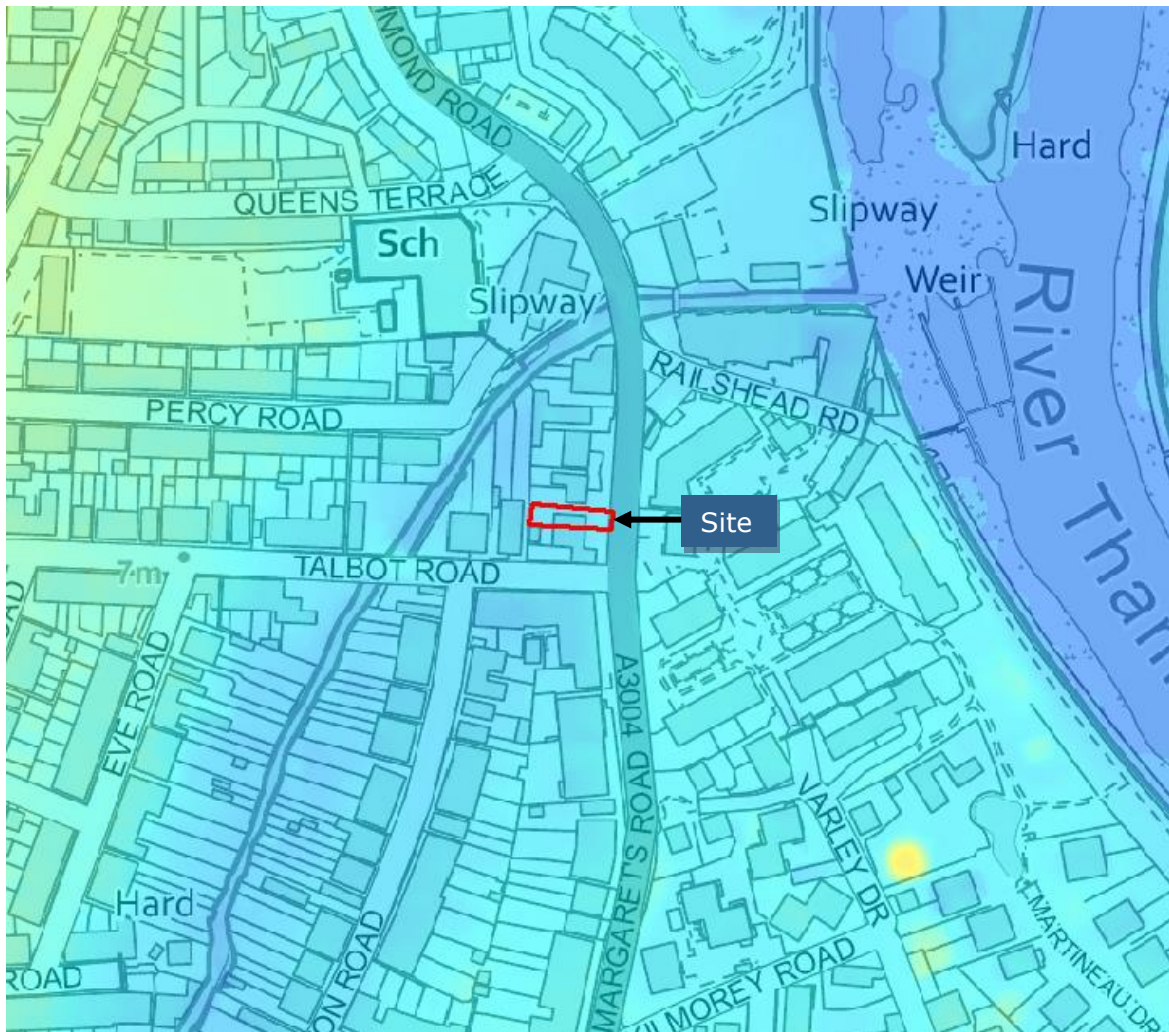


Figure 2: Filtered 1m LIDAR survey data where higher ground is denoted as orange and yellow colours and lower areas denoted by blue and green colours

3.2 Site Proposals

3.2.1 It is the Client's intention to extend the building and provide internal alterations together with a loft conversion. The extension will be set at the same level as the building and at 5.51m AOD. The building will be converted into a dwelling.

3.2.2 The site proposals can be seen on Drawing Number PL-02, PL_03, PL_04, PL_05, PL_06, PL_07, PL_08 and PL_09.

3.2.3 Annex 3 of the NPPF confirms that this proposal is classified as a 'more-vulnerable' use.

4. BASELINE INFORMATION

4.1 Environment Agency Flood Zone Map

4.1.1 The Environment Agency’s Flood Zone Map (Figure 3) and the Council’s interactive maps which accompany the SFRA 2020 shows that the site is located within the NPPF defined Flood Zone 3a.

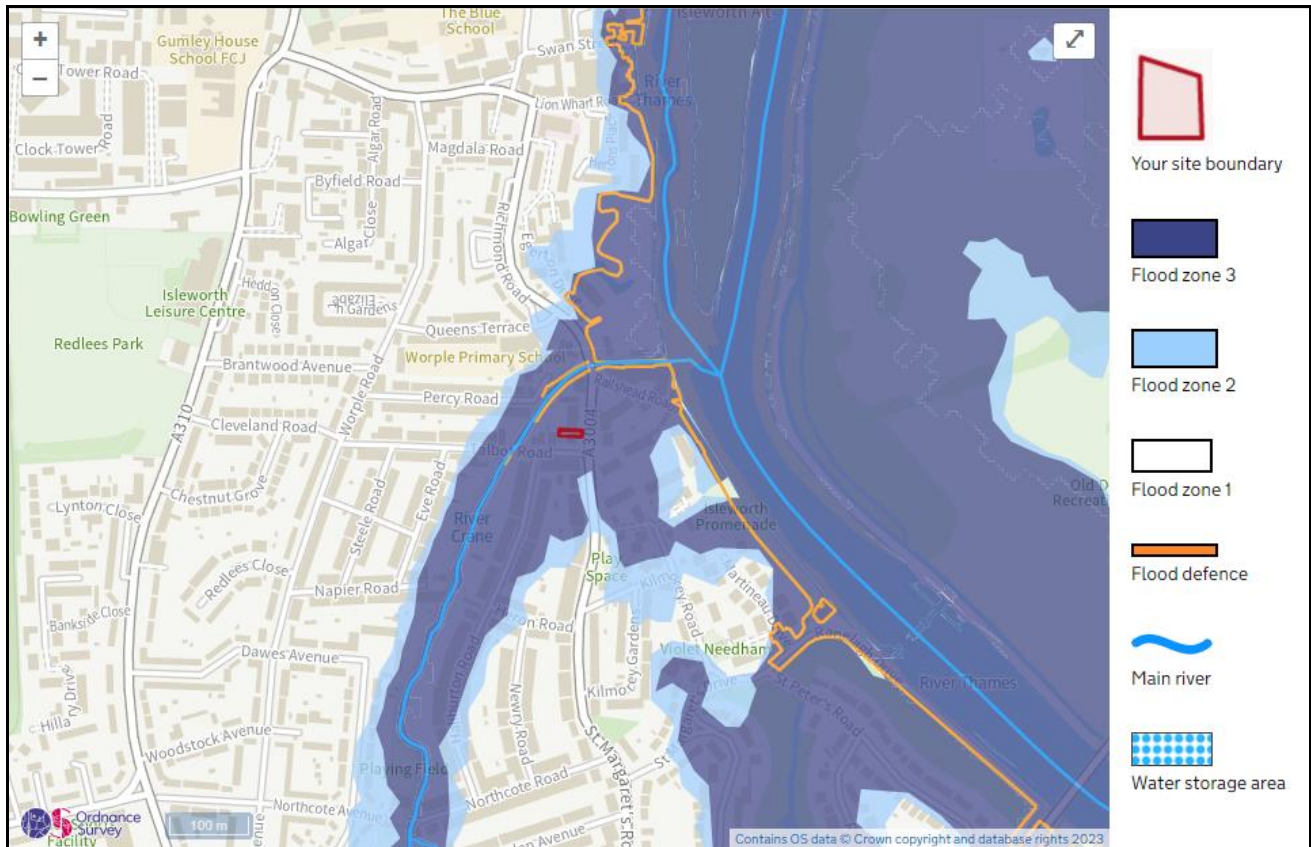


Figure 3: Environment Agency Flood Zone Map (Source: Environment Agency)

4.2 Flood Defences and Environment Agency Flood Levels

4.2.1 The Environment Agency flood defence information via <https://environment.data.gov.uk/asset-management/index.html> and Figure D of the SFRA 2016 indicates that the tidal River Thames is defended by raised river walls, which run parallel to the river and which are in good condition and set at 5.98m AOD. It is understood that the defences as a whole offer a standard of protection of 1 in 1000 years.

4.2.2 The River Crane within the vicinity of the site is also defended by a flood defence wall along part of its length. The defence is set at 5.48m AOD and is in fair condition.

4.2.3 Product 6 flood breach data has been provided by the Agency as GIS files (Thames_Upriver_Breach_Model_P6). The Agency has stated that as a result of the Thames Estuary 2100 Study completed by HR Wallingford in 2008, together with the presence of the Thames Barrier, flood levels for specific return periods are not now provided. Instead, a single extreme water level is provided for present day conditions and a design water level is provided for future climate change conditions.

Table 1: EA modelled flood level data for the Thames

Model Node	TE2100 2008 Extreme Water Level (m AOD)	TE2100 climate change Design Water Level (m AOD)
2.9u	5.54	6.28

4.2.4 Flood data for the River Crane has also been provided by the Agency as part of a Product 6 request and is discussed further in Chapter 5.

4.3 Flood Warning and Emergency Planning

4.3.1 The site is located within an Environment Agency flood warning area 062FWB36Islewort - Tidal River Crane at Isleworth, and 063FWT23Twicknhm - Tidal Thames from the River Crane to Teddington Weir.

4.3.2 The Environment Agency has a target to issue flood alerts and warnings 9 hours ahead of the peak of the high tide. However, overtopping can occur in advance of the high tide further reducing the warning time. There is no target lead time for issuing severe flood warnings as these are mostly issued after flooding has already begun. Flood alerts are only issued during daylight hours.

4.3.3 Sites at risk of fluvial flooding could have a minimum of 2 hours warning before any of the levels of flood warning is issued.

4.3.4 Flood Alerts, Flood Warnings and Severe Flood Warnings are issued to residents and businesses within flood risk areas by the Agency’s *Floodline Warnings Direct* (FWD) service. This system is managed by the Environment Agency and dials out a message to the recipient when a particular category of flood warning is being advised. The message is conveyed by a constant ringing of the telephone or can alternatively be communicated to mobile phones and computers. The Flood Alert system operates during daylight hours, issuing flood warnings and alerts in conjunction with announcements on radio and other media. Owners and occupiers of dwellings or businesses thought to be at risk can sign up to the scheme. **The owners must confirm details with the Agency and to sign up for these warnings.** The various flood warning codes can be seen on Figure 4.



Figure 4: Flood warning codes (Source: Environment Agency)

- 4.3.5 It is understood that in the event of flooding, evacuation is managed by a multi-agency team in conjunction with the Police. The multi-agency team provides suitable premises for shelter, first aid, refreshments and possible transportation with consideration given to the elderly and vulnerable groups. It is essential that occupants produce robust Emergency Flood Plans to avoid putting themselves or emergency services at risk and that they do not rely solely on emergency services during the event.

5. TIDAL AND FLUVIAL FLOOD RISK

5.1 Tidal Thames

5.1.1 The breach inundation map for 2100 (taken from Thames_Upriver_Breach_Model_P6) as shown on Figure 5 below, and the Council’s interactive maps which accompany the SFRA 2020, show that the site is located within the 2100 breach inundation area as well as the 2005 breach inundation area.

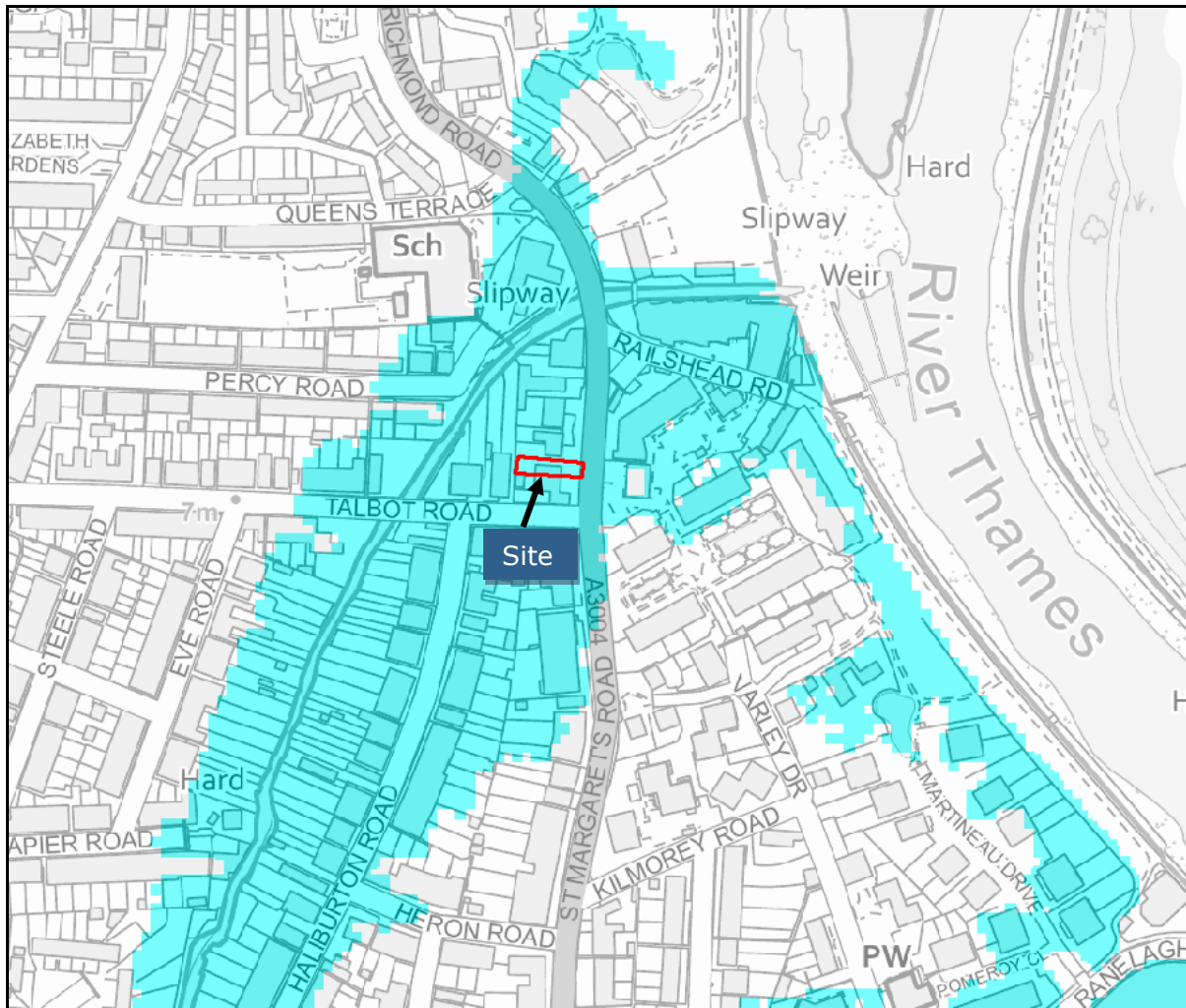


Figure 5: Breach inundation map for 2100 (taken from Thames_Upriver_Breach_Model_P6)

5.1.2 The Product 6 flood breach data provided by the Agency as GIS files (Thames_Upriver_Breach_Model_P6) shows that the site would be affected during climate change events and that the flood level would reach 6.25m AOD.

5.1.3 The flood hazard is calculated based on different combinations of floodwater depth and velocity. The flood hazard to people accessing or leaving the site can be calculated based on the numerical hazard rating extracted from the model which is then categorised into four degrees of flood hazard (Table 2) in accordance with Table 3.2 of FD2321/TR1 and Table 4.2 of FD2321/TR2.

Table 2: Hazard to people categories (taken from Table 3.2 of FD2321/TR1 and Table 4.2 of FD2321/TR2)

Hazard Rating	Degree of Flood Hazard	Description
< 0.75	Very low hazard	Caution "Flood zone with shallow flowing water or deep standing water"
0.75 – 1.25	Danger for Some	Dangerous for some (i.e. children) "Danger: Flood zone with deep or fast flowing water"
1.25 – 2.0	Danger for Most	Dangerous for most people (i.e. general public) "Danger: Flood zone with deep fast flowing water"
> 2.0	Danger for All	Dangerous for all "Extreme danger: flood zone with deep fast flowing water"

5.1.4 The model indicates a flood hazard rating across the site of 1.62 which equates to a hazard which is *Dangerous for Most*.

5.1.5 The ground floor of the building would be affected to a depth of 0.74m. The first floor will be set higher than the flood level thus providing safe (dry) refuge.

5.2 Fluvial Crane

5.2.1 Flood data for the River Crane has been provided by the Agency as part of a Product 6 request.

5.2.2 The UK Government’s climate change allowances guidance states that for more-vulnerable development, the “Central” climate change allowance should be used in FRA’s. For the London Management Catchment the climate change allowance is 17% up to year 2080s.

5.2.3 Therefore, when considering this scenario, the Agency’s modelling includes a 1 in 100 plus 20% climate change allowance which is higher than the required 17%.

5.2.4 The Agency’s data and the Council’s interactive maps which accompany the SFRA 2020, indicates that the site would be located outside of all modelled flood extents (Figure 6).

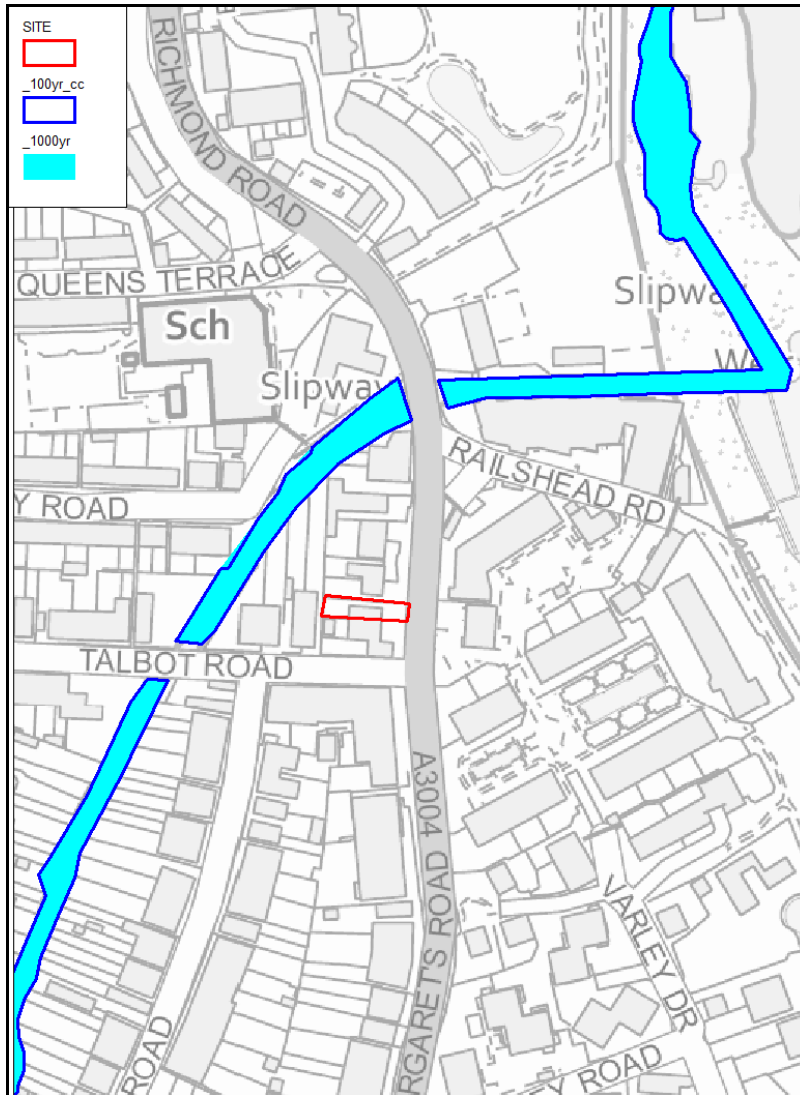


Figure 6: River Crane flood extents during present day 1000yr event and climate change 1 in 100 year event

6. FLOOD RISK MITIGATION AND EVACUATION

6.1 Reducing Exposure to the Hazard

- 6.1.1 In order to assess and reduce the exposure to the hazard and the vulnerability to the hazard after the site has been developed, the guidance outlined in the DCLG/DEFRA/EA document entitled *Flood Risk Assessment Guidance for New Development Phase 2; Flood Risks to People, Phase 2; Improving the Flood Performance of New Buildings* has been consulted.
- 6.1.2 In accordance with the Agency's recommendations and Paragraph 002 of the NPPF Planning Practice Guidance, the "design" event flood level for which mitigation measures should be designed to is the tidal breach climate change flood level of 6.25m AOD.
- 6.1.3 Paragraph 004 of the NPPF Planning Practice Guidance states that the first preference is to avoid flood risk by raising floor levels above the design flood level.
- 6.1.4 Paragraph 069 of the NPPF Planning Practice Guidance continues to state that "Resistance and resilience measures are unlikely to be suitable as the only mitigation measure to manage flood risk, but they may be suitable in some circumstances, such as:
- water-compatible and less vulnerable uses where temporary disruption is acceptable and the development remains safe;
 - where the use of an existing building is to be changed and it can be demonstrated that the avoidance measures set out in paragraph 004 are not practicable and the development remains safe;
 - as a measure to manage residual flood risk from flood risk management infrastructure when avoidance measures have been exhausted.
- 6.1.5 As the proposals are in relation to an existing building the proposals comply with the second criterion above and raising of the ground floor above the design flood level is not possible.
- 6.1.6 Therefore, as discussed above, other mitigation measures such as resistance and resilience measures will be appropriate in this case.
- 6.1.7 Safe (dry) refuge will be available across the first floor for residents during the design event.

6.2 Differential Depth

- 6.2.1 During the design event the depth of floodwater would reach 0.74m above the ground floor level. The differential depth (i.e. the depth difference between the inside of the building and outside of the building) could therefore reach 0.74m.
- 6.2.2 The DEFRA/EA document entitled *Improving the Flood Performance of New Buildings*, dated 2007, suggests that where the depth of floodwater is higher than 0.5m above the floor level within a building, there will be damage to internal finishes.
- 6.2.3 It is also stated in the aforementioned DEFRA/EA document that there is some damage to buildings if the depth differential between the outside and inside water levels exceeds 0.6m. Severe damage can occur if this reaches 1m even if the buildings are flood proofed.

6.2.4 In order to reduce this differential depth to safe limits, it is proposed that floodwater is allowed across the ground floor as part of a *Water Entry Strategy*.

6.3 Water Entry Strategy

6.3.1 In accordance with the ODPM guidance document *Preparing for Floods* and the aforementioned DCLG/DEFRA/EA document, a *Water Entry Strategy* in this case aims to allow floodwater to enter the building and flood resilience techniques are incorporated across the ground floor level to reduce the consequences of flooding. It is proposed that the following mitigation measures are established up to the design level of 6.25m AOD.

Floors

6.3.2 Suitable floor finishes such as ceramic or concrete based flooring are recommended.

Walls

6.3.3 Suitable flood proofing measures will need to be incorporated within the walls up to the flood level. Insulation can be fitted externally as it is easily replaced. If cavity insulation is preferred then rigid closed cell materials should be used as they have a low moisture take-up.

6.3.4 Internal cement renders should be avoided as they prevent effective drying. Standard gypsum plasterboard could be used as a sacrificial material and can be removed after the flood. Lime-based plaster and ceramic tiles are also known to offer some resilience.

Fittings

6.3.5 Durable fittings which are not affected by floodwater could be used internally (e.g. plastic or stainless steel units). Wood fittings should be avoided; however sacrificial fittings can be installed which can then be replaced easily after the flood. There should be gaps behind the fittings to promote drainage and drying.

Services

6.3.6 It may not be practical to raise ground floor electrical sockets above the design level, however, the mains supply of electric should be turned off in the event of a flood, and any boiler units should be placed as high as possible and above the flood level. Wiring for communications should also be insulated to prevent damage. Non-return valves are recommended to prevent back-flow of foul water.


6.3.7 It is recommended that after the event, a structural survey is carried out in order to assess any damage due to prolonged periods of flood water exposure. The CIRIA guidance document (C623) entitled *Standards for the repair of buildings following flooding* outlines the various approaches.



6.4 Reducing Vulnerability to the Hazard

6.4.1 It is understood that the police and other emergency services will assist in the evacuation to rest centres operated by the Council. The Fire Service will assist in any rescuing of people from the flooded area once this has occurred. People at the site will need to make a judgment themselves with regards to the flood hazard if evacuation is attempted and not solely rely on the emergency services.

- 6.4.2 It is recommended that the occupants liaise with the Agency in order to register with the Agency’s Flood Warnings Direct service and ensure that they are aware of the flood risk so that they have the option to escape/evacuate upon receipt of a *Flood Warning* or upon the instruction of the emergency services.
- 6.4.3 The occupants should develop a *Family Flood Plan*. Further guidance is offered in the Environment Agency’s guidance document entitled *What to do before, during and after a flood*. The *Family Flood Plan* should consider, for example, information about vital medication needed and a *Flood Kit*.
- 6.4.4 A *Flood Kit* is a useful precautionary measure especially if evacuation from the site is prolonged. The kit should be stored in an accessible location to ensure that it is not affected by floodwater. The contents should also be checked every 6 months and items replaced if necessary.
- 6.4.5 It may be sensible to compile two *Flood Kit’s* to suit each eventuality. For example, a smaller kit could be compiled which would allow the occupants to carry it during evacuation. A larger kit could also be compiled which included additional food and beverage items in case of ongoing refuge within the property. Both kits should contain the necessary items as suggested below.
1. Important documents
 2. Torch and batteries
 3. Mobile phone (fully charged)
 4. First-aid kit
 5. Wind-up radio
 6. Important telephone numbers
 7. Bottled water
 8. Non-perishable food provisions
 9. Rubber Gloves and wellington boots
 10. Medication or information relating to medication and its location
 11. Blankets, warm clothes
 12. Essential toiletries
 13. Camera to record any damage
 14. Emergency cash

Table 3: Flood Event Action Plan

Environment Agency Flood Warning Code	What to do!	Evacuate?
<p>Flood Alert (Flooding Possible. Be aware/prepared! Watch Out).</p> 	<ul style="list-style-type: none"> • Monitor flood risk through media and Floodline Warnings Direct. • Locate family members and inform them of risk. If away from the site make assessment on risk if considering returning to site (i.e. how long it will take to return etc). • Check flood kit, check occupants, check pets – BE PREPARED in case the situation gets worse. 	<p>Not necessary.</p> <p>Occupants can evacuate themselves if they feel unsafe providing that they make a judgement in relation to any external flood hazard. Take flood kit, occupants and pets with you.</p>
<p>Flood Warning (Flooding of homes, businesses and main roads is expected).</p>	<ul style="list-style-type: none"> • Maintain communication through Floodline Warnings Direct and the 	<p>Occupants can evacuate themselves if they feel</p>

<p>Act now!).</p> 	<p>media.</p> <ul style="list-style-type: none"> • Begin to implement Flood Plan. • Consider advice given from emergency services/Environment Agency. • Check insurance, Check flood kit, Check Pets. • Check alternative accommodation arrangements. 	<p>unsafe providing that they make a judgement in relation to any external flood hazard. Take flood kit, occupants and pets with you.</p> <p>People who do not evacuate should reside across first floor.</p> <p>No formal evacuation or rest centre set-up will be undertaken at this warning level, however, if flooding is experienced across the area emergency services will rescue people.</p>
<p>Severe Flood Warning (Severe flooding is expected. Imminent danger to life and property. Act now!).</p> 	<ul style="list-style-type: none"> • Leave site immediately if not already done so. • Take flood kit, occupants and pets with you. • Follow advice given by Emergency Services and Council. 	<p>Leave site according to advice given by Emergency Services and Council. Take flood kit, occupants and pets with you.</p> <p>If evacuation cannot be undertaken, people should reside across first floor with <i>flood kit</i> and maintain communication with the emergency services.</p>
<p>Warnings no longer in force (No further flooding is expected in the area. Be careful).</p>	<ul style="list-style-type: none"> • Return to site upon instruction from emergency services and assess any damage. • Contact insurance company depending on damage caused. • Beware of flood debris. • Do not touch sources of electricity. • Arrange for utilities to reconnect services. • Do not dispose of damaged property until your insurance company has agreed. 	<p>Not applicable, however site may be uninhabitable.</p> <p>Return to site upon instruction from emergency services as floodwater may not have receded.</p>

6.5 Vulnerable Groups

- 6.5.1 The occupants at the site may include vulnerable groups such as elderly people, those with sensory or physical disabilities, minority ethnic groups, or the infirm. Priority will need to be given to these people during the flood event.
- 6.5.2 Vulnerable groups should be identified by the occupants and priority should be given to these groups during the event.

6.6 Safe Access/Egress

- 6.6.1 The hazard rating along the evacuation route (Figure 7) has been provided by the Agency in the GIS model files and assessed in the same way as described in Section 5 above.
- 6.6.2 When considering breaching of the defences during climate change events, the Agency's data together with Table 2 above shows that the hazard would be *Dangerous for Most* for 25m, *Dangerous for Some* for 16m then *Very low* (Figure 8).



Figure 7: Preferred evacuation route in relation to Breach inundation map for 2100 (taken from Thames_Upriver_Breach_Model_P6)

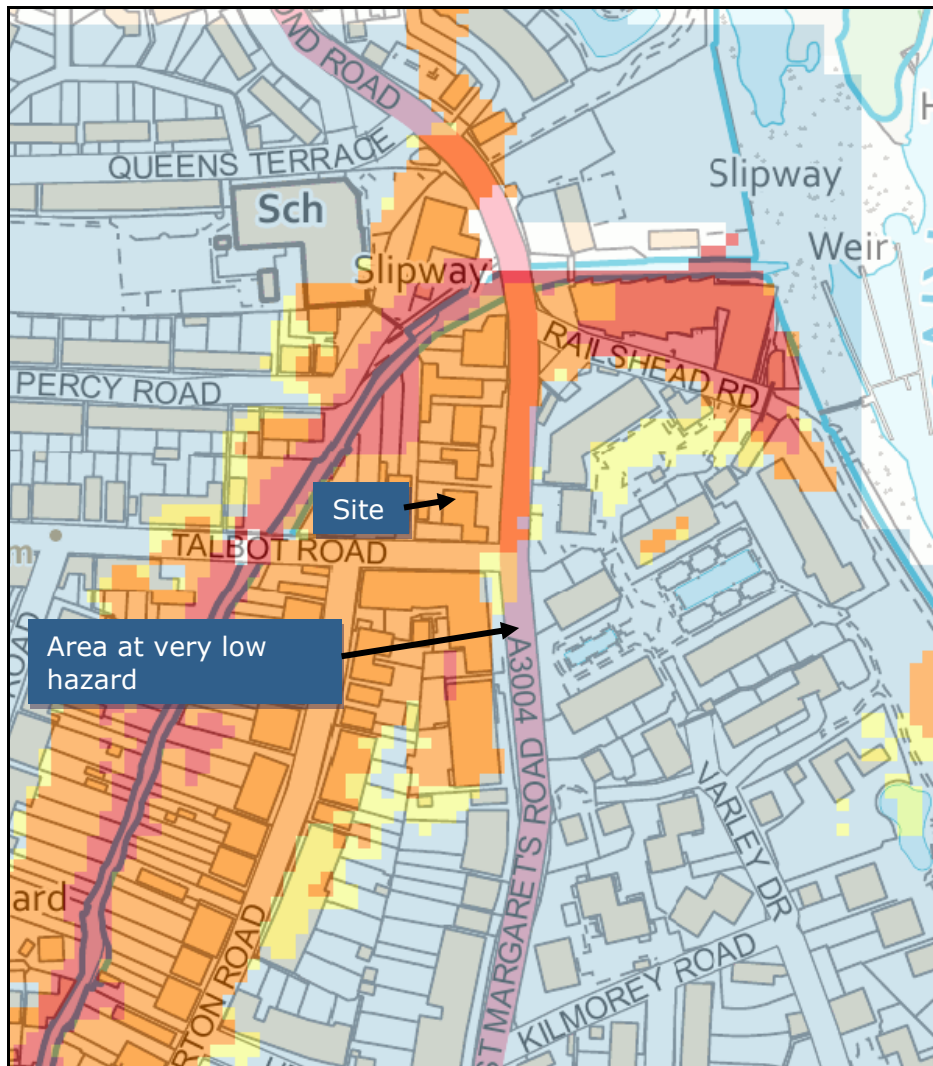


Figure 8: Breach hazard map for 2100 (taken from Thames_Upriver_Breach_Model_P6) (refer to Table 3 above for classification)

6.7 Insurance

- 6.7.1 The Association of British Insurers (ABI) published a guidance document in 2012 entitled *Guidance on Insurance and Planning in Flood Risk Areas for Local Planning Authorities in England*.
- 6.7.2 The ABI guidance sets out the requirements of the insurance industry when considering flood risk and insurability of the property. The guidance suggests that properties should be protected for flood events up to the 1 in 100 year event in order to access insurance at a competitive price.
- 6.7.3 The guidance also states that insurers would of course prefer to cover properties which are not at risk of flooding, however, for those properties which are at risk of flooding insurers would prefer that the properties are raised above the flood level, over resistance measures which prevent floodwater from entering the building, or resilience measures which allows floodwater to enter the building.
- 6.7.4 It is not practical to raise the ground floor above the flood level, however, flood resilience measures have been proposed up to the climate change breach event.

Therefore, the ABI's requirement of protection during the climate change 1 in 100 year event will be exceeded and there will be a good chance of the property being insured at a competitive rate.

7. OTHER SOURCES OF FLOODING

7.1 Groundwater Flooding

7.1.1 In order to assess the potential for groundwater flooding during higher return period rainfall events, the Jacobs/DEFRA report entitled *Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study*, published in May 2004, was consulted, together with the guidance offered within the document entitled *Groundwater flooding records collation, monitoring and risk assessment (ref HA5)*, commissioned by DEFRA and carried out by Jacobs in 2006.

Soil and Geology at the Site

7.1.2 It can be seen from the various soil and hydrogeological data, listed in Section 2, that the soils beneath the site comprise sand and gravel overlying London Clay.

Groundwater Flooding Potential at the Site

7.1.3 There have been no recorded groundwater flood events across the site between 2000 and 2003, as indicated by the Jacobs study and Figures D and K of the SFRA 2016.

7.1.4 The Council's interactive maps which accompany the SFRA 2020 shows that the site is located across an area with an increased potential for elevated groundwater. The maps indicate that there is also a 50% to 75% susceptibility to groundwater flooding. However, the building footprint will reduce the risk to acceptable levels.

7.1.5 The Council's interactive maps which accompany the SFRA 2020 (Figure 9), together with the document *Further Groundwater Investigations Prepared for the London Borough of Richmond Upon Thames, Version 1.3 dated March 2021*, shows that the site is not located within a *Throughflow Catchment Area (Throughflow and Groundwater Policy Zone)*, or *Potential Throughflow Catchment Area*.

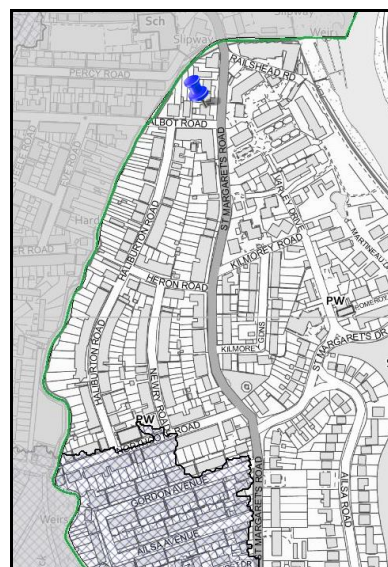


Figure 9: Throughflow Catchment Area (Council's interactive maps which accompany the SFRA 2020)

7.2 Surface Water Flooding and Sewer Flooding

7.2.1 Surface water and sewer flooding across urban areas is often a result of high intensity storm events which exceed the capacity of the sewers thus causing them to surcharge and flood. Poorly maintained sewer networks and blockages can also exacerbate the potential for sewer flooding.

Surface Water Flooding

7.2.2 Figure D-9 of the SWMP shows that the site is not located within a Critical Drainage Area (CDA).

7.2.3 Figure K of the SFRA 2016 indicates that there have been no historical flooding incidents across the site.

7.2.4 Figure G of the SFRA 2016 and the Council’s interactive maps which accompany the SFRA 2020 shows that the site has a very low risk of surface water flooding.

7.2.5 The Agency’s Surface Water Flooding Map (Figure 10) also shows that there is a very low surface water flood risk across the site (i.e. less than 1 in 1000 year chance).

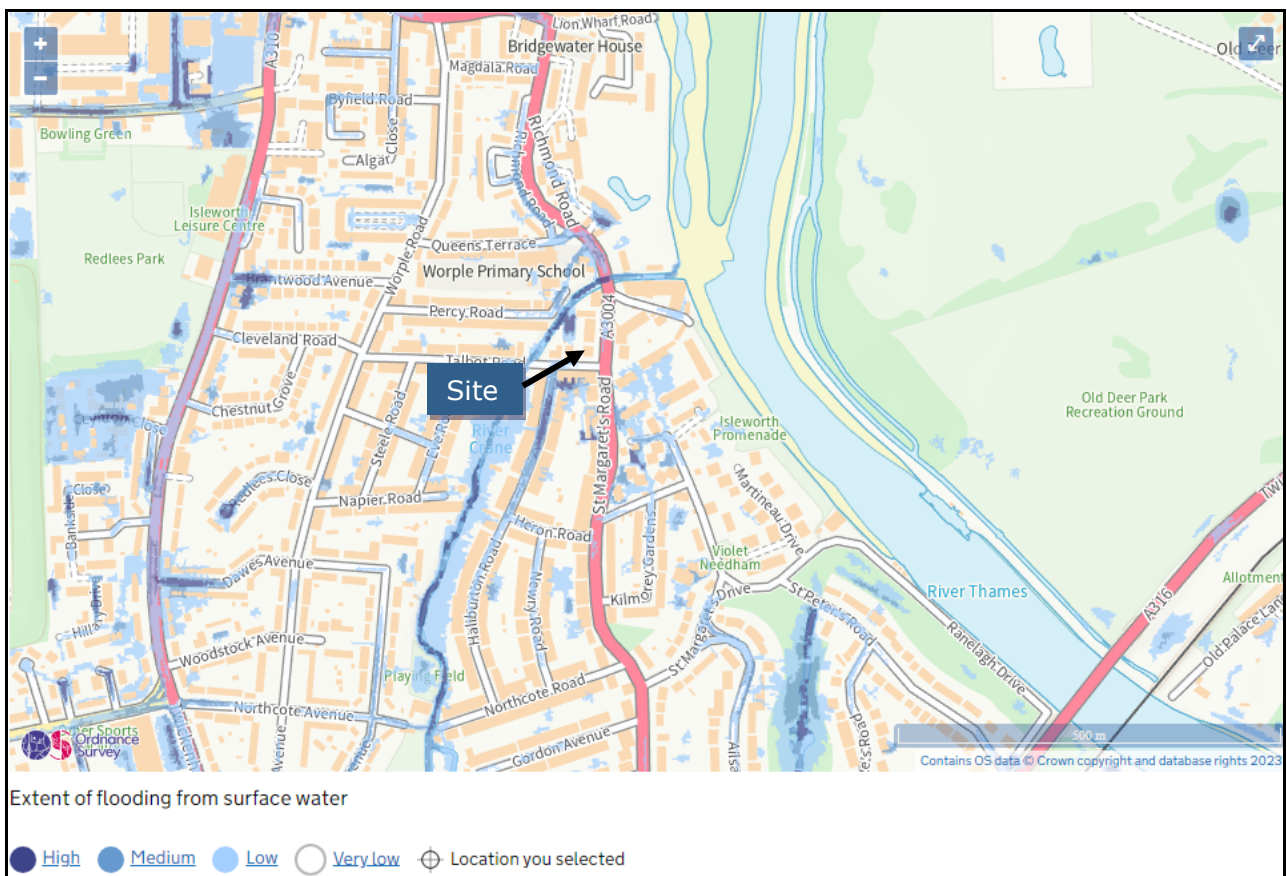


Figure 10: Environment Agency Surface Water Flooding Map (Source: Environment Agency, 2023)

Sewer Flooding

- 7.2.6 The Council's interactive maps which accompany the SFRA 2020 and Figure I of the SFRA 2016 indicates that the site is located across a postcode area which has had between 1-5 reported incidents of sewer flooding. It is understood that the information was provided by Thames Water and on a broad scale. No information was provided for specific addresses.

7.3 Reservoirs, Canals And Other Artificial Sources

- 7.3.1 The failure of man-made infrastructure such as flood defences and other structures can result in unexpected flooding. Flooding from artificial sources such as reservoirs, canals and lakes can occur suddenly and without warning, leading to high depths and velocities of flood water which pose a safety risk to people and property.
- 7.3.2 The Environment Agency's "Risk of flooding from reservoirs" map indicates that the site is at risk of flooding reservoirs when there is also flooding from rivers.
- 7.3.3 However, as the information associated with the maps suggest, it is considered that reservoir flooding is extremely unlikely to happen and such features are regularly inspected by qualified engineers under the Reservoir Act 1975.

8. CONCLUSIONS

- It is the Client's intention to extend the building and provide internal alterations together with a loft conversion. The extension will be set at the same level as the building and at 5.51m AOD. The building will be converted into a dwelling.
- The site is located within the NPPF Flood Zone 3a from a tidal surge event within the River Thames.
- When considering a breach in the defences and tidal inundation during climate change events the flood level at the site is estimated to reach 6.25m AOD.
- The ground floor of the building would be affected to a depth of 0.74m. The first floor will be set higher than the flood level thus providing safe (dry) refuge.
- A *Water Entry Strategy* should be adopted across ground floor areas to reduce the differential depth to safe limits during the event and to protect property.
- A warning and evacuation strategy has been developed within this assessment. It is proposed that the occupants register with the Agency's *Flood Warnings Direct* and prepare a *Family Flood Plan*.
- Safe access/egress cannot be achieved during the peak of the event.
- There is a low fluvial flood risk from the River Crane.
- It is considered that there is a low risk of groundwater flooding and a very low flood risk from surface water and sewers.

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