Project:

Priests Bridge

26-28 Priests Bridge
SW14 8TA
Barnes

Date:
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Revision:
P1

Title:

Flood Risk Assessment

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Flood Risk

The Site is located within the Flood Zones 2&3 with a high probability of flooding risk. The Site has a low probability of flooding from surface water runoff, groundwater, public sewers, and artificial sources; however, it has high probability of fluvial flooding. In order to mitigate the residual risk of flooding the designers of development on the Site will be required to consider the flood resistance and flood resilience of the design.

The development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and will achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

• Store rainwater for later use
• use infiltration techniques, such as porous surfaces in non-clay areas
• attenuate rainwater in ponds or open water features for gradual release
• attenuate rainwater by storing in tanks or sealed water features for gradual release
• discharge rainwater direct to a watercourse or to a surface water sewer/drain or the combined sewer

The surface water drainage system for the development on the Site will need to be designed for exceedance in a 1 in 100 year + 30% for climate change worst case storm, taking into account overland flow routes and control/containment of excess flows on site.

No flooding of property should occur as a result of a 1 in 100 year + 30% for climate change storm. In principle, the surface water drainage system should ensure that there is little or no residual risk of property flooding occurring during events in excess of the return-period for which the sewer system itself is designed.

Development Description

The redevelopment of the Priests Bridge buildings is to comprise a residential-led mixed-use scheme for 9 homes and 649 sq. m of commercial spaces and associated development, infrastructure and landscape works. The current proposals outline a new 3 no. storey structure containing 1 no. commercial and 7 no. residential units to take place in-between the existing terraced residential building and The Stag's Head Barns pub on the south east corner of the site. At the rear the developer has proposed a new 2 storey partly commercial and two residential units with a pitched roof.

The commercial building footprint extends over the existing ground bearing slab that was occupied by the garage.

Planning Policy
National Planning Policy Framework (NPPF)

Sequential Test

Paragraph 101 of the NPPF states that development will not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding (the Sequential Test). However the LBR Planning Guidance Supplementary Planning Document states due to the fact that approximately 60% of the LBR lies within Flood Zone 2 or 3 it is considered unreasonable to restrict development just to this area and the Sequential Test does not need to be applied.

Exception Test

The requirements of the Exception Test must be satisfied in order for the development to be permitted. For the Exception Test to be passed it must be demonstrated that the development:

• provides wider sustainability benefits to the community that outweigh the flood risk, and;
• will be safe for its lifetime, without increasing flood risk elsewhere, and, where possible, will reduce overall flood risk.

The London Plan

The development will need to comply with the requirements of policies 5.12 Flood risk management and 5.13 Sustainable drainage of The London Plan London Plan

Policy 5.12 - Flood risk management

In addition to the requirements of the NPPF developments which are required to pass the Exception test will need to address flood resilient design and emergency planning by demonstrating that:

• the development will remain safe and operational under flood conditions.
• a strategy of safe evacuation and/or safely remaining in the building is followed under flood conditions
• key services including electricity, water etc. will continue to be provided under flood conditions
• buildings are designed for quick recovery following a flood

London Plan Policy 5.13 - Sustainable drainage

A 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 and ensure that surface water run-off is managed as close to its source as possible in line with the drainage hierarchy. Drainage should be designed and implemented in ways that deliver other policy objectives of this plan, including water use efficiency and quality, biodiversity, amenity and recreation.

London Plan Supplementary Planning Guidance (SPG)

Supplementary Planning Guidance (SPG) to the London Plan was published in April 2014. Section 3.4 lists the following Mayor's Priorities with regards to surface water flooding and sustainable drainage:

• Developers should maximise all opportunities to achieve greenfield runoff rates in their developments.
• When designing their scheme developers should follow the drainage hierarchy set out in London Plan policy 5.13.
• Developers should design Sustainable Drainage Systems (SuDS) into their schemes that incorporate attenuation for surface water runoff as well as habitat, water quality and amenity benefits.

Local Planning Policy

The LBR local plan includes policy CC3 Reducing Water Use and the Risk of Flooding which is applicable to this flood risk assessment. The following clauses which are particularly relevant to the site:

• SuDS should be implemented with the aim of achieving greenfield run-off rates where possible. If this is not feasible, a minimum of at least 50% attenuation of the undeveloped site's surface water run-off at peak times should be achieved;
• All new developments should include water efficient fittings and appliances, where provided. In addition, major developments and high water use developments should include other measures such as rainwater harvesting and grey water re-use;
• All new development proposals will be required to demonstrate that there is sufficient water and wastewater infrastructure capacity both on and off site to serve the development or that any necessary upgrades will be delivered ahead of the occupation of development;.

Existing Flood Risk

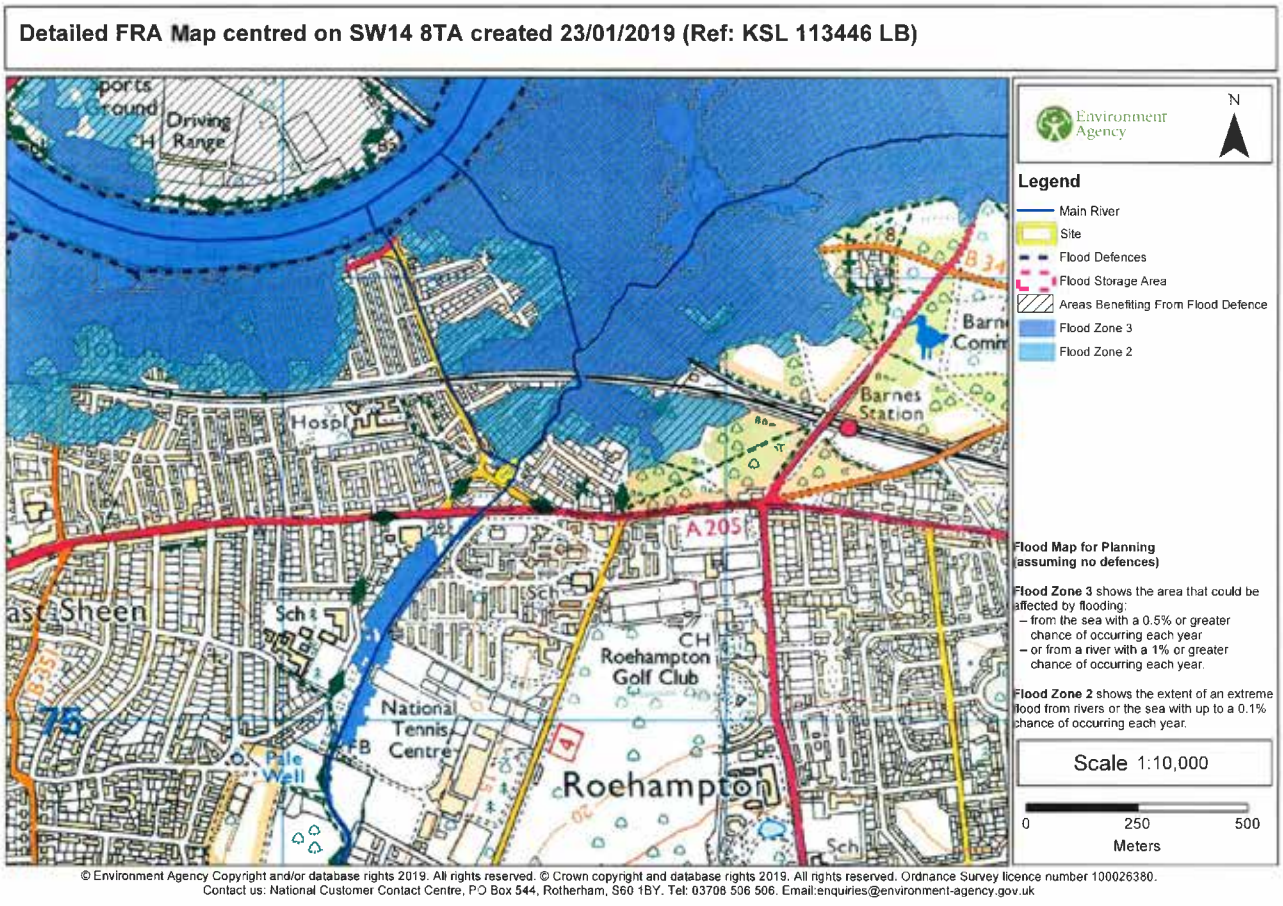
Tidal Flooding

Environment Agency (EA) Flood Maps

A Product 4 flood information report was ordered from the EA providing site specific information on flood probability. The information above has been used in order to assess the current and future tidal flood risk to the site.

EA Flood Zone

From Figure it can be seen that Priest Bridge lies in Flood Zone 2. There is no record of the site having been affected by historical floods. Flood Zone 2 is defined as area that has a 0.5% or greater annual probability of being affected by flooding from the sea.



Fluvial Flooding

The LBR SFRA identifies that the site and vicinity are at very low fluvial flood risk.

Surface Water Flooding
Modelled Surface Water Flooding

• The site is in a built up urban area. Surface water flooding will be governed by the capacity of the highway drainage and surface water sewer network.
• The site is completely covered by a building and doesn't appear to be properly represented in the EA Risk of Flooding from Surface Water mapping.
• As the flood depths surrounding the site are shown as low or non-existent in all of the maps, the overall risk from surface water flooding is considered to be low.

Groundwater Flooding

The SFRA stated that no cases of historical groundwater flooding have been found in this area and the risk of groundwater flooding is considered low.

Summary of Existing Flood Risk

The site lies within Flood Zone 2 but is protected to at least the 0.1% AEP tidal event by the Thames Barrier and defences along the Thames banks. The site is outside of the flooded area in the modelled EA breach scenarios and is therefore considered to be at low risk from tidal flooding. Indicative mapping shows a raised probability of surface water flooding. There is history of sewer flooding in the area, though no incidents are known to have affected the site. Overall, the risk of flooding from surface water and sewers is considered to be low.

Tidal Flooding

The site is protected by tidal defences with a standard of protection of greater than 1 in 1000 years. Sea levels are expected to rise as a result of climate change, the Environment Agency Thames Estuary 2100 plan sets out the management strategy for flood risk over the coming century. As a result the flood risk to the site from tidal sources is low over the life of the development. However, there is a residual risk in the event of breach of the tidal defences, considered below.

Residual risk

Breach Analysis

There is a residual flood risk resulting from breach of the tidal defences. This residual risk is considered to be low as:

• The defences are maintained and monitored by the EA.
• The defences protect over 1 million people and £200billion worth of property (Thames Estuary Partnership figures). It is anticipated that the current level of protection will be maintained as sea level rises over the life of the development.

Residual Risk Classification

In accordance with the LBR SFRA the site is on the boundary between the Medium Residual Risk and High Residual Risk areas.

Overtopping of Defences

The site is not shown to flood in the 2102 0.5% AEP overtopping scenario.

Upstream Inundation Modelling

The upstream inundation modelling map is defined in the Product 4 as follows,“The modelled scenario is that the Thames Barrier is operational but all linear defences have been removed. The modelling is based on the 2008 TE2100 inchannel levels including an allowance for climate change”. The levels identified are lower than the maximum level taken from the breach modelling.

Fluvial and Groundwater Flood Risk

Existing flood risk from these sources is low and the impact of climate change is unlikely to significantly increase the risk over the life of the development.

Surface Water Flood Risk

Climate change projections indicate that over the next century intense storms will become more frequent and rainfall intensity will increase. This increases the likelihood of surface water flooding. However upgrades to the sewer infrastructure surrounding the site may help to reduce the probability of surface water flooding. The measures proposed in Section 5 will mitigate the risks of surface water flooding.

Flood Risk from Artificial Sources

The risk of flooding from reservoirs will not increase as a result of climate change. The risk of sewer flooding is actively managed by Thames Water and other stakeholders. It is expected that the risk to the site will decrease over the lifetime of the development due to new infrastructure.

Flood Risk from the Development

The building footprint is not increasing post-development. Therefore there is no loss of flood storage and the development will have no impact on tidal flood risk to the surrounding area.

Proposed Mitigation

The probability of flooding from all sources is not increased as a result of the development. A good level of protection against tidal flood risk is provided by the Thames barrier and linear defences up to a 0.1% AEP (1 in 1000 year) level. A small residual risk of flooding from surface water and in the event of a breach of the defences remains. Flood resilience measures will be implemented in order to manage this risk as discussed below.

Flood Resilience

Flood Warning
A comprehensive flood warning and evacuation plan will be implemented for the development, in-line with the EA flood warning system.

Sequential Design and Floor Levels

Within the site a sequential approach has been applied when considering the site layout. Residential accommodation is provided at first and second floor level, with floor levels well above the residual flood level of 4.745m AOD.
Ground floor is non-residential. Ground floor FFL is set at 4.065m AOD, in-line with the external level around the building. Disabled access is a priority for this project and removing physical barriers into the building been a driver for setting the ground levels. Measures to protect against surface water flooding such as protection to thresholds are being considered and will be looked at in more detail in the next stage of the design.

Access and Egress

Safe access and egress to the residential units will be maintained in the events of a flood. The residential levels have their own dedicated core with access onto street level. The level around the building is constant at approximately 4.065m AOD so escape is only possible at that level.
The residual risk of flooding remains from a high tide event combined with a breach in the flood defences. In this instance a flood warning would alert the residents in advance allowing them to safely evacuate. Furthermore tidal flooding is cyclical and only lasts for the duration of the high tide, approximately 6 hours. In the unlikely event of a flood the residents would be able to safely remain inside the building until the flood water subsides.

Other

These additional design measures will be implemented to provide additional flood resilience:

- Non-return valves on all discharge pipes;
- Water resistant materials to be used in construction;
- Top down wiring;
- Resilient floor and wall finishes with flood resistant fixtures and fittings.

Sustainable Drainage

Surface Water Drainage

The run-off rates for the existing site will be calculated during next phase.

SUDS Hierarchy

Policy 5.13 of the London Plan states that run-off should be managed as close to its source as possible in-line with the drainage hierarchy. The options are considered below.

Table 1 – Sustainable drainage options

Option	Description
1. Store rainwater for later use	Rainwater harvesting systems have been considered to be located to the front of the site footprint being a suitable location for the storage tank. The system does not provide guaranteed attenuation storage during a peak event, as the storage may already be full.
2. Use infiltration techniques, such as porous surfaces in non-clay areas	The ground conditions are clay so infiltration is not possible.
3. Attenuate rainwater in ponds or open water features for gradual release	Only 200sqm are splitted into two open spaces, an internal courtyard connected with a path next to the river to a terrace at the rear, so there is not enough open space available.
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release	A below ground rainwater attenuation tank would be underneath the ground floor to the front of the site. Also, a green roof area will provide rainwater attenuation.
5. Discharge rainwater to a watercourse	This is a valid option using the Brook that runs adjacent to the site.
6. Discharge rainwater to a surface water sewer/drain	This option is to be investigated
7. Discharge rainwater to the combined sewer	The existing site discharges into the combined sewer. The new development continue to use this connection.

Control of Surface Water Runoff

Surface water run-off is proposed to be attenuated at source wherever possible. Rainwater Harvesting, Green Roofs have all been considered and are discussed below.

Rainwater Harvesting

Rainwater Harvesting system is considered feasible with the storage tank located to the front of the site, considering unfeasible to guarantee storage in the system during a peak event.

Green Roofs

The drainage strategy aims to provide some betterment in run-off from the site. A flat roof area on the front building is identified as being appropriate for a green roof and will be utilised to reduce the rate and volume of surface water flow the sewer network.
The details of the roof build-up are yet to be confirmed and every effort will be made maximise the attenuation in this area. If possible the roof drainage from other areas will flow through this storage structure in order to attenuate a larger area of the site.

Conclusions

The proposed site is located in Flood Zone 2 and protected by the Thames Barrier up to a 1 in 1000 year tidal event.

• The development has been designed to keep more vulnerable residential use areas on the upper floors out of the flood zone.
• Non-return valves will be provided on all outgoing pipes to protect against sewer flooding.
• A comprehensive flood warning and evacuation plan will be implemented for the development.
• The proposed drainage strategy will utilise the existing connection to the public Thames Water sewer in Priest Bridge.
• A green roof will be provided in order to reduce the rate and volume of surface water discharge into the sewer.

This report has demonstrated that flood risk to the site can be managed safely whilst still providing an accessible building which benefits the whole community.

Environment Agency

Product 4 (Detailed Flood Risk) for: 24 Priests Bridge, Sheen, London, SW14 8TA
Requested by: Alex Zimmermann
Reference: KSL 113446 LB
Date: 23/01/2019

Contents

Environment Agency

Flood Map for Planning Confirmation

The Flood Map for Planning (Rivers & Sea)

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. The map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time, taking into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at www.environment-agency.gov.uk.

At this Site:

The Flood Map shows that part of this property/site lies within the outline of Flood Zone 2 this zone comprises land assessed as having a 0.1% chance of flooding from rivers in any given year.

Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed fluvial modelling of Beverley Brook 2D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

Detailed FRA Map centred on SW14 8TA created 23/01/2019 (Ref: KSL 113446 LB)

Environment Agency

Model Output Data

You have requested flood levels for various return periods at this location.

1D

The modelled flood levels for the most appropriate cross sections taken from our ISIS 1D modelling of the Beverley Brook, any additional information you may need to know about the modelling from which they are derived and/or any specific use or health warning for their use are set out below.

Table 1: Modelled Defended Node Levels

			Modelled Flood Level for Annual Exceedance Probability Shown, in Metres AOD				
Node ID	Easting	Northing	20% AEP	5% AEP	2% AEP	1% AEP	1% AEP Plus Climate Change
2.028	521395	175418	5.55	5.77	5.86	5.80	5.90
2.027	521443	175465	5.64	5.72	5.71	5.81	5.75
2.026	521500	175514	5.40	5.62	5.68	5.67	5.72
2.025a	521510	175531	5.40	5.61	5.68	5.66	5.72
2.0241a	521521	175549	5.25	5.48	5.53	5.53	5.57
2.024	521528	175569	5.30	5.51	5.55	5.57	5.60
2.023	521589	175644	5.27	5.47	5.50	5.52	5.53
2.021	521629	175733	5.18	5.44	5.48	5.48	5.50

Data taken from our Beverley Brook 1D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

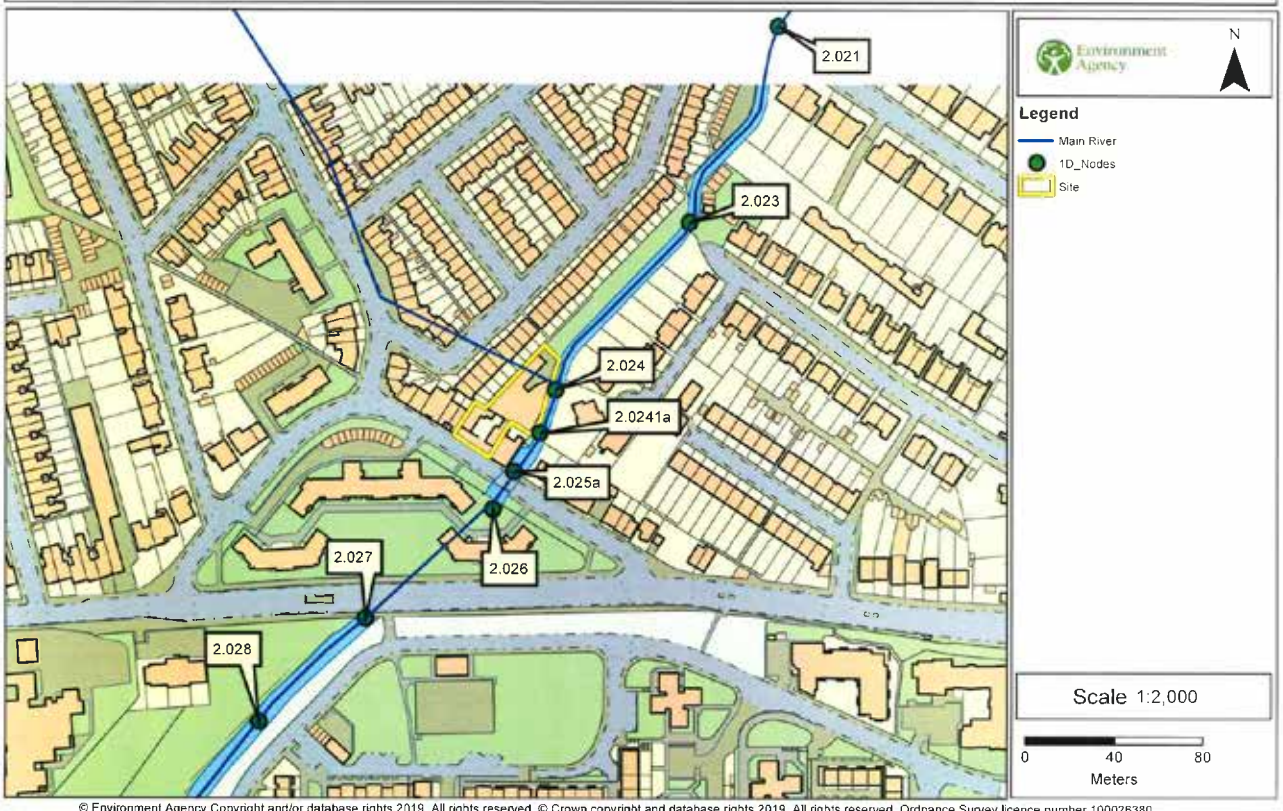
Table 2: Modelled Defended Node Flows

			Modelled Discharge for Annual Exceedance Probability Shown, in m^3/s				
Node ID	Easting	Northing	20% AEP	5% AEP	2% AEP	1% AEP	1% AEP Plus Climate Change
2.028	521395	175418	13.86	16.47	17.92	16.75	17.80
2.027	521443	175465	14.35	14.63	14.49	15.76	14.24
2.026	521500	175514	12.74	14.89	15.70	15.89	16.05
2.025a	521510	175531	12.38	14.56	15.61	15.55	15.91
2.0241a	521521	175549	8.58	10.14	10.72	10.61	10.91
2.024	521528	175569	8.63	10.17	10.02	10.39	10.48
2.023	521589	175644	8.78	9.77	10.11	10.33	10.41
2.021	521629	175733	8.38	9.71	9.87	9.96	9.94

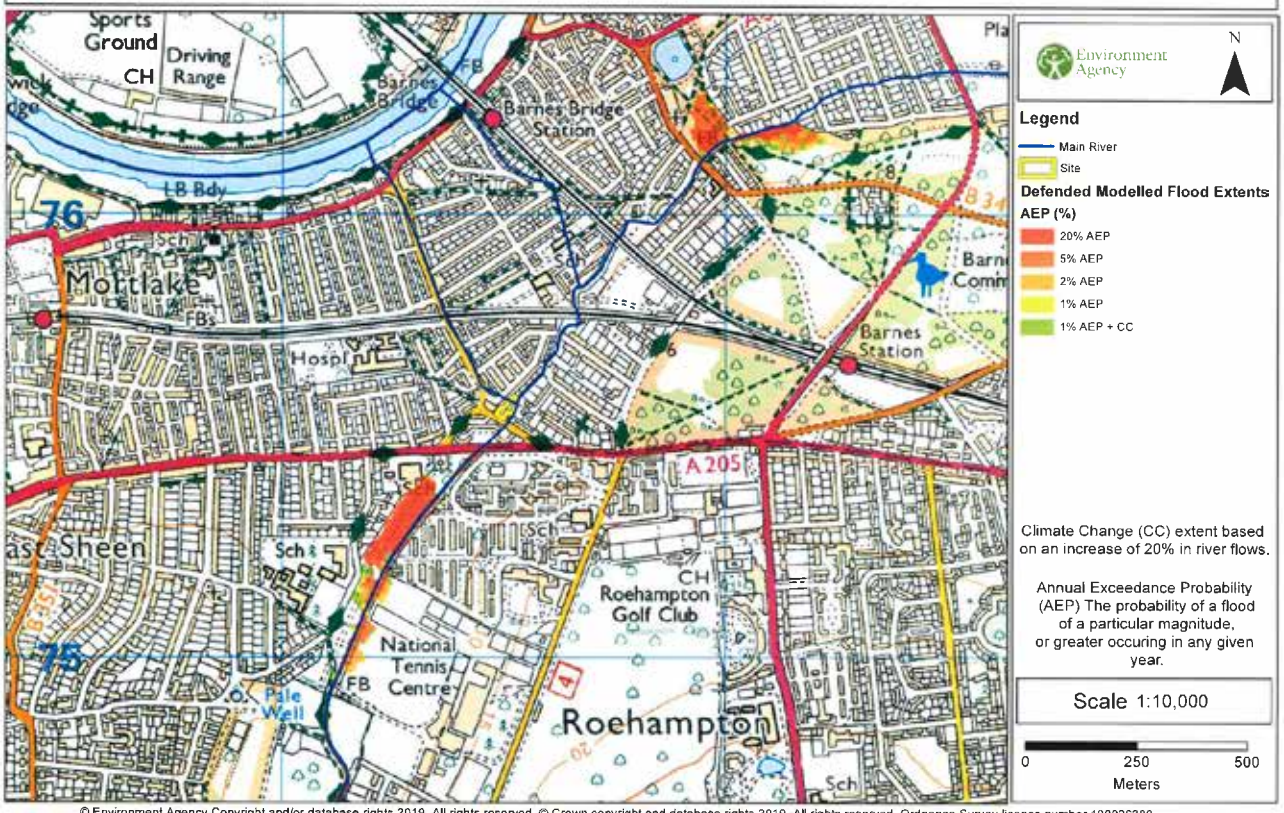
Data taken from our Beverley Brook 1D Flood Risk Mapping Study completed in 2008 by Royal Haskoning.

There are no health warnings or additional information for these levels or the model from which they were produced.

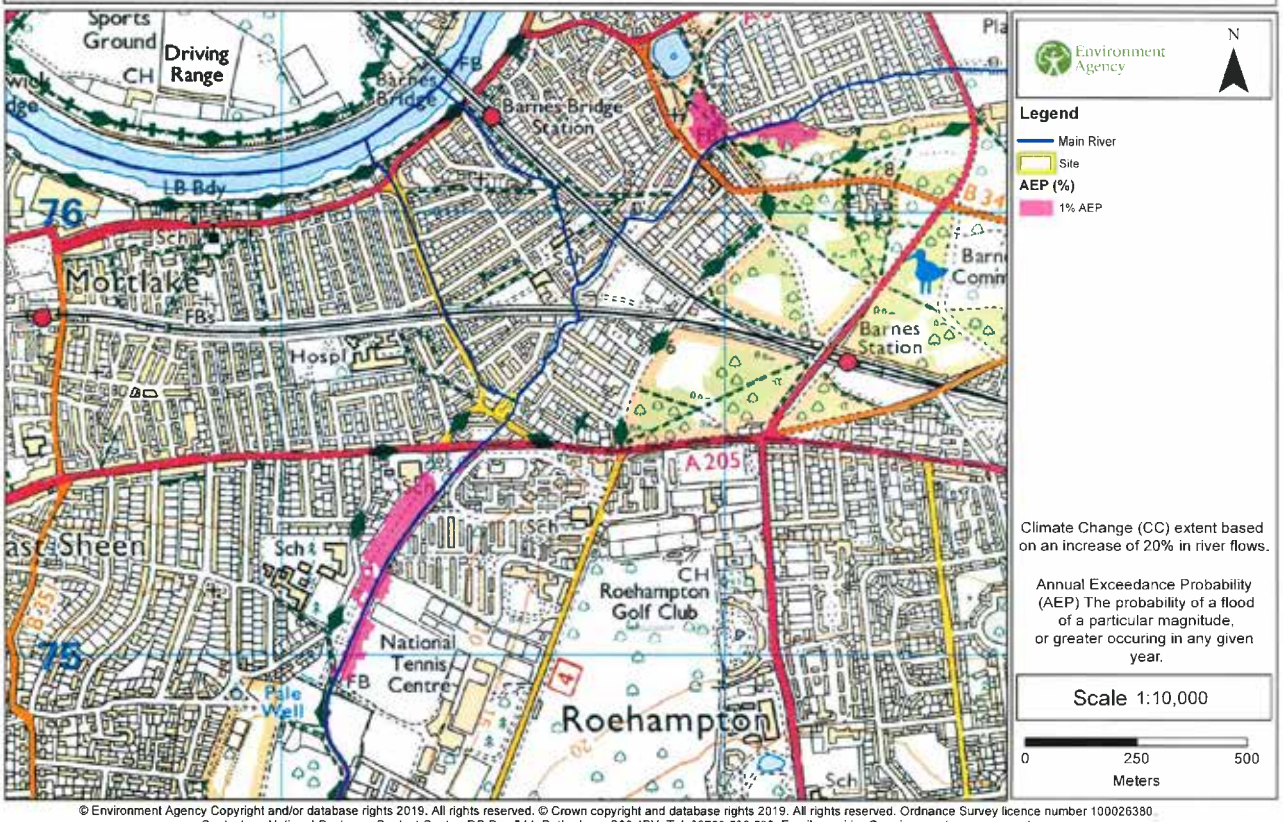
1D Node Location Map centred on SW14 8TA created 23/01/2019 (Ref: KSL 113446 LB)



Modelled Defended Flood Extents Map centred on SW14 8TA created 23/01/2019 (Ref: KSL 113446 LB)



Modelled Undefended Flood Extents Map centred on SW14 8TA created 23/01/2019 (Ref: KSL 113446 LB)



Environment Agency

Historic Flood Events Data

We hold records of historic flood events from rivers. Information on the floods that may have affected the area local to your property/site are provided below and in the enclosed map (if relevant).

Flood Event Data

We do not hold records of historic flood events from rivers affecting the area local to this property/site. However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Please note that our records are not comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers