

4 Assessment of Flood Risk

4.1 Flood Zone Designation

Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. The NPPF and PPG defines Flood Zones as follows:

- a. Flood Zone 1 (Low Probability): Land having a less than 1 in 1,000 annual probability of river or sea flooding.
- b. Flood Zone 2 (Medium Probability): Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
- c. Flood Zone 3a (High Probability) Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
- d. Flood Zone 3b (The Functional Floodplain): This zone comprises land where water has to flow or be stored in times of flood.

The flood zones are shown on the Environment Agency Flood Map for Planning (Rivers and Sea). The flood zones shown on the flood map are defined by the predicted extent of flooding during the present day 1 in 100 (non-tidal rivers), 1 in 200 (tidal rivers and sea) and 1 in 1,000 (rivers and sea) annual exceedance probability (AEP) events. The zones do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Flood zone 3b (functional floodplain) is not separately distinguished on the Flood Map for Planning but is usually identified by local planning authorities in their SFRAs. The boundary of flood zone 3b is normally defined as land that would flood during the present day 1 in 20 AEP event, although definitions may vary particularly in some districts and in urban areas.

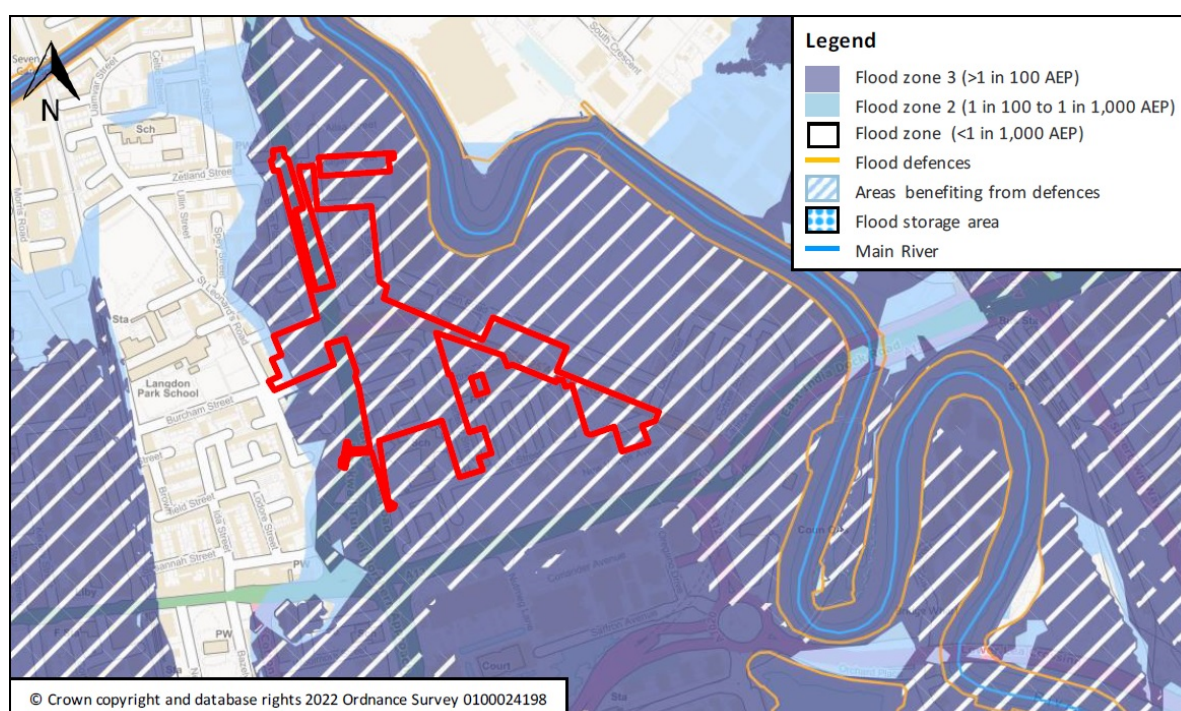


Figure 12 – EA Flood Map from Rivers & Sea

Where an area benefits from formal flood defences providing a minimum standard of protection, the defended area may be indicated as an area benefiting from flood defences. However, not all areas are shown as such, and unless specifically indicated, the Flood Map for Planning conservatively shows land at risk of flooding in the absence of flood defences. The Flood Map for Planning (**Figure 12**) indicates the site to be located in flood zone 3 and is in an area benefiting from the presence of flood defences.

4.2 Historical Records of Flooding

The Environment Agency historic flood map indicates that extensive flooding of the site occurred in 1928 and that land beyond the south-east corner of the site was also flooded in 1947 (**Figure 13**).

It should be noted that raised defences were not present along the River Lee when flooding occurred at the site. The London Borough of Tower Hamlets SFRA indicates that flood defences were constructed following the 1947 flood event.

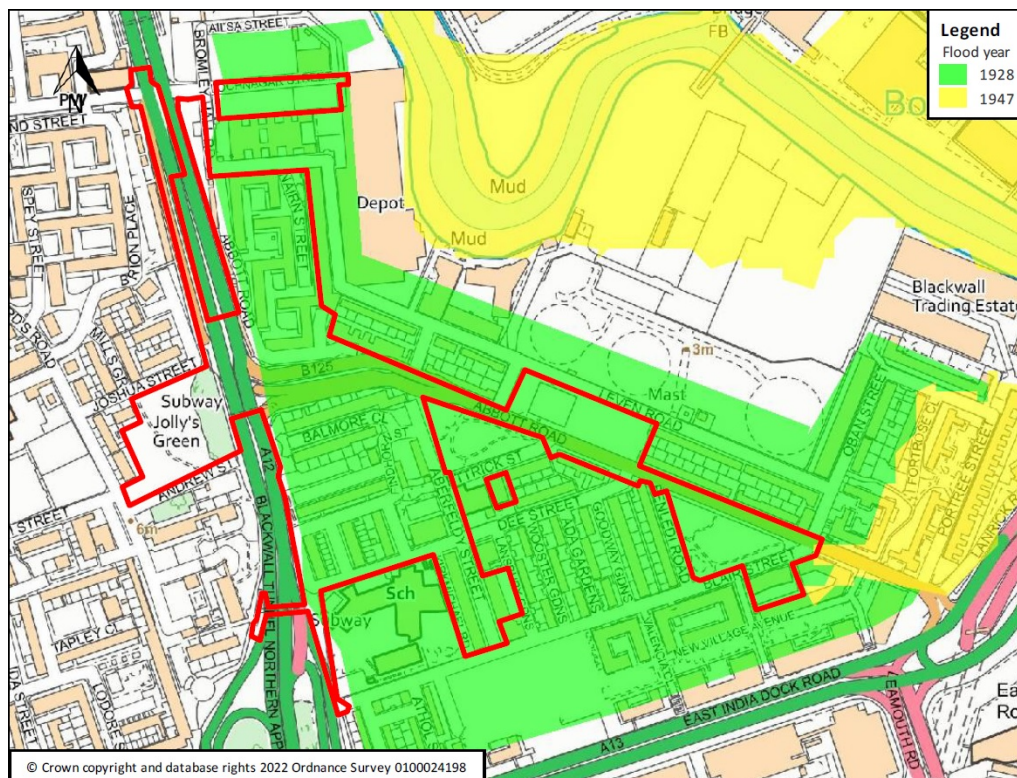


Figure 13 – Recorded Flood Outlines.

4.3 Flood Risk – River Lee

As detailed in Section 3.3, the River Lee is located a minimum of approximately 160 m east of the site and flows in a generally southerly direction to its confluence with the River Thames.

The Environment Agency (EA) has confirmed that the flood defences along the River Lee prevent flooding in up to the 1 in 1,000 AEP event and that the planning application should be informed by an assessment of flood risk from the River Thames. Refer to **Appendix C** for the Product 4 Detailed Flood Risk Maps provided by the EA.

4.4 Flood Risk – River Thames

As detailed in Section 3.3, the River Thames is located approximately a 550 m south of the site and flows in an easterly direction towards the Thames Estuary.

The extent of flooding presented by the Flood Map for Planning does not take into account the presence of flood defences. However, the site is located in an area benefitting from formal defences, including the Thames Barrier.

The Thames Barrier and the raised defences along the banks of the River Thames and are designed to provide a 1 in 1,000 annual probability Standard of Protection (SoP) and therefore mitigate the risk of flooding from the River Thames in up to the present day 1 in 1,000 annual probability event.

The crest level of the defences situated adjacent to the site is currently 5.23 m AOD. It is expected that the crest level of the defences will be raised to 6.20 m AOD in accordance with the TE2100 Plan in order to maintain the current SoP up to 2100.

Based upon the above, the site is assessed to be at a low risk of flooding form the River Thames. However, a residual risk of flooding exists due to potential overtopping of the defences for events exceeding the SoP, due to a structural failure of the flood defence walls, or due to a failure of Thames Barrier to operate as intended.

The Environment Agency has provided outputs from its 2017 Thames Tidal Upriver Breach Inundation Modelling Study. The extents of flooding resulting from a breach of the River Thames flood defences for the present day and 2100 climate change scenarios are presented by **Figure 14** and indicate that the site is at risk of flooding.

Maximum flood levels for the present day and 2100 climate change scenarios are presented by **Figure 15** and **Figure 16** respectively. The model results indicate that peak flood levels across the southern site parcel for the present day and 2100 climate change scenarios are 2.80 m AOD and 3.68 m AOD respectively. Peak flood levels within the northern site parcel are shown to range from 3.18 – 3.55 m AOD in the present day scenario and 3.65 – 5.10 m AOD in the 2100 climate change scenario.

Flood hazard mapping for the present day and 2100 climate change scenarios are presented by **Figure 17** and **Figure 18** respectively. The flood hazard at the site is generally shown to be significant (i.e. dangerous for most people), with areas of extreme hazard (i.e. dangerous for all) identified along the site access roads in the 2100 climate change scenario. Refer to **Appendix D** for the Environment Agency EIA response letter.

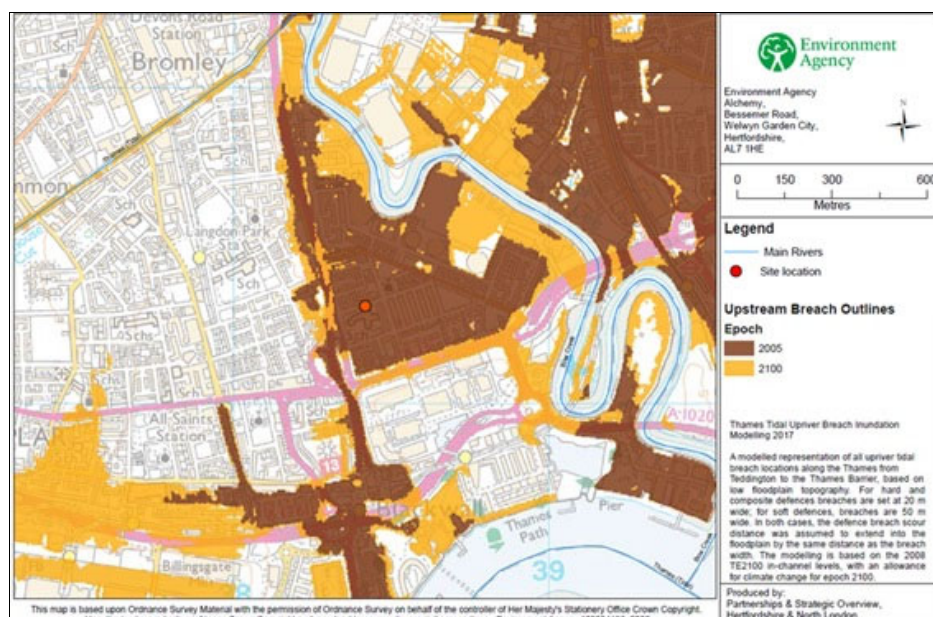
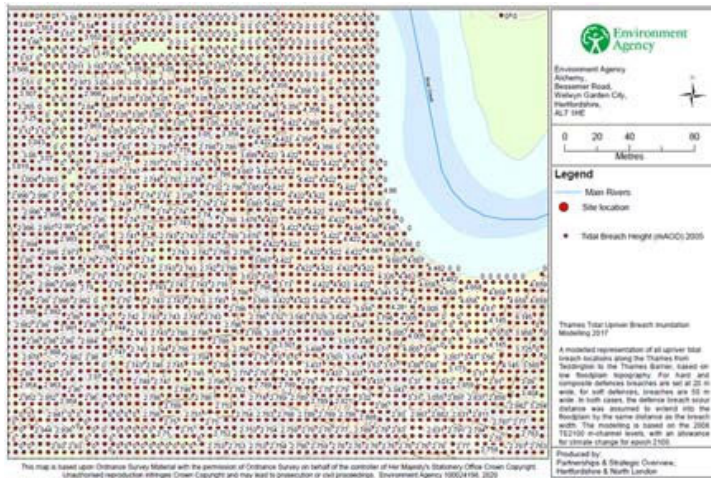
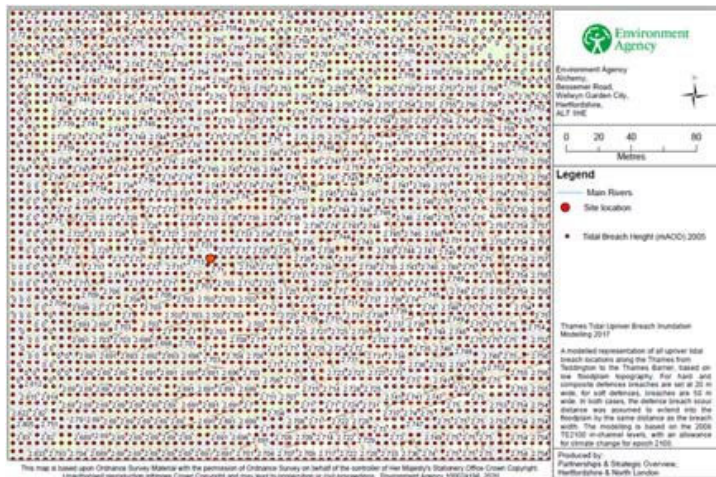


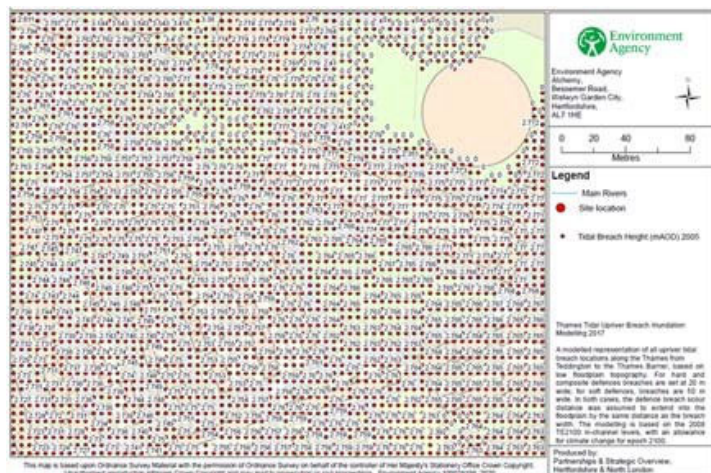
Figure 14 – Modelled Flood Extent – Breach. Tidal Upriver Breach Inundation Modelling Study 2017



North Aberfeldy Village

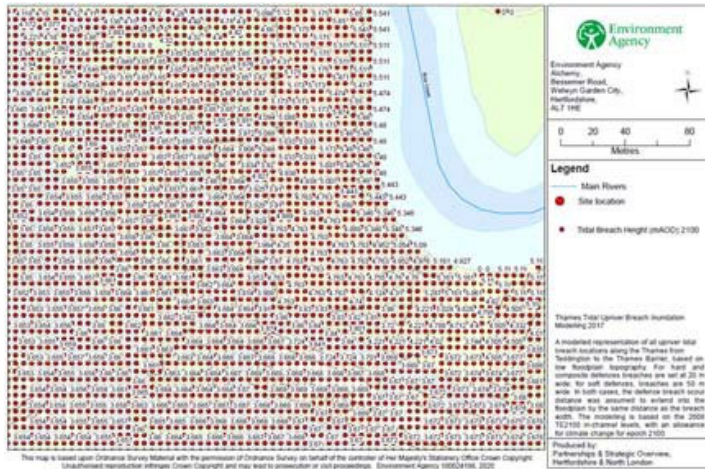


South-west Aberfeldy Village

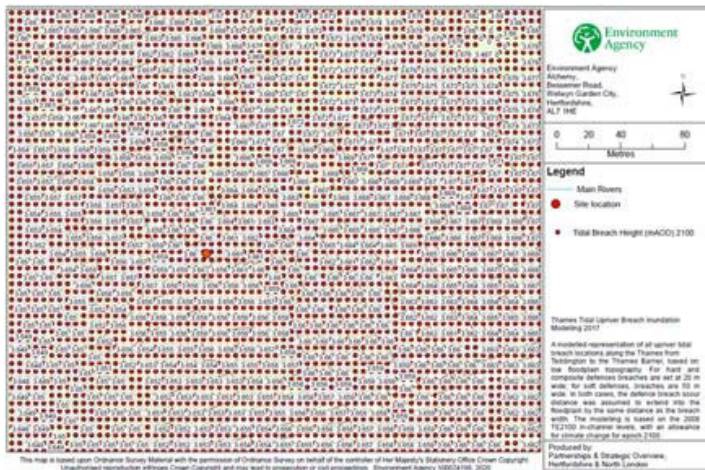


South-east Aberfeldy Village

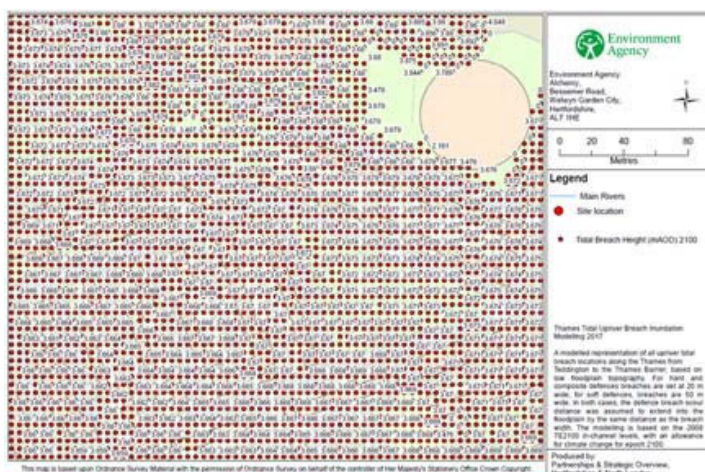
Figure 15 – Maximum Water Level – Breach (2005). Tidal Upriver Breach Inundation Modelling Study 2017



North Aberfeldy Village



South-west Aberfeldy Village



South-east Aberfeldy Village

Figure 16 – Maximum Water Level – Breach (2100). Tidal Upriver Breach Inundation Modelling Study 2017

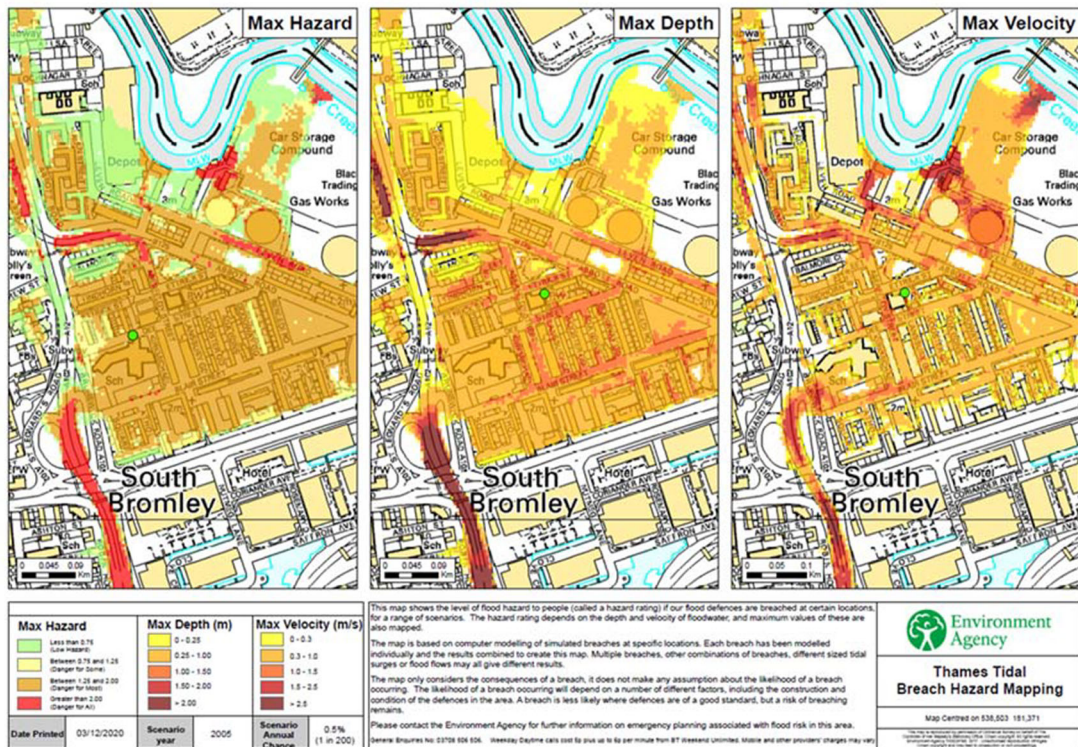


Figure 17 – River Thames Hazard Mapping Breach (2005). Tidal Upriver Breach Inundation Modelling Study 2017

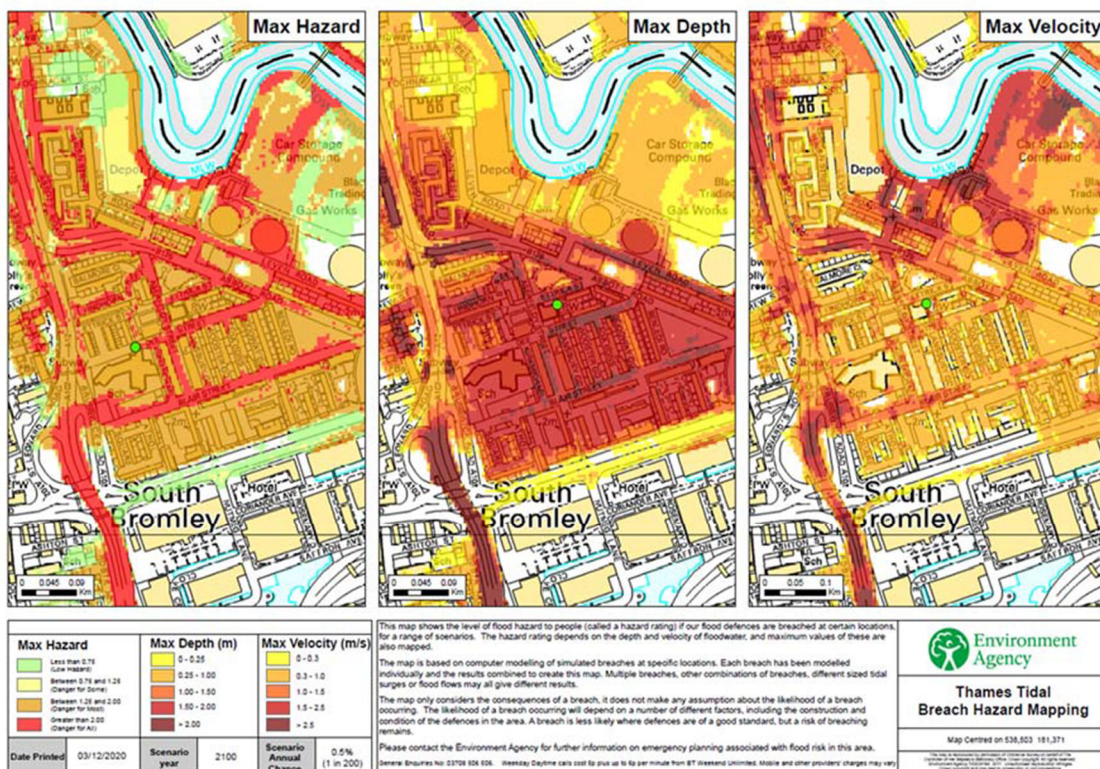


Figure 18 – River Thames Hazard Mapping Breach (2100). Tidal Upriver Breach Inundation Modelling Study 2017

4.5 Surface Water Flooding

Pluvial flooding occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems. This flood water would then be conveyed via overland flow routes dictated by the local topography.

Appendix A, Map 006, of the SFRA indicates that the site is located within a Critical Drainage Area.

The Flood Risk from Surface Water map (**Figure 19**) shows the majority of the site to be at very low risk of flooding from surface water, with the site access roads identified as being at increased risk.

Potential flood depths along the site access roads for the low, medium and high risk events are presented by **Figure 19**. Flood depths are shown to be approximately 300 mm, with the exception of the A12 underpass where flood depths are expected to exceed 900 mm.

It should be noted that the modelling approach used to generate the Flood Risk from Surface Water map generally underestimates the capacity of urban drainage networks. It is typically assumed that drainage networks provide a surface water removal rate of 12 mm per hour, equivalent to 33 litres per second per hectare of impermeable area. As such, it is likely that the Flood Risk from Surface Water map overstates the risk of flooding at the site from this source.

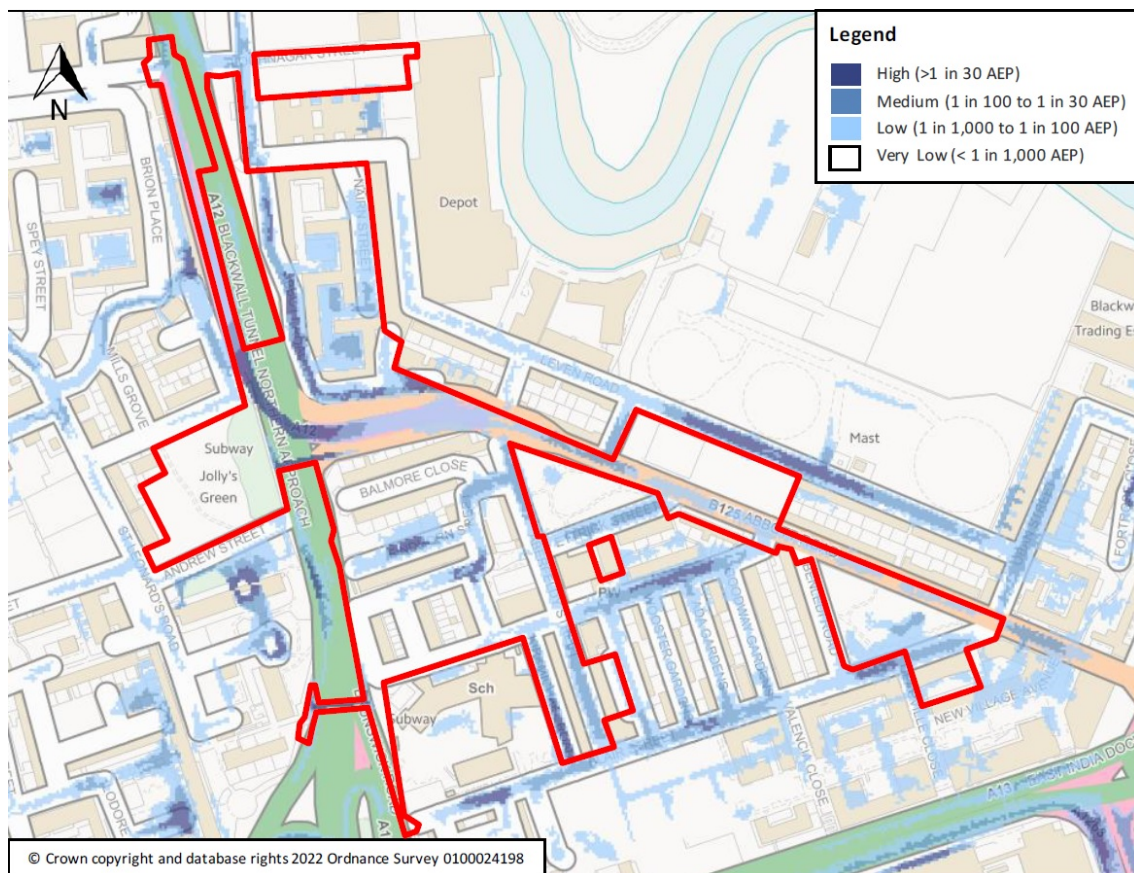


Figure 19 – EA Flood Risk from Surface Water

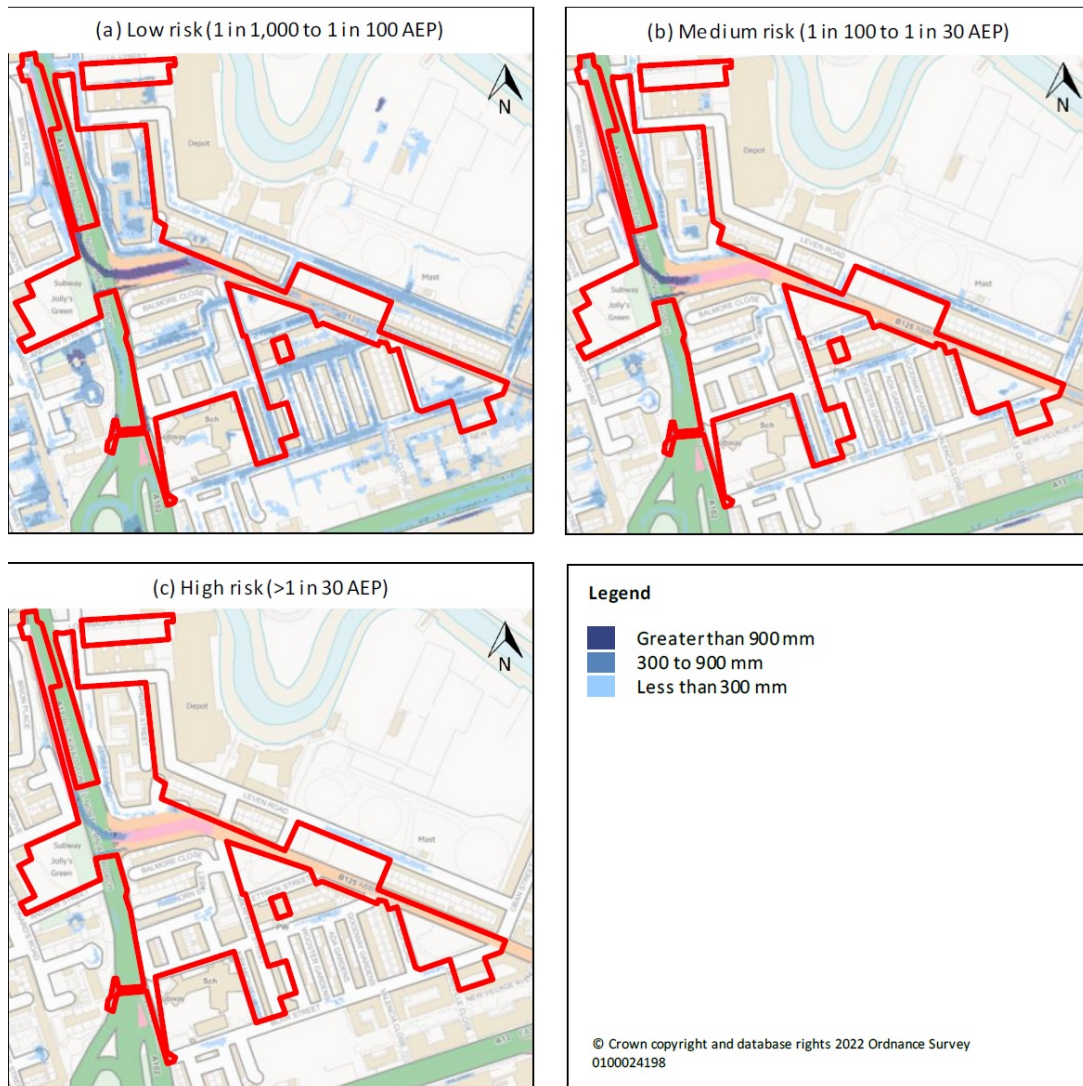


Figure 20 – EA Flood Risk from Surface Water - Depth

In Abbot Road the existing properties are at high risk of surface water flooding with a water depth less than 300mm as shown on **Figure 20**. The reason is that there are overland surface water flows coming from the northwest into the site (Blackwall Tunnel Northern Approach, Bromley Hall Road, Abbot Road) as indicated on the Environment Agency surface water velocity map (**Figure 21**).

The surface water runoff is currently channelled along Abbot Road between the existing buildings and retaining walls. The development proposals will minimise the risk of surface water flooding providing a wider area between existing and proposed buildings to spread overland surface water flows without affecting properties and reducing water depth for all exceedance storm events.

Refer to Meinhardt’s Aberfeldy Village Drainage Strategy report and Overland Flow Routes Map



Figure 21 – EA Flood Risk from Surface Water Velocity Map

4.6 Sewer Flooding

The existing sewer system in London was constructed in the 19th century. The sewer system consists of combined sewers which were initially designed to collect foul waters only. However, the spare capacity of the sewers at the time and surface water flood risk incidents, resulted in a decision to use the sewers, also for the collection of surface water. Six main interceptor sewers were built and fed by 450 miles of main sewers and 13,000 miles of local sewers which historically discharged into the River Thames.

In the LB of Tower Hamlets the sewer network is a largely combined foul and surface water system managed by Thames Water. The combined sewers have brickwork culverts which outfall into the River Thames. Based on present day forecasting for heavy rainfall events, it is predicted that the culverts only have capacity for the 1 in 10 annual probability flood event. Additionally, any new surface water sewers have been designed to hold the 1 in 30 annual probability flood event. Subsequently, London experiences flooding as a result of a lack of sewer capacity, although they are generally of small consequence (mainly flooding of roads). However, climate change will result in summer storms increasing in frequency, and winter storms becoming more prolonged. This means that the current standard of protection for the existing sewer system will be reduced and more frequent localised flood events, as a result of sewer flooding, can be expected.

The data provided by Thames Water shows postcodes where properties are known to have experienced sewer flooding. The majority of the incidents of sewer flooding are clustered in the north of the borough around Bow and Victoria Park - post codes E3 2, E3 5, E9 5 and E9 7. The relatively high number of incidents reported in post code areas E3 2 and E3 5 may be the result of a shallow gradient drainage network. There are recorded 3no internal sewer flood records at the site post code E14 0.

The sewer system was not modelled for the SWMP explicitly hence interaction between the sewer system and surface water modelling was not investigated.

Sewer flooding generally results in localised short-term flooding caused by intense rainfall events overloading the capacity of the sewers. Flooding can also occur as a result of a blockage, poor maintenance or structural failure.