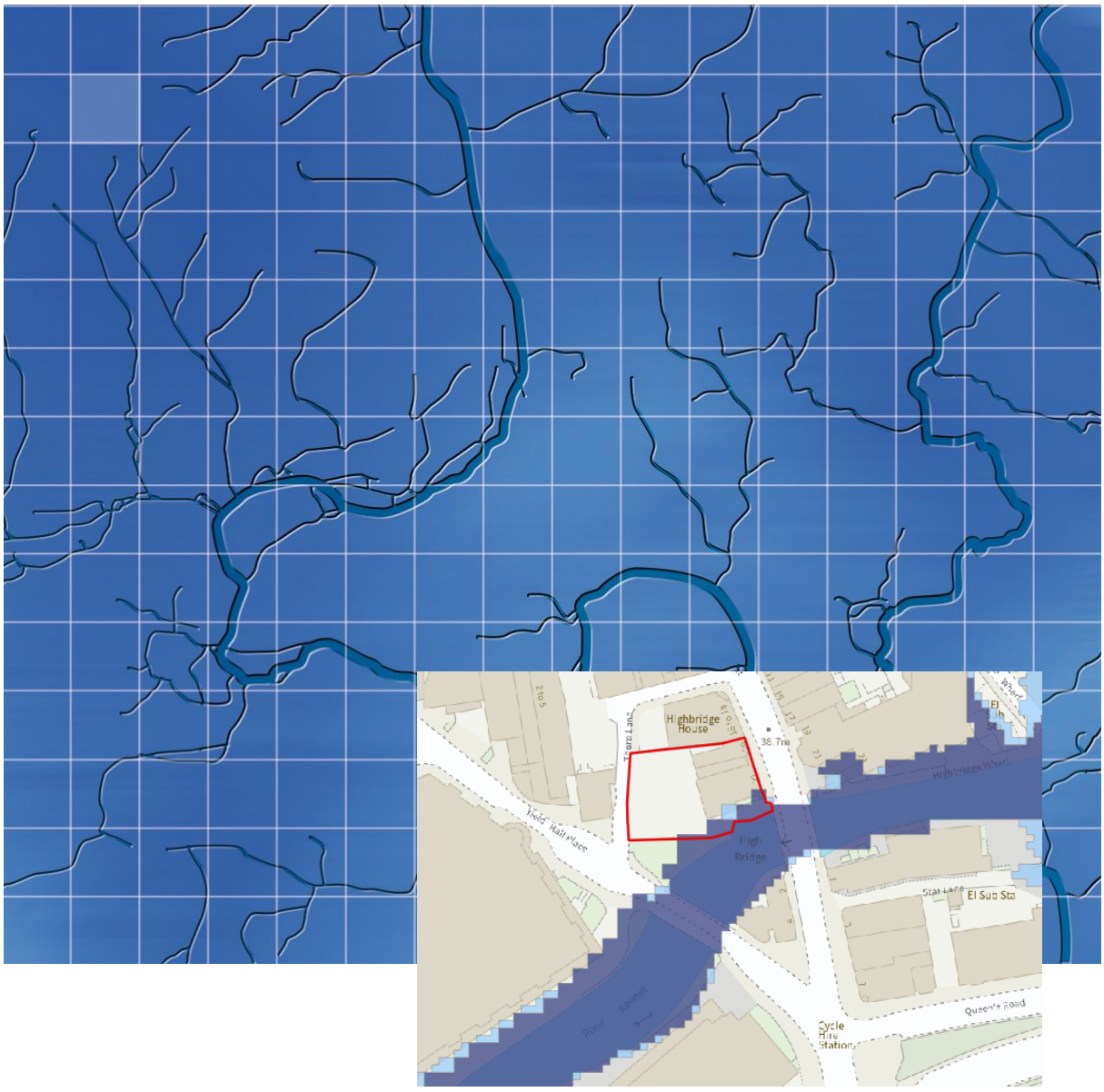
Reading Borough Council

May 2025

20-22 Duke Street (CR14s)

Level 2 Strategic Flood Risk Assessment



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For and on behalf of Wallingford HydroSolutions Ltd.

The WHS Quality & Environmental Management system is certified as meeting the requirements of ISO 9001:2015 and ISO 14001:2015 providing environmental consultancy (including monitoring and surveying), the development of hydrological software and associated training.

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20-22 Duke Street (CR14s) Level 2 SFRA
Flood Risk Overview

Fluvial Flood Risk	**M**
Pluvial Flood Risk	**M**
Other Sources of Flood Risk	**M**
Confidence in Assessment	**M**

Flood Risk

Fluvial flood risk represents the greatest risk to the site, with 22% of the site located within Flood Zone 2.

In the location of the site the latest Flood Map for Planning is based on national scale modelling. However, the River Kennet model (Tyle Mill to Thames Confluence) (2018) which informed the previous flood map was assessed to attain further detail on fluvial flooding. Whilst it shows significant flood depths and velocities at the site, these are mostly limited to the river channel. In this respect fluvial flood risk is considered to be moderate.

It should be noted that pluvial flooding is also significant at the site. It shows greater extents for the higher order 1.0% AEP and 0.1% AEP events than fluvial flooding. However, based on the national mapping, flood depths are below 0.2m. Overall, it has been classified as a moderate risk. The risk from other sources of flooding is considered to be low.

The overall confidence in the assessment is moderate. Whilst detailed modelling is available it does not inform the latest national scale mapping.

Conclusions and Recommendations

The development proposed is categorised as More Vulnerable Development, which is permissible in Flood Zone 2, but needs to pass the Exception Test to justify development in Flood Zone 3a. More vulnerable development is not permissible in Flood Zone 3b.

As only a small proportion of the site is located in Flood Zone 3a with the majority of its area falling in Flood Zone 1 a residential development should be possible. There is areas at pluvial flood risk also which need to be considered when locating infrastructure, however these are not considered to be a significant barrier to development.

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1 Introduction

1.1 Background

Wallingford HydroSolutions Ltd has been commissioned by Reading Borough Council (RBC) to undertake a Level 2 Strategic Flood Risk Assessment (SFRA) at 20-22 Duke Street (CR14s) in accordance with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and associated guidance from the Environment Agency (EA).

Where there is a risk of flooding at the site, this risk has been quantified with the latest available datasets and any associated limitations with the assessment have been identified.

Where applicable, recommendations for improving our understanding of flood risk and/or mitigating the risk has also been included in this report.

1.2 Assessment of Flood Risk

For the site, a detailed assessment of the nature of flood hazard was undertaken. This included using the relevant fluvial modelling data to assess:

- The proportion of the site inundated for a range of return periods
- The speed of onset
- Flood depth
- Flood velocity
- Flood Hazard

The sites were assessed against a range of return periods, however the design event, the 100-year (plus central climate change) event, was considered most important for planning purposes.

In addition to the analysis of modelling data, the location, standard and condition of existing flood defences was assessed. Other sources of flooding were also reviewed at each site. This included an assessment of surface water flooding and an assessment of groundwater flooding based on available hydrogeological information from BGS and Soilscapes. Potential access/egress routes were identified with respect to the risk posed from all sources of flooding.

Following a review of flood risk, flood defences and the identification of access/egress routes, an assessment was made on whether a future site-specific FRA would be able to show that the site can be allocated for development. The assessment takes into account the flood risk vulnerability of the development, the scale of development proposed along with any requirements for the Exception Test. In this context, any mitigative actions in the form of ground raising and compensatory storage are identified.

The site assessments also include guidance for the preparation of FRAs, including information about the use of SuDS.

1.3 Report Structure

This FRA follows the structure summarised below:

1 - Introduction (this section)

2 - Site Description

3 - Flood Risk

4 – Detailed Review of Primary Flood Risk

5 – Development Viability and FRA Recommendations

2 Site Description

2.1 General Location Plan

20-22 Duke Street (CR14s) is located in central Reading adjacent to the River Kennet. The 0.08 ha site houses a disused building that faces onto Duke Street, see Figure 1. The surrounding land use is urban.

In the Replacement Local Development Plan (RLDP) it is proposed to be used for a residential development of between 12 and 18 dwellings.

2.2 Topography

Based on 1m LiDAR data, the site is relatively flat, with a slight gradient towards the river in the southeast, see Figure 2. The ground levels within the site boundary range from 37.3 m AOD in the southeast to 38.8 m AOD in the northeast. The average ground level is approximately 38.0 m AOD.

2.3 Nearby Watercourses

The site is located on the left bank of the River Kennet. The River Kennet runs from southwest to east at this location. Holy Brook is culverted beneath much of central Reading but emerges and confluences with the River Kennet approximately 280 m northeast of the site. Figure 1 shows the location of these watercourses.

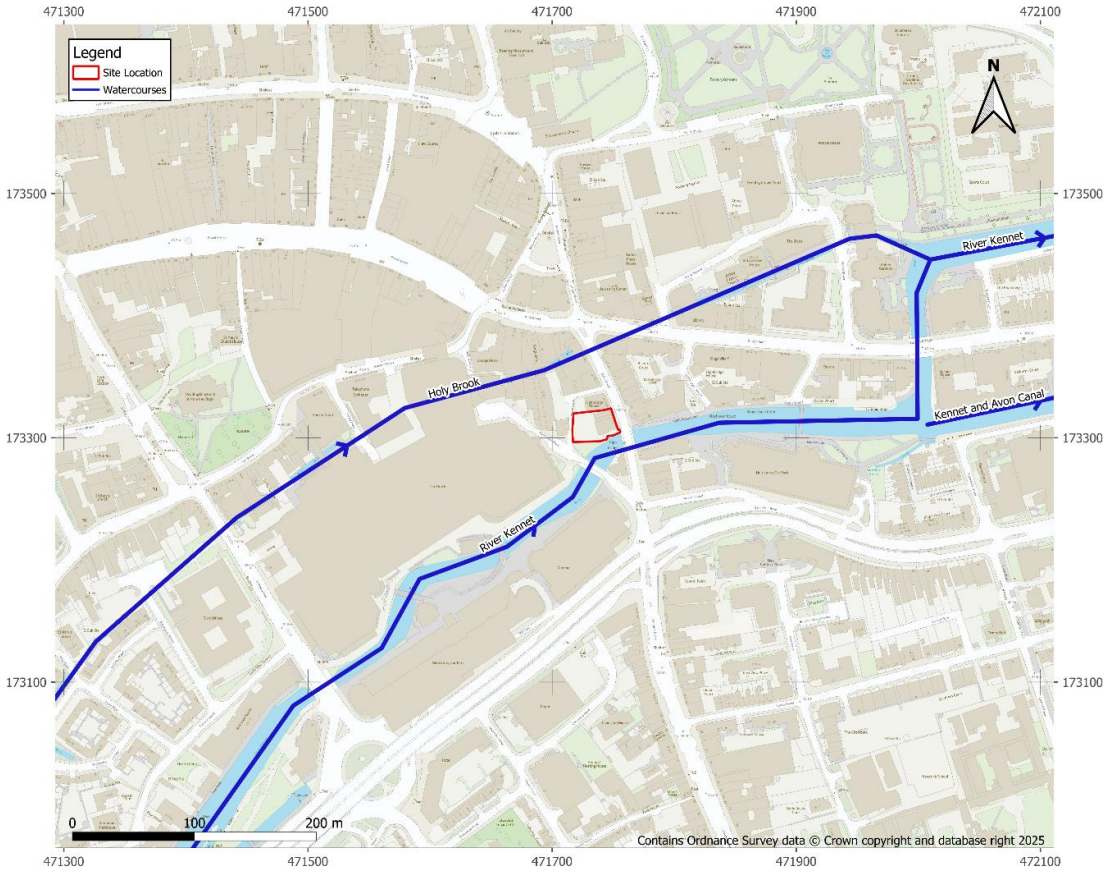

Figure 1 - Site Location

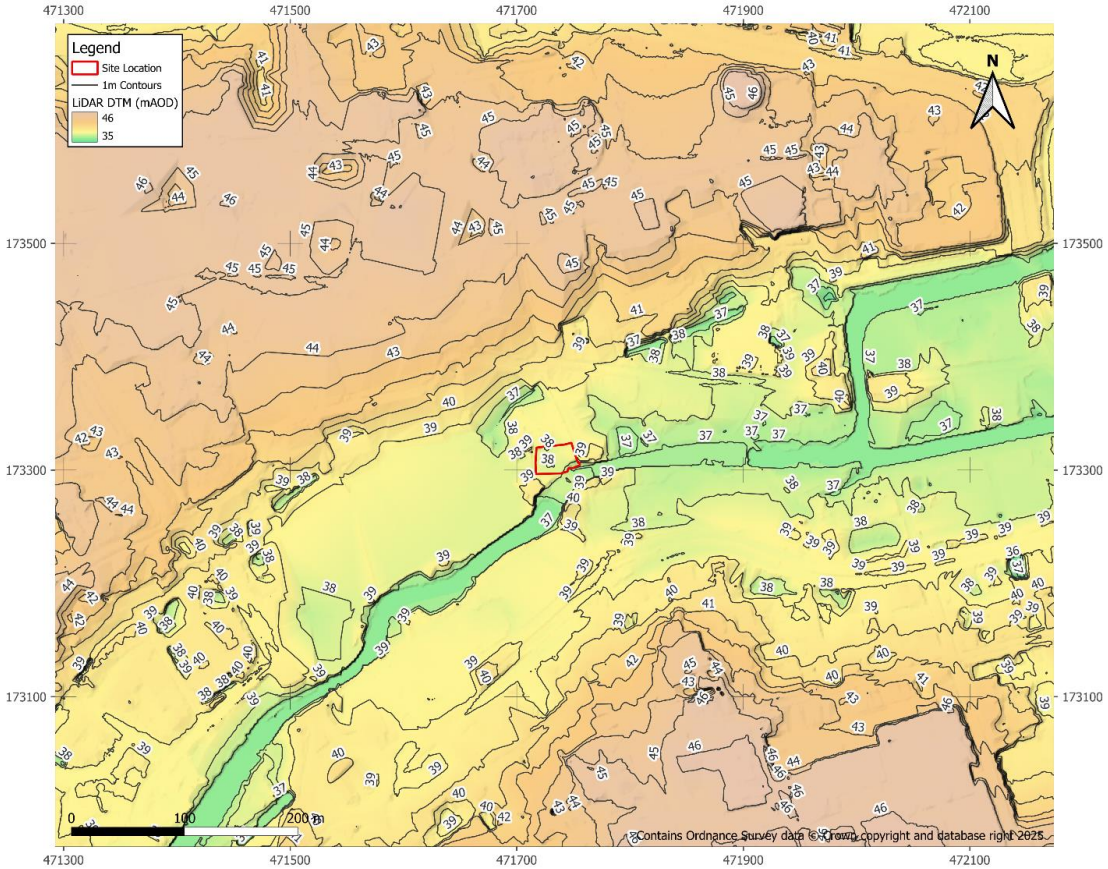

Figure 2 – Topography

3 Flood Risk

3.1 Historical Flooding

The EA does not hold any records of flooding occurring at the site. The closest recorded flood extent is located approximately 115 m downstream of the site along the River Kennet.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 12% of the site is located in Flood Zone 2, and 10% of the site is located in Flood Zone 3a. This inundation is confined to the area of the site closest to the River Kennet.

These proportions are based on the latest national scale modelling, rather than the River Kennet (Tyle Mill to Thames Confluence) (2018) model, which informed the previous iteration of the FMfP and the level 1 SFRA for Reading Borough completed in November 2024.

Viewing the 2018 model results when compared to the latest national scale modelling, similar extents were generated for Flood Zone 2 and Flood Zone 3a. The model also has results for the 3.3% AEP event equivalent to Flood Zone 3b, these show 3% of the site to be inundated during this event. All flooding at this site is associated with the River Kennet, see Figure 3.

The EA climate change fluvial outputs for Flood Zone 2 and 3 have also been assessed. The proportion of the Site located within Flood Zone 2 increases to 56% and the proportion of the site located in Flood Zone 3a remains 10%, see Figure 4. Similar extents were generated by the River Kennet (Tyle Mill to Thames Confluence) (2018) model.

Fluvial flood risk is considered to be moderate and is assessed in more detail in section 4.

3.3 Flood Defence Infrastructure

There is no formal flood defence infrastructure in the vicinity of the site. The site is not located within an area associated with a reduction in risk of flooding from rivers and sea due to defences nor is it located within a flood storage area.

3.4 Surface Water Flood Risk

The EA's surface water flood map shows 48% of the site within the 0.1% AEP extent and 12% is within the 1.0% AEP extent, see Figure 5. No part of the site is located within the 3.3% AEP extent. When considering the effects of climate change, the proportions increase to 55%, 22% and 12% respectively, see Figure 6.

Overall, the risk of surface water flooding is deemed to be moderate.

3.5 Groundwater Flooding

The site is underlain by a bedrock of chalk in the form of the Seaford Chalk formation. It is expected to permit high amounts of infiltration. Superficial deposits of Alluvium are also present at this site, these are also expected to be freely draining. The underlying soils are loamy and clayey floodplain soils which are also expected to have a naturally high water table.

Based on the data available the water table at the site could be mobile, translating to a moderate risk of groundwater flooding. More data is required at the planning stage to confirm this. However, given the site's location adjacent to a river, groundwater flooding is likely to be heavily correlated with fluvial flooding.

3.6 Reservoir Flood Risk

The FMfP shows that the site is not at risk from reservoir flooding during either scenario, see Figure 7.

3.7 Flood Warning Service

The site is located partially within the River Kennet at the Burghfield, Southcote, Coley and Holybrook EA Flood Warning Area.

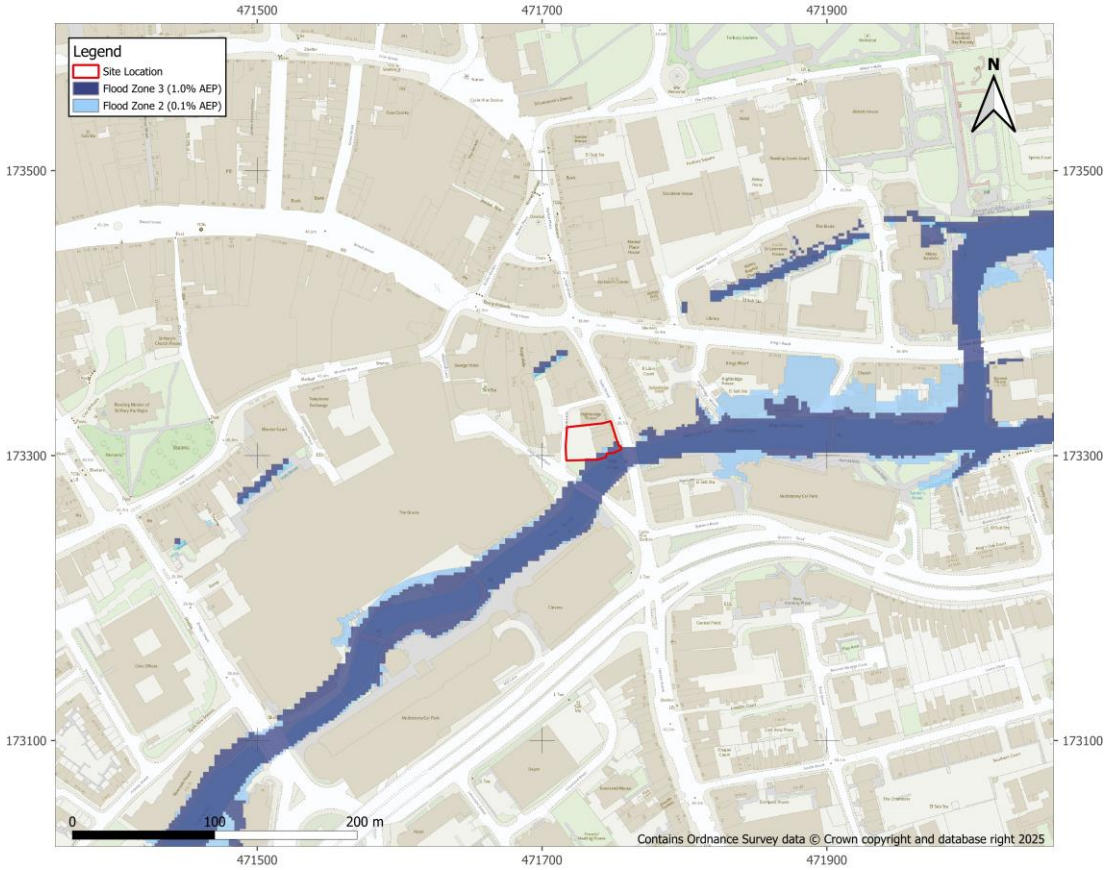

Figure 3 - Fluvial Flood Map

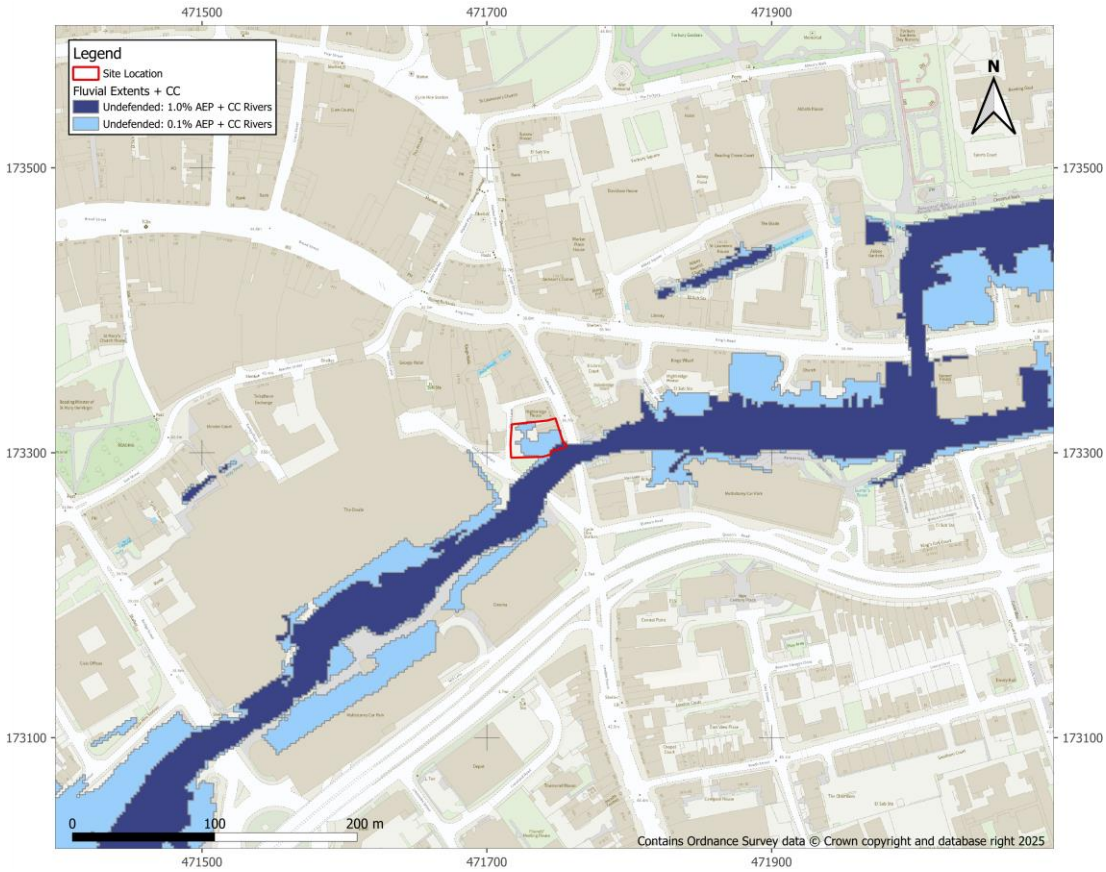

Figure 4 – Fluvial Climate Change Flood Map

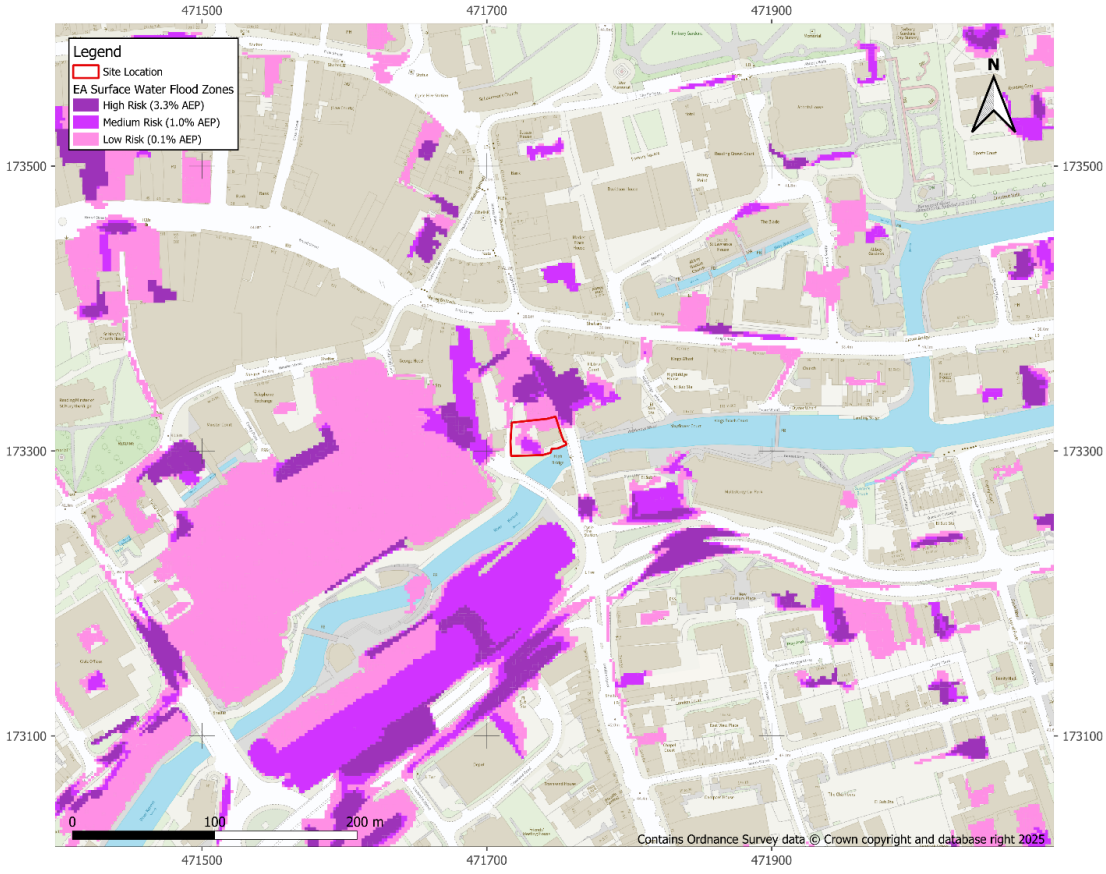

Figure 5 – Surface Water Flood Map

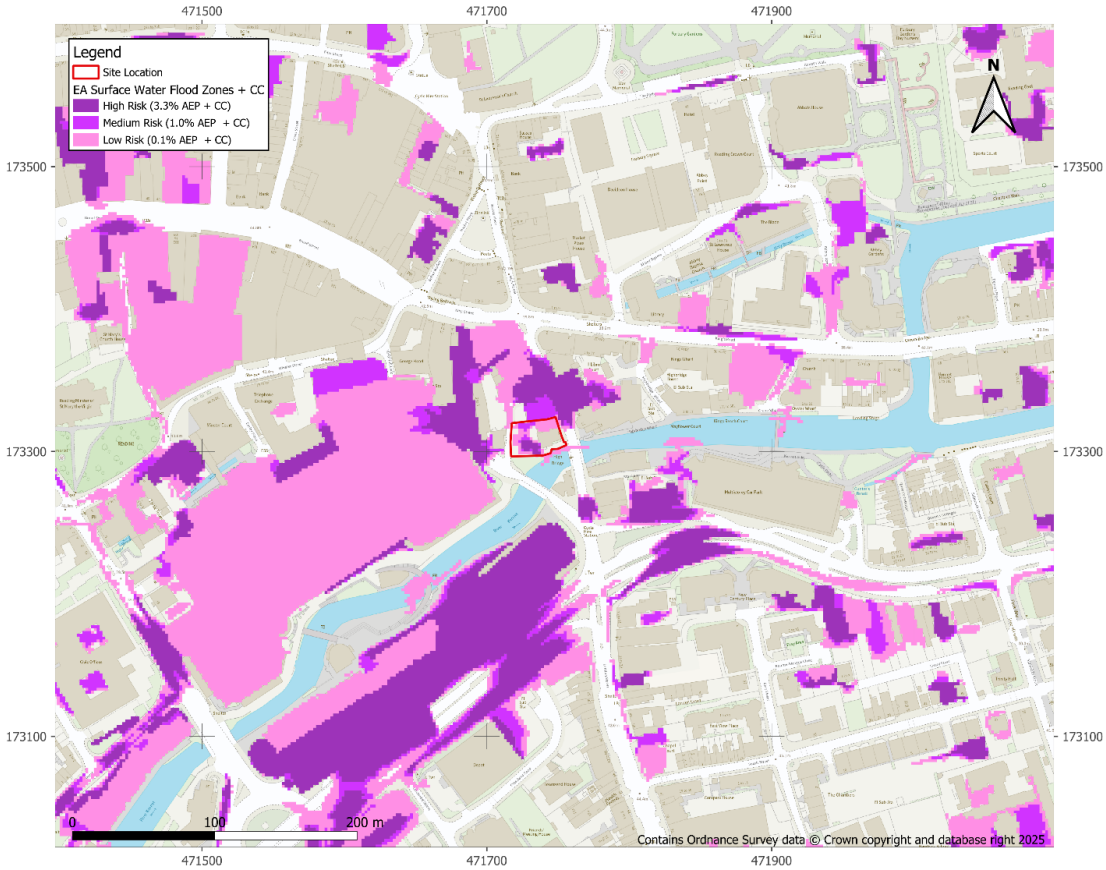

Figure 6 -Surface Water Climate Change Flood Map

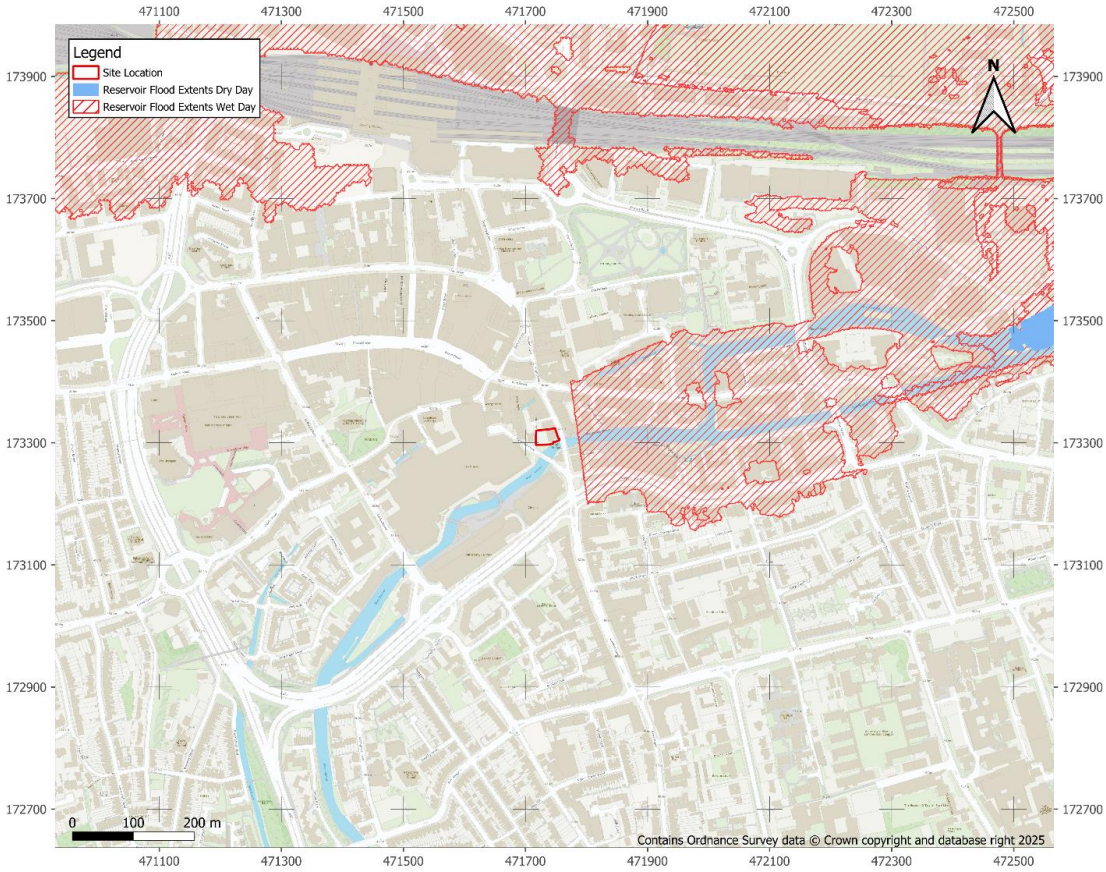

Figure 7 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

The primary flood risk mechanism at the site is fluvial in origin, however the risk of surface water flooding is similar and so is also assessed. The flood risk is quantitively assessed in more detail below.

4.2 Flood Risk Metrics

The national scale modelling does not provide details on flood depths, velocities, hazard or speed of onset. Therefore, the River Kennet model (Tyle Mill to Thames Confluence) (2018) was assessed to attain further detail on fluvial flooding.

For the 100-yr plus central climate change (21%) design event, the maximum flood level at the site is 37.4 m AOD, lower than the average ground level on the site. The hazard map for this event (see Figure 8) shows the limited area that is at risk to have a high hazard rating from *danger for most* to *danger for all*. It is expected that some of the modelled hazard values are in fact from the river channel rather than the site due to the resolution of the model grid. Given the location of the site relative to the River Kennet, speed of onset values are very fast (<1-hr) however as mentioned fluvial flood extents are limited to a small proportion of the site. Table 1 shows the flood risk metrics associated with the design event.

Table 1- Flood Risk Metrics

	Design Event 1.0% AEP (+21%)
Percentage Inundated (%)	10%
Average Flood Depth (m)	0.53 m (Max – 1.25 m*)
Average Velocity (m/s)	0.44 m/s (Max – 0.84 m/s*)
Speed of Onset (hrs)	<1 hr

**Maximum values may be taken from within the river channel.*

In terms of pluvial flooding, for the design 100-yr plus climate change event 22% of the site is flooded. The current extents are based on national scale mapping, velocity data is not available however depth banding is available. Across the majority of the site the depth banding is less than 0.2m depth, suggesting limited flood depths for the design event. The mapping shows flood risk to be largely focused in the south of the site. Based on the surface topography this appears to be associated with a small depression in this location.

4.3 Access and egress

Vehicle access to the site is from the west via Thorn Lane though pedestrians may also access the site directly from Duke Street to the east. During an extreme fluvial flood event, all roads around the site are at low risk of flooding. However, when also considering surface water flood risk the safest exit route from the site for both vehicles and pedestrians will be via Thorn Lane travelling south. To avoid areas of surface water flood risk, site users should continue south, crossing the River Kennet along Yield Hall Place to areas of lower flood risk.

Note, this route relies on the safety of the bridges crossing the River Kennet.

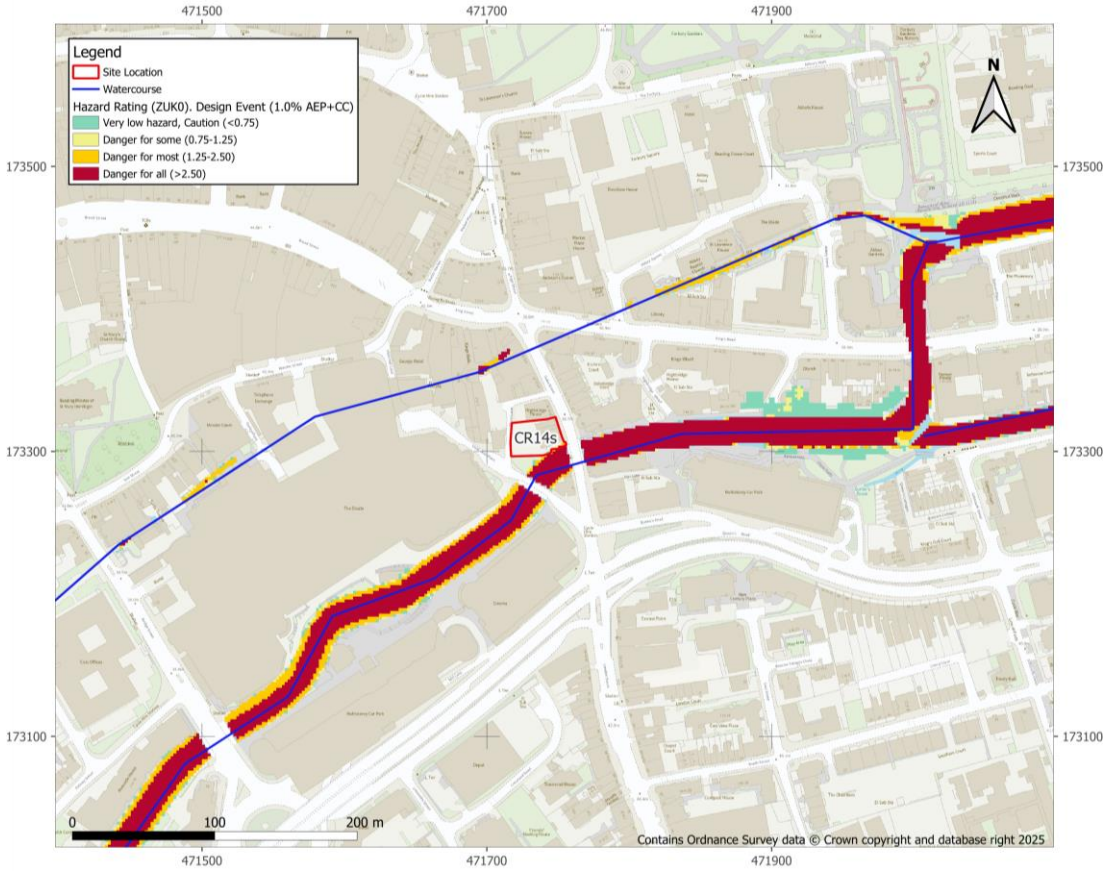

Figure 8 - Flood Hazard Map for the Design Event

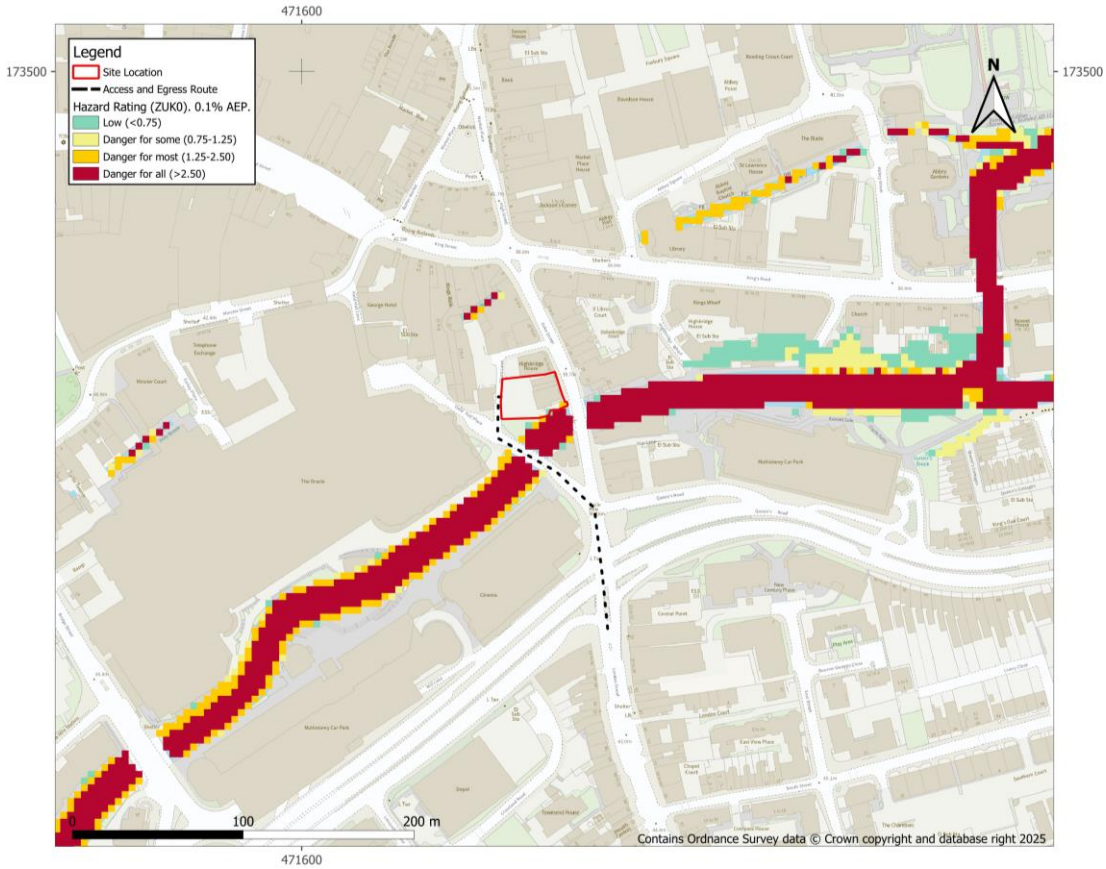

Figure 9 - Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

The development proposed is categorised as *More Vulnerable Development,* which is permissible in Flood Zone 2, but needs to pass the Exception Test to justify development in Flood Zone 3a. More vulnerable development is not permissible in Flood Zone 3b.

As only a small proportion of the site is located in Flood Zone 3a with the majority of its area falling in Flood Zone 1 a residential development should be possible. There is areas at pluvial flood risk also which need to be considered when locating infrastructure, however these are not considered to be a significant barrier to development.

5.2 Scale of Development

The total site area is currently 0.08 ha; allocated for residential development between 12 and 18 dwellings. It is assumed that given the scale of the development it is likely to cover the majority of the site area. To reduce the impact on floodplain storage, building footprints and infrastructure should be sited outside of the small area lying within the modelled design flood extent. This should in turn reduce the need for compensatory storage which could compromise the land available for development.

5.3 Sequential Approach

Whilst it should be possible to locate the majority of infrastructure in Flood Zone 1 it is important that a sequential approach is implemented at the site, prioritising more vulnerable residential development in lower flood risk areas with ancillary infrastructure such as car parks and green spaces located in higher flood risk areas if required. This is under the assumption that it does not increase flood risk elsewhere and is designed to be appropriately resistant and resilient to flooding. For this site it is recommended that the climate change extents are used, which more clearly show the graduation in flood risk across the site. Pluvial flood risk should also be used to inform the development layout with more vulnerable infrastructure located outside of high-risk areas.

5.4 Other Site-Specific Considerations

The pluvial flood risk at the site is considered to be moderate. A site-specific FRA should consider in more detail the nature of the surface water flood risk to determine how quickly it occurs and the degree of hazard on site. If new infrastructure is proposed, the drainage strategy for the proposed development should be suitably designed to manage additional runoff arising from the development and ensure that surface water flood risk at the site and to third party land is not increased.

In assessing and demonstrating the viability of any drainage solution for the site, a site-specific FRA should follow the non-statutory technical standards for SuDS and any relevant Local Authority Local Plan policies. The geology at the site is freely draining. However, the water table is likely to be high and at the same level as the river, therefore the significant use of infiltration SuDS solutions may not be possible. It is recommended that a geotechnical investigation is undertaken at this site to obtain further information relating to infiltration rates, this will confirm whether infiltration could be viable in some areas. Attenuated discharge to a watercourse or a sewer will also need to be considered as part of a site-specific FRA.