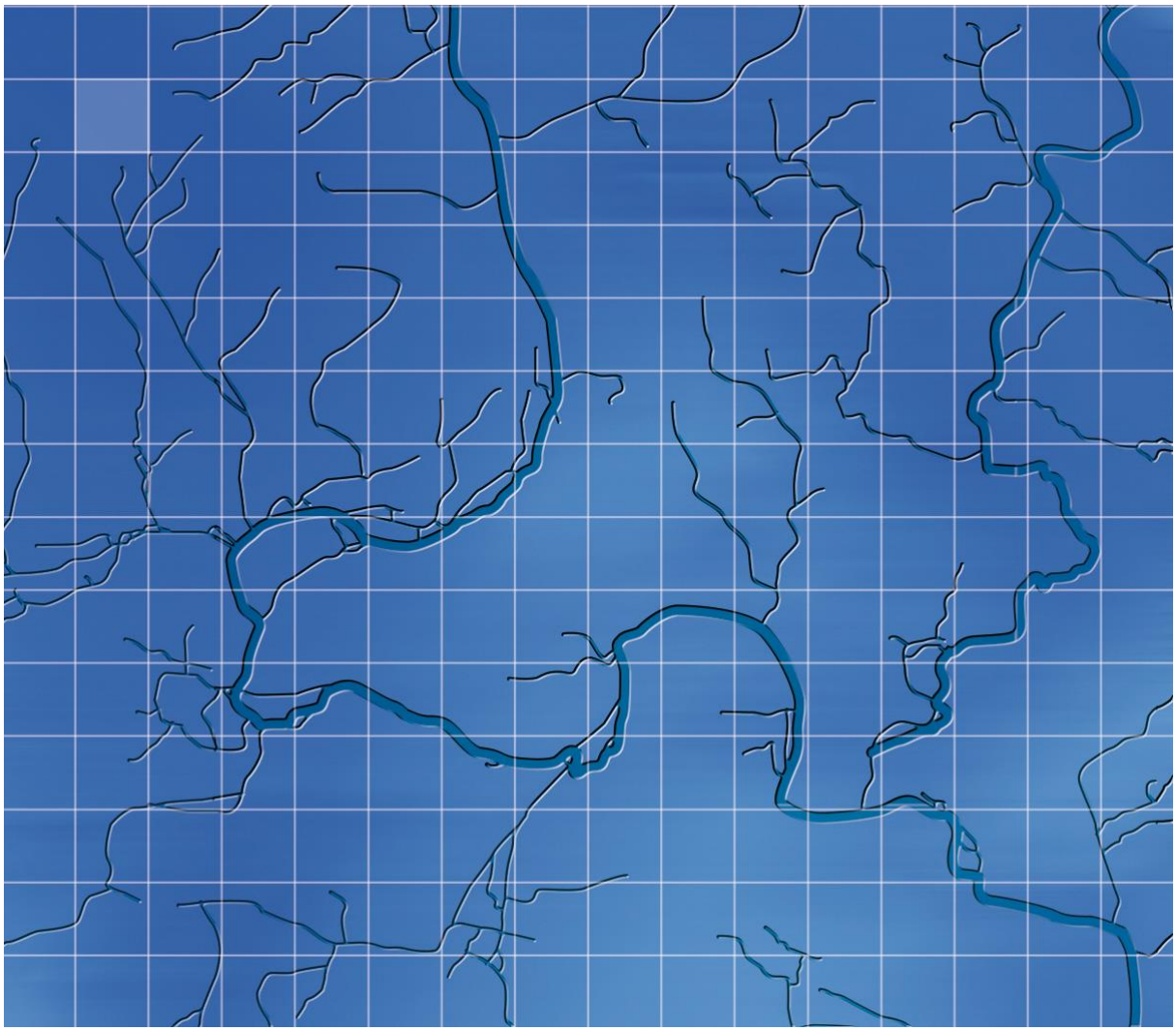
Oxford City Council

October 2025

Overflow carpark at Kassam Stadium (028b)

Level 2 Strategic Flood Risk Assessment



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Overflow carpark at Kassam Stadium (028b)Level 2 Strategic Flood Risk Assessment

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WHS10237

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1.0	17/10/2025	Draft	Tirion Lewis (*Graduate Consultant*)	Daniel Hamilton (*Principal Consultant*)

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Overflow carpark at Kassam Stadium (028b)Level 2 SFRA Flood Risk Overview

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

Flood Risk

The site is at risk of flooding from primarily fluvial sources.

The EA Flood Map for Planning shows 6% of the site is located within Flood Zone 2, 3.8% of the site is located in Flood Zone 3a and 0.4% of the site is located in Flood Zone 3b. The Risk of Flooding from Rivers and Sea (RoFRS) depth data shows inundation depths across the site vary between less than 0.2m up to 0.6m.

The risk from surface water flooding is considered low with only isolated areas on the site at risk.

The risk from other sources of flooding is considered to be moderate, due to a potential risk of groundwater flooding.

The overall confidence in the assessment is moderate. This is based on the fact that the EA's latest national scale modelling has informed the assessment of flood risk.

Conclusions and Recommendations

The development proposed is residential categorised as *More Vulnerable Development*. A sequential approach to the siting of the development should be used, with development prioritised first within Flood Zone 1 prior to consideration of any siting within Flood Zone 2 or 3a. The design must ensure that areas of the site that may be located within Flood Zone 3b in the future are avoided altogether.

As only a small proportion of the site is located in Flood Zone 2 and the design 1.0% AEP + CC extent, it should be possible to locate the majority if not all infrastructure within Flood Zone 1. In this regard development onsite should be possible.

It should be noted that parts of the access routes to and from the site are located within Flood Zone 2 and 3. Whilst access should be achievable this should be assessed in more detail as part of a site-specific FRA.

Contents

1 Introduction

1.1 Background

Wallingford HydroSolutions Ltd has been commissioned by Oxford City Council (OCC) to undertake a Level 2 Strategic Flood Risk Assessment (SFRA) at Overflow Carpark at Kassam Stadium (reference: 028b) 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

The Overflow carpark at Kassam Stadium site (028b) is 2.29 ha. It is located in the west of Blackbird Leys, see Figure 1. The current land use at the site is a carpark.

Proposed development at the site is residential housing with a capacity of 100 dwellings.

2.2 Topography

Based on 1m LiDAR data, the site slopes towards the southwest in the direction of the Littlemore Brook, see Figure 2. The ground levels within the site boundary range from 58.4 to 65.4 m AOD. The average ground level is approximately 61.5 m AOD.

2.3 Nearby Watercourses

Littlemore Brook, a tributary of the River Thames, flows from east to west along the southern boundary of the site, see Figure 1. It is joined by Northfield Brook just past the midway point of this boundary, see Figure 1.

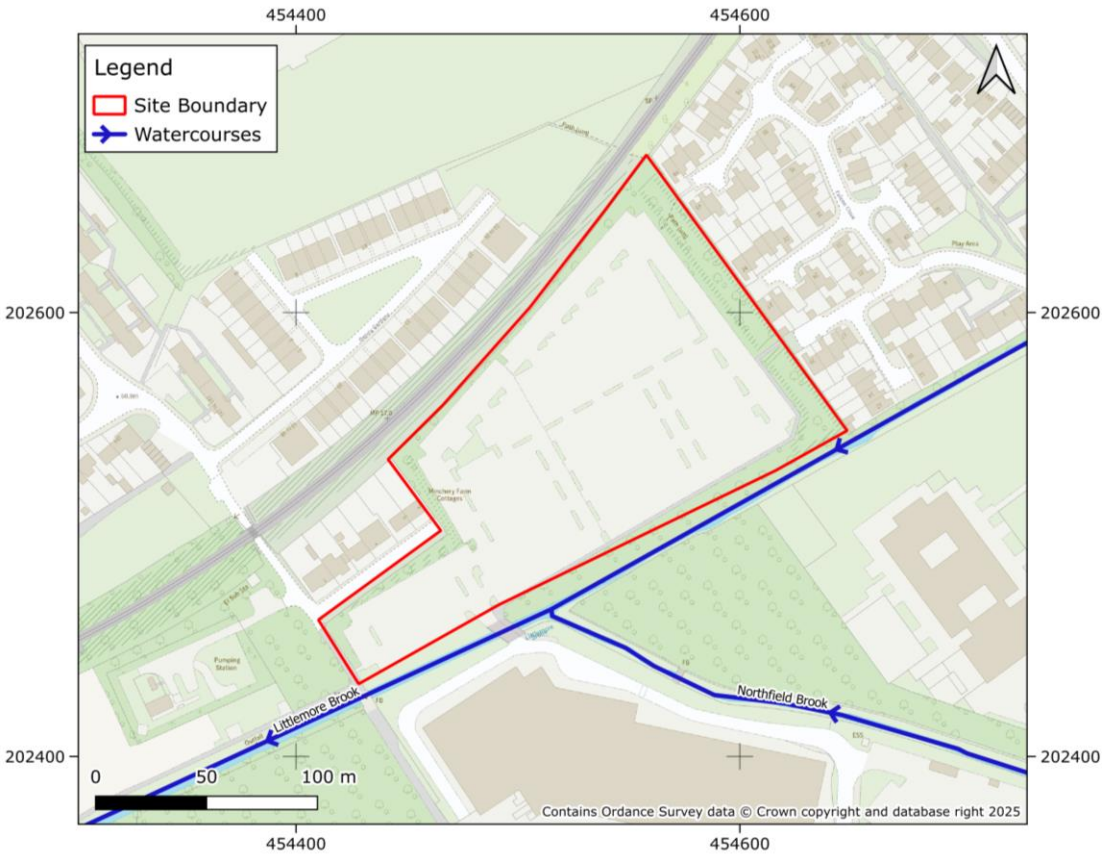

Figure 1 - Site Location

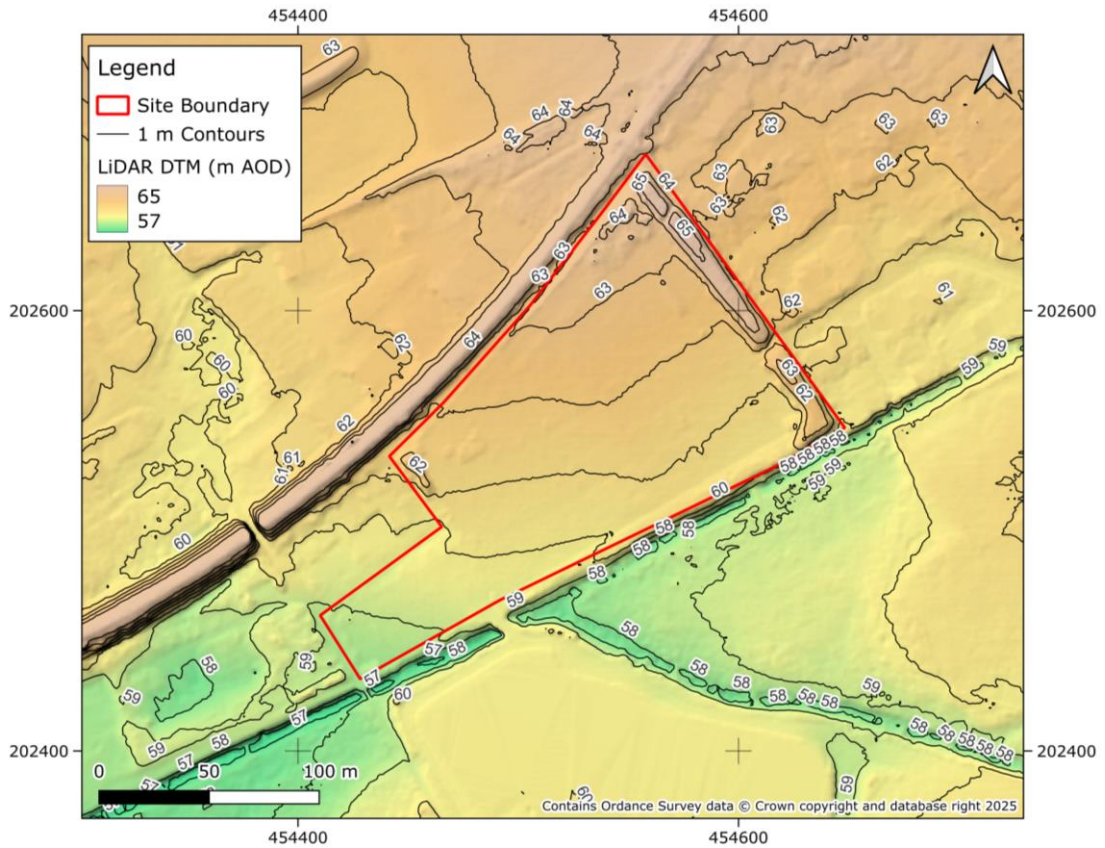

Figure 2 – Topography

3 Flood Risk

3.1 Historical Flooding

There are no recorded historical flooding events at the site

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 5.9% of the site is located within Flood Zone 2 (0.1% AEP), and 3.8% is located within Flood Zone 3a (1% AEP), see Figure 3. These Flood Zones consider the undefended scenario whereas Flood Zone 3b (3.3% AEP) considers the defended scenario. This extent shows 0.4% of the site to be located within Flood Zone 3b.

The EA climate change fluvial outputs for the 0.1% AEP and 1.0% AEP undefended extents have also been assessed, these show 8.8% of the site inundated during the 0.1% AEP event and 5.9% of the site inundated during the 1.0% AEP event. The climate change extent for the 3.3% AEP defended event was also assessed, it shows 4.2% of the site to be inundated, see Figure 4.

Fluvial flood risk is considered to be low across the majority of the site, however in the south west of the site the risk is considered to be moderate to high. It is assessed in more detail in section 4.

3.3 Flood Defence Infrastructure

There is no recorded flood defence infrastructure at the site.

3.4 Surface Water Flood Risk

The EA's surface water flood maps show 2.2% of the site to be inundated during a 3.3% AEP event, 2.5% is inundated during a 1.0% AEP event, and 3.0% is inundated during a 0.1% AEP event, see Figure 5. The surface water flood risk would mainly impact the south eastern edge of the site.

When considering the effects of climate change, the proportion of the site at risk for each event increases to 2.4%, 2.7%, and 4.3% respectively, see Figure 6.

Overall, the surface water flood risk to the site is low.

3.5 Groundwater Flooding

The site is underlain by sandstone in the form of the Beckley Sand Member. It is expected to permit moderate amounts of infiltration. The superficial deposits consist of a small section of alluvium containing clay, silt, sand and gravel located along the Littlemore Brook; these are expected to have variable permeabilities. The underlying soils are freely draining slightly acidic loamy soils.

Based on the data available the water table is expected to be mobile meaning that there may be a moderate risk of groundwater flooding, however more data is required at the planning stage to confirm this.

3.6 Reservoir Flood Risk

The site is not located within an area affected by reservoir flood risk, see Figure 7.

3.7 Flood Warning Service

The site is not located within an EA Flood Warning Area.

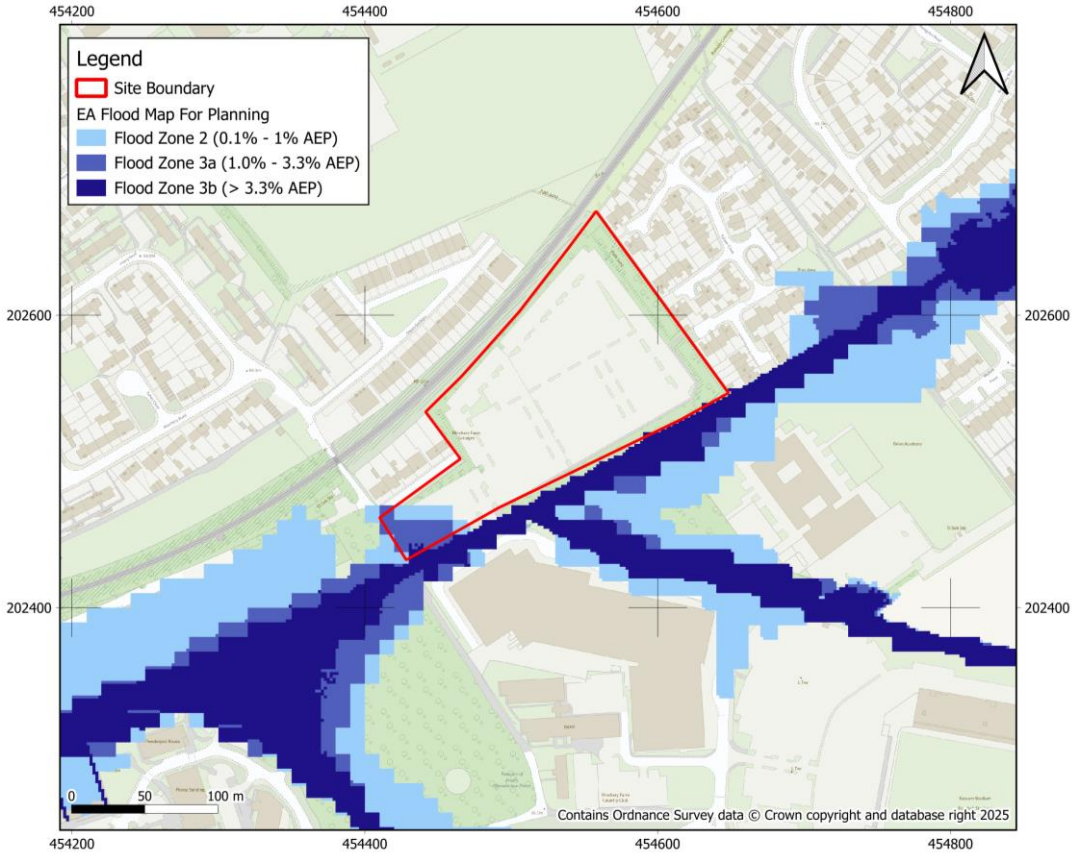

Figure 3 - Fluvial Flood Map

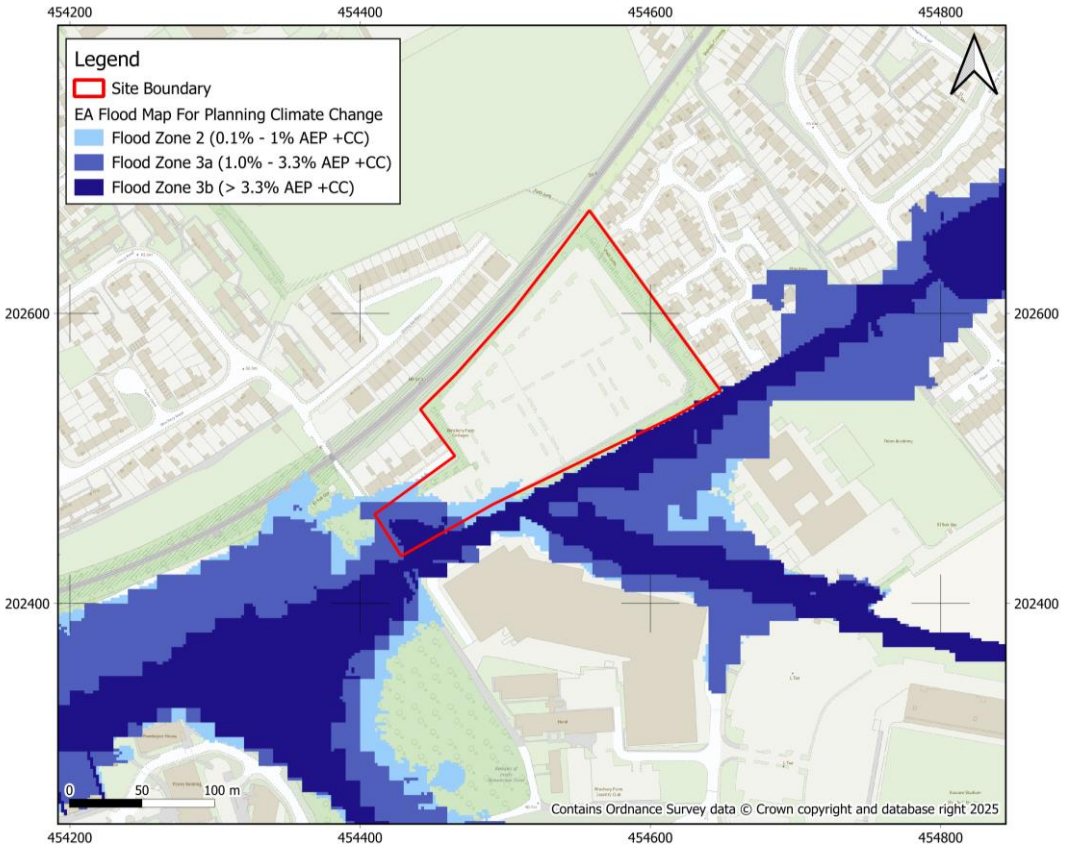

Figure 4 – Fluvial Climate Change Flood Map

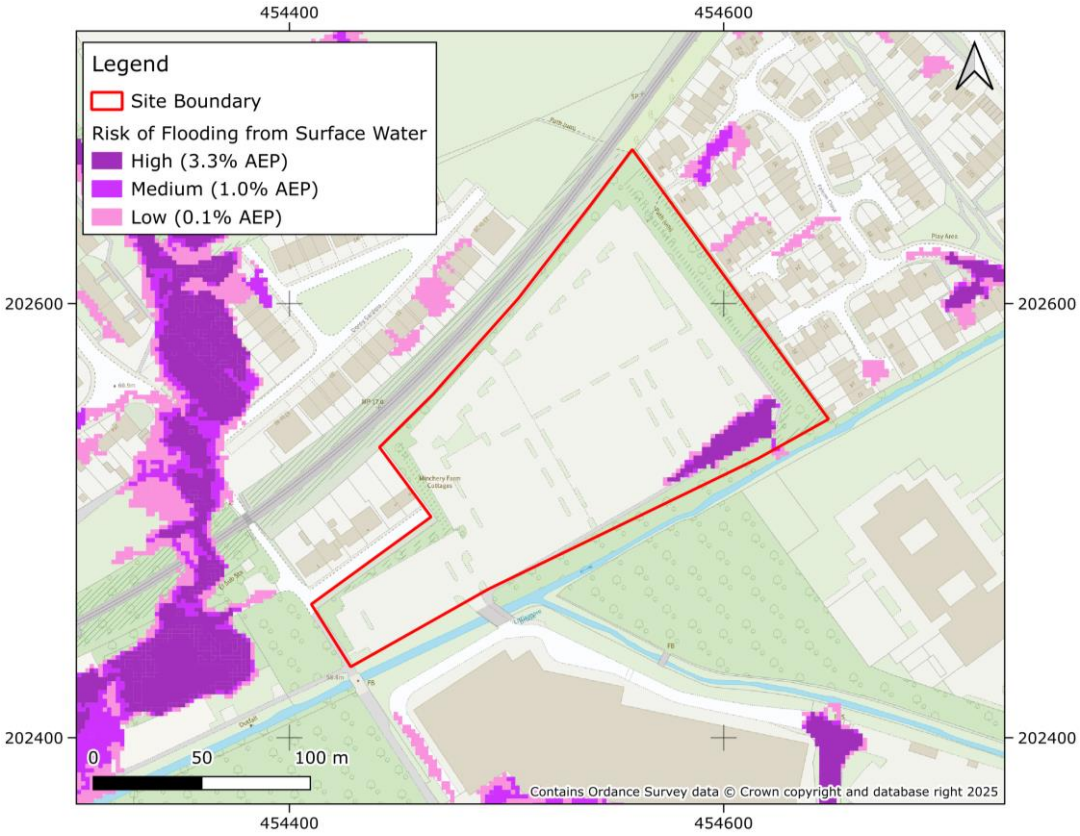

Figure 5 – Surface Water Flood Map

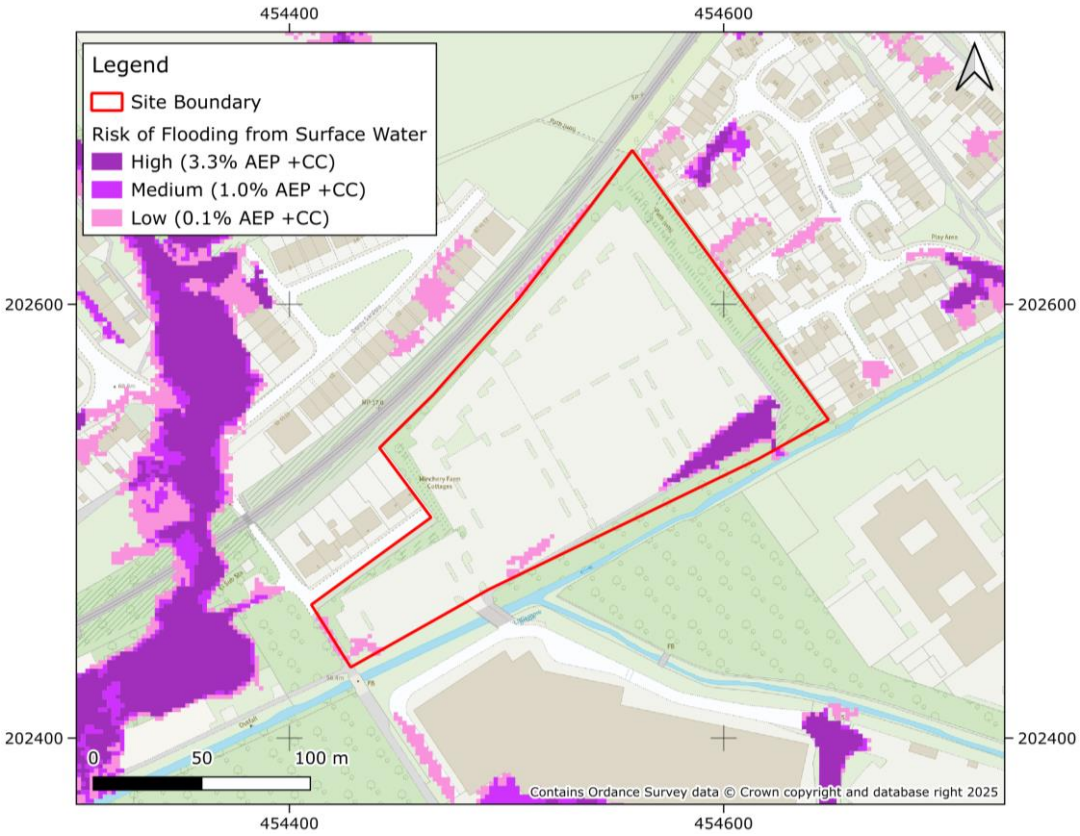

Figure 6 -Surface Water Climate Change Flood Map

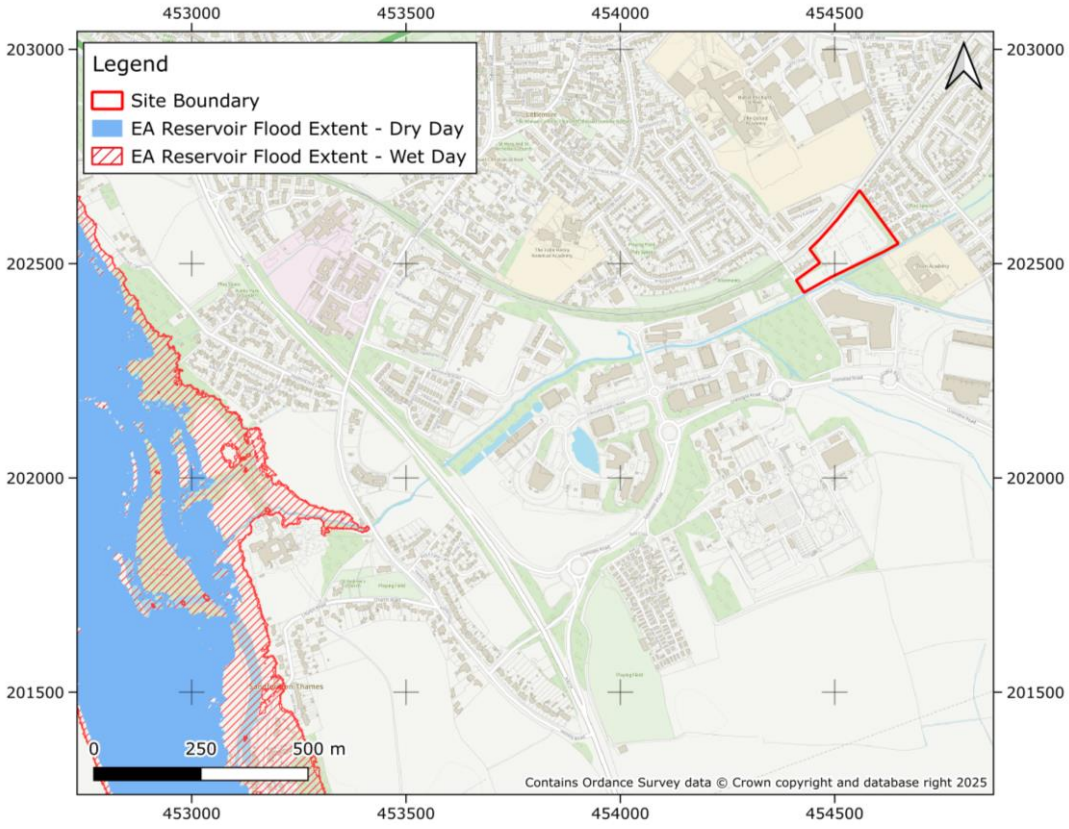

Figure 7 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

Fluvial flooding is the primary flood risk mechanism at the site and is assessed in more detail below.

4.2 Flood Risk Metrics

The Northfield Brook and Littlemore Brook Model (2011) was re-run as part of the previous SFRA for Oxford City in 2023. This was to obtain results applying the latest climate change allowances. These extents have been reviewed and are significantly reduced relative to the climate change extents shown in the latest national mapping (see Figure 4). Therefore, to ensure a precautionary approach the national mapping outputs have been assessed in more detail.

Depth data is not available for the climate change extents reviewed in section 3.2, these extents consider the 2080s epoch (2070-2125). However, depth data is available from the national mapping from the Risk of Flooding from Rivers and Sea (RoFRS) dataset. The climate change allowances used in RoFSW are based on the 2050's epoch (2041-2069) and reflect the median estimate of flow increases. The RoFRS extents are very similar to the extents applying the 2080s allowances, therefore are considered suitable for the purposes of this SFRA.

The depth mapping across the site (see Figure 9) shows flooding is limited mostly to the southwestern corner of the site, with approximately 5.8% of the total site area being inundated. Inundation depths within this area vary from less than 0.2m to 0.6m, with depths tending to fall moving away from the Littlemore Brook.

It should be noted that given the expected lifetime of the development, a site-specific FRA will need to consider the climate change impacts for the 2080's epoch (2075-2125).

4.3 Access and egress

Vehicular access and egress to and from the site should be possible along Priory Road which runs along the western site boundary, see Figure 10. Whilst the majority of this route lies in Flood Zone 1, early parts of the route are located in Flood Zone 2 and within the design 1.0% AEP + CC extent. Therefore, early flood warning will be vital to ensure that the access route can be utilised before it is inundated by floodwaters. There is a pedestrian route via a small footpath to the northeast of the site, it joins Falcon Close. Falcon Close lies in Flood Zone 1 but only allows travel southwards towards the flood extents of the Littlemore Brook.

The Littlemore Brook catchment is underlain by clay so is expected to have a reasonably fast response to rainfall. Flood warning will therefore be important. It should be noted that the site is not currently located within an EA Flood Warning Area. However, other areas of Oxford are located within flood warning areas and so Flood Warnings from these should be considered when assessing the need for evacuation from the site.

Once the development layout is known, a site-specific FRA should consider onsite routes across the site and any infrastructure or instructions to site users required to reach the proposed access route. The proposed route should also be reassessed in a site-specific FRA when all access points to the site are known, to ensure the route with the lowest hazard remains the same. It should also consider pluvial flood risk along any routes identified.

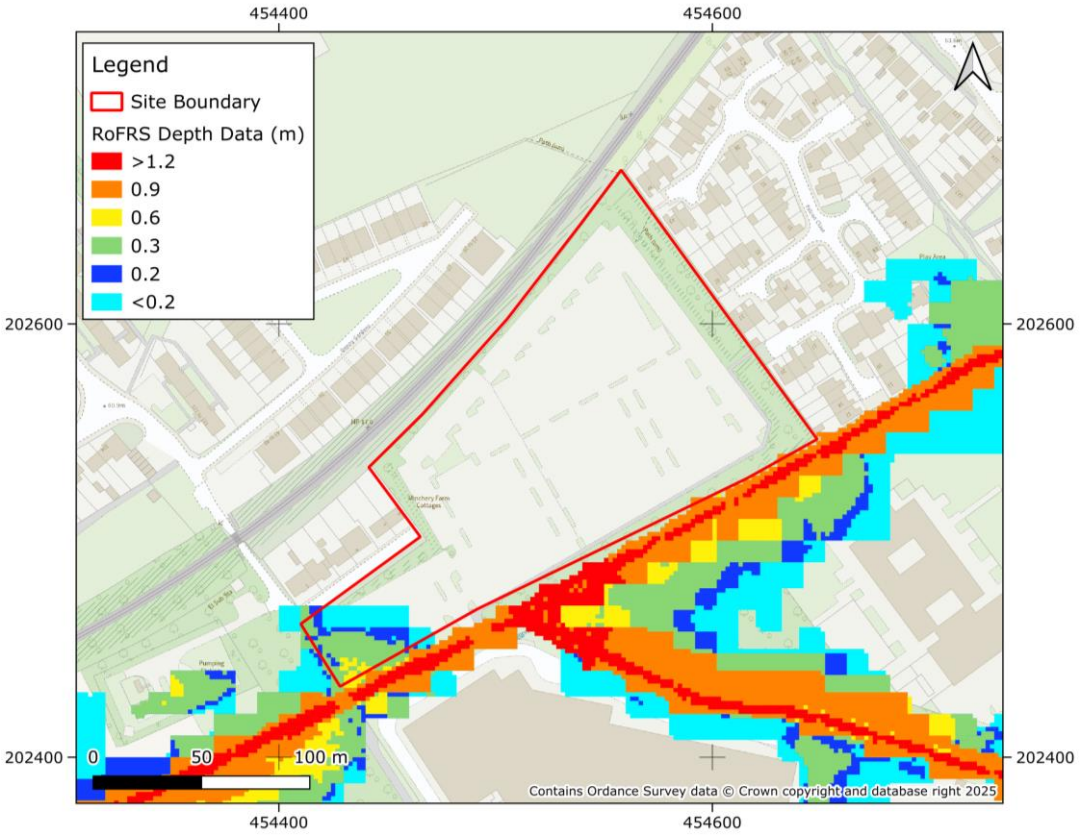

Figure 8 – RoFRS Depth Data for 1.0% AEP + Climate Change Event

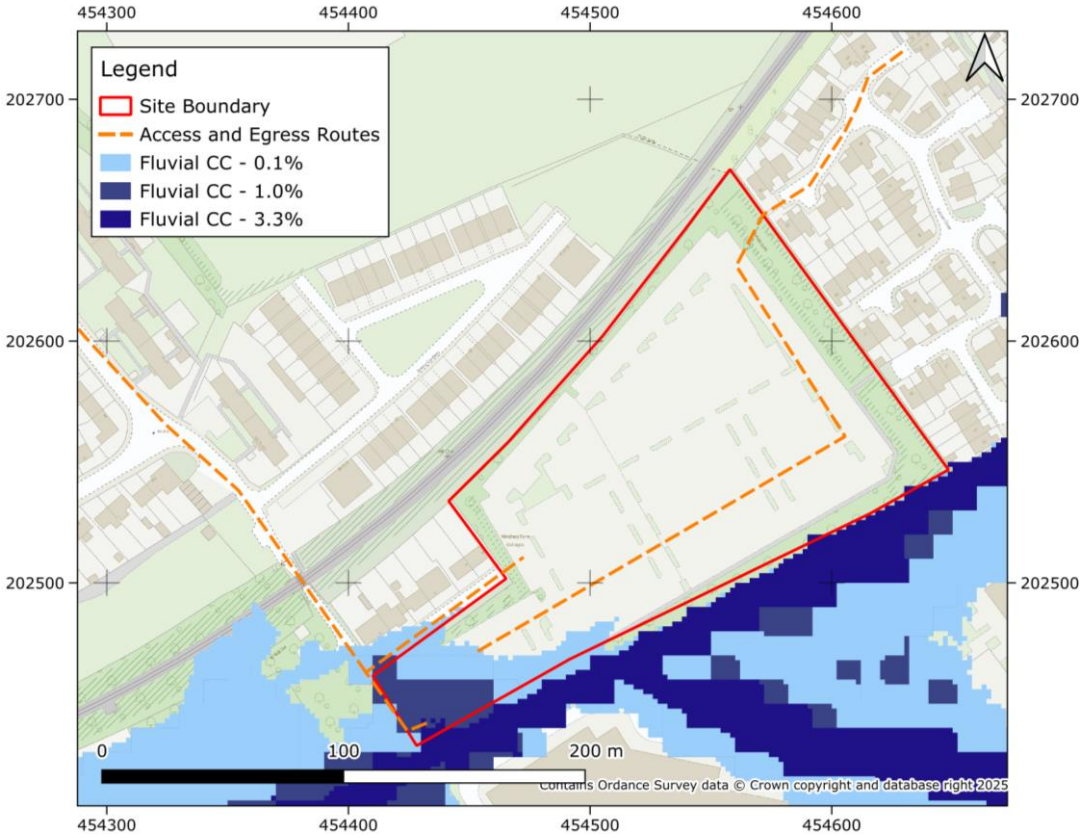

Figure 9 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

The development proposed is residential categorised as *More Vulnerable Development*. A sequential approach to the siting of the development should be used, with development prioritised first within Flood Zone 1 prior to consideration of any siting within Flood Zone 2 or 3a. The design must ensure that areas of the site that may be located within Flood Zone 3b in the future are avoided altogether.

As only a small proportion of the site is located in Flood Zone 2 and the design 1.0% AEP + CC extent, it should be possible to locate the majority if not all infrastructure within Flood Zone 1. In this regard development onsite should be possible.

It should be noted that parts of the access routes to and from the site are located within Flood Zone 2 and 3. Whilst access should be achievable this should be assessed in more detail as part of a site-specific FRA.

5.2 Scale of Development

The total site area is currently 2.29 ha; allocated for 100 dwellings. Assuming medium density housing (60 dwelling per hectare), 100 dwellings would require 1.70 ha of land.

In total approximately 9.3% of the site or 0.2 ha of land lies within the fluvial flood zones when accounting for climate change. The at-risk areas are concentrated in the southwest corner of the site. Therefore, it should be possible to locate all infrastructure in Flood Zone 1. This is provided there are no constraints (non-flood related) which require development to be located in at-risk areas. Even if this is the case, as stated above housing development is permissible in Flood Zone 2 without requirement for an exception test.

5.3 Sequential Approach

It is important that a sequential approach is implemented at the site, prioritising development in Flood Zone 1 wherever possible, followed by Flood Zone 2 and then Flood Zone 3a. No development should be located in Flood Zone 3b. If required more vulnerable housing development should be prioritised in lower flood risk areas with less vulnerable ancillary infrastructure (i.e. car parks, open spaces) located in higher flood risk areas if required. This is on the assumption that it does not increase flood risk elsewhere and is designed to be appropriately resistant and resilient to flooding.

Note, surface water flood risk is also present in a small area in the southeast of the site. Therefore, it should be used to inform the development layout with development located outside of high-risk areas if possible.

5.4 Other Site-Specific Considerations

Areas of surface water flood risk are present along the access routes. 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. 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 national standards for SuDS and any relevant Local Authority Local Plan policies. The geology at the site has moderate permeability, therefore the use of infiltration SuDS solutions may 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.