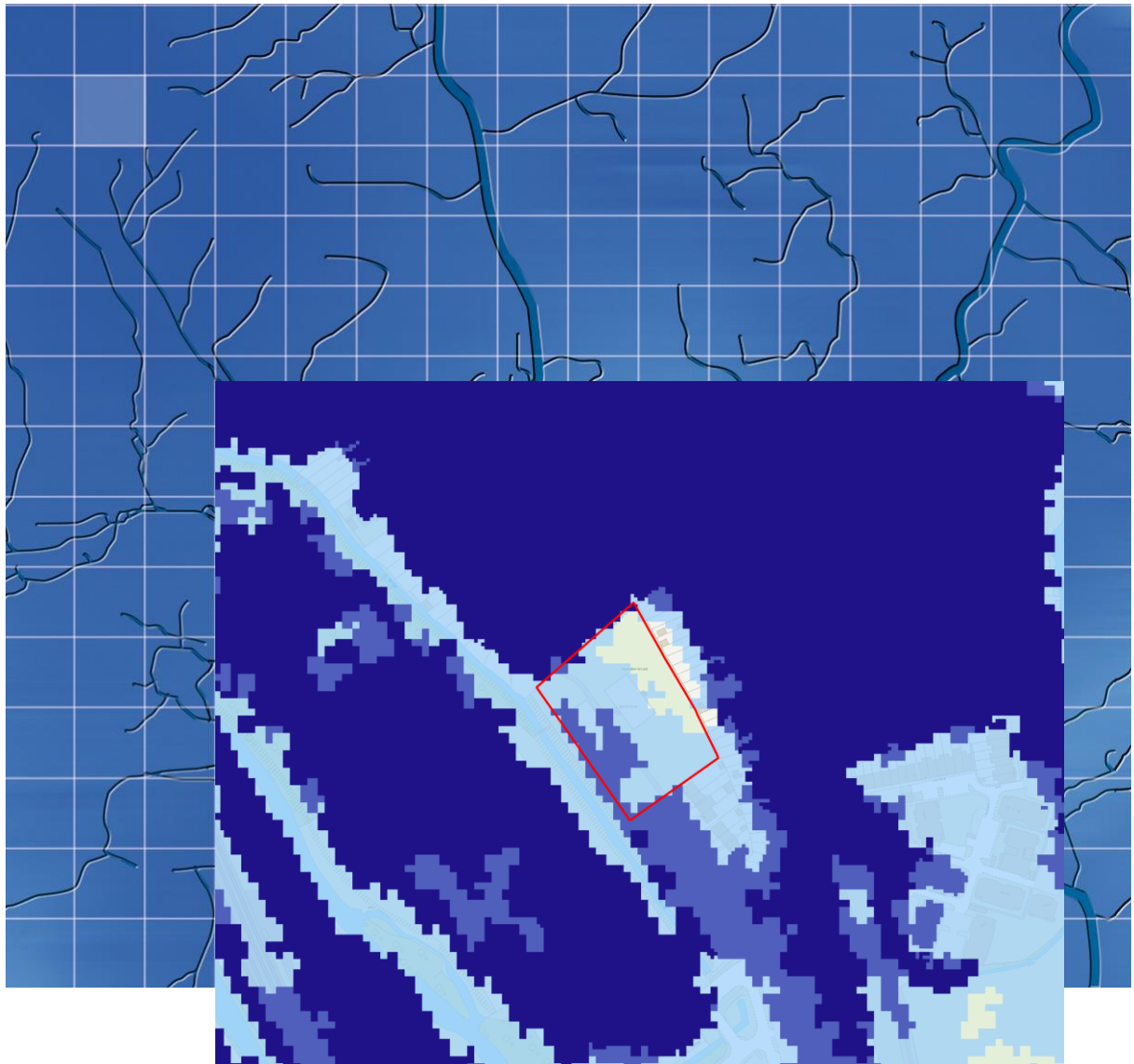


Oxford City Council

October 2025

Bertie Place Recreation Ground (008a)

Level 2 Strategic Flood Risk Assessment



WHS

Oxford City Council

Bertie Place Recreation Ground (008a)

Level 2 Strategic Flood Risk Assessment

Document issue details

WHS10237

Version	Issue date	Issue status	Prepared By	Approved By
V1.0	17/10/2025	Draft	Lloyd Prytherch (<i>Graduate Consultant</i>)	Daniel Hamilton (<i>Principal Consultant</i>)

For and on behalf of Wallingford HydroSolutions Ltd.

This report has been prepared by WHS with all reasonable skill, care and diligence within the terms of the Contract with the client and taking account of both the resources allocated to it by agreement with the client and the data that was available to us. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. This report is confidential to the client and we accept no responsibility of any nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.



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.



Registered Office Maclean Building, Benson Lane, Wallingford OX10 8BB
www.hydrosolutions.co.uk

Bertie Place Recreation Ground (008a) Level 2 SFRA

Flood Risk Overview

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

Flood Risk

The EA Flood Map for Planning shows 33.1% of the site is located within Flood Zone 2 (0.1% AEP), and 6.2% is located within Flood Zone 3a (1.0% AEP).

The River Thames Model (2018, re-run in 2023) 1.0% AEP + 26% CC design event extent covers 16.3% of the site area. Depths in the areas of inundation are generally less than 0.2 m, however in some areas exceed 0.6m. The design flood level at the site is 56.6 m AOD. Overall fluvial flood risk is considered to be moderate.

The risk from other sources of flooding is considered to be moderate.

The overall confidence in the assessment is high as a detailed hydraulic model has been used to inform the assessment of fluvial flood risk with the most up to date climate change allowances applied.

Conclusions and Recommendations

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 proposed development at the site is a housing development. Residential areas are classed 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.

It should be possible to locate the majority of infrastructure in Flood Zone 1 outside of the Flood Zone 2 extent and the design flood extent, negating the requirement for ground raising and compensatory storage.

Contents

1	Introduction	2
1.1	Background	2
1.2	Assessment of Flood Risk	2
1.3	Report Structure	2
2	Site Description	3
2.1	General Location Plan	3
2.2	Topography	3
2.3	Nearby Watercourses	3
3	Flood Risk	5
3.1	Historical Flooding	5
3.2	Fluvial Flood Risk	5
3.3	Flood Defence Infrastructure	5
3.4	Surface Water Flood Risk	5
3.5	Groundwater Flooding	5
3.6	Reservoir Flood Risk	6
3.7	Flood Warning Service	6
4	Detailed Review of Primary Flood Risk	10
4.1	Primary Flood Risk	10
4.2	Flood Risk Metrics	10
4.3	Access and egress	10
5	Development Viability and FRA recommendations	13
5.1	Development Categorisation	13
5.2	Scale of Development	13
5.3	Sequential Approach	13
5.4	Other Site-Specific Considerations	13

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 Bertie Place Recreation Ground (reference: 008a) 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 Soilscales. 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

Bertie Place Recreation Ground (008a) is a 0.67 ha site located in New Hinksey, in the south of Oxford, see Figure 1. Current land use at the site is for recreational purposes, with a children's play area and a sports court.

The proposed development at the site consists of redevelopment for residential purposes.

2.2 Topography

Based on 1m LiDAR data, the site is relatively flat, see Figure 2. The ground levels within the site boundary range from 55.8 to 57.0 m AOD. The average ground level is approximately 56.6 m AOD.

2.3 Nearby Watercourses

Redbridge Stream, which bifurcates from Hinksey Stream approximately 250m northwest of the site, flows from north to south parallel to the site's western boundary, see Figure 1. Hinksey Stream is located approximately 150m to the west of the site, whilst the River Thames is located approximately 200m to the east of the site.

Bertie Place Recreation Ground (008a) Level 2 SFRA

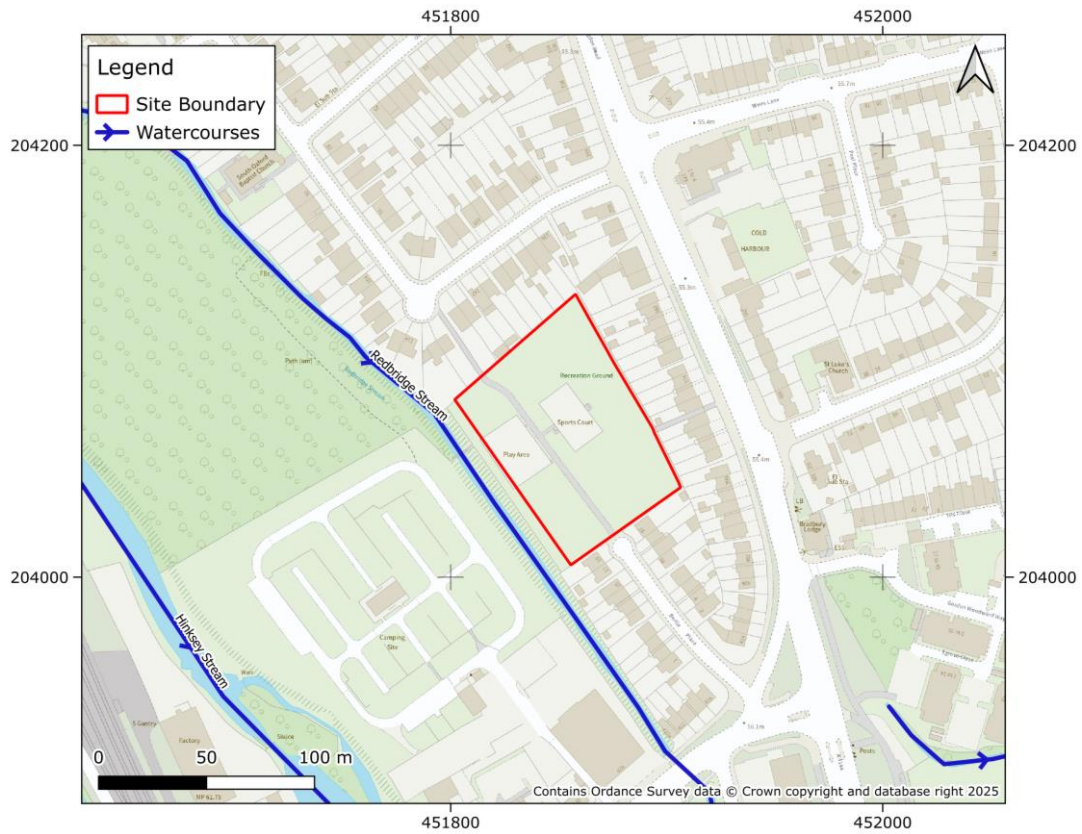


Figure 1 - Site Location

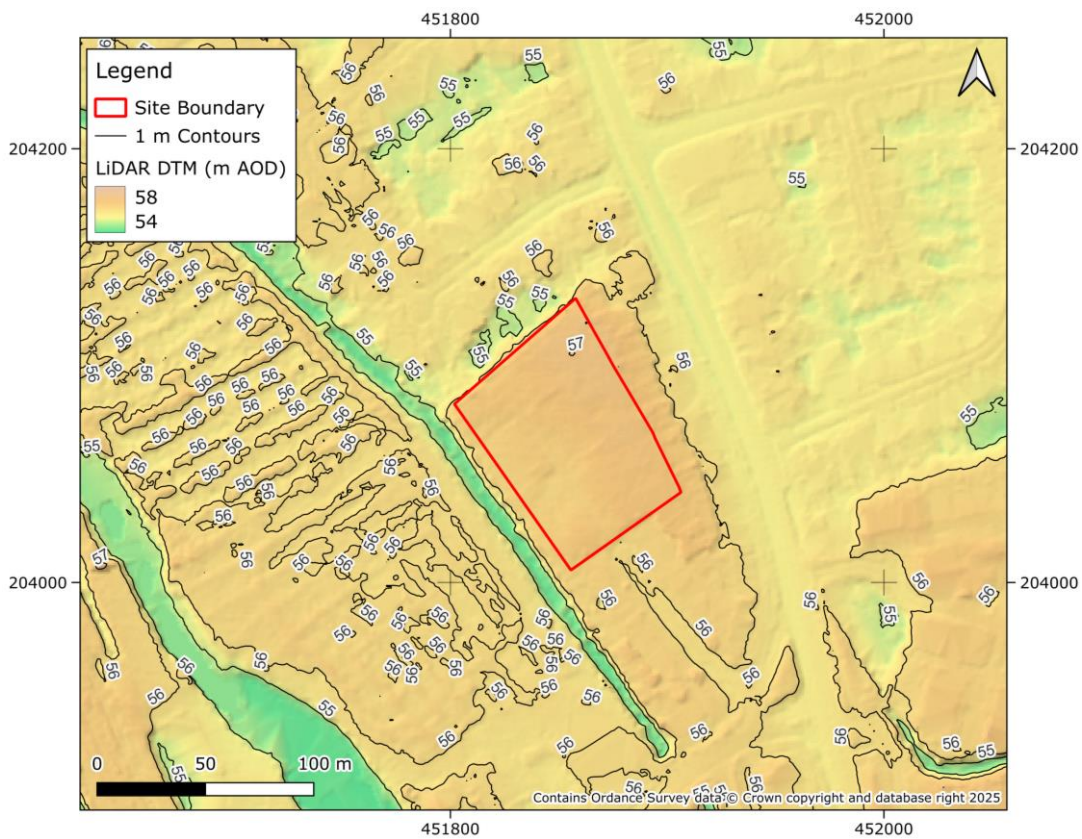


Figure 2 - Topography

3 Flood Risk

3.1 Historical Flooding

The EA has one record of historical flooding within the site boundary. This occurred in Winter 2003 and was associated with the River Thames catchment, see Figure 3. During this event flooding was constrained to the north of the site only. Several other historic flooding events have occurred in the vicinity of the site without affecting the site directly. The most recent event was in winter 2013/14, where flooding occurred across the Cold Harbour area to the northwest of the site. During the summer flooding of 2007, flood extents were approximately 40m to the north of the site boundary. Further historical events which affected the immediate area include the winter floods of 1979, and an event in the spring of 1947.

3.2 Fluvial Flood Risk

In the existing Flood Map for Planning (FMfP), 33.1% of the site is located within Flood Zone 2 (0.1% AEP), and 6.2% is located within Flood Zone 3a (1% AEP), see Figure 4. Viewing the River Thames 2018 model results for the undefended 3.3% AEP event, 1.0% of the site is located within Flood Zone 3b. At this location the FMfP is based on a combination of modelled extents and the maximum historical extent.

The EA climate change fluvial outputs for the 0.1% AEP and the 1% AEP events have also been assessed, with 78.2% of the site located within the 0.1% AEP extent and 20.8% of the site located in the 1% AEP extent, see Figure 5. The River Thames (2018) undefended 3.3% AEP +26% Climate Change extent shows approximately 1.5% of the site to be inundated.

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

3.3 Flood Defence Infrastructure

Raised embankments are present along Redbridge stream immediately to the west of the site area. Further raised embankments are present along the right-hand bank of Hinksey Stream 180m west of the site. Neither are considered to have significant impact on flooding at this site, and no part of the site is within an area associated with a reduction in risk from flooding due to defences. The site is not located within a flood storage area.

3.4 Surface Water Flood Risk

The EA's surface water flood maps show no part of the site to be inundated during either the 3.3% or 1.0% AEP event, see Figure 6. In the 0.1% AEP event, 1.9% of the site is expected to be inundated.

When considering the effects of climate change, the site remains outside of the 3.3% and 1.0% AEP extents, with the proportion at risk during the 0.1% AEP event increasing slightly to 2.2%, see Figure 7.

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

3.5 Groundwater Flooding

The site is underlain by a bedrock of clay and mudstone in the form of the Oxford Clay formation and West Falton Formation. It is expected to permit low amounts of infiltration. Superficial deposits of Northmoor Sandy Limestone Gravels are also present at this site; these are expected to have variable permeabilities and are generally associated with the Thames floodplain. Soils consist of loamy and clayey floodplain soils with naturally high groundwater. Based on the data available there is expected to 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 FMfP shows that the entire site is at risk from reservoir flooding during the wet day scenario, see Figure 8. None of the site is at risk during a dry day scenario. The site is predominantly at risk due to Farmoor Reservoir, located approximately 7km to the northwest of the site. Whilst the site is shown to be at risk, it should be noted that reservoir failure is a rare event with a very low probability of occurrence. Current reservoir regulations aim to make sure that all reservoirs are properly maintained and monitored to detect and repair any problem. If required, the local planning authority (LPA) can consult the local resilience forum for emergency planning advice in relation to reservoir failure.

3.7 Flood Warning Service

The site is partially located within the River Thames and tributaries at New Botley, New Hinksey, North Hinksey, South Hinksey and Grandpont EA Flood Warning Area.

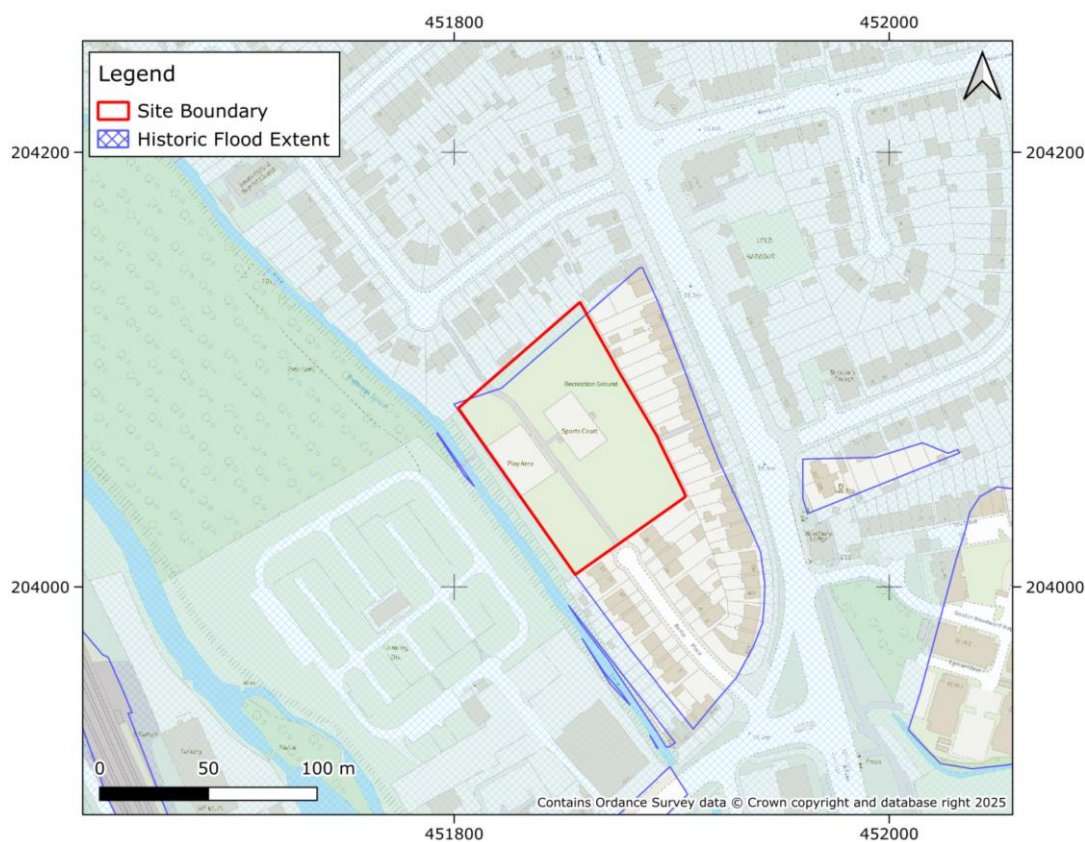


Figure 3 - Recorded Flood Outlines

Bertie Place Recreation Ground (008a) Level 2 SFRA

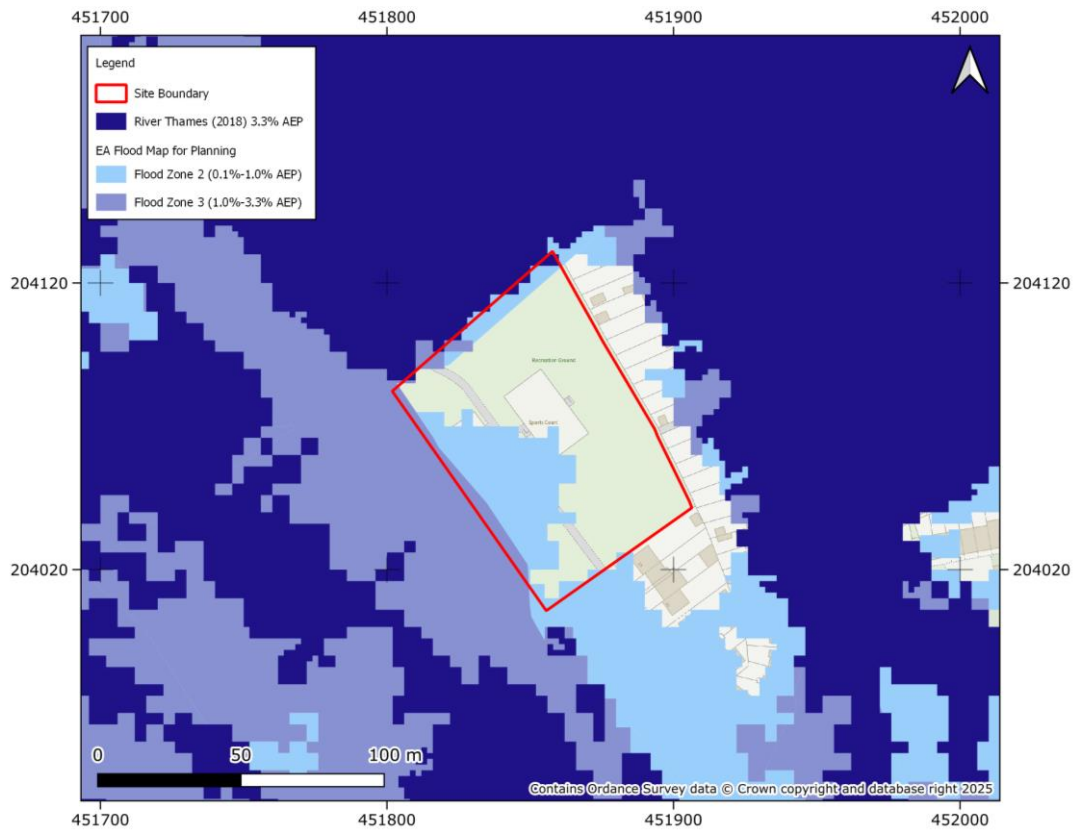


Figure 4 - Fluvial Flood Map

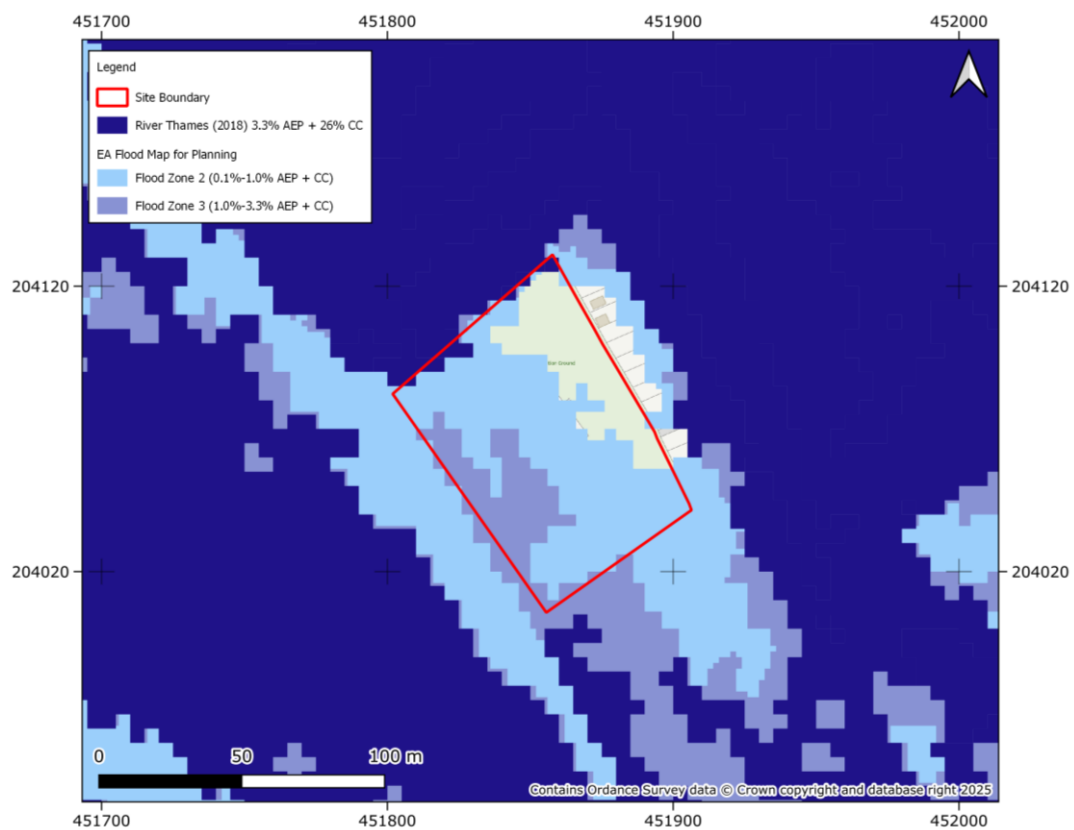


Figure 5 - Fluvial Climate Change Flood Map

Bertie Place Recreation Ground (008a) Level 2 SFRA

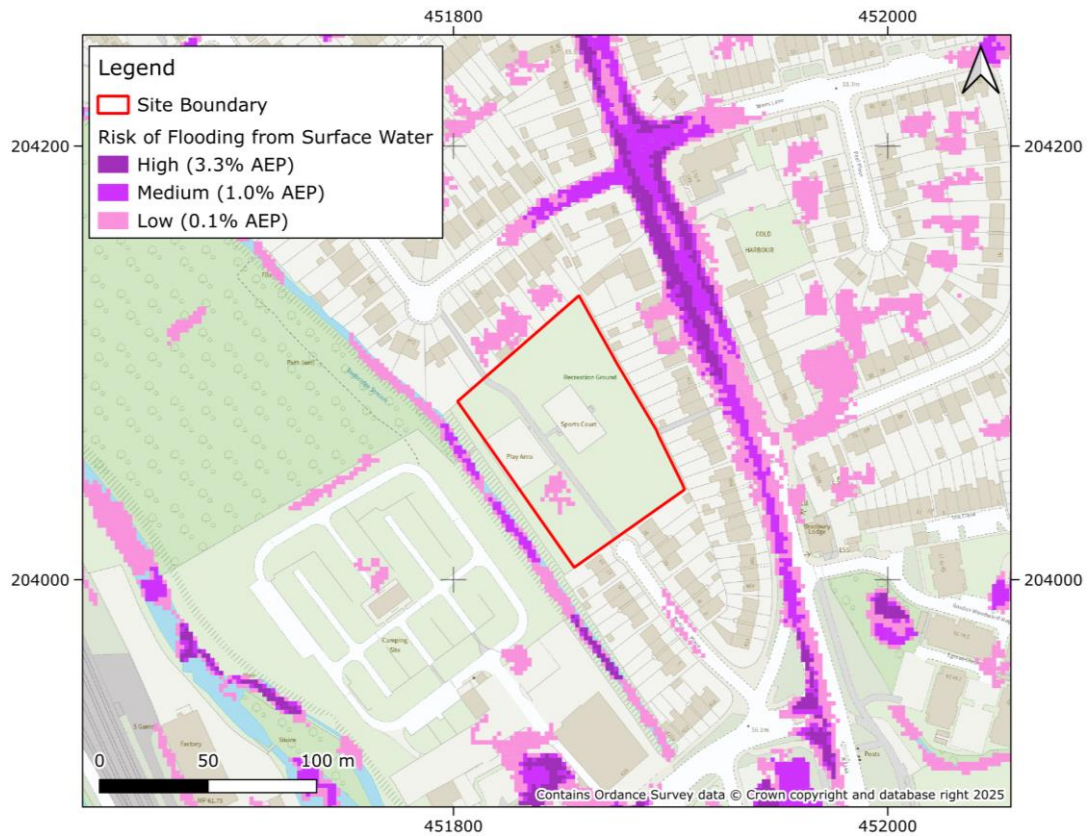


Figure 6 – Surface Water Flood Map

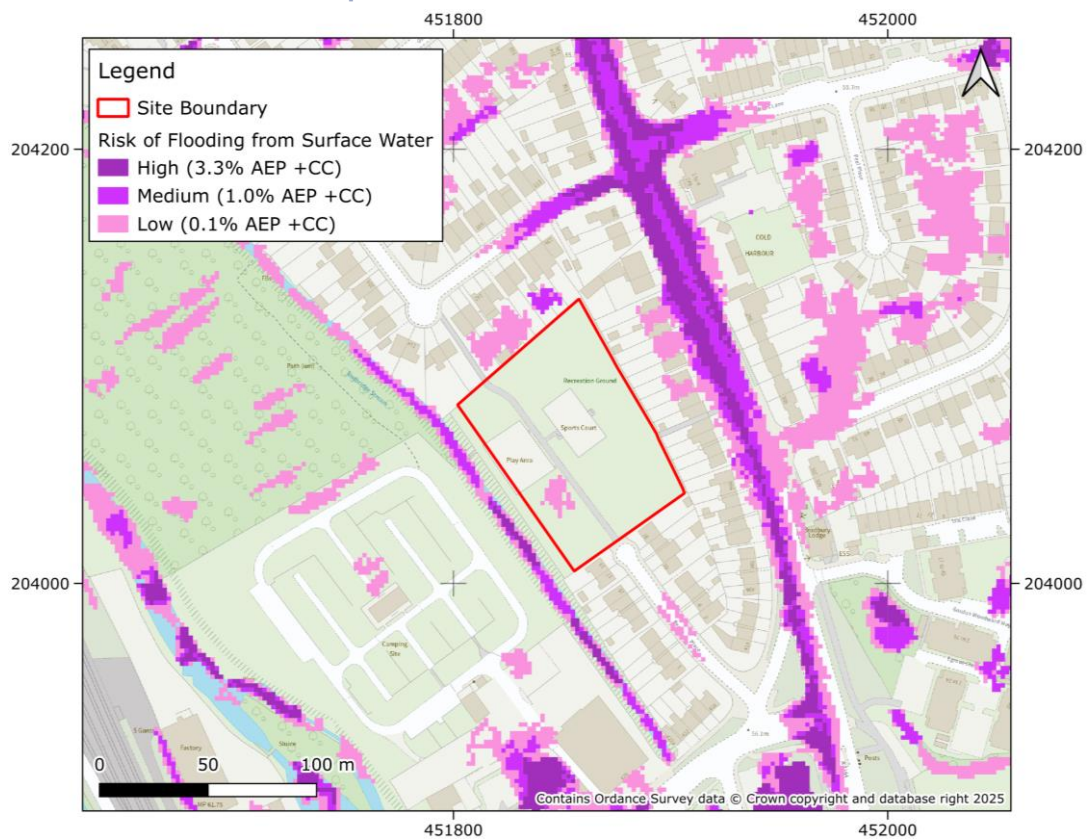


Figure 7 -Surface Water Climate Change Flood Map

Bertie Place Recreation Ground (008a) Level 2 SFRA

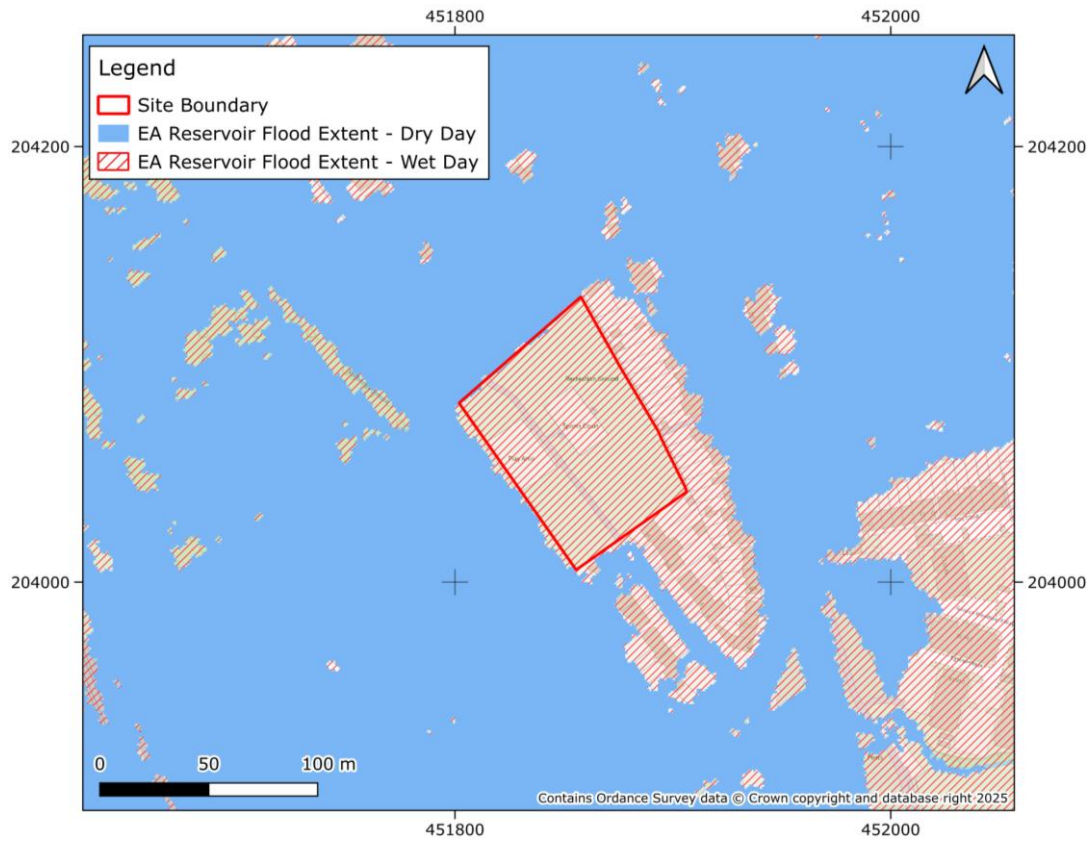


Figure 8 - Reservoir Failure Flood Map

4 Detailed Review of Primary Flood Risk

4.1 Primary Flood Risk

The primary flood risk to the site is fluvial in nature. The flood risk is quantitatively assessed in more detail below.

4.2 Flood Risk Metrics

The River Thames Model (2018) 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.

Depth data for the 100-yr plus central (26%) climate change design event is first assessed to attain further detail on fluvial flooding. The modelled scenario considers the presence of flood defences unlike the FMfP data, although the impact at this site is minimal.

The depth mapping for the design event (see Figure 9) shows flooding to be most widespread in the southwest of the site, with further areas of inundation along the site's southeastern and northwestern boundaries. In total 16.3% of the site is inundated during the design event. The maximum flood depth within the site is 0.69m, located in the northeastern corner of the site adjacent to the gardens of residential properties along Wytham Street. The depth of inundation in the southwest of the site adjacent to Redbridge Stream is less than 0.12m. The design flood level for the 1.0% AEP +26% CC event is 56.34 m AOD, just below the average ground level at the site based on LIDAR (56.6 m AOD).

As part of this site lies in Flood Zone 3b, the River Thames Model (2018) depth data for the 100-yr plus higher central (41%) climate change design event (re-run in 2023) was assessed to attain further detail on fluvial flooding. Once more, the modelled scenario considers the presence and condition of flood defences unlike the FMfP data.

The depth mapping across the site for this event (see Figure 10) shows an increase in flood extents with 31.8% of the site inundated. Flooding remains most widespread across the southwestern half of the site. In this area, flood depths are generally between 0.1–0.3 m, however along the site's northwestern boundary they are between 0.4–0.9m. Maximum flood depth within the site is 0.98m, again located adjacent to the gardens of residential properties on Wytham Street. The design flood level within the site for the 1.0% AEP + 41% CC design event is 56.45 m AOD, slightly lower than the average ground level on site based on LIDAR (56.6 m AOD).

4.3 Access and egress

Given the pre-existing road network near the site, current access and egress to the site is assumed to be along Bertie Place to the south of the site (see Figure 11). Given the flood risk to the New Hinksey area north of the site, the best identified route of egress remains to leave the site along Bertie Place. Site users should travel along Abingdon Road (A4144) before continuing to the Southern and Eastern-By-Pass roads which remains flood free. Note, the bypass road crosses the River Thames and in the EA flood maps is shown to lie in Flood Zone 3, this is not a true representation of flood risk as the bypass road is significantly raised above the River Thames.

This route travels through the smallest area of inundated land, isolated to a length of approximately 130m along Bertie Place and 100m along Old Abingdon Road. In these sections a maximum depth and velocity of 0.54 m and 0.18 m/s is reached. The hazard rating along Bertie Place is *Low to Danger for Some*, whilst a 20m section of Old Abingdon Road has a hazard rating of *Danger for Most*. The remainder of the route is flood free, with egress to the Eastern-By-Pass. Note, the bypass road crosses the River Thames and in the EA flood maps is shown to lie in Flood Zone 3, this is not a true representation of flood risk as the bypass road is significantly raised above the River Thames.

Due to the hazard present along the route close to the site, early flood warning will be vital to ensure that the access route can be utilised before floodwater inundates the junction of Old Abingdon Road and the A4144. The River Thames catchment which the site falls within is dominated by chalk, it has relatively slow river response times to storm events, being groundwater, rather than surface water dominated. This increases the time taken for inundation and for adequate warnings and preparation in an extreme flood event.

The site is partially located within an EA Flood Warning Area. This flood warning area should be considered to apply to the entire site and 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 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.

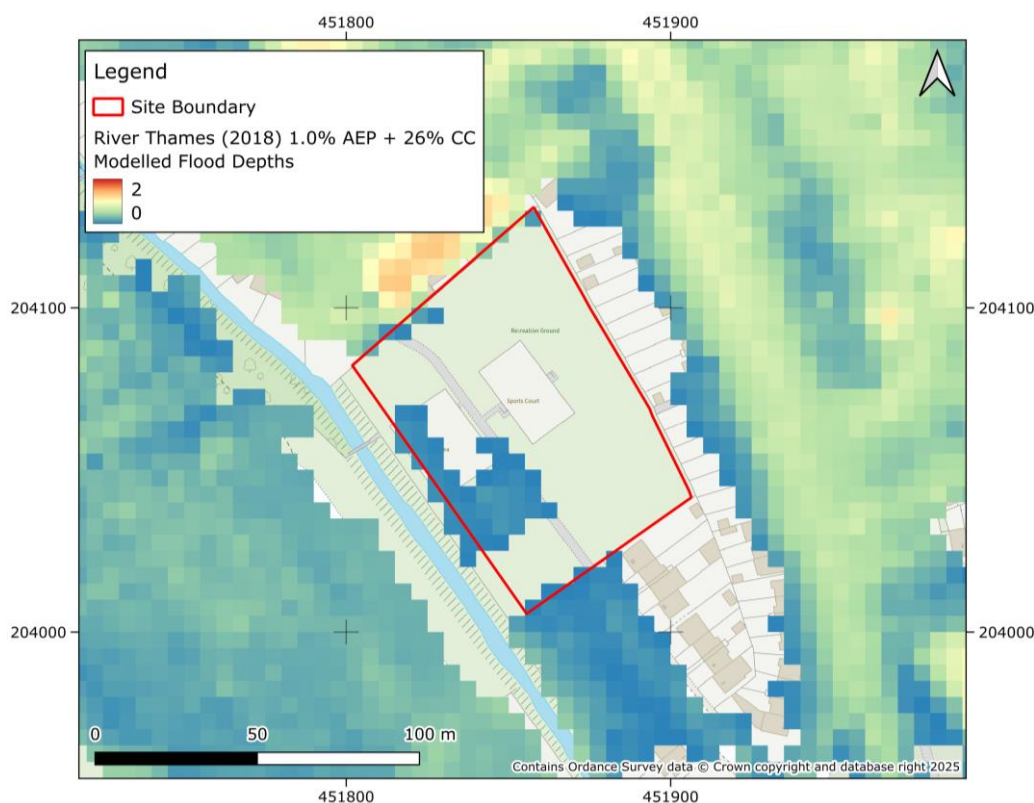


Figure 9 – River Thames (2018) 1.0% AEP +26% CC Modelled Flood Depths (m)

Bertie Place Recreation Ground (008a) Level 2 SFRA

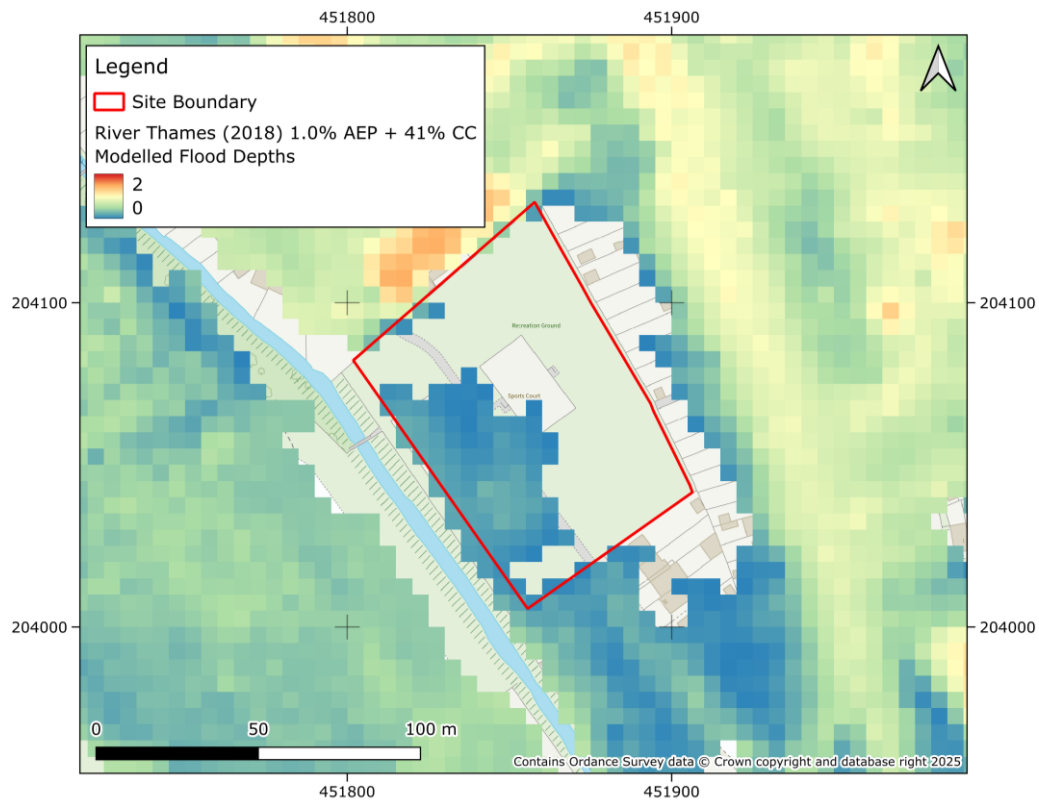


Figure 10 - River Thames (2018) 1.0% AEP +41% CC Modelled Flood Depths (m)

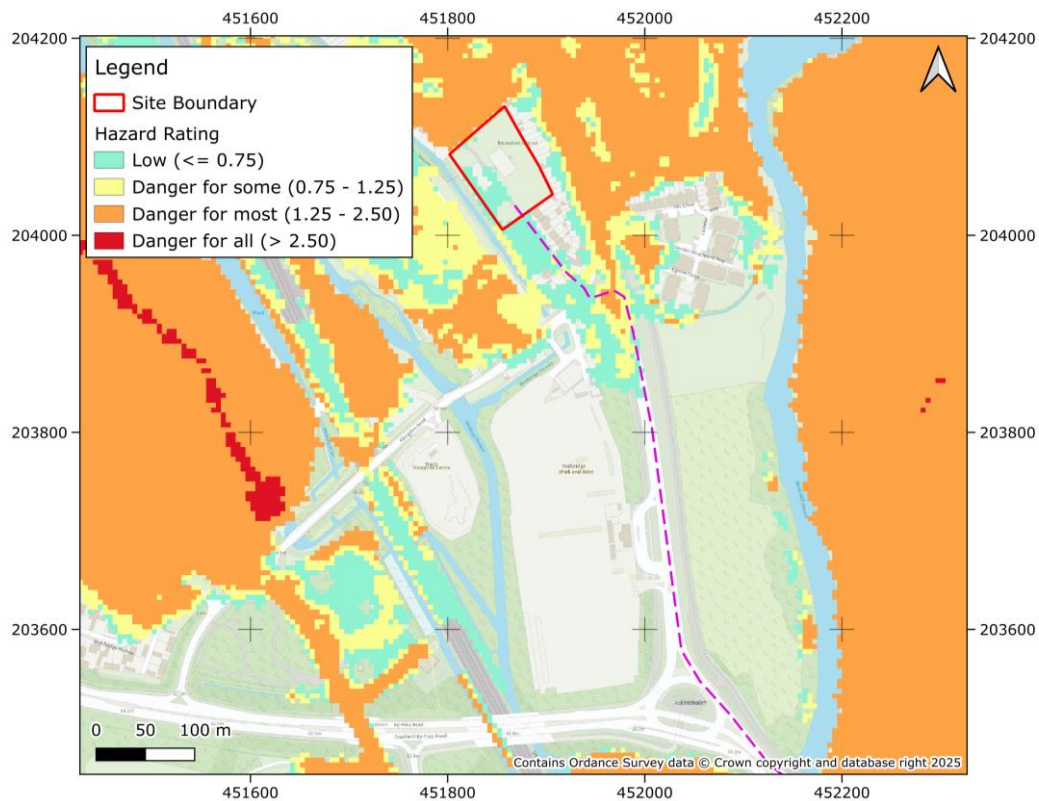


Figure 11 – Access/Egress Routes

5 Development Viability and FRA recommendations

5.1 Development Categorisation

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 proposed development at the site is a housing development. Residential areas are classed 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.

It should be possible to locate the majority of infrastructure in Flood Zone 1 outside of the Flood Zone 2 extent and the design flood extent, negating the requirement for ground raising. However, should more vulnerable development be located in the design flood extent raising will be required above the design flood level with compensatory storage potentially needed to offset any 3rd party flood risk impacts.

5.2 Scale of Development

The total site area is currently 0.67 ha; allocated for residential redevelopment. At the site, 25 residential dwellings are proposed. If assuming medium density housing (60 dwellings per hectare) 25 dwellings would require 0.42 ha (63% of the site area).

Based on this information, it should be possible to locate all dwellings outside of the 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

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. As already stated, no development should be located in Flood Zone 3b. 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 when considering the design flood event (57.34 m AOD) and is designed to be appropriately resistant and resilient to flooding.

5.4 Other Site-Specific Considerations

Areas of flood risk surround the site to the north, east and west, with no completely flood free egress options. A route with low hazard has been identified during the design event. However a site-specific FRA should consider the evacuation requirements before the design event and a more extreme fluvial event. This assessment should take into account the site layout and advice from the emergency services, including Oxford City Council's emergency planner.

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. Due to historical modification of the site, no information was available from a desk-top study regarding the soils within the site. It is recommended that a geotechnical investigation is undertaken at this site to obtain further information relating to soils and associated infiltration rates, this will confirm whether infiltration could be viable in some areas. The geology at the site has low permeability and this combined with adjacent floodplain soils which have naturally high groundwater, means the effectiveness of infiltration SuDS solutions may be limited.

Attenuated discharge to a watercourse or a sewer will also need to be considered as part of a site-specific FRA.

Due to the entire site being located in the wet day reservoir failure inundation extent, any development could affect the reservoirs risk designation, design category and how it is operated with potential cost implications for developers. However, it is noted that the quantum of development is very small in comparison to the existing development in Oxford already lying within the reservoir flood extents so any change in designation is assumed to be unlikely.