South Oxfordshire and Vale of White Horse
Joint Local Plan 2041

EVIDENCE BASE

STRATEGIC FLOOD RISK ASSESSMENT (SFRA) LEVEL 2 APPENDICES

Joint Local Plan

Pre-submission Publication Version

(Regulation 19)

South Oxfordshire District Council
Listening Learning Leading

Vale of White Horse District Council

October 2024

South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS1 - Land at Berinsfield Garden Village

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

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Contract

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Freya Nation of JBA Consulting carried out this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS1 - Land at Berinsfield Garden Village. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS1 - Land at Berinsfield Garden Village

- Location: Land at Berinsfield Garden Village (Figure 1-1)
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More vulnerable
- Site area: 132.43 ha
- Proposed development impermeable area: 112.6 ha (assumed 85% of site area)
- EA model: N/A
- Watercourse: River Thame to east of site and unnamed drainage ditches that flow through the south west and north east corners of the site
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Subject to Exception Test
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the north at approximately 59mAOD. The lowest ground levels are located towards the south west of the site at approximately 50mAOD.

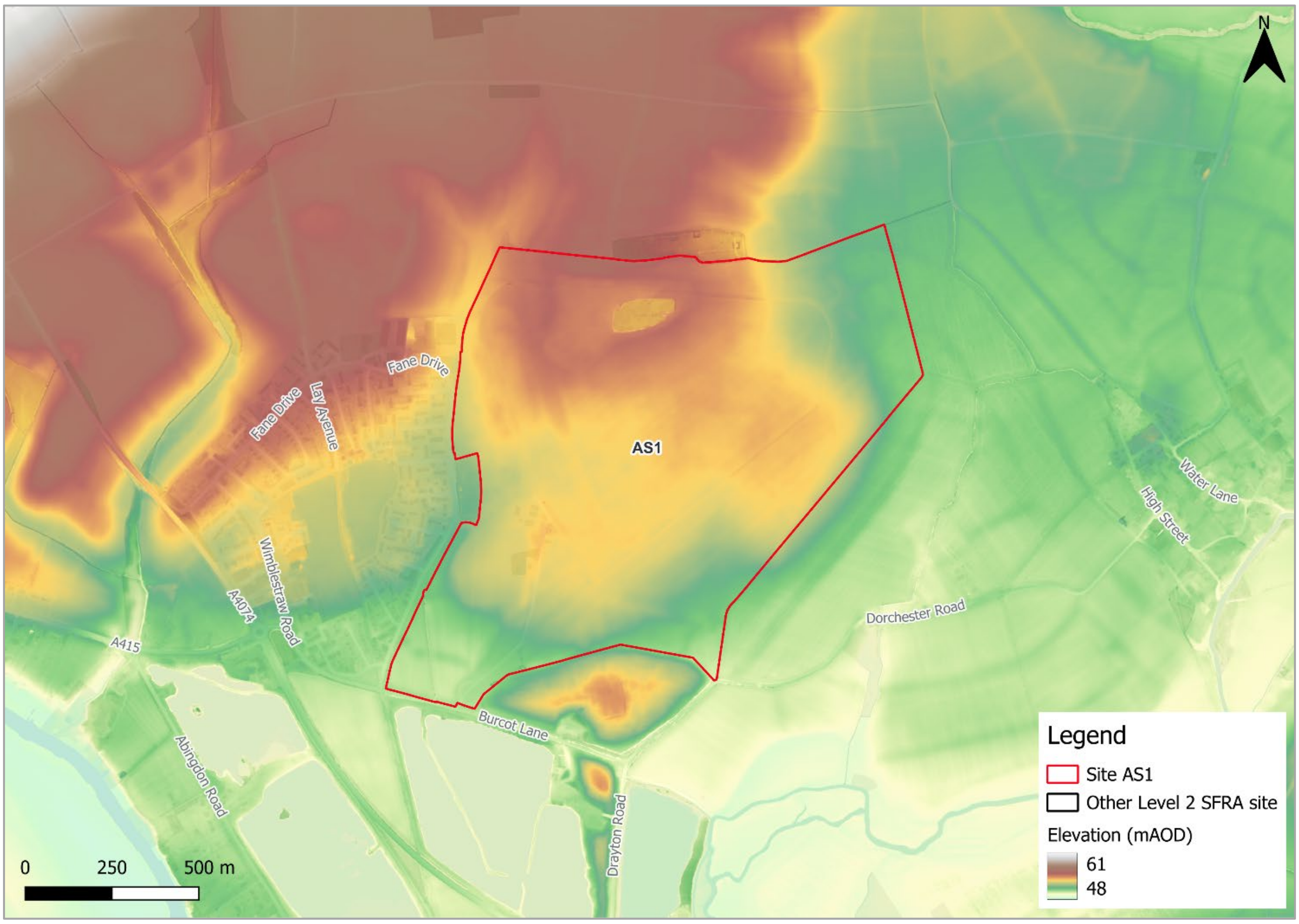

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

Approximately 4% of the site is modelled to be within Flood Zone 3b, with 1% of the site modelled to be within Flood Zone 2. The remaining area of the site is modelled to be entirely within Flood Zone 1. There should be no vulnerable development in the area of the site within the functional floodplain. The functional floodplain in this area is based on Flood Zone 3 of the EA's Flood Map for Planning (1% AEP undefended event), as a precautionary approach in the absence of suitable modelled data.

The Flood Map for Planning in this location is based on broadscale JFlow modelling. Any site-specific FRA undertaken to inform a planning application should produce a detailed model of the River Thame to understand modelled depths and hazards within the site.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
95	1	0	4

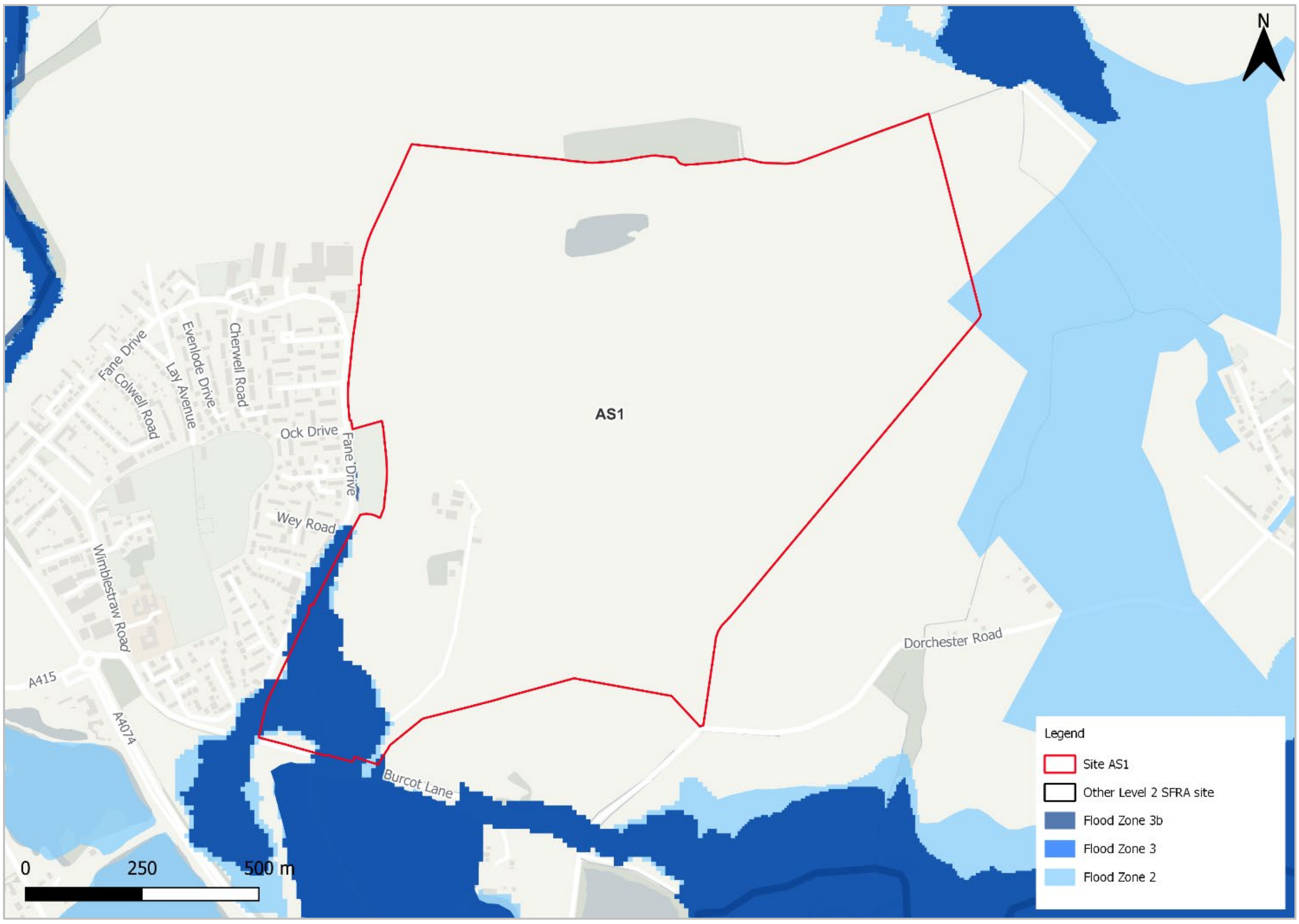

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on flood risk from the River Thame and the unnamed drain have not been modelled for this SFRA, as a detailed model covering the River Thame is not available. Therefore, in the absence of modelled climate change information, Flood Zone 2 of the Flood Map for Planning (based on the 0.1% AEP undefended event) can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar to the present day Flood Zone 3, with a slightly greater extent of flooding (Figure 2-1).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. The Flood Map for Planning in this location is based on broadscale JFlow modelling. Any site-specific FRA should produce a detailed model of the River Thame and include for the most up to date climate change allowances.

2.3 Flood risk management

There are no engineered flood defences within the vicinity of the site that are likely to impact fluvial flood risk.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS1 (Land at Berinsfield Garden Village) is located within one catchment, namely; Thame (Scotsgrove Brook to Thames). This is ranked as a medium sensitivity catchment. Planning considerations for sites at medium sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Within the south-western corner of the site there is potential for floodplain tree planting, which can slow floodwaters and reduce flood peak height. Within the north-eastern corner of the site, there is potential for riparian tree planting, which can slow flows, reduce sediment delivery to the watercourse and reduce bankside erosion. The majority of the site is also identified to have potential for wider catchment tree planting, which can intercept, slow, store and filter water. There is also potential for floodplain reconnection along the drain adjacent to the western site boundary, as well as to the east of the site. These areas are shown in Figure 2-2.

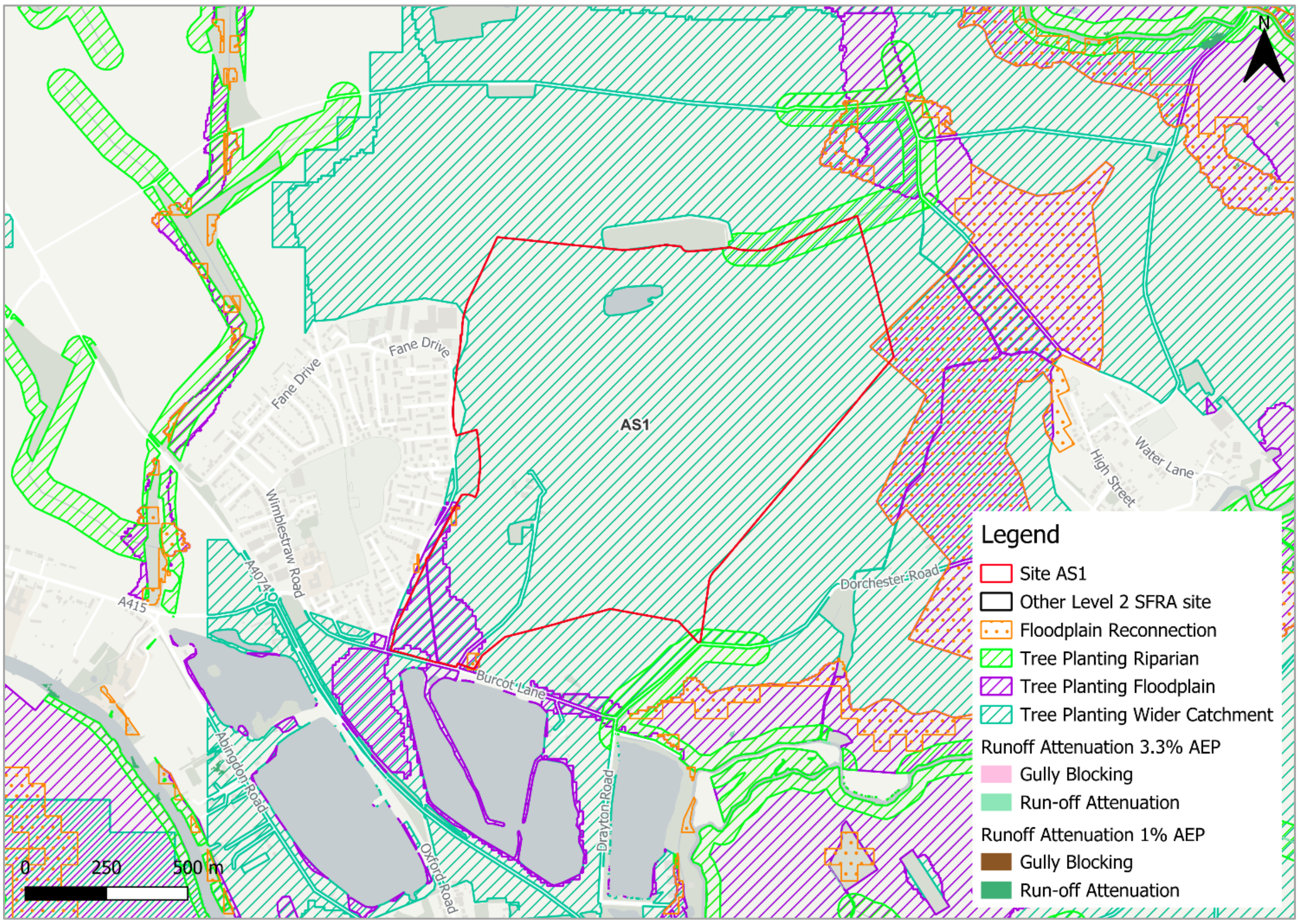

Figure 2-2: Natural Flood Management (NFM) opportunities mapping

2.4 Residual risk

There is potential residual risk to the site from a possible blockage of the unnamed drain which runs through the southwestern corner of the site and is culverted under the access track to Mount Farm (Figure 2-3). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA, as there is no existing flood model for the watercourse. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on residual flood risk to the site.

Figure 2-3: Potential culvert blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is not modelled to be at risk of flooding from reservoirs.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. Historic risk to the site is shown in Figure 2-4 which shows that a small area along the western border of the site has been subject to flooding in the past. The RFO dataset references that the historic event occurred in January 2003 due to channel capacity exceedance of a drain to the west of the site. The River Thame to the south of the site flooded in both 1992 and 2003, with the extent of flooding to the southeast of the site being located approximately 200m from the site boundary.

The RFO dataset also indicates the flood event in January 2003 also impacted a small area close to the road in the south of the site.

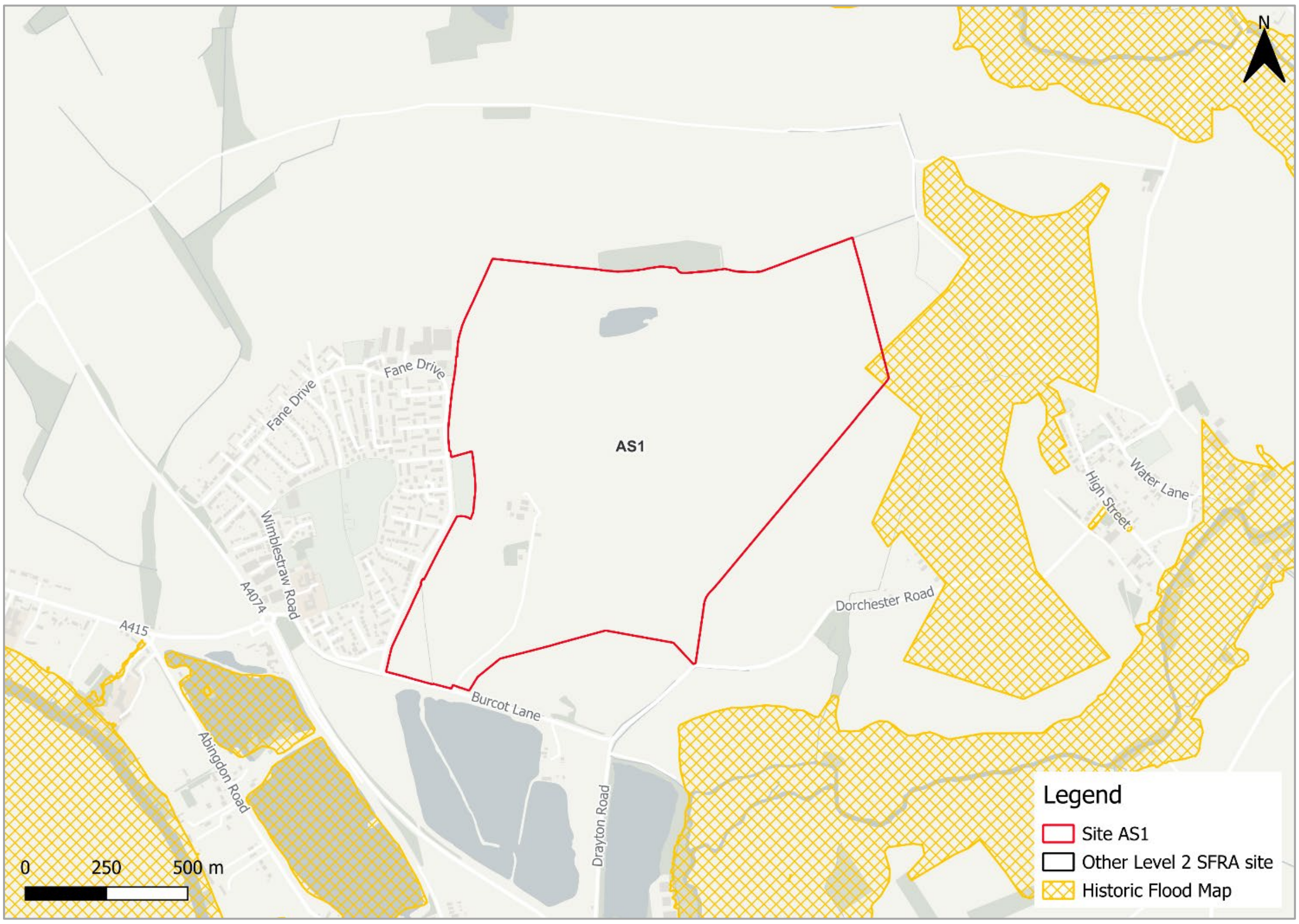

Figure 2-4: Recorded historic flood events onsite and around the site

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. Site AS1 (Land at Berinsfield Garden Village) is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is located within a FAA, namely 061WAF19Thame - River Thame, Horsenden Stream and Chalgrove Brook.

Based on the Flood Map for Planning, safe access and escape should be possible via Fane Drive to the west of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain due to the unnamed drain which flows through the southwestern corner of the site. Vulnerable development is not permitted within the functional floodplain. However, the functional floodplain in this area is based on Flood Zone 3, as a precautionary approach, and only comprises 4% of the total site area. The channel should be maintained and included in site design as a green / blue corridor which can provide ecological, social and amenity value.

- The EA's Flood Zone 2 extent has been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with a slightly larger extent of flooding. However, climate change must be modelled at the site-specific FRA stage.
- The Flood Map for Planning in this location is based on broadscale JFlow modelling. Any site-specific FRA should produce a detailed model of the River Thame to understand modelled depths and hazards within the site and include the most up to date climate change allowances.
- It would be acceptable to use updated climate change modelling to assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The EA flood alert area should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape should be possible via the northern end of Fane Drive to the west of the site.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the medium risk surface water flood zone, a further 3% is at low surface water risk, as shown in Table 3-1.

In both events, surface water risk is largely confined to southwest corner of the site. Small areas of ponding are also located in topographical low spots across the site. Greatest flood depths in the medium risk event range between 0.3 and 0.6 m (Figure 3-1) with some areas of moderate hazard (Figure 3-2). Safe access and escape routes should be possible via Fane Drive to the west of the site.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
96	3	1	0

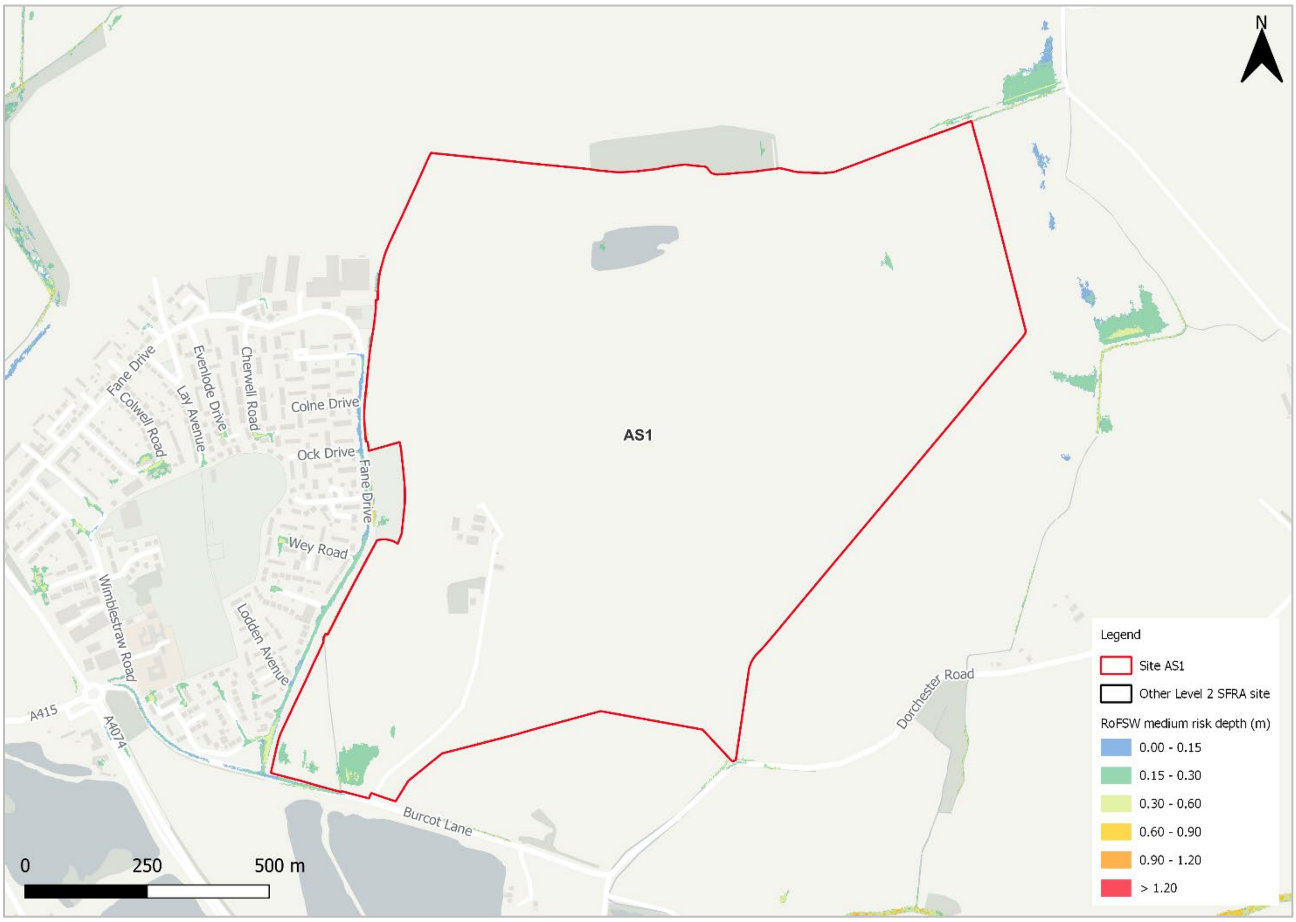

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

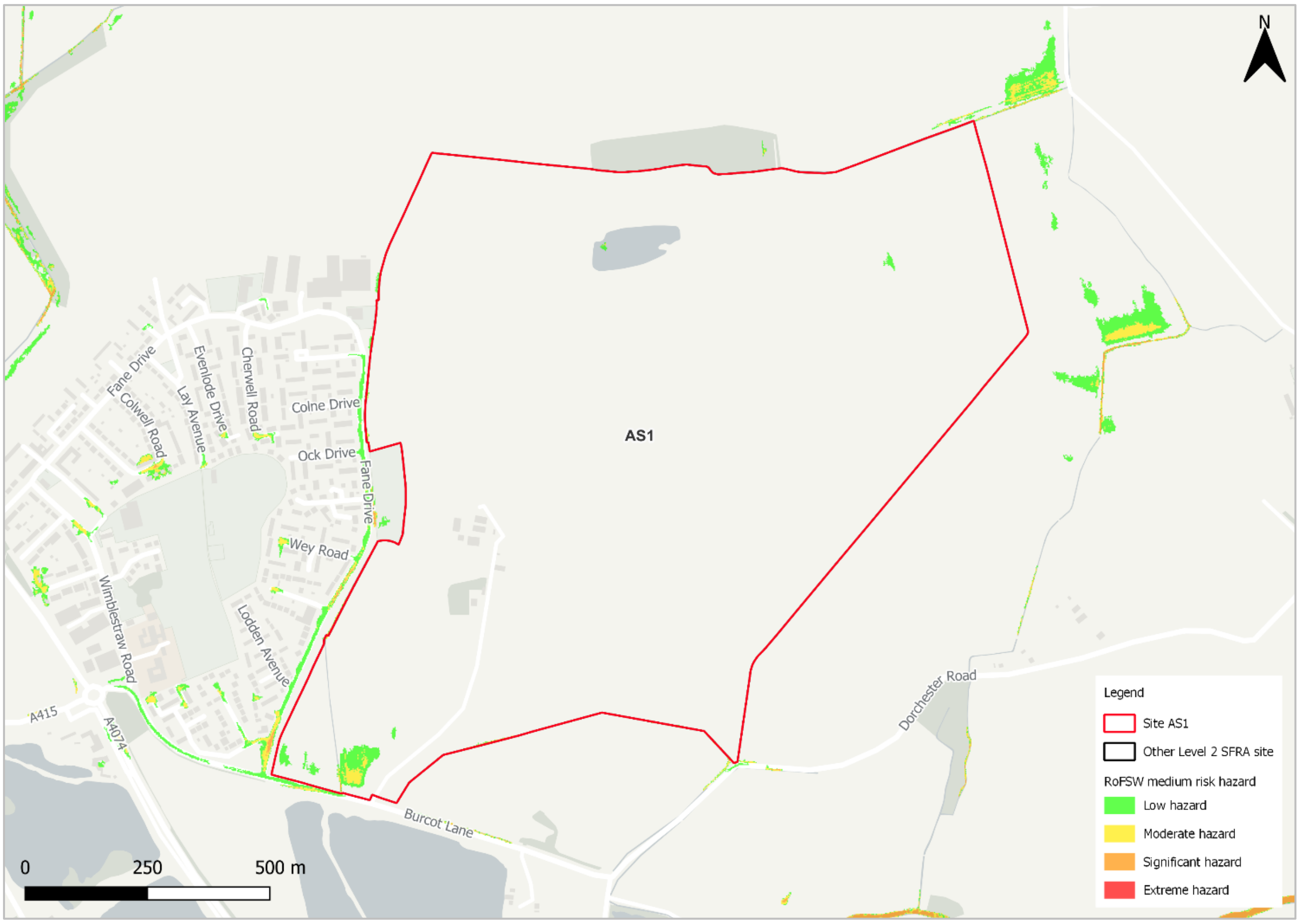

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled low risk event can be used as a precautionary proxy for the medium risk surface water event plus climate change.

Figure 3-3 shows the low risk surface water flood depths, as a proxy for the medium risk surface water event plus climate change. Risk is largely similar to the medium risk event, with a greater extent of ponding within topographic low spots, particularly within the southwestern corner of the site. The unnamed drain which flows through the southwestern corner of the site, and the land adjacent to it, is also modelled to be inundated in the low risk event. Maximum flood depths are modelled to be between 0.3 and 0.6m, with areas of significant hazard (Figure 3-4) within the southwestern corner of the site.

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

Figure 3-3: Low risk event surface water flood depths (as a proxy for the medium risk event plus climate change)

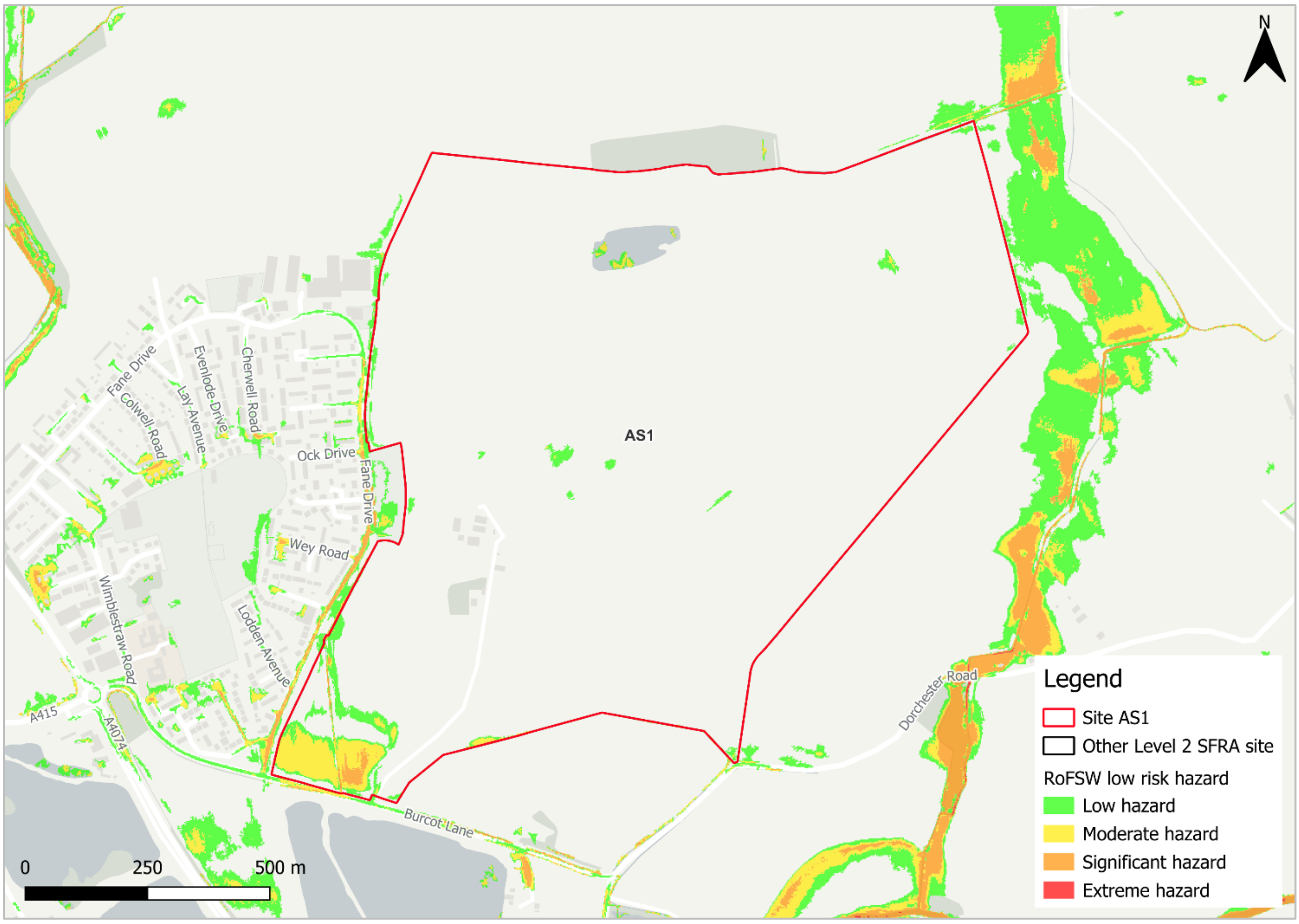

Figure 3-4: Low risk event surface water flood hazards (as a proxy for the medium risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 96% of the site being at very low surface water flood risk. Surface water risk in the medium risk event is confined to small areas of ponding within topographic low spots, largely in the southwestern corner of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. Risk is largely similar to the medium risk event, with a greater extent of ponding within the topographic low spots. There is an emerging flow path within the unnamed drain which flows through the southwestern corner of the site in the low risk event. Any existing flow paths should be maintained in site design.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- When a planning application is submitted, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 show the map for Site AS1 (Land at Berinsfield Garden Village) and the surrounding areas and Table 4-1 explains the risk classifications.

The majority of the site is within an area where there is a risk of groundwater flooding to both surface and subsurface assets. There are areas along the southern and eastern borders of the site where groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

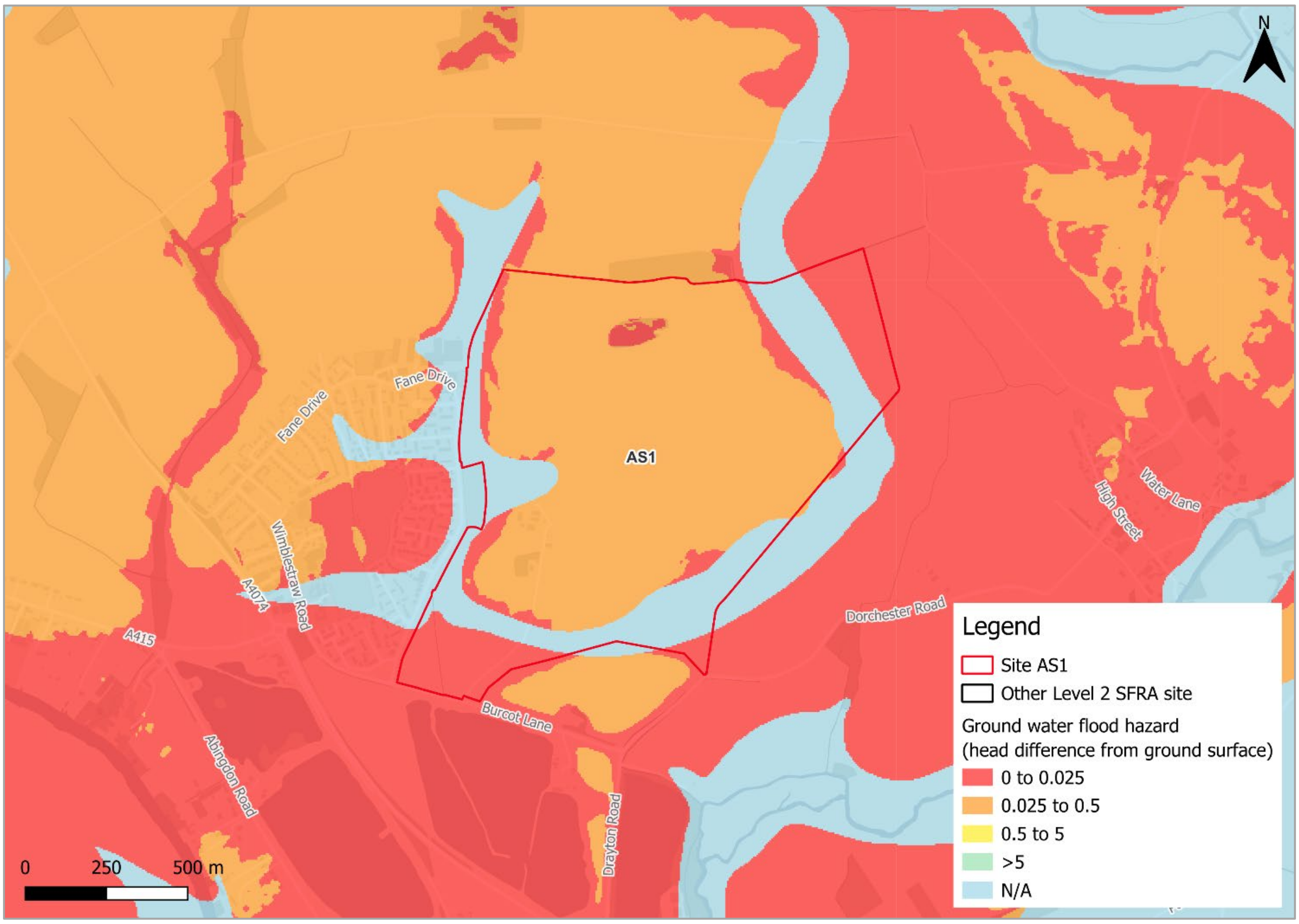

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

Based on current information and the use of proxies to represent the impacts of climate change, this site should be able to pass the exception test. However, all the recommendations suggested in this Level 2 SFRA should be considered at the site-specific FRA stage or before any site design planning.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- Updated present day and climate change modelling of the River Thame and the unnamed watercourse should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to update the modelling at the site-specific FRA stage.
- Based on current information, this site could be allocated in the Joint Local Plan based on nominal current and future fluvial risk.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on existing and future flood risk from the River Thame and the unnamed watercourse is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large area of the site.
- Groundwater conditions must be investigated further through the site-specific FRA.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

[3] Para 170 National Planning Policy Framework 2023

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out full detailed flood modelling of the site for the River Thame and the unnamed watercourse.
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should undertake a condition assessment of the drain adjacent to the western site boundary and investigate the impact of a potential blockage of the structures.
- Any site-specific FRA should be carried out in line with the NPPF, FRCC-PPG, EA guidance, South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies, and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable: the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS2 - Land adjacent to Culham Campus

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

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Authorised by	Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM Associate Director

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1.1 Site AS2 - Land Adjacent to Culham Campus

- Location: Land adjacent to Culham Campus (Figure 1-1)
- Existing site use: Agriculture and employment
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More vulnerable
- Site area: 217.27 ha
- Proposed development impermeable area: 184.8 ha (assumed 85% of site area)
- EA model: Thames (Sandford to Pangbourne) 2018
- Watercourse: River Thames. Unnamed ordinary watercourse flows out of the south east of the site via a culvert.
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Subject to Exception Test
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
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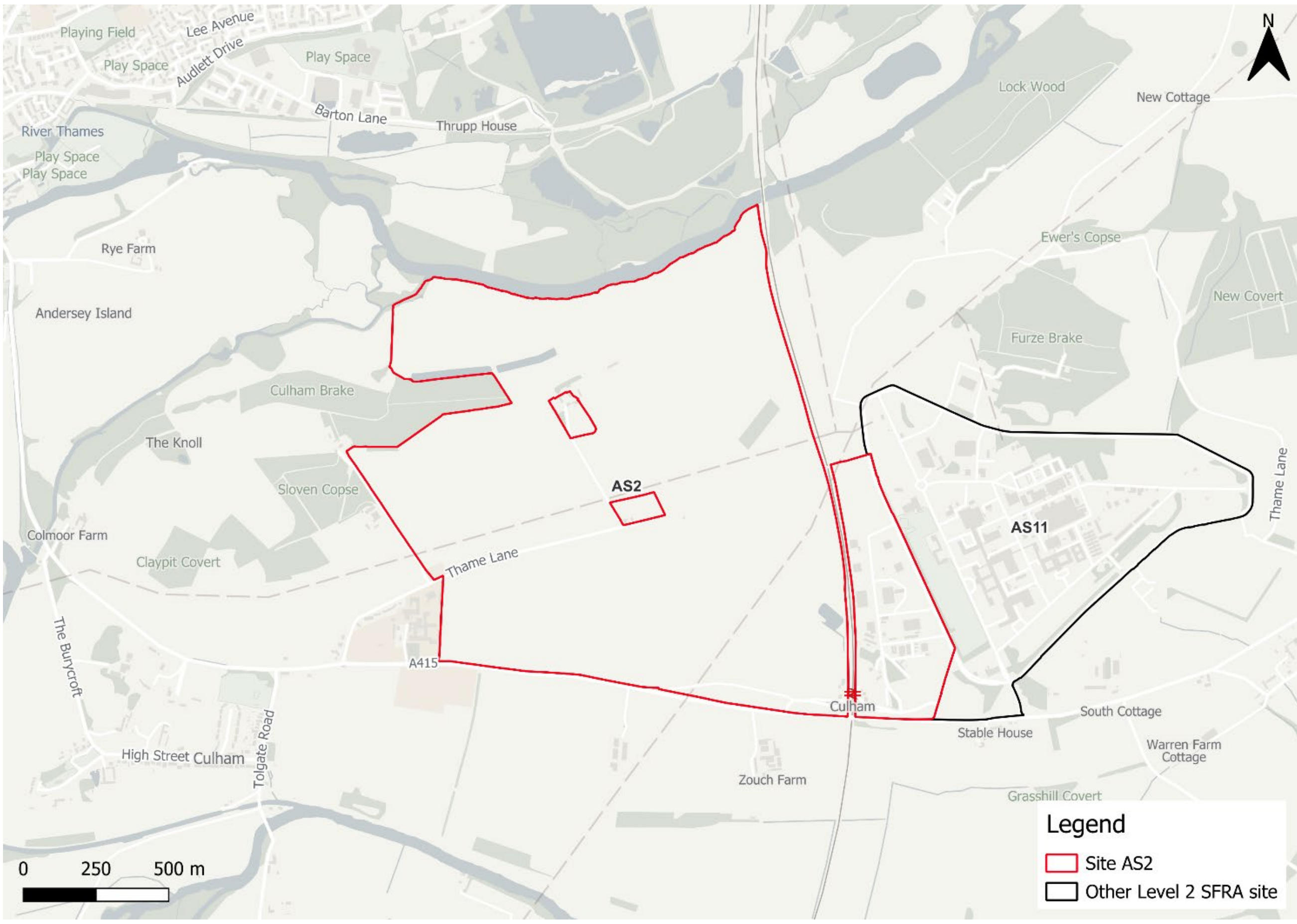

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels are located towards the east of the site at approximately 76mAOD.The lowest ground levels in the site are located within the north, adjacent to the River Thames, at approximately 52mAOD.

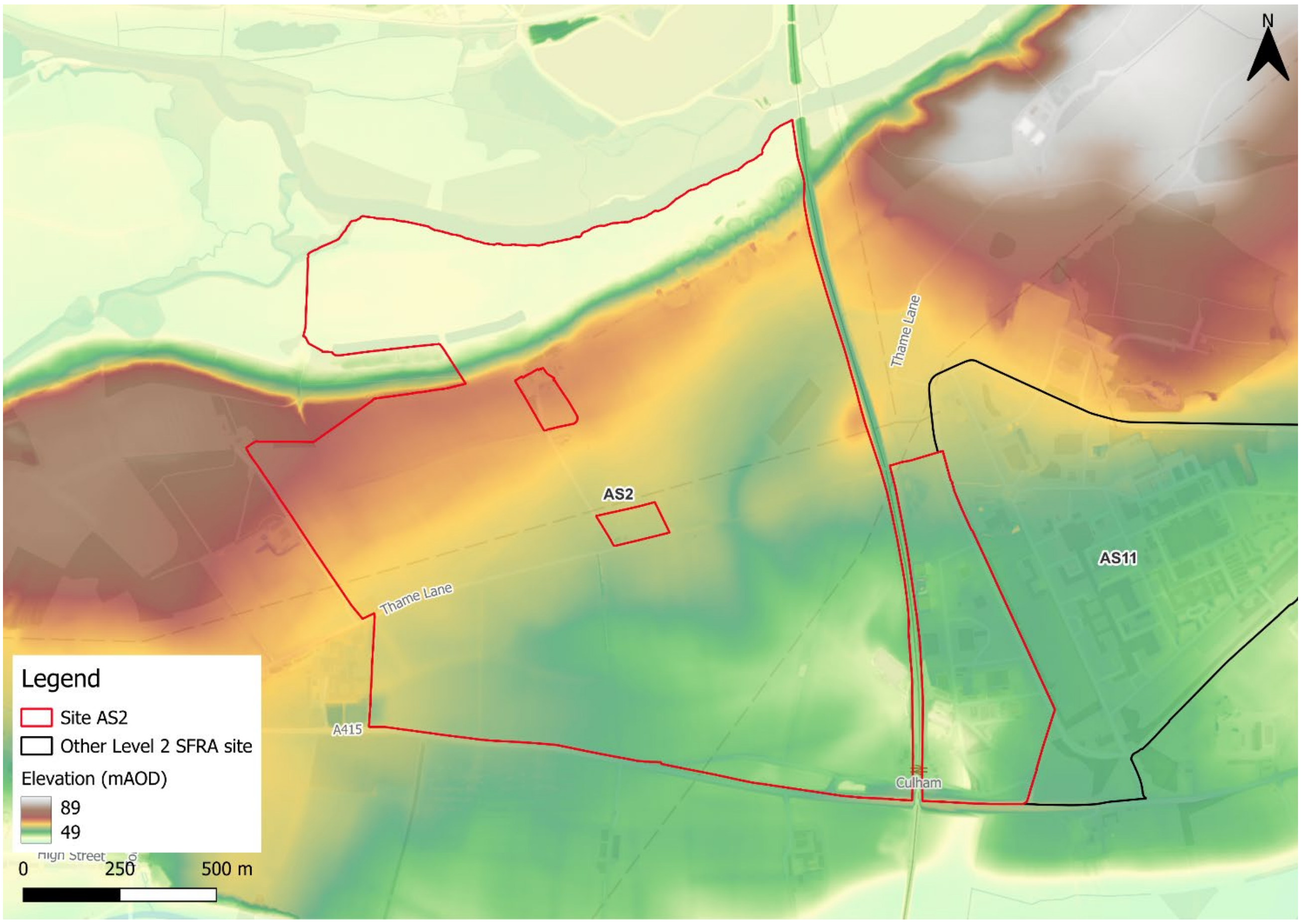

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The area along the northern boundary of the site is located within Flood Zone 3b. The area of functional floodplain onsite should be left free of vulnerable development. The functional floodplain in this location is based on the 3.3% AEP undefended event from the Thames (Sandford to Pangbourne) 2018 model. There is an additional area of fluvial risk to the south of the site within Flood Zone 2.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
88	2	1	9

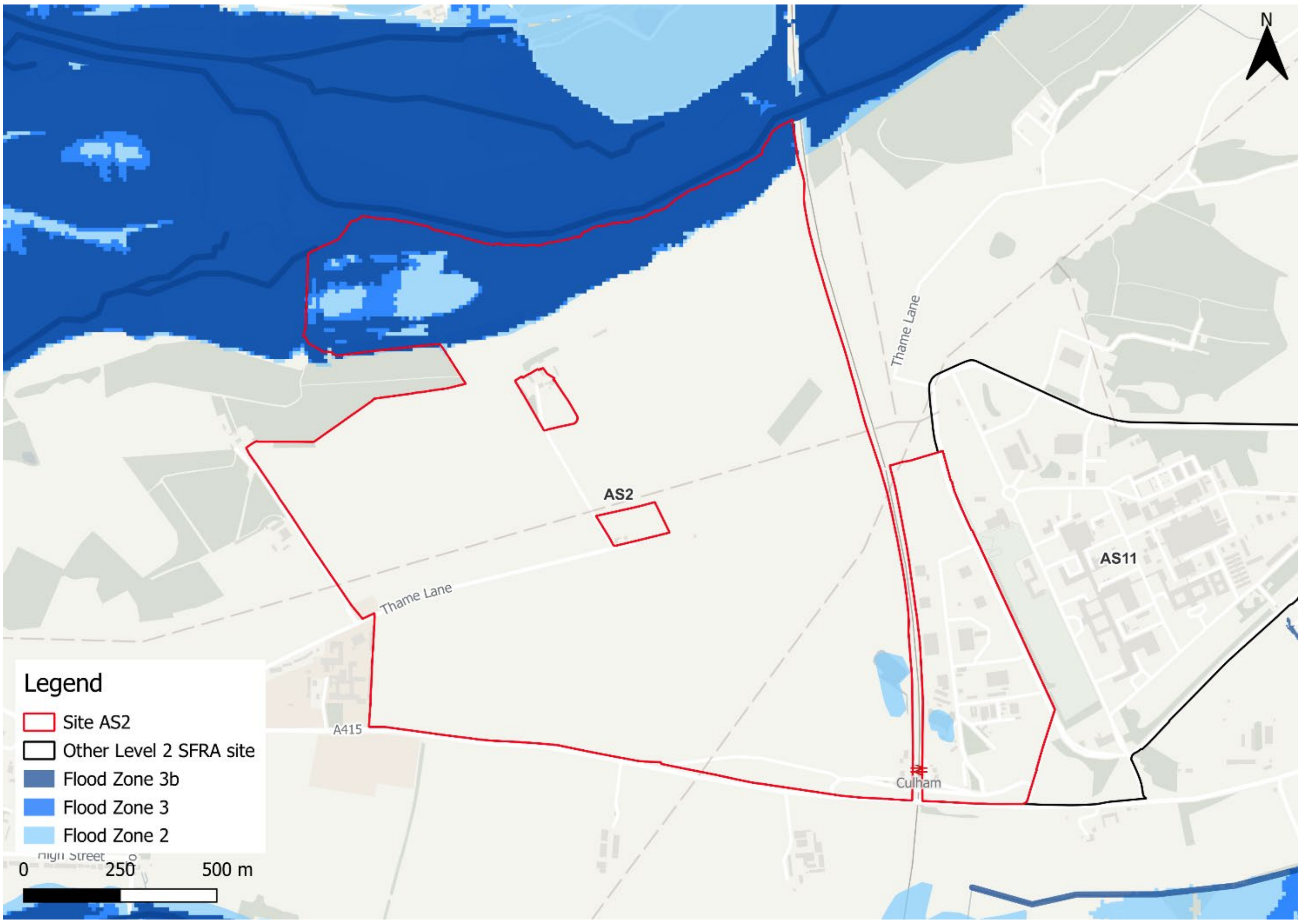

Figure 2-1: Existing risk from rivers to the site

2.1.2 Thames (Sandford to Pangbourne) 2018 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is similar to Flood Zone 3 in the vicinity of the site, with the area along the northern boundary of the site modelled to be at risk. Maximum flood depths within the site are modelled to be > 1.2m, located largely within the two ponds. There are also some areas of significant depths towards the northern boundary of the site. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard in the area of the site at fluvial flood risk is largely categorised as 'Danger for some', with some areas categorised as 'Danger for most'. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event.

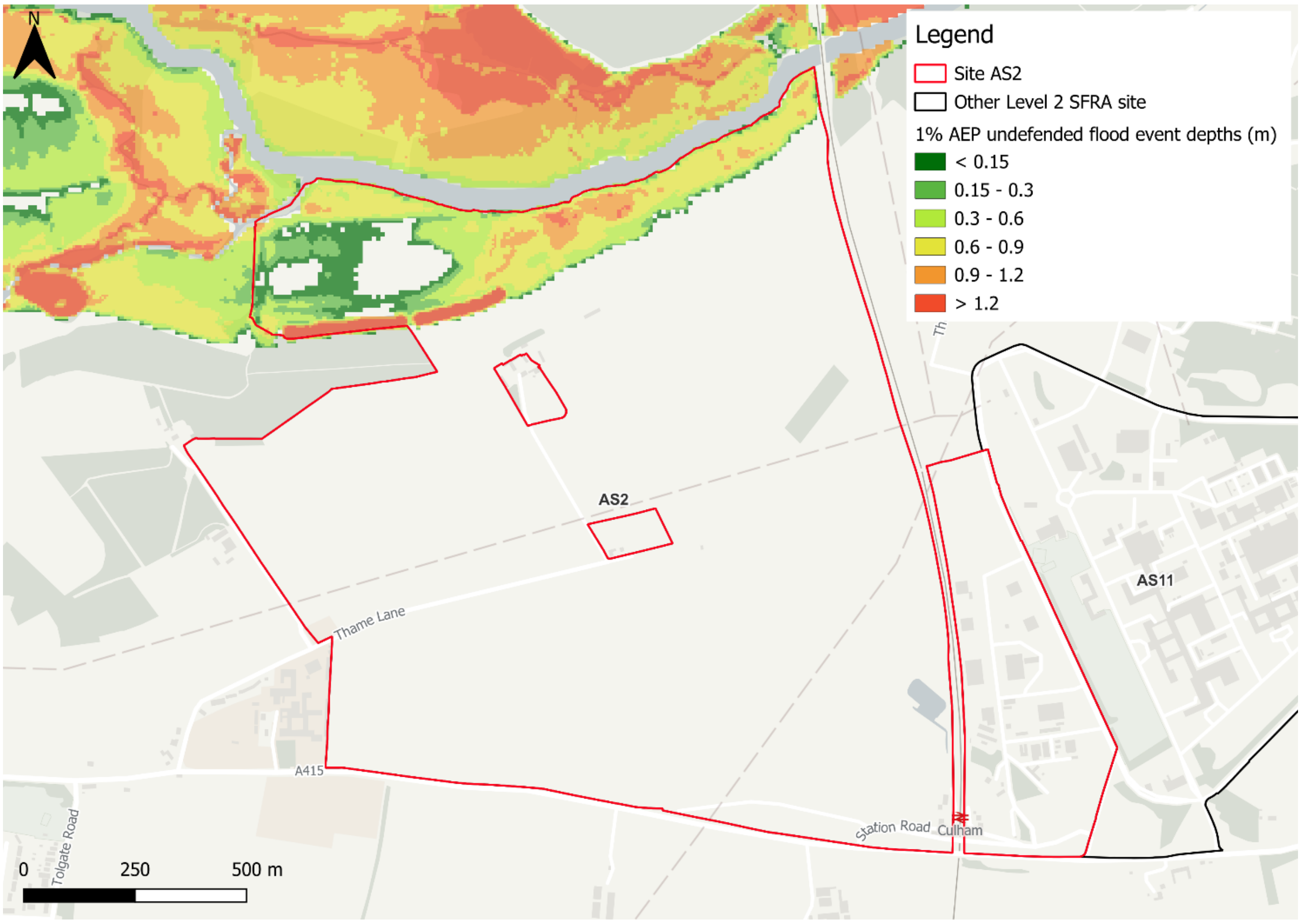

Figure 2-2: Flood depths for 1% AEP undefended flood event

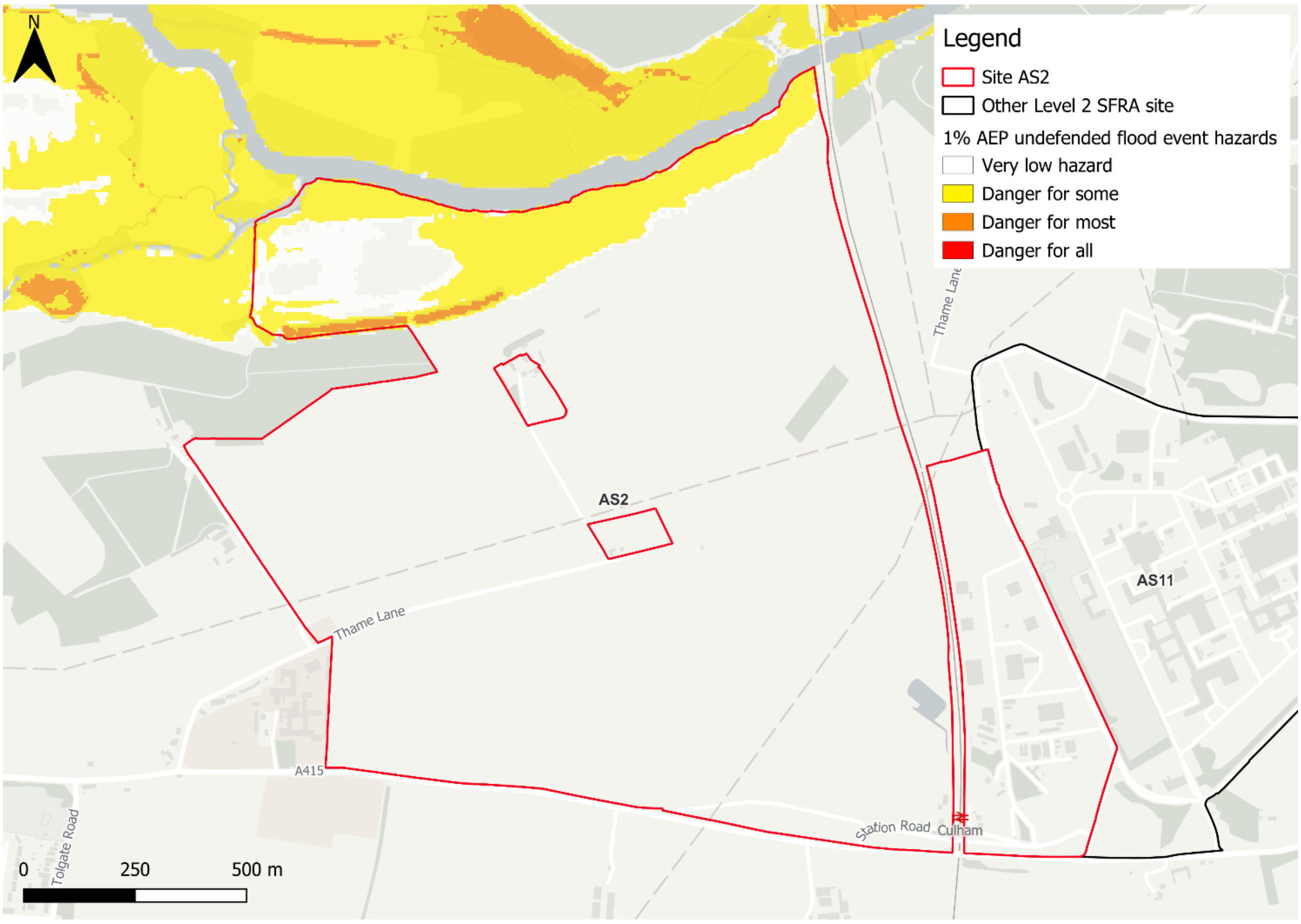

Figure 2-3: Flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from the River Thames has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with some slightly larger areas of significant depths (Figure 2-4) and hazards (Figure 2-5).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA produced to inform a planning application should include the most up to date climate change allowances.

[1] Fluvial hazard ratings based on Table 4 of the Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008. Environment Agency.

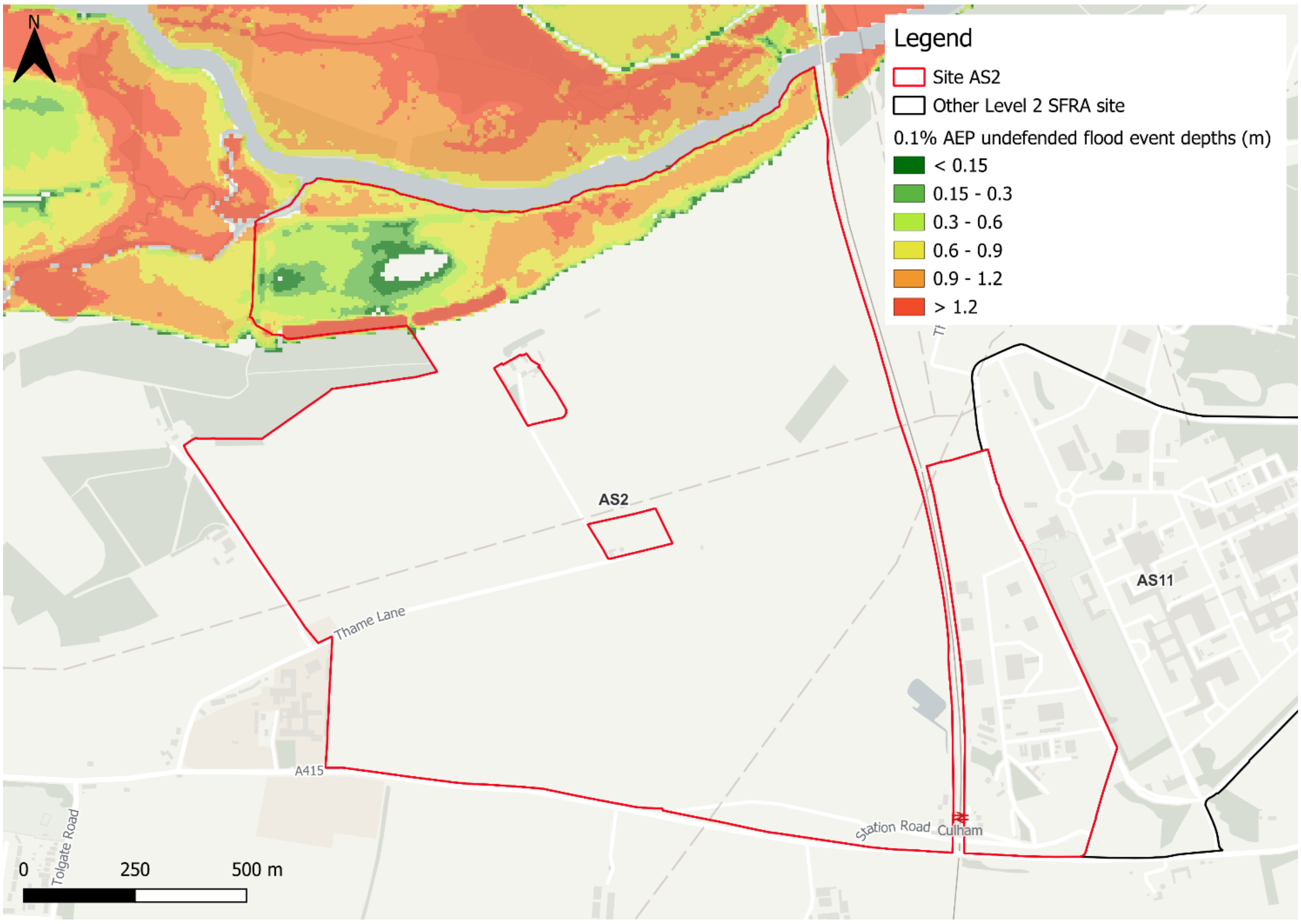

Figure 2-4: Flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

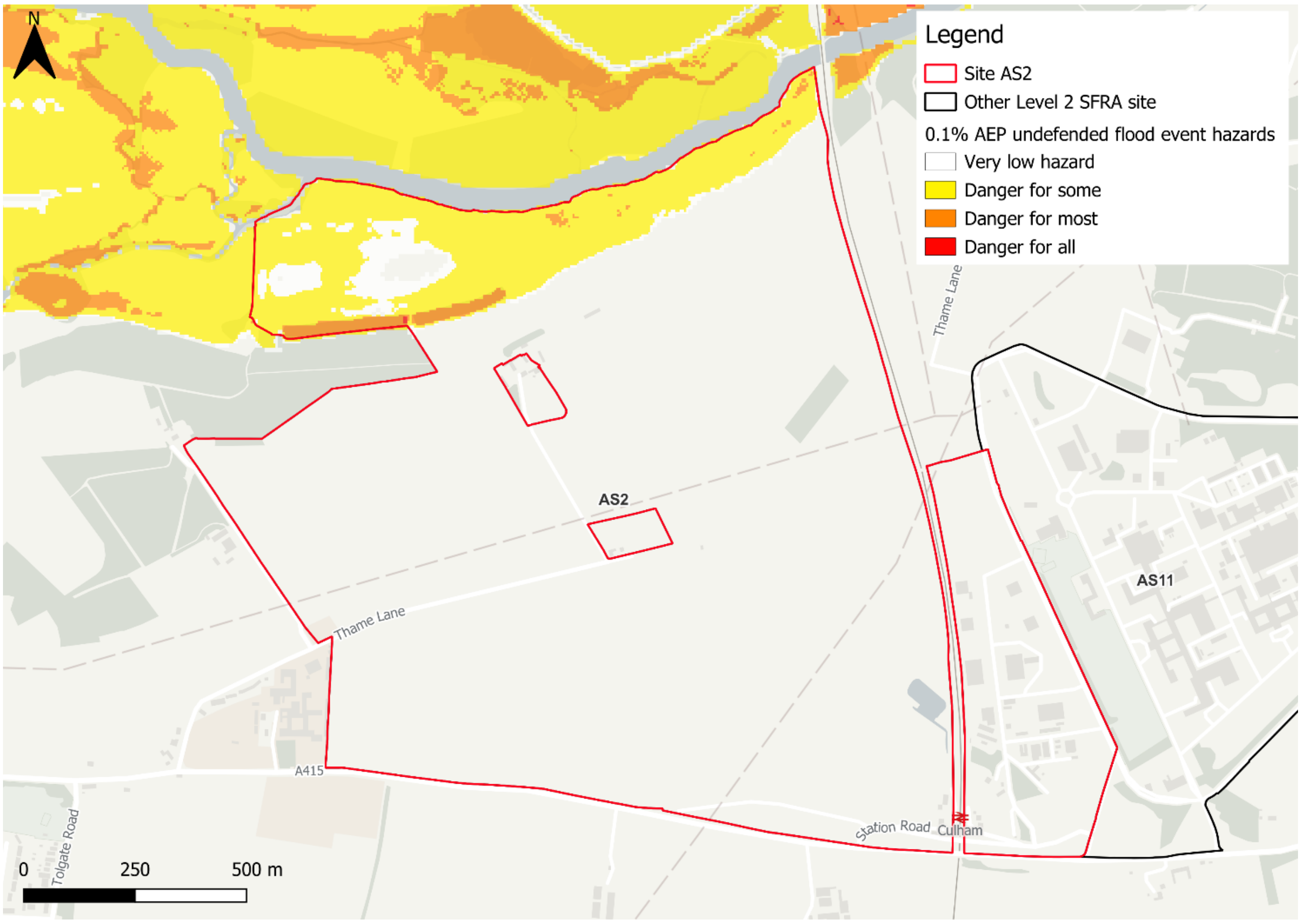

Figure 2-5: Flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset. There are however areas of natural high ground to the south of the River Thames floodplain, within the north of the site.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS2 (Land Adjacent to Culham Campus) is located within one catchment, namely; Thames (Evenlode to Thame). This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there are significant opportunities for tree planting within the areas at flood risk to reduce runoff. There is also potential to reconnect the channel to the floodplain, allowing flood water to be stored. These areas are shown in Figure 2-6.

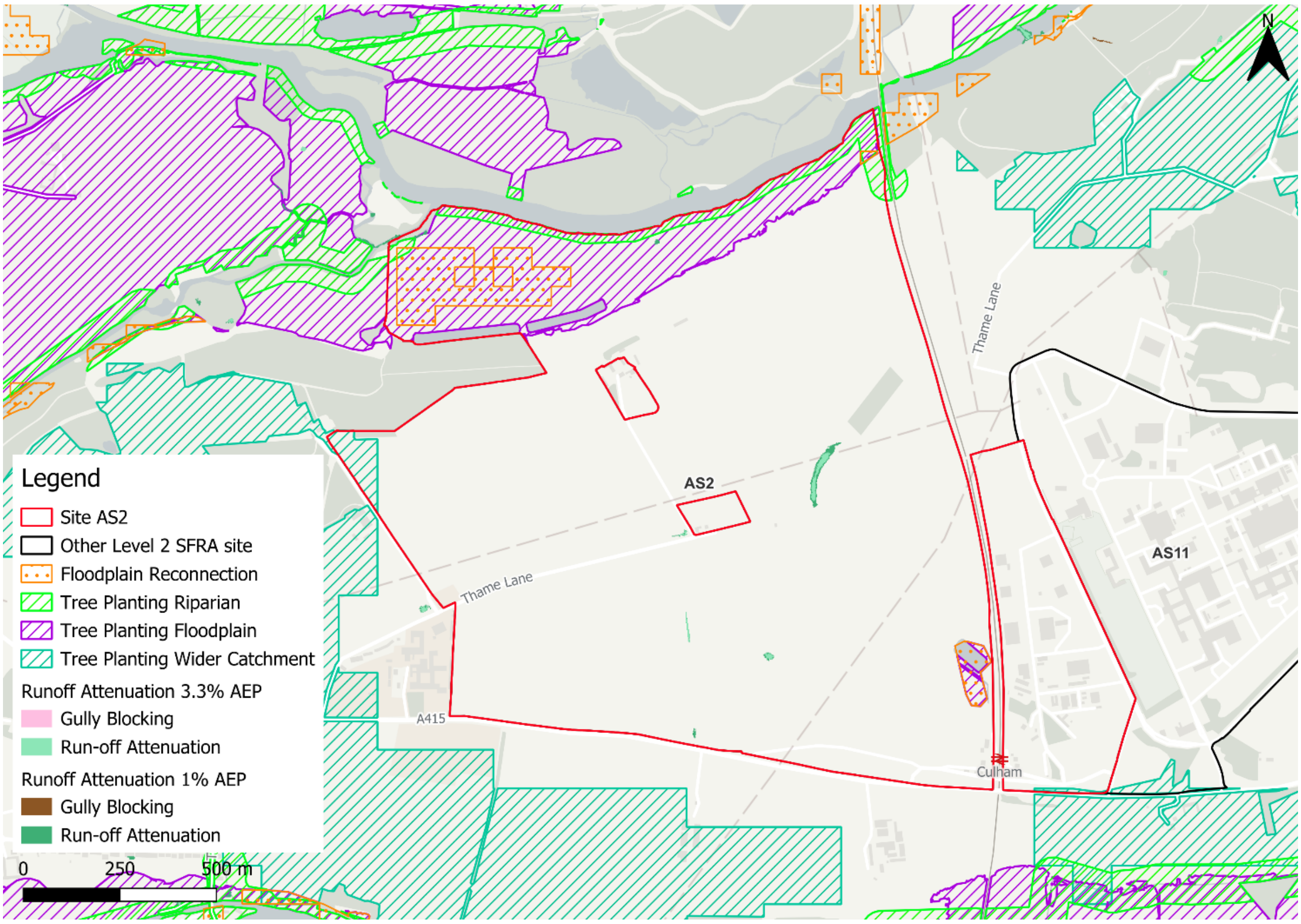

Figure 2-6: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. Figure 2-7 shows the RFM in a "dry day" and "wet day" scenario. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is potentially at risk from two reservoirs which are located in Oxfordshire, namely Farmoor No.1 and Farmoor No.2.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required.

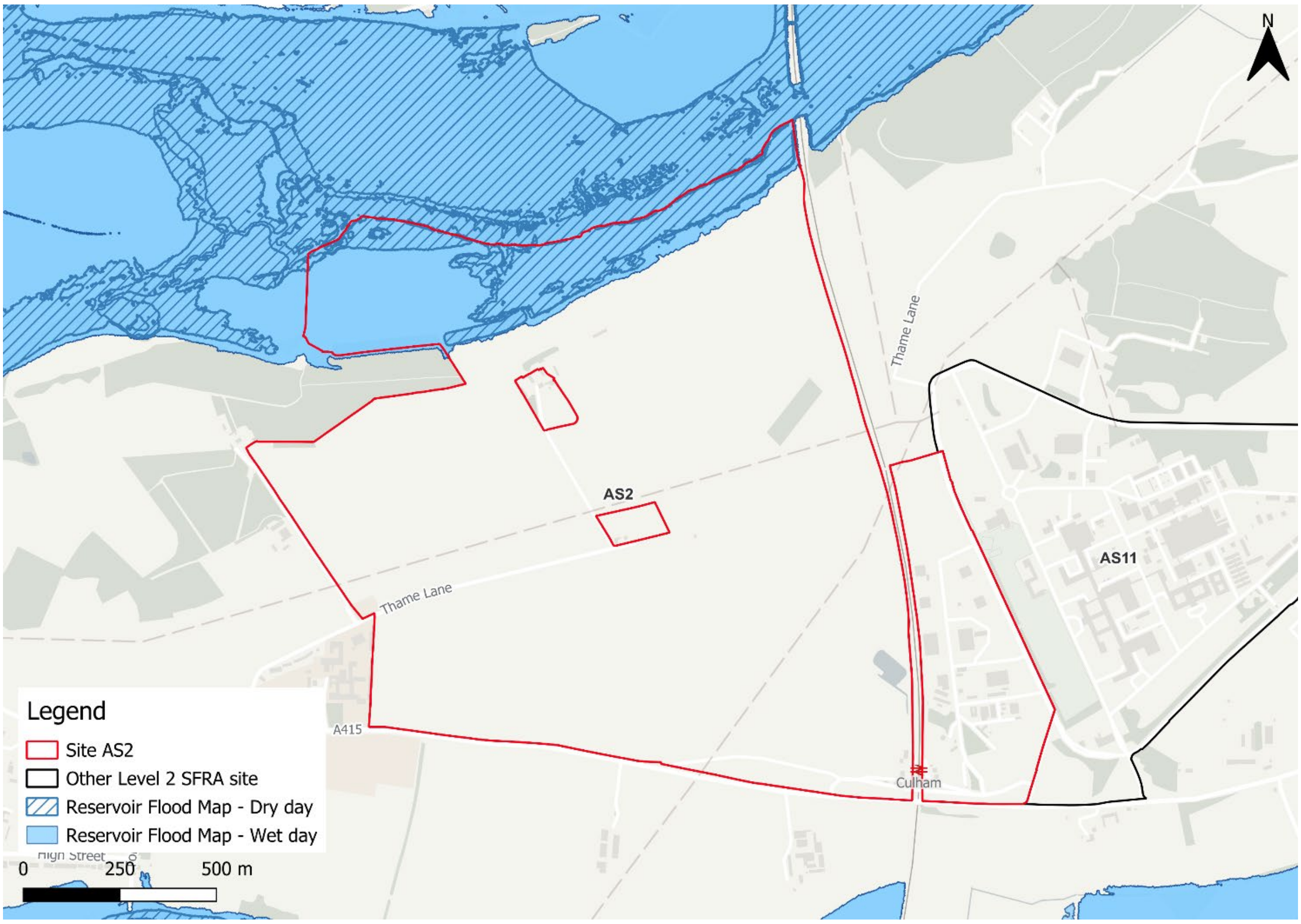

Figure 2-7: Flood risk from reservoirs

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. Historic risk to the site is shown in Figure 2-8 which shows that the area along the northern boundary of the site and a small area within the south of the site have been subject to flooding in the past, relating to an existing on site pond. Any site-specific FRA should assess the current regime providing water to the existing pond. The RFO dataset references that the area to the north of the site was subject to flooding in spring 1947, summer 1977, winter 1979, winter 2000, winter 2003, summer 2007 and winter 2013/2014 due to fluvial flooding from the River Thames. The northeast of the site has also experienced flooding in the past as a result of surface water. The area within the south of the site was subject to flooding in January 2003. To the southeast of the site, flooding occurred at the high street in 2014/2015, with the cause thought to be surface water flooding.

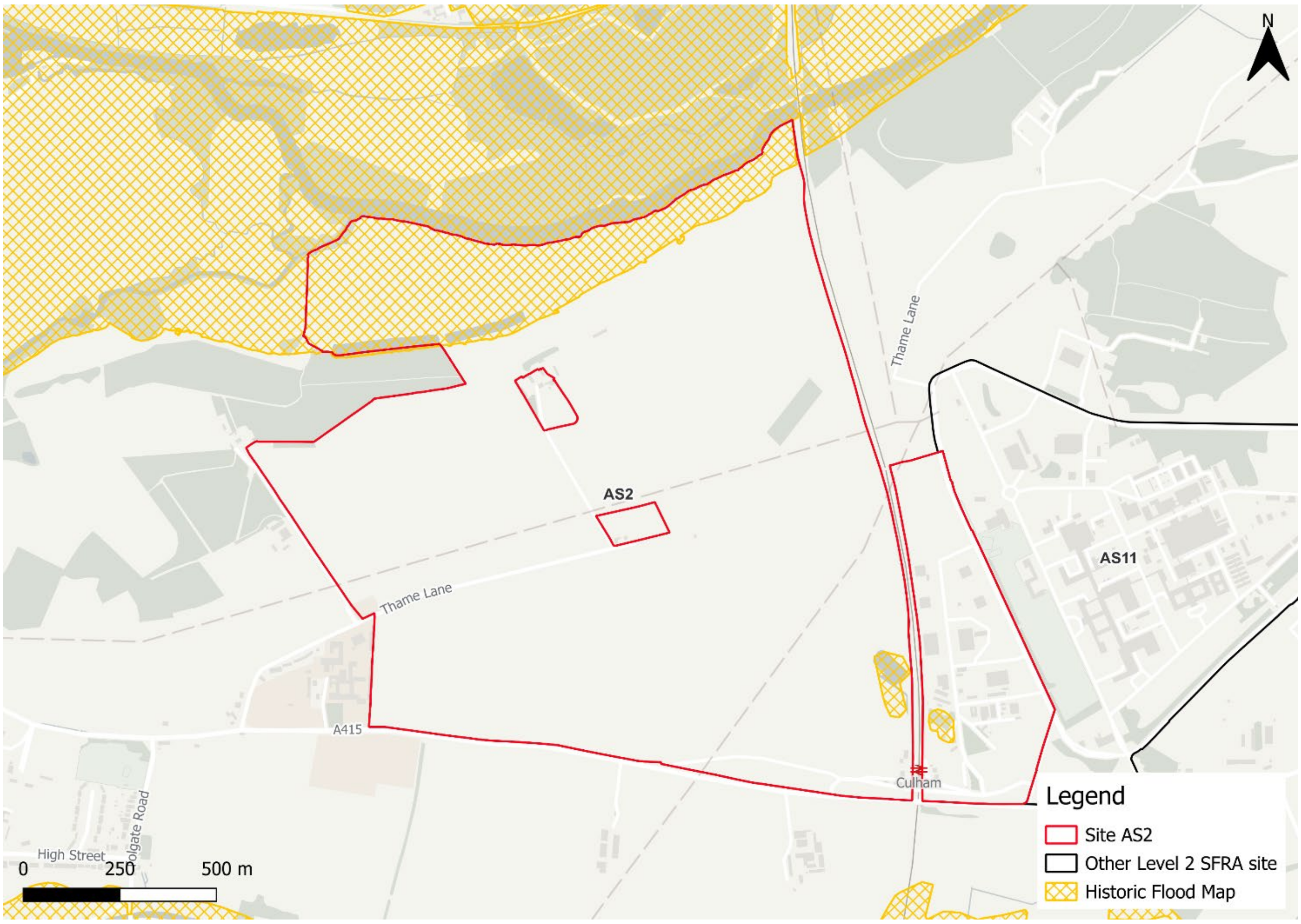

Figure 2-8: Recorded historic flood events onsite and around the site

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. Site AS2 (Land Adjacent to Culham Campus) is located within two FWAs; 061FWF23Abingdon - River Thames in Abingdon-on-Thames and 061FWF23ClfntoWt - River Thames at Clifton Hampden, Dorchester and Little Wittenham, as shown on Figure 2-9.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is also located within a FAA, namely 061WAF23Abingdon - River Thames for the Abingdon-on-Thames area.

Safe access and escape routes could likely be achieved during a flood event via Thame Lane and the A415 to the south of the site.

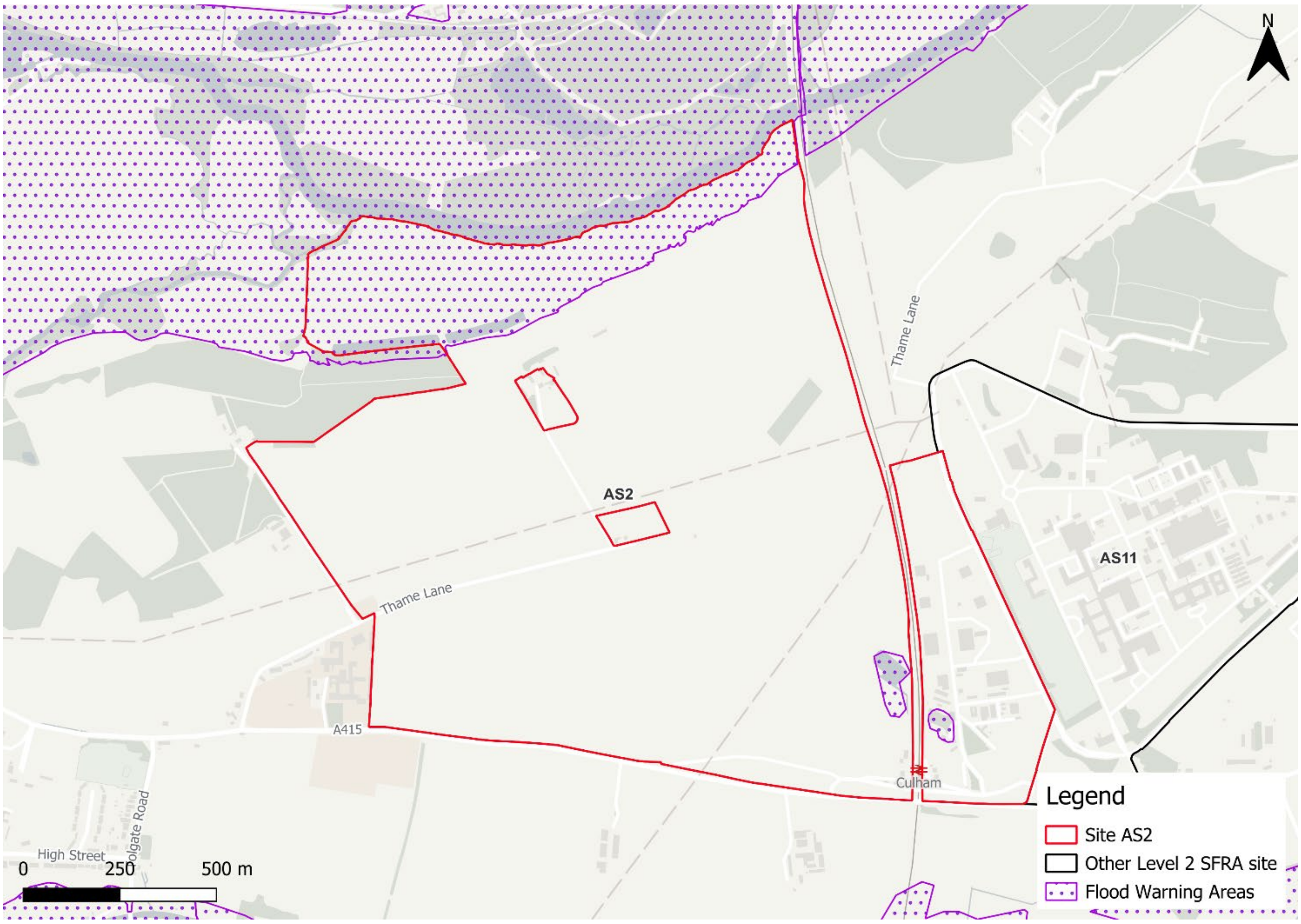

Figure 2-9: EA Flood Warning Areas

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the northern boundary of the site, adjacent to the River Thames. Vulnerable development is not permitted within the functional floodplain.
- There should be no development within 8m of the River Thames apart from permitted access. The EA recommend for a 8m no development buffer for all main rivers to enable access for maintenance activities. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- A flood risk activity permit may be required if development is planned within 8m of the riverbank. The EA can advise on whether a permit will be required.
- The site is partially located in Flood Zone 3, as indicated by the EA's Flood Map for Planning and the Thames (Sandford to Pangbourne) 1% AEP undefended event outputs. Greatest depths within the site boundary are modelled to be > 1.2m. More vulnerable development should be directed away from the area of the site within Flood Zone 3.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent

to the present day Flood Zone 3, with some slightly larger areas of significant depths. However, climate change must be modelled at the site-specific FRA stage.

- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The EA flood warnings should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape routes are available from several locations based on current information.
- Were development of this site to proceed, given the proximity of this site to neighbouring site AS11 (Culham Campus), it would be prudent to formulate a strategy to develop these sites in tandem and for consultation between each developer to take place to ensure a joined-up approach for managing flood risk and drainage is in place.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the high risk surface water flood zone. A further 1% is at medium surface water risk, and a further 2% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is largely confined to small areas of ponding in topographic low spots within the larger site parcel. In the low risk event, there is a short surface water flow path through the south of the larger site parcel. Greatest flood depths in the high risk event range between 0.3 and 0.6m (Figure 3-1) with some areas of moderate hazard (Figure 3-2). Safe access and escape routes should be possible via Thame Lane and the A415 in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
96	2	1	1

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

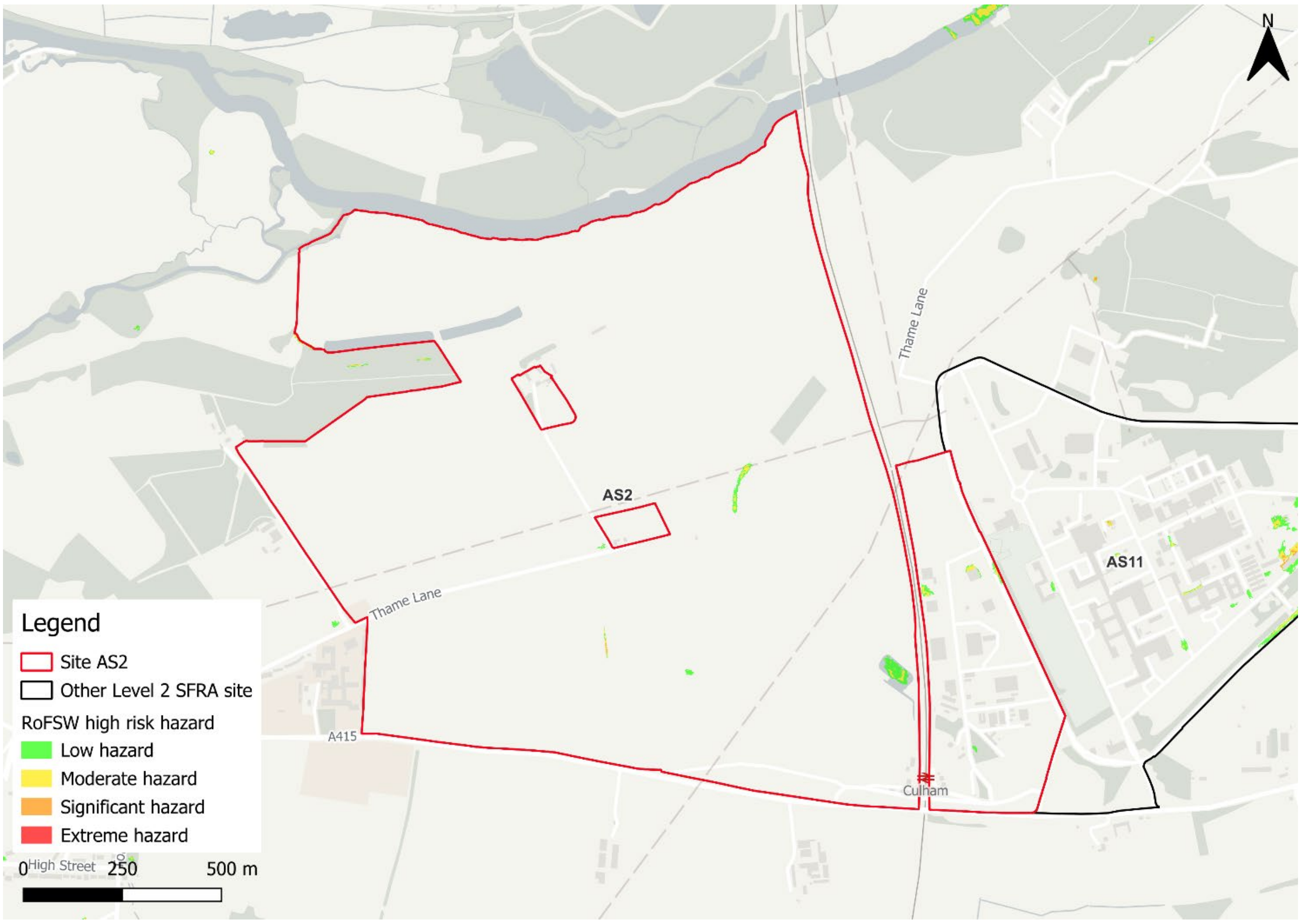

Figure 3-2: High risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding within the topographic low spots. Maximum flood depths are modelled to be between 0.9 and 1.2m, with areas of significant hazard (Figure 3-4), within the area of ponding in the centre of the site.

[2] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 96% of the site being at very low surface water flood risk. Surface water risk in the high and medium risk events is confined to small areas of ponding within topographic low spots in the centre of the site.
- In the low risk surface water event, there is an emerging flow path within the south of the larger site parcel. Any existing flow paths should be maintained in site design.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding within the topographic low spots.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- When a planning application is submitted,, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based

on layout plans and detailed design and full consultation with the LLFA. The existing onsite pond should be considered as part of the drainage strategy.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map for Site AS2 (Land adjacent to Culham Campus) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. Across the majority of the site, there is a possibility of groundwater emerging at the surface locally. Within the south west of the site, there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. Within the area of the site adjacent to the River Thames, and a small area within the smaller site parcel, there is a negligible risk from groundwater flooding. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

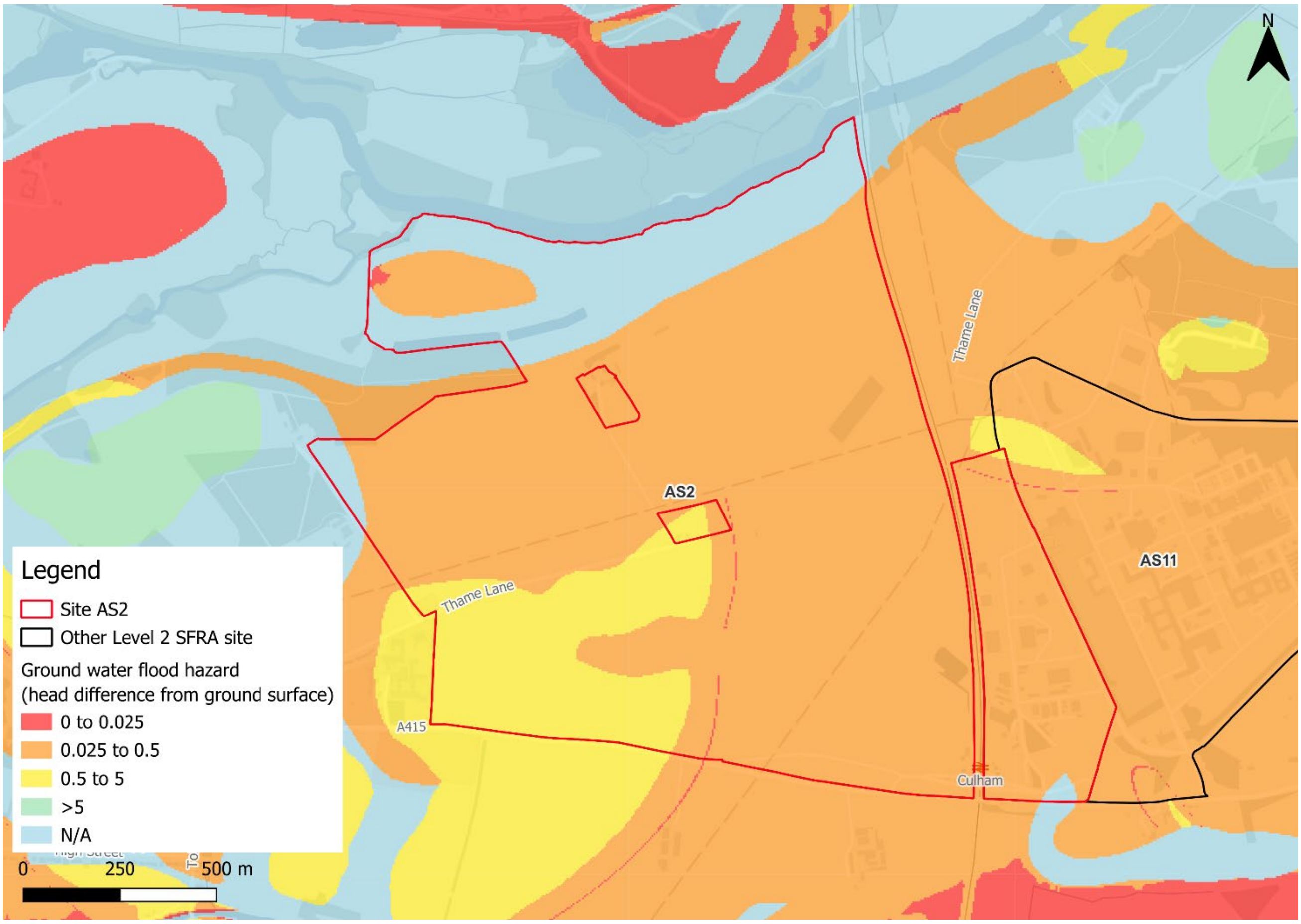

Figure 4-1: JBA 5m Groundwater Flood Map

[3] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

Based on current information and the use of proxies to represent the impacts of climate change, this site should be able to pass the exception test. However, all the recommendations suggested in this Level 2 SFRA should be considered at the site-specific FRA stage or before any site design planning.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- There should be no development within 8m of the River Thames apart from permitted access. The EA recommend for an 8m no development buffer for all main rivers to enable access for maintenance activities. This should be used as a blue / green corridor to provide ecological, amenity and social value.
- Updated climate change modelling of the River Thames should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated in the Joint Local Plan if development avoids the area at modelled fluvial risk in the 0.1% AEP undefended event.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from the River Thames is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large area of the site.
- Groundwater conditions must be investigated further through the site-specific FRA.

[4] Para 170 National Planning Policy Framework 2023

- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF, FRCC-PPG, EA guidance, South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies, and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable: the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS3 - Land South of Grenoble Road, Edge of Oxford

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS3 - Land South of Grenoble Road, Edge of Oxford. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS3 - Land South of Grenoble Road, Edge of Oxford

- Location: Land South of Grenoble Road, Edge of Oxford (Figure 1-1)
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More vulnerable
- Site area: 152.53 ha
- Proposed development impermeable area: 129.7 ha (assumed 85% of site area)
- EA model: Northfield & Littlemore Brooks 2011
- Watercourse: Northfield Brook / Littlemore Brook. An ordinary watercourse originates within the south of the site and flows northwards. There is a small drainage ditch through the centre of the site.
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Subject to Exception Test
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

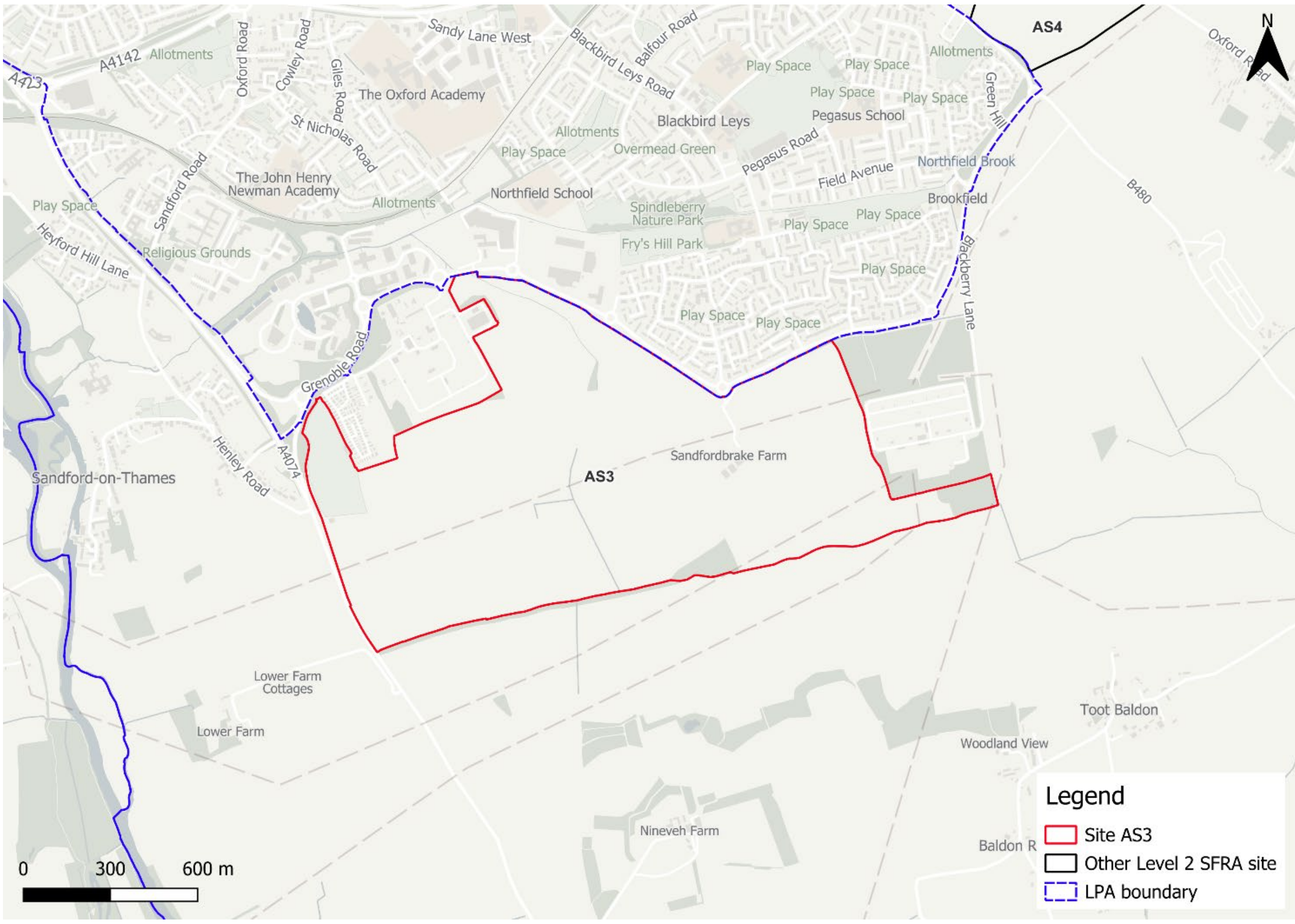

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the east at approximately 74mAOD. The lowest ground levels are located towards the north of the site at approximately 58mAOD.

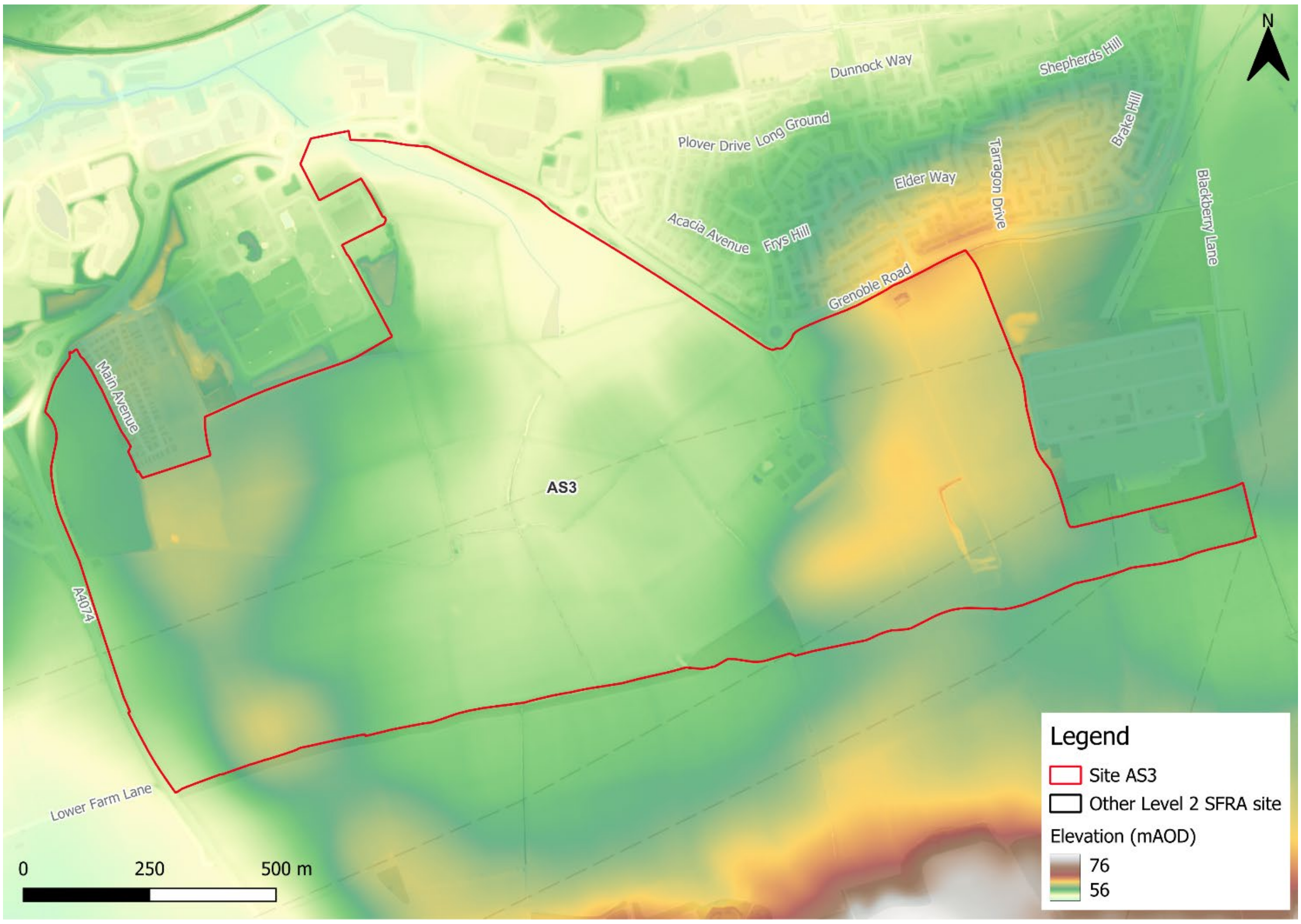

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

There is a small drainage ditch running through the centre of the site. Flood Zone 3b is present along the drainage ditch, based on the 1% AEP surface water flood extent. The area of functional floodplain onsite should be left free of vulnerable development. The functional floodplain within the north of the site is based on the 1% AEP undefended event from the Northfield & Littlemore Brooks 2011 model, as a precautionary approach in the absence of suitable modelled data. There is an additional area of fluvial risk to the north of the site within Flood Zone 2.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
94	1	0	5

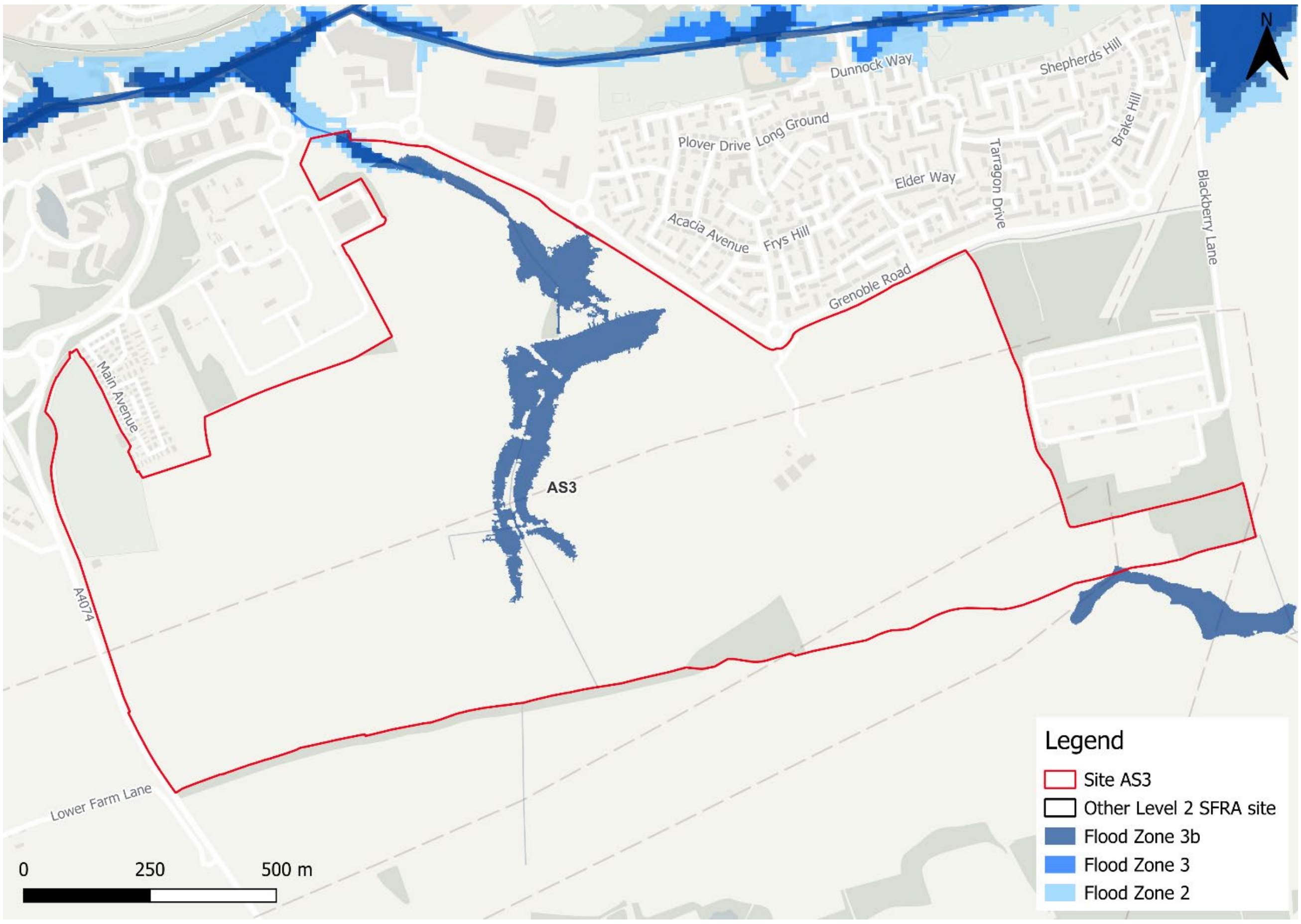

Figure 2-1: Existing risk from rivers to the site

2.1.2 Northfield & Littlemore Brooks 2011 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is confined to a flow path through the centre of the site to the northern boundary. Flood depths within the site are modelled to be shallow. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard in the area of the site at fluvial flood risk is categorised as very low. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event.

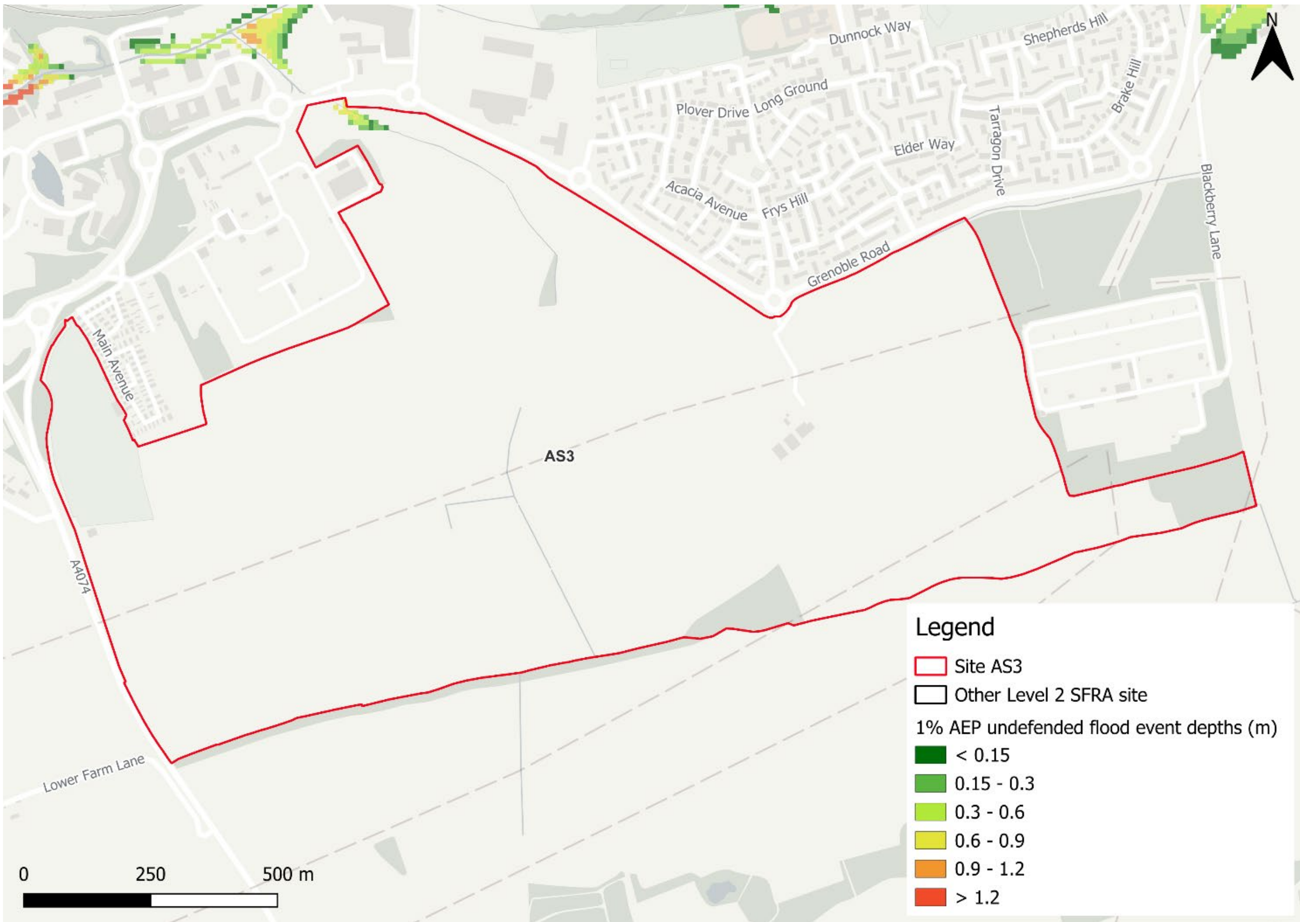

Figure 2-2: Flood depths for 1% AEP undefended flood event

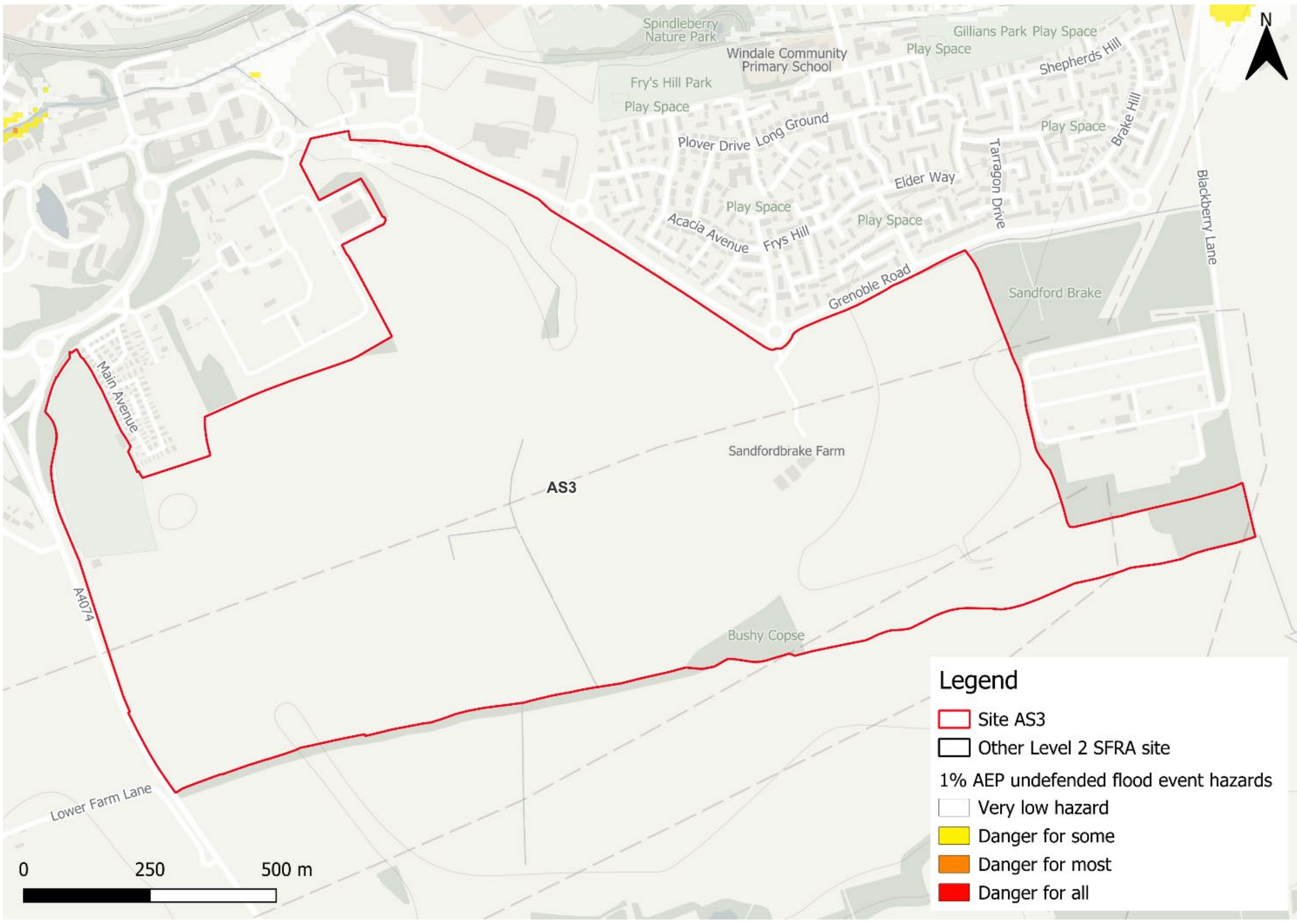

Figure 2-3: Flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from Northfield Brook and Littlemore Brook has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, future fluvial risk is modelled to be slightly greater than the present day Flood Zone 3. Maximum depths are modelled to be > 1.2 m (Figure 2-4) with areas of hazard classified as 'Danger for most' (Figure 2-5).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA should include for the most up to date climate change allowances.

[1] Fluvial hazard ratings based on Table 4 of the Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008. Environment Agency.

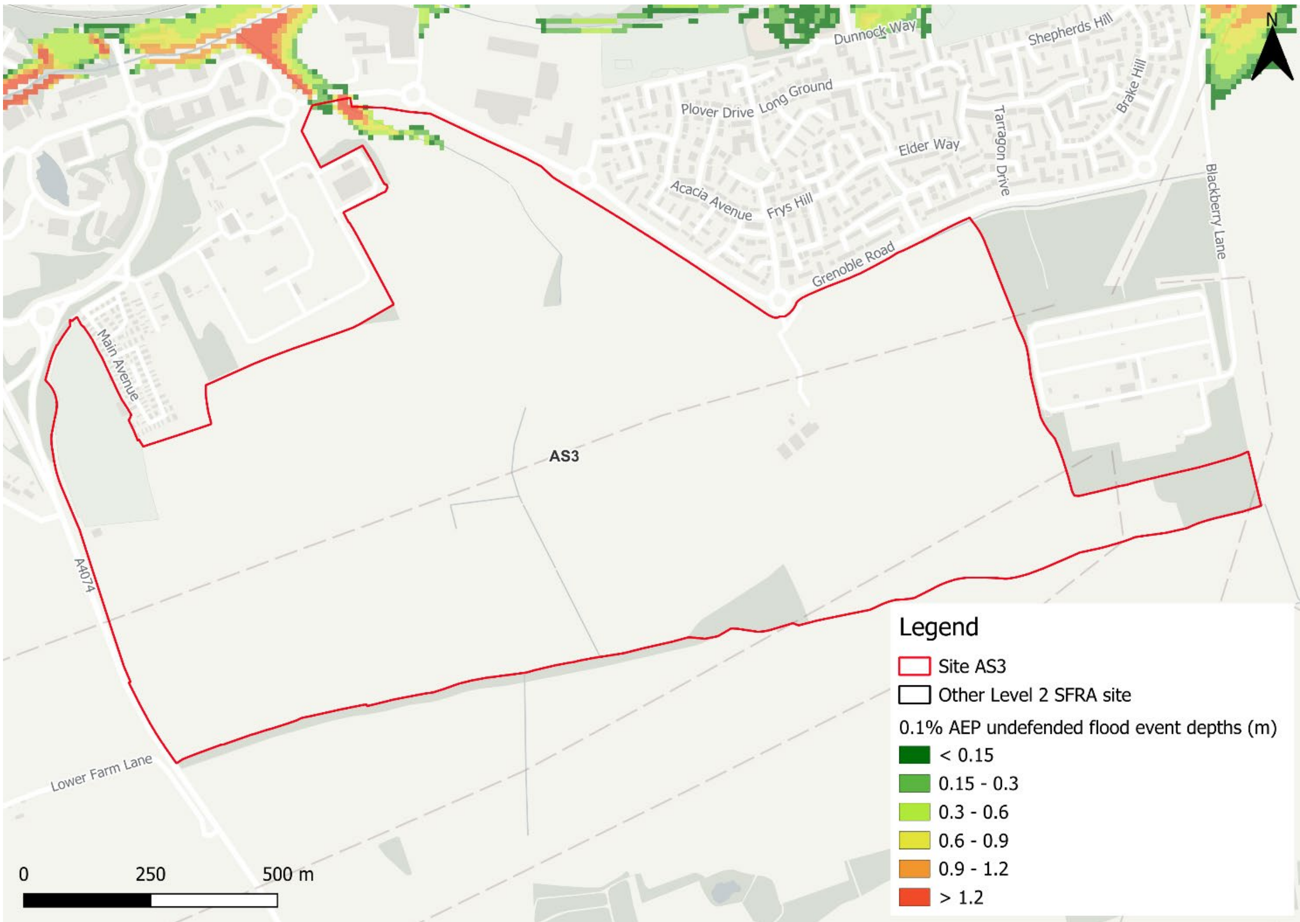

Figure 2-4: Flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

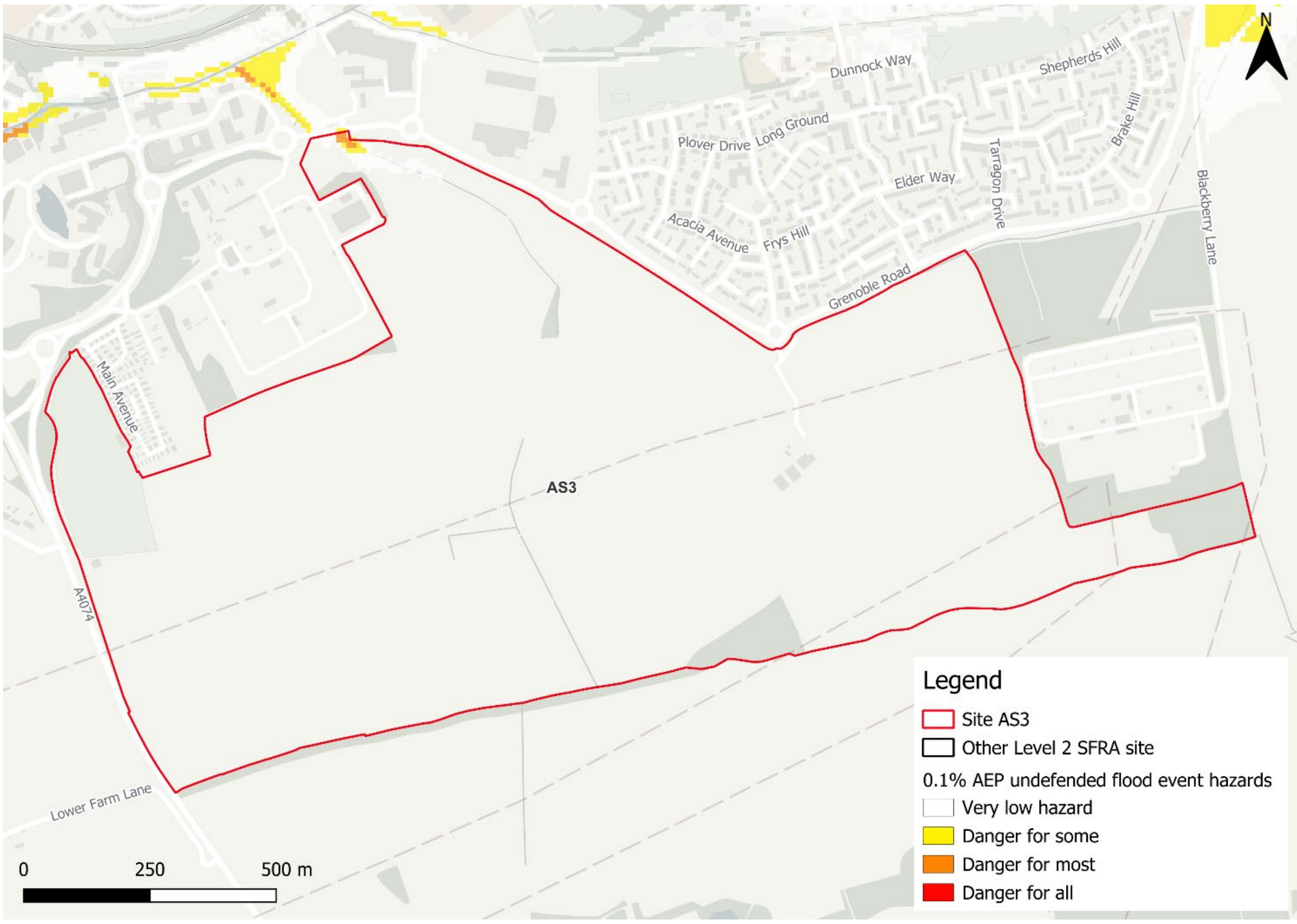

Figure 2-5: Flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset. There are however areas of natural high ground along the banks of Northfield Brook and Littlemore Brook to the north of the site.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS3 (Land South of Grenoble Road, Edge of Oxford) is located within three catchments, namely; Thames (Evenlode to Thame), Baldon Brook (South of Oxford) and Northfield Brook (Source to Thames) at Sandford. The majority of the site is located within higher sensitivity catchments. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there are significant opportunities for tree planting to reduce runoff. There is also potential to reconnect the channel to the floodplain, allowing flood water to be stored. These areas are shown in Figure 2-6.

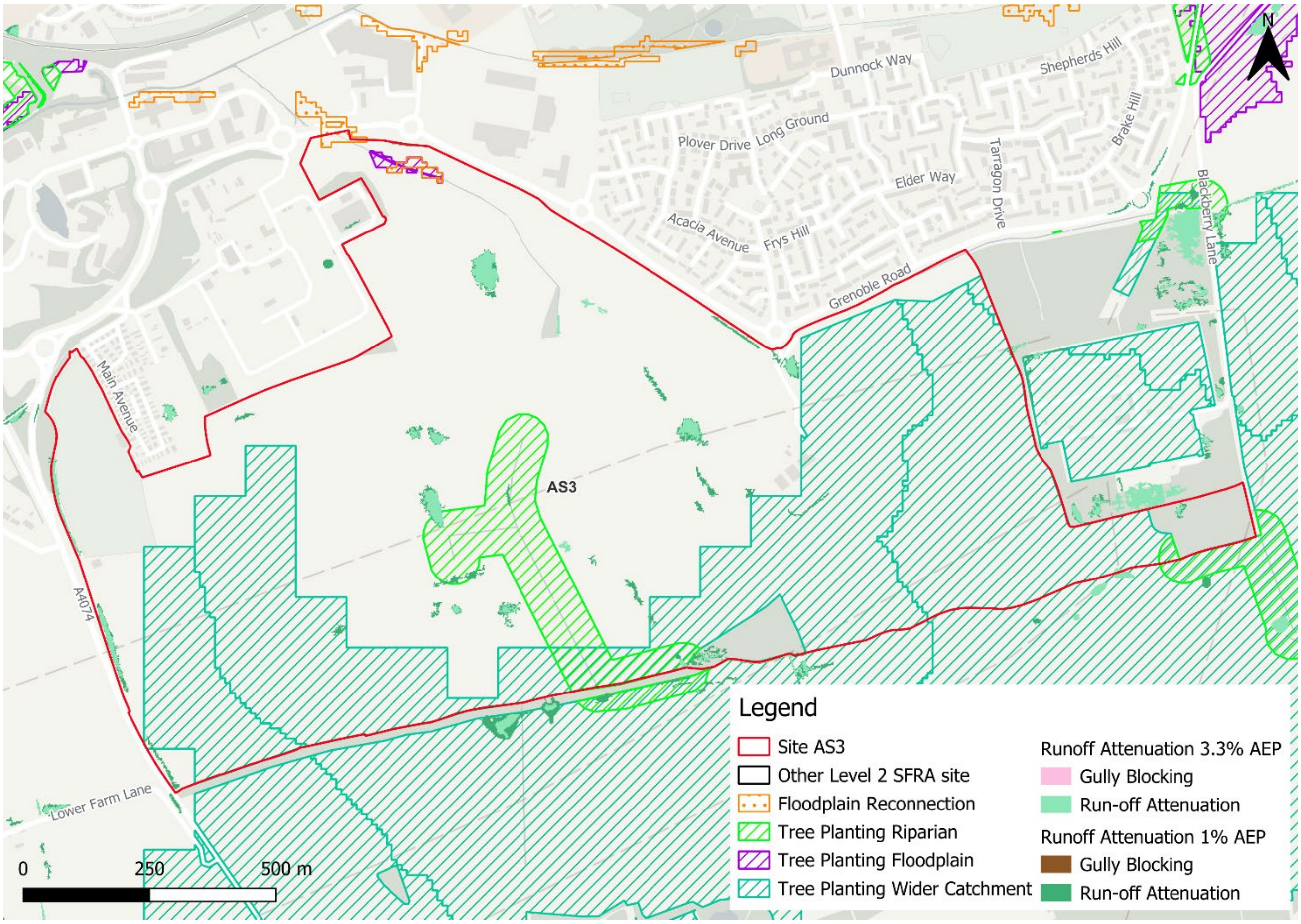

Figure 2-6: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the site. Although no flood incidents have been recorded at the site itself, Church Road to the west of the site was affected by flooding during Winter 2013/2014.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes could likely be achieved during a flood event via Grenoble Road to the north of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the drainage ditch through the centre of the site. Vulnerable development is not permitted within the functional floodplain. If feasible, this area should be used as a green / blue corridor which can provide ecological, social and amenity value. However, the functional floodplain is based on the Northfield & Littlemore Brooks 1% AEP undefended event as a precautionary approach.
- The site is partially located in Flood Zone 3, as indicated by the Northfield & Littlemore Brooks 1% AEP undefended event outputs though depths are shallow. More vulnerable development should be directed away from the area of the site within Flood Zone 3.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to be slightly greater in extent to the present day Flood Zone 3, with some areas of greater depth. However, climate change must be modelled at the site-specific FRA stage.
- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly low. Approximately 4% of the site is within the high risk surface water flood zone. A further 2% is at medium surface water risk, and a further 10% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, there is a significant surface water flow path along the drainage ditch through the centre of the site. There are also some scattered areas of surface water ponding within topographic low spots. In the low risk event, surface water risk to the site is significant, with a number of additional surface water flow paths through the centre of the site. Greatest flood depths in the high risk event are > 1.2 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Grenoble Road in all events, if access roads within the site avoid the areas of surface water flood risk.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
84	10	2	4

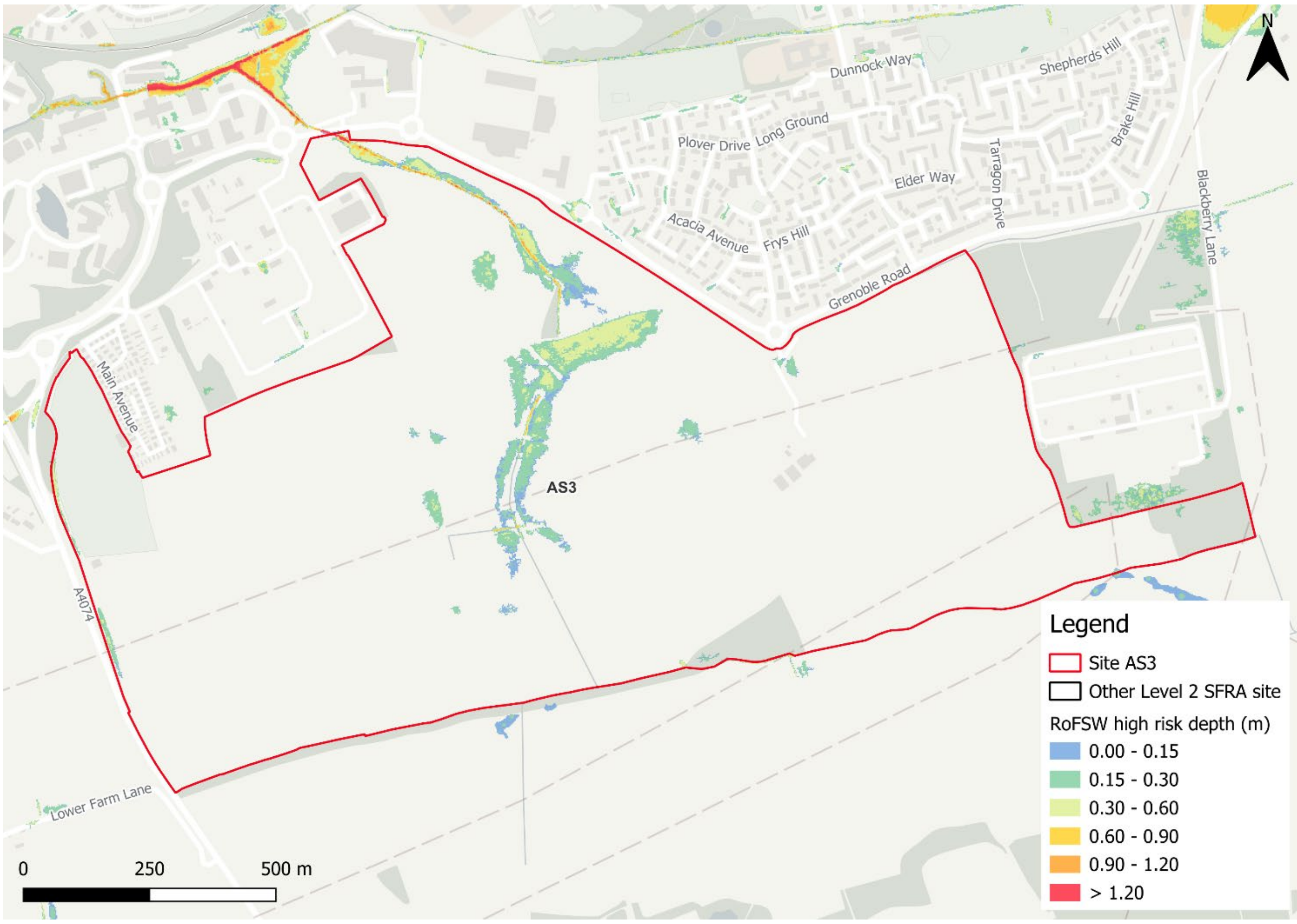

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

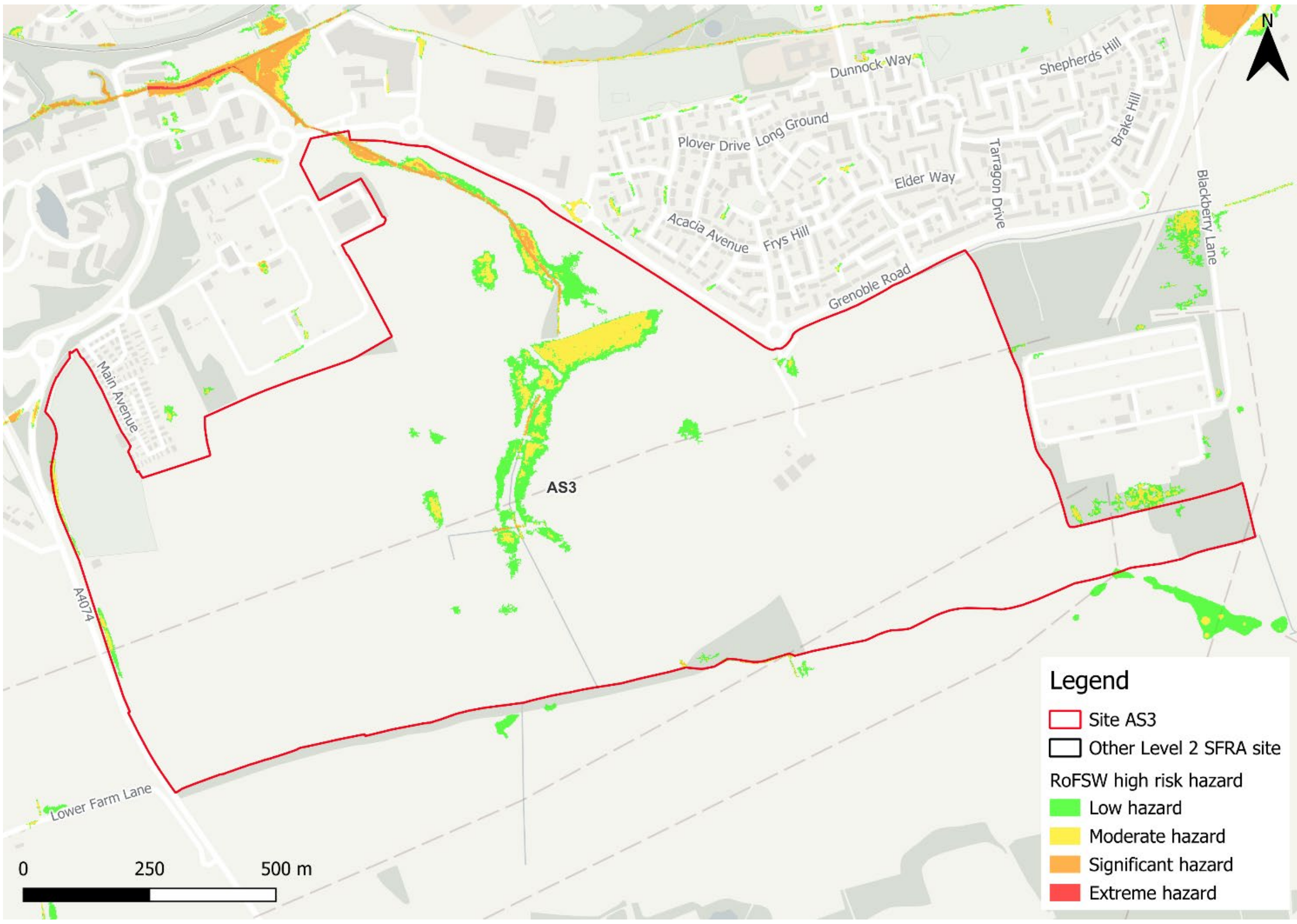

Figure 3-2: High risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the path of the drainage ditch. Maximum flood depths are modelled to be > 1.2m, with some areas of significant hazard (Figure 3-4).

[2] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

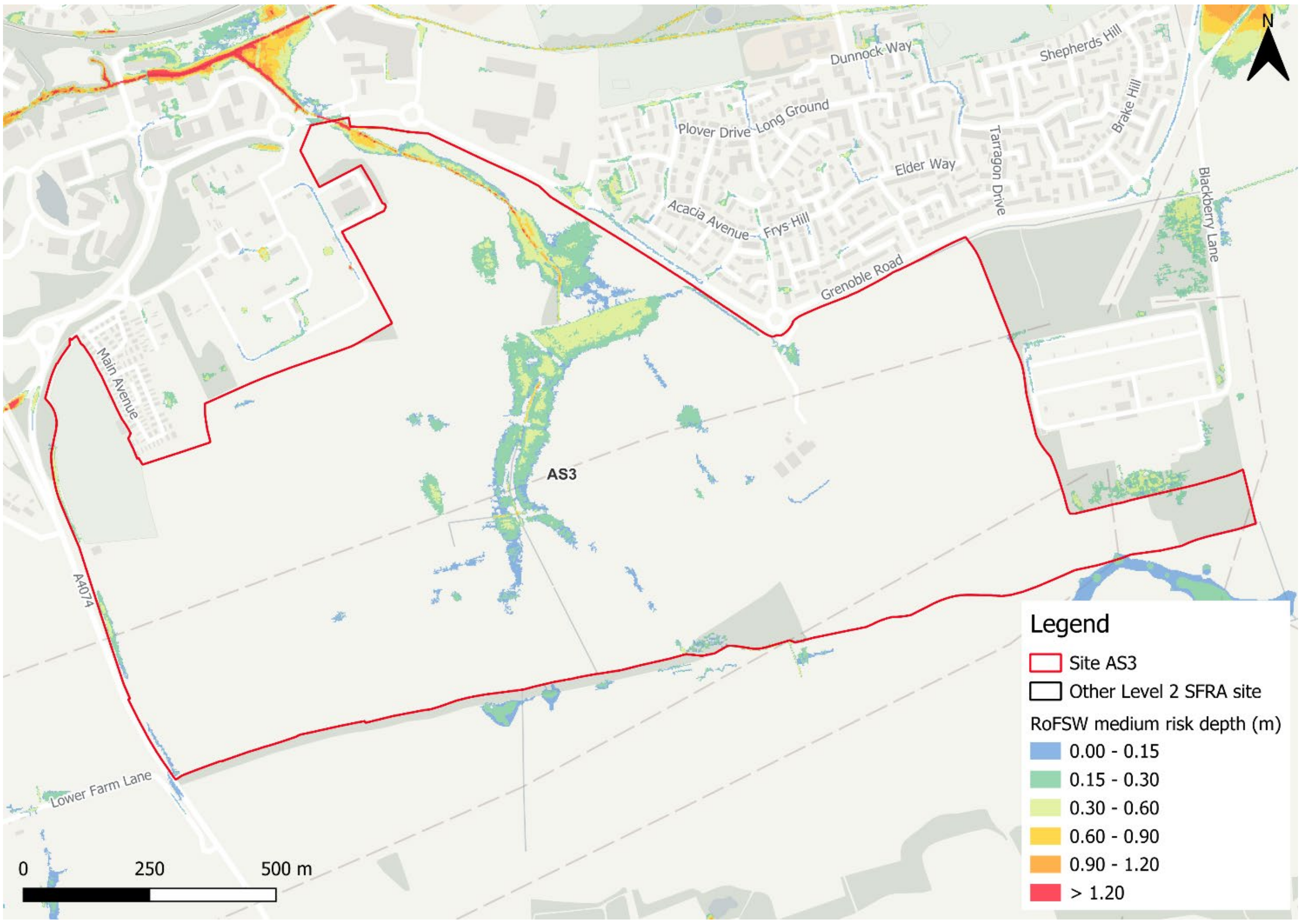

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

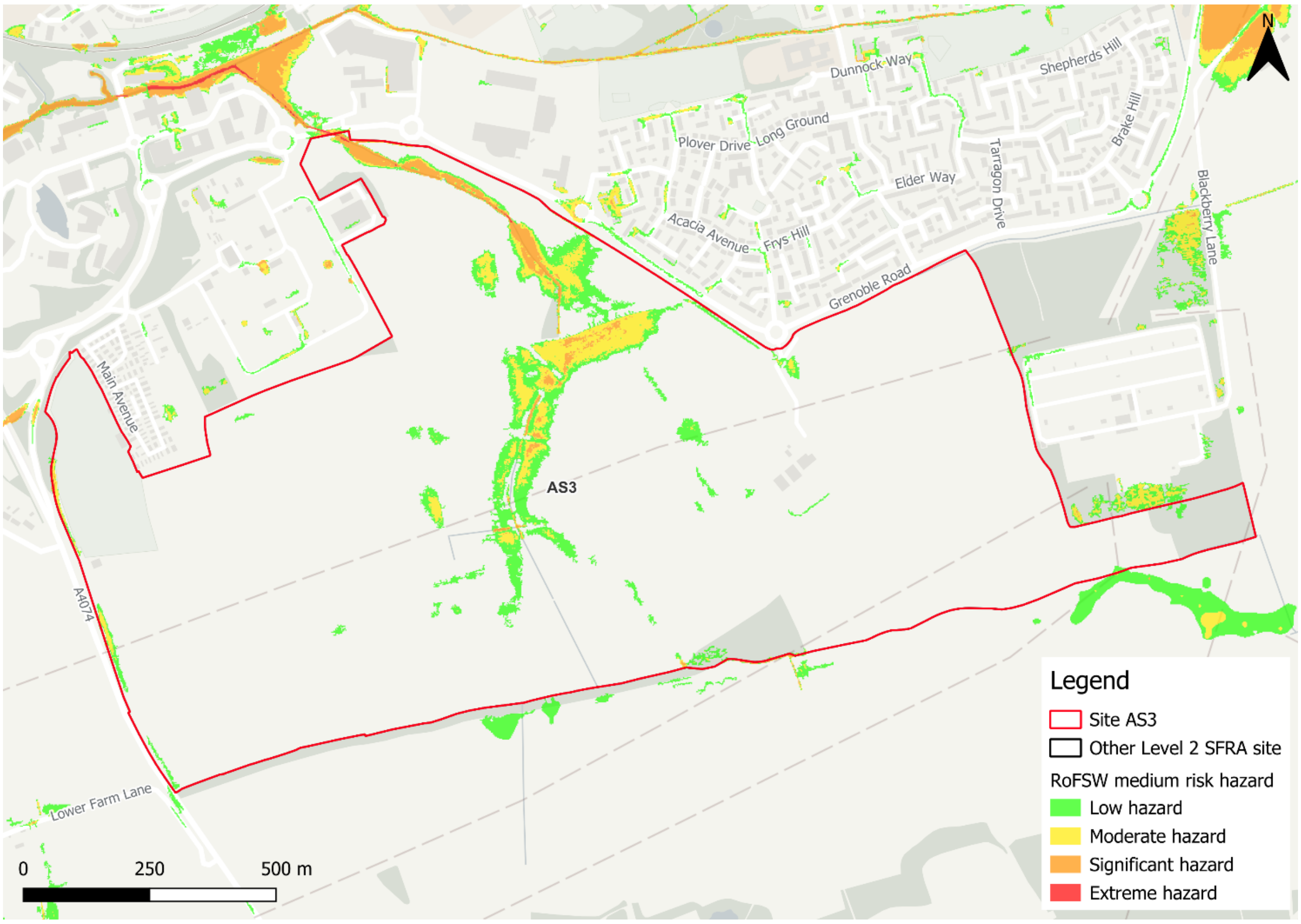

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 84% of the site being at very low surface water flood risk. Surface water risk in the high and medium risk events is present along the path of the drainage ditch through the centre of the site. Any existing flow paths should be maintained in site design.
- In the low risk surface water event, there are a number of significant flow paths through the centre of the site which should be maintained in site design.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the path of the drainage ditch.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- The drainage ditch should be kept in place and remain unobstructed. The watercourse should be maintained and included within the landscaping design of the residential development.
- When a planning application is submitted, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere

as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- To ensure safe access and escape during a low risk surface water event, any access roads within the site should avoid the significant flow paths within the centre of the site or be raised above the modelled flood level.
- The groundwater table is likely to be high across northern parts of the site judging from the Groundwater Flood Risk Map in Figure 4-1, therefore infiltration SuDS may not be appropriate. However, the majority of the site should be conducive to infiltration SuDS.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map for Site AS3 (Land South of Grenoble Road, Edge of Oxford) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. Across the majority of the site, there is a possibility of groundwater emerging at the surface locally. Within the north of the site, there is a risk of groundwater flooding to both surface and subsurface assets. Across the rest of the site, there is a negligible risk from groundwater flooding. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions in the north of the site.

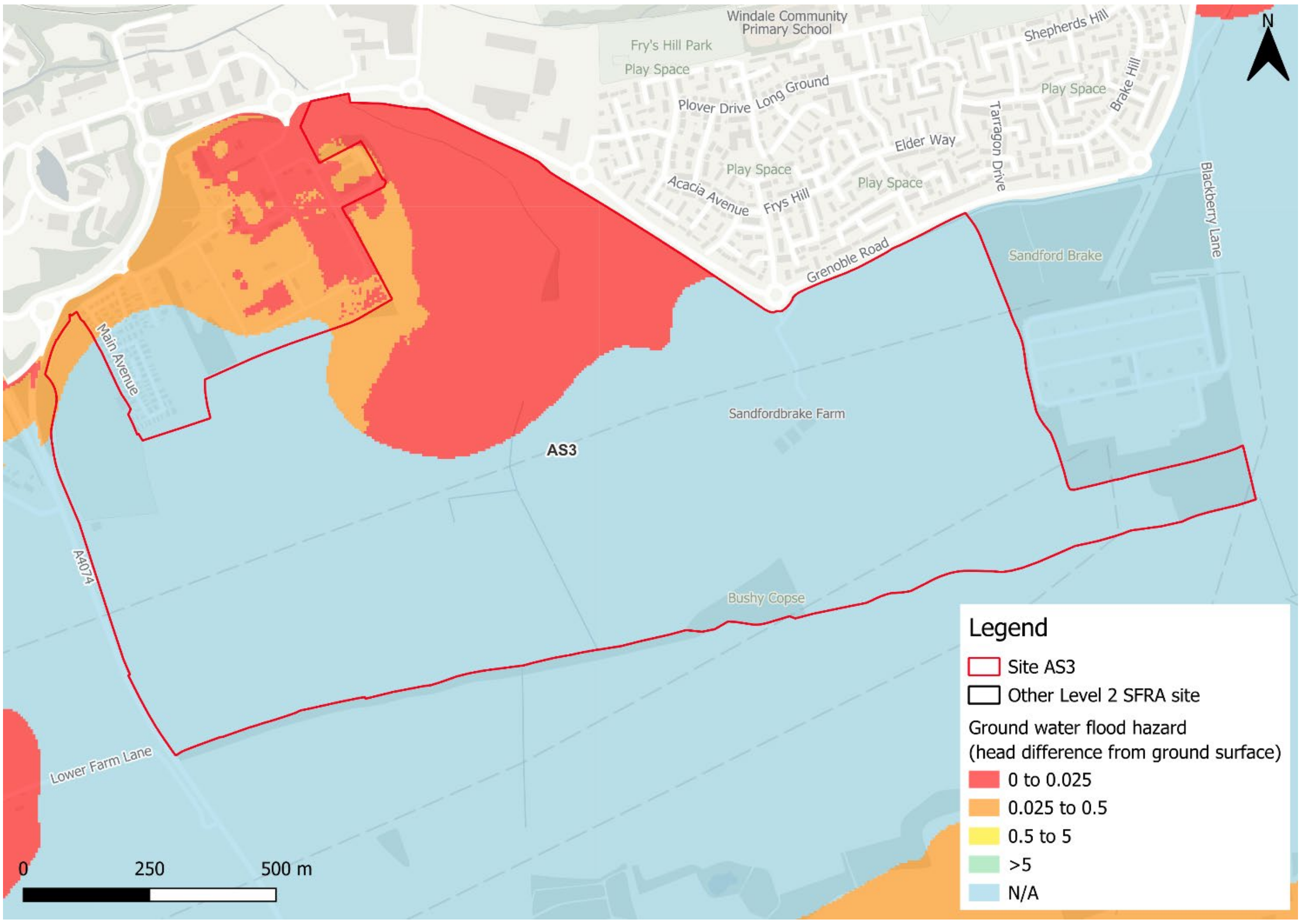

Figure 4-1: JBA 5m Groundwater Flood Map

[3] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

Based on current information and the use of proxies to represent the impacts of climate change, this site should be able to pass the exception test. However, all the recommendations suggested in this Level 2 SFRA should be considered at the site-specific FRA stage or before any site design planning.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- There should be no vulnerable development within the area of the site covered by the functional floodplain. This should be converted to a blue / green corridor to provide ecological, amenity and social value.
- Updated climate change modelling of Northfield Brook and Littlemore Brook should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- This site could be allocated in the Joint Local Plan, based on current information, if vulnerable development avoids the area of functional floodplain and significant surface water flow path along the drainage ditch through the centre of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from Northfield Brook and Littlemore Brook is fully ascertained.
- The drainage ditch should be kept in place and remain unobstructed. The watercourse should be maintained and included within the landscaping design of the residential development.

[4] Para 170 National Planning Policy Framework 2023

- Appropriate evacuation and emergency planning arrangements should be in place to ensure site users can be safely evacuated in advance of the extreme surface water event.
- A detailed drainage strategy will be required for any new development, given the large area of the site.
- Groundwater conditions must be investigated further through the site-specific FRA.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF, FRCC-PPG, EA guidance, South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies, and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable: the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS4 - Land at Northfield, Edge of Oxford

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

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List of Tables

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS4 - Land at Northfield, Edge of Oxford. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS4 - Land at Northfield, Edge of Oxford

- Location: Land at Northfield, Edge of Oxford (Figure 1-1)
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly residential
- Proposed site use vulnerability: More vulnerable
- Site area: 68.00 ha
- Proposed development impermeable area: 57.9 ha (assumed 85% of site area)
- EA model: Northfield & Littlemore Brooks 2011
- Watercourse: Northfield Brook. A culverted watercourse is present within the western corner of the site.
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Subject to Exception Test
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

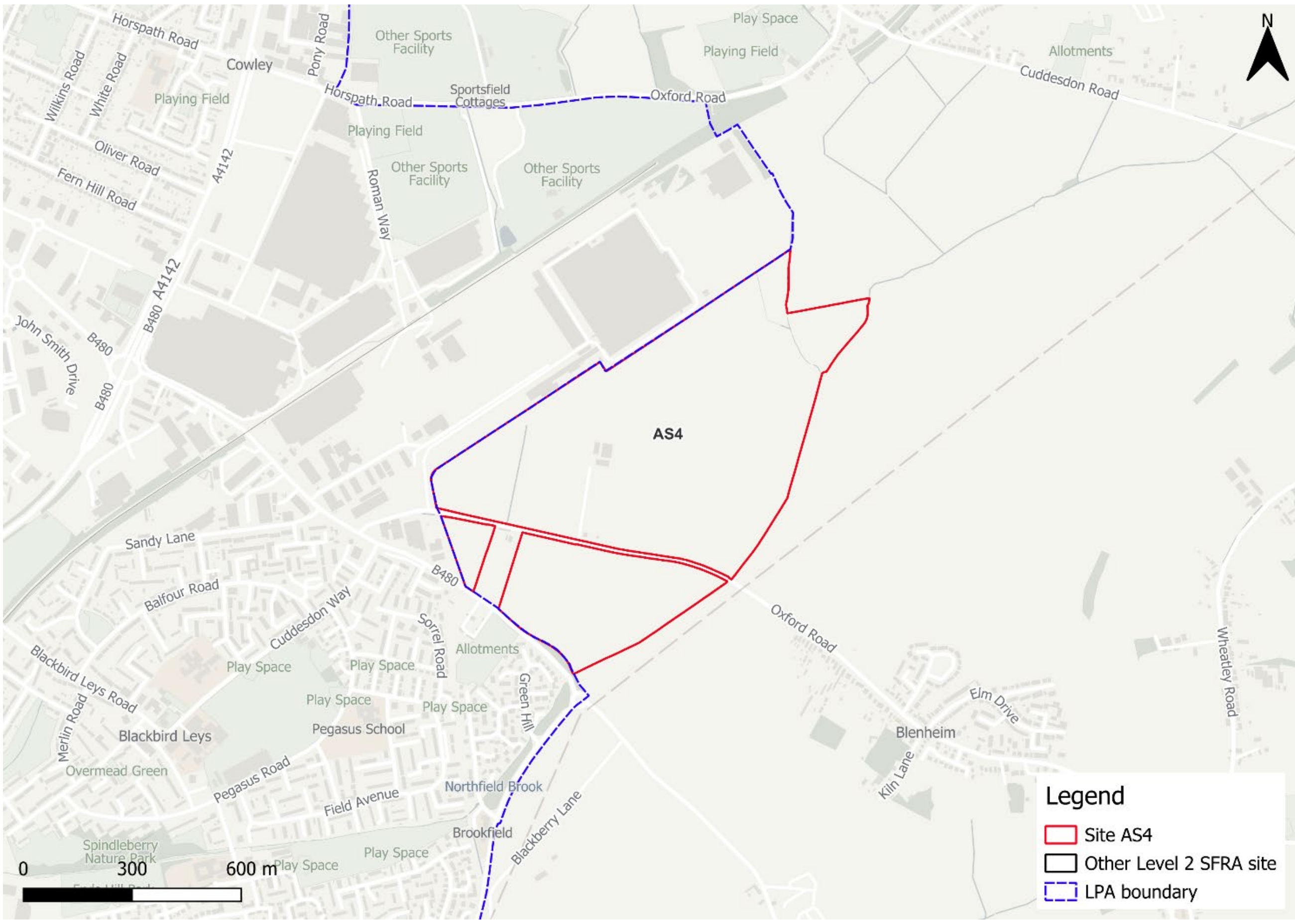

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the north at approximately 73mAOD. The lowest ground levels are located towards the south west of the site at approximately 64mAOD.

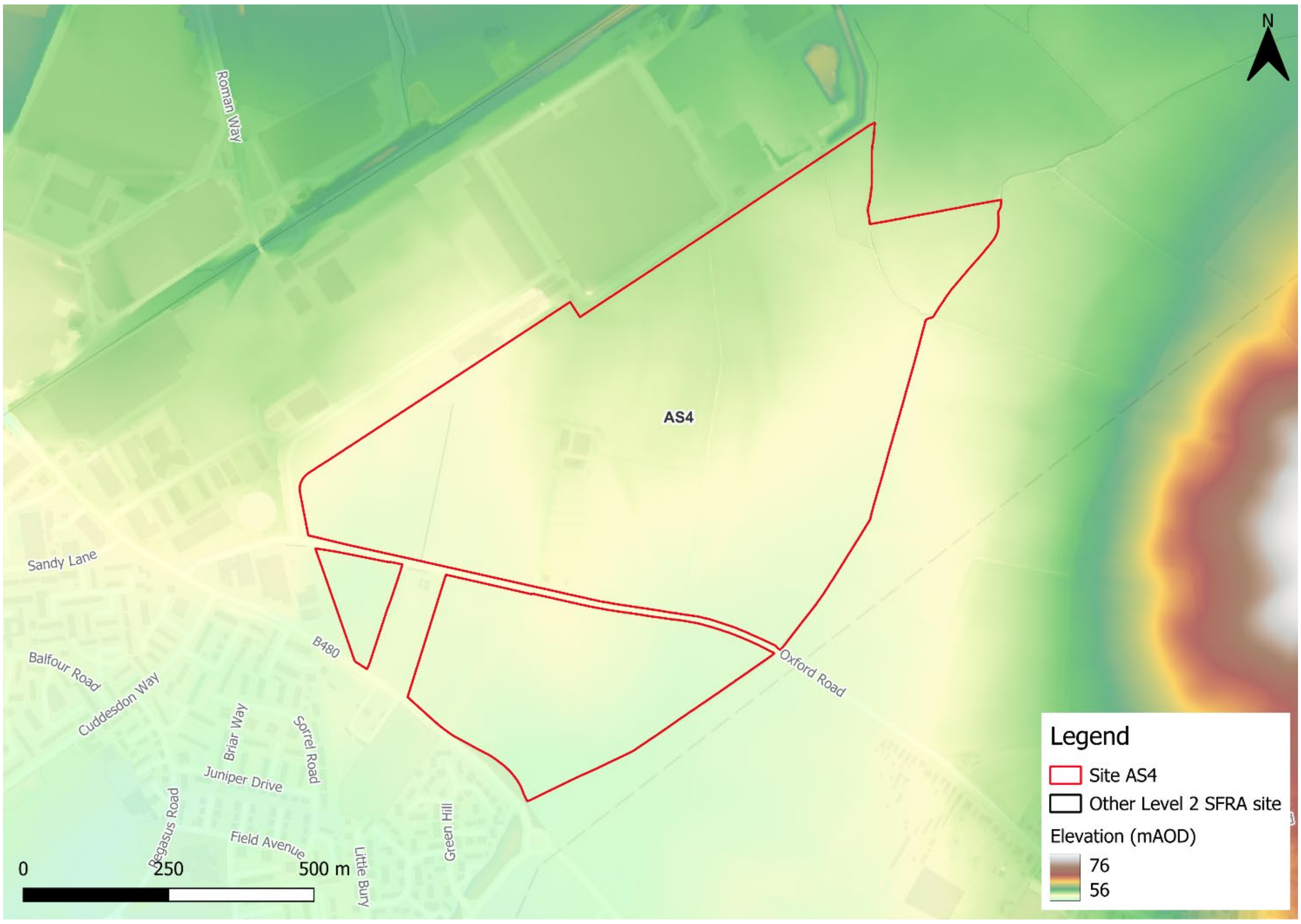

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

Northfield Brook runs along the eastern boundary of the site. Flood Zone 3b is present along Northfield Brook, impacting the area adjacent to the eastern boundary of the larger site parcel and the site parcel to the south. Flood Zone 3b is based on the 1% AEP undefended event from the Northfield & Littlemore Brooks 2011 model, as a precautionary approach in the absence of suitable modelled data. The area of functional floodplain onsite should be left free of vulnerable development.

Through the west of the site, and along the northern boundary of the smallest site parcel, a culverted watercourse represents Flood Zone 3b. There should be no development over the culverted watercourse beneath the site. Note that the path of the culvert represented within the Flood Zone 3b outline may not be accurate. The actual path of the culvert should be confirmed with the LLFA.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
81	3	2	14

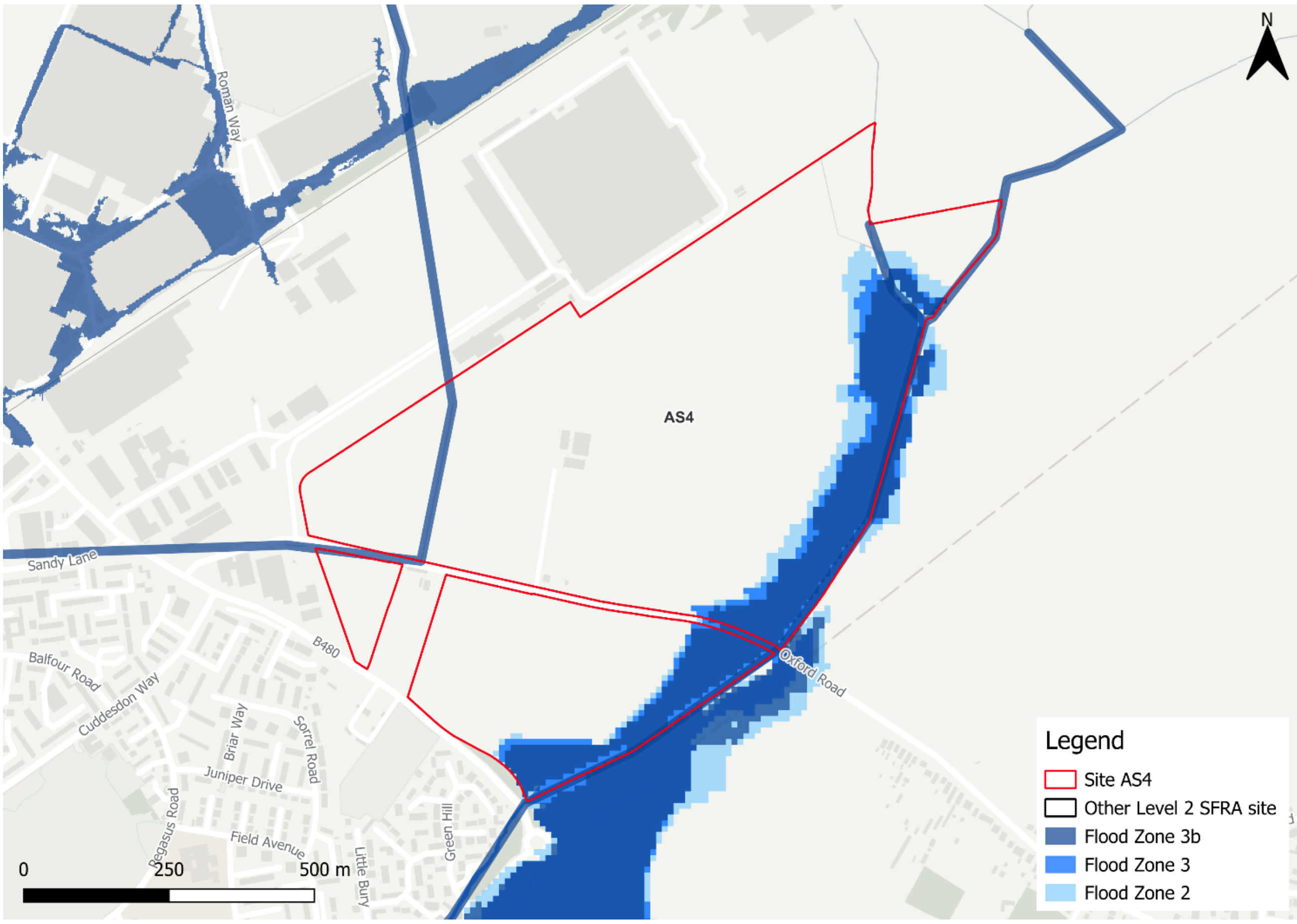

Figure 2-1: Existing risk from rivers to the site

2.1.2 Northfield & Littlemore Brooks 2011 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is confined to the area adjacent to Northfield Brook along the eastern boundary of the site, impacting the larger site parcel and the smaller parcel to the south. Maximum flood depths within the site are largely modelled to be between 0.6 and 0.9 m. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard in the area of the site at fluvial flood risk is categorised as very low. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event.

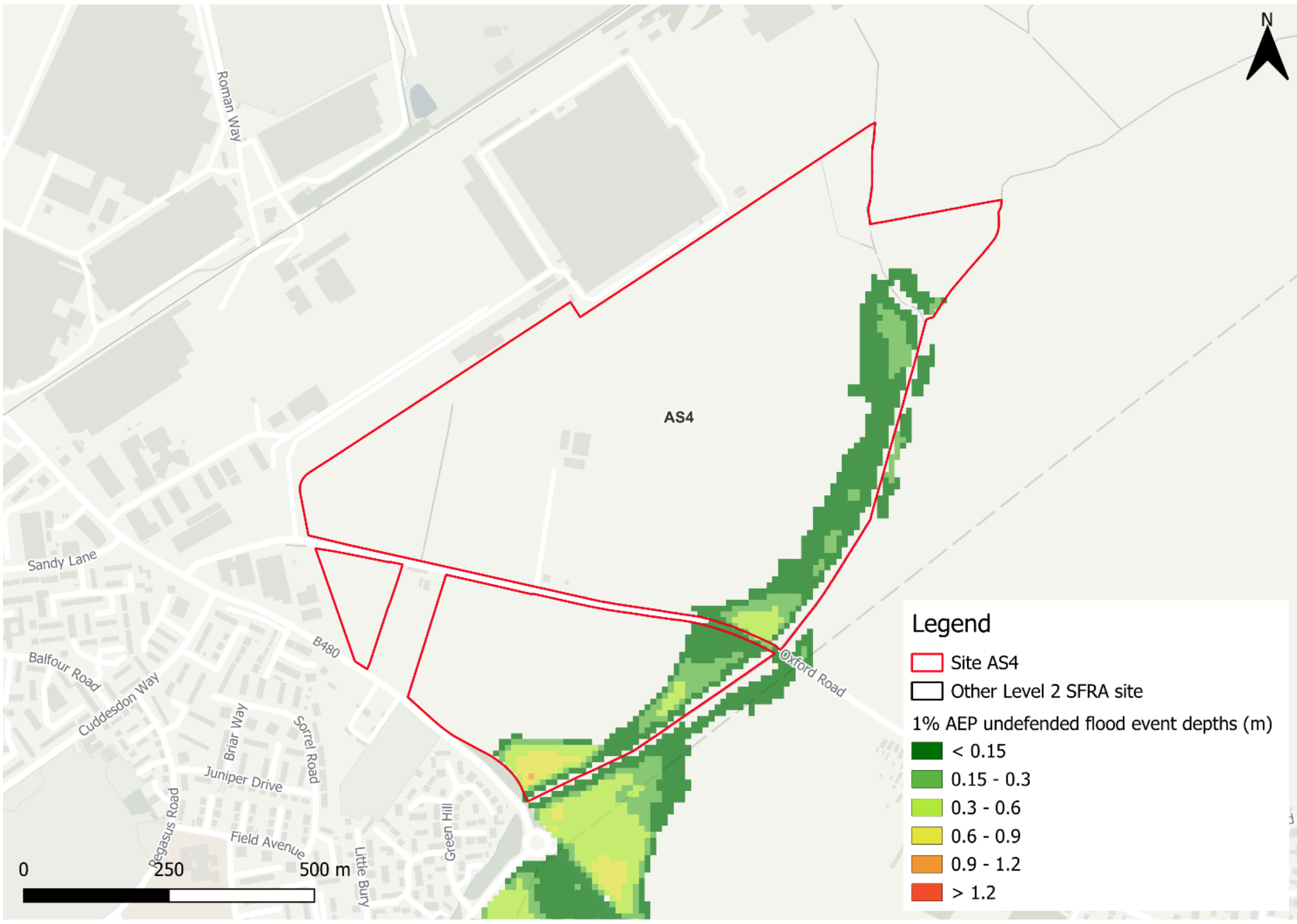

Figure 2-2: Flood depths for 1% AEP undefended flood event

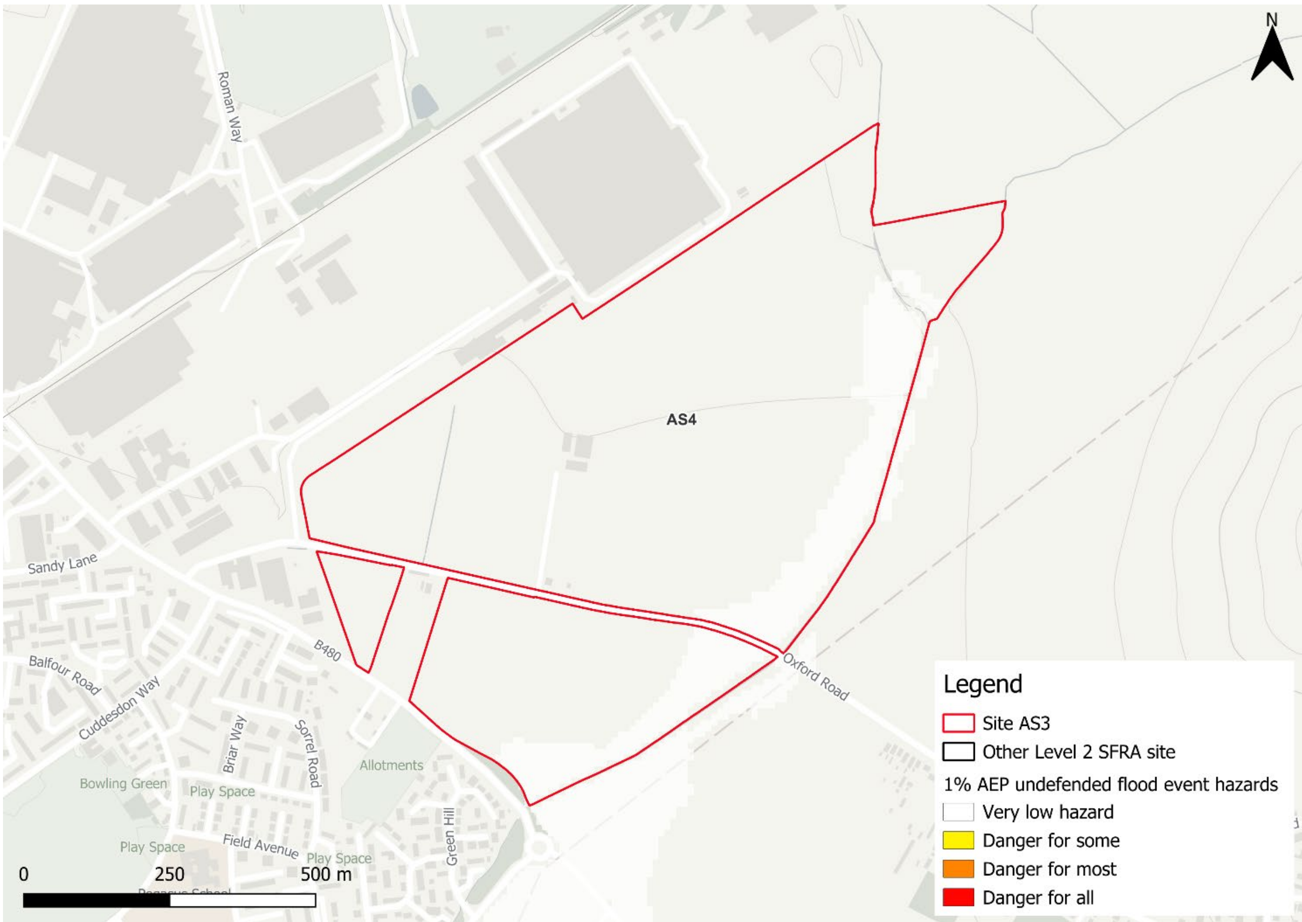

Figure 2-3: Flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from Northfield Brook and Littlemore Brook has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, future fluvial risk is modelled to be slightly greater than the present day Flood Zone 3. Maximum depths are largely modelled to be between 0.6 and 0.9 m (Figure 2-4) with areas of hazard classified as very low (Figure 2-5).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA should include for the most up to date climate change allowances.

[1] Fluvial hazard ratings based on Table 4 of the Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008. Environment Agency.

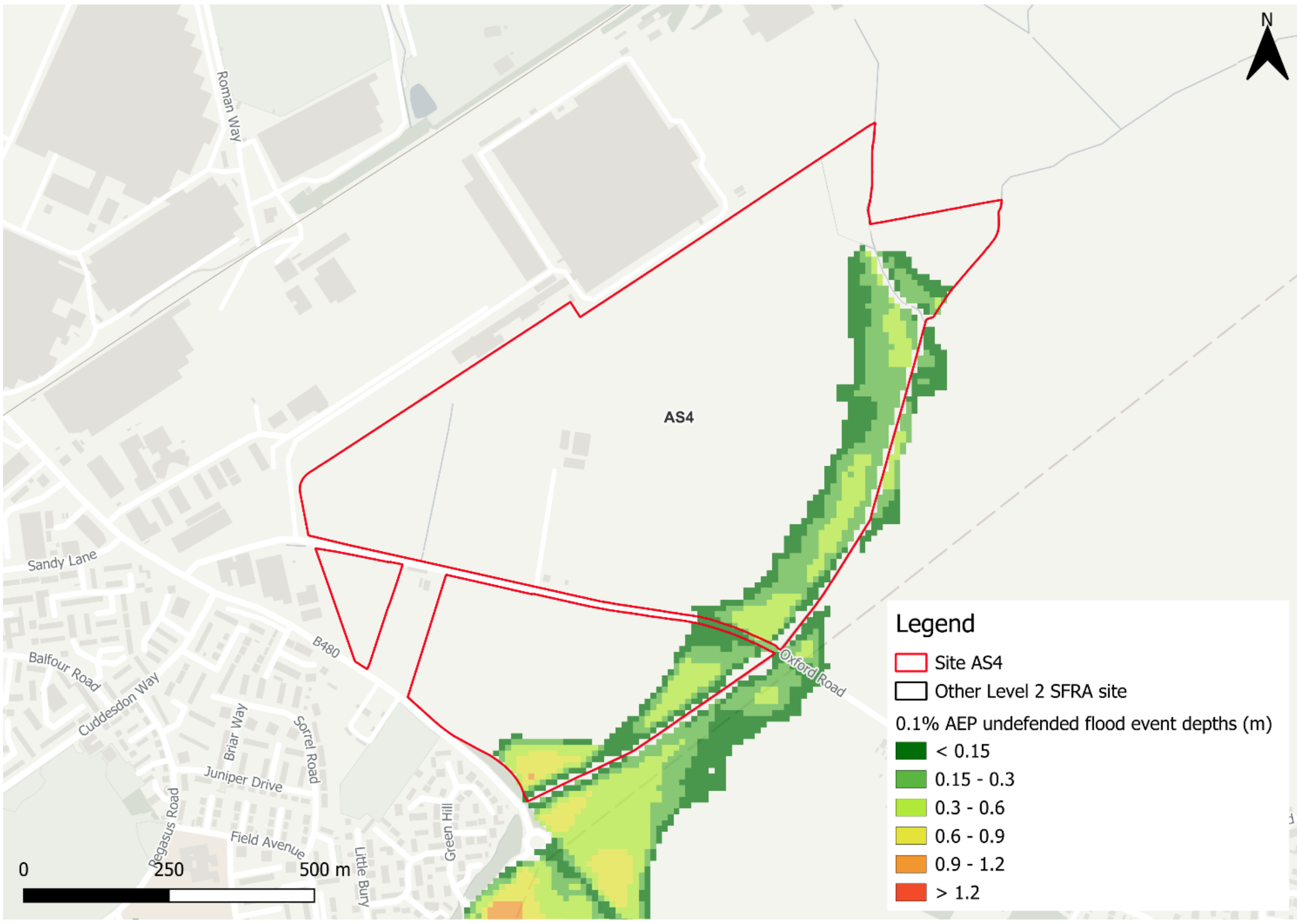

Figure 2-4: Flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

Figure 2-5: Flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS4 (Land at Northfield, Edge of Oxford) is located within one catchment, namely; Northfield Brook (Source to Thames) at Sandford. This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there are significant opportunities for tree planting to reduce runoff. There is potential to reconnect the channel to the floodplain, allowing flood water to be stored. There are also some areas of potential for runoff attenuation features. These areas are shown in Figure 2-6.

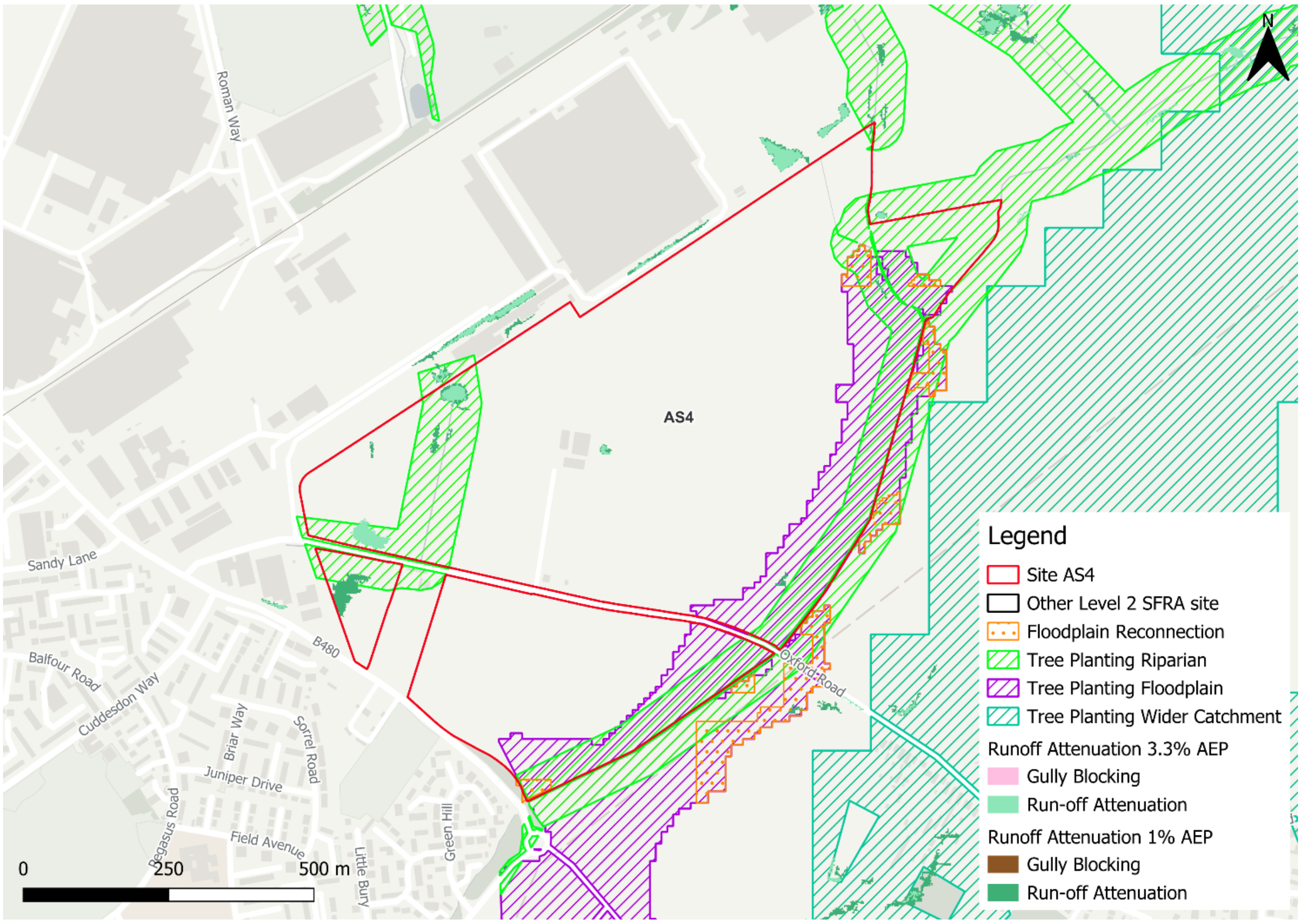

Figure 2-6: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

There is potential residual risk to the site from a possible blockage of the culvert along Northfield Brook which runs beneath the B480 to the south of the site (Figure 2-7). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on residual flood risk to the site.

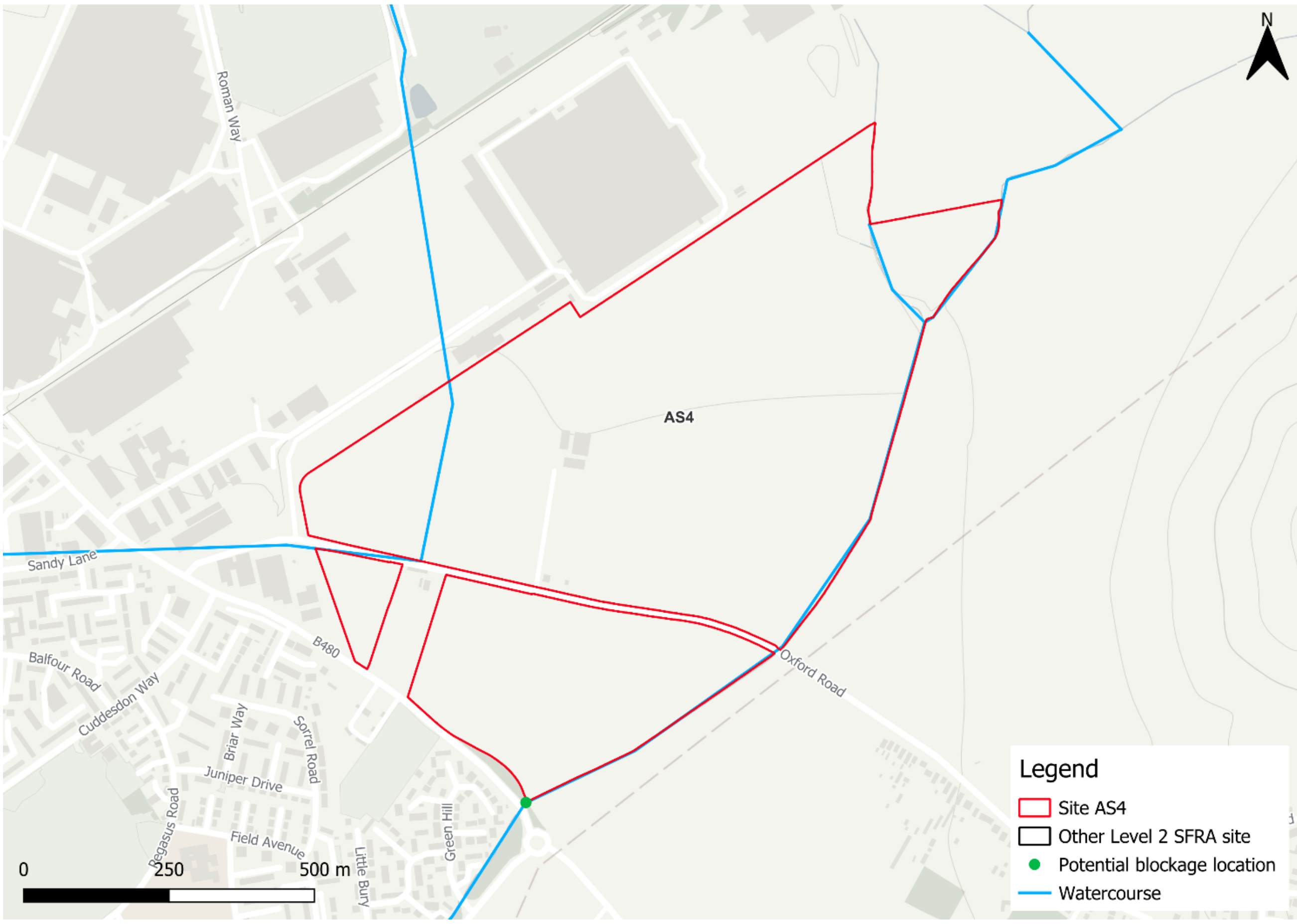

Figure 2-7: Potential blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes could likely be achieved during a flood event via Oxford Road which is located between the northern and southern site parcels.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the eastern boundary of the site, adjacent to Northfield Brook. Vulnerable development is not permitted within the functional floodplain. If feasible, this area should be used as a green / blue corridor which could provide ecological, social and amenity value. However, the functional floodplain is based on the Northfield & Littlemore Brooks 1% AEP undefended event as a precautionary approach.
- Through the west of the site a culverted watercourse represents Flood Zone 3b. There should be no development over the culverted watercourse beneath the site. Note that the path of the culvert represented within the Flood Zone 3b outline may not be accurate. The actual path of the culvert should be confirmed with the LLFA.
- The site is located in Flood Zone 3, as indicated by the Northfield & Littlemore Brooks 1% AEP undefended event outputs. Greatest depths within the site boundary are modelled to be between 0.6 and 0.9 m. More vulnerable development should be directed away from the area of the site within Flood Zone 3.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to be slightly greater in extent to the present day Flood Zone 3. However, climate change must be modelled at the site-specific FRA stage.
- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly low. Approximately 7% of the site is within the high risk surface water flood zone. A further 4% is at medium surface water risk, and a further 11% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, there is a significant surface water flow path along Northfield Brook to the east of the site. There are also some scattered areas of surface water ponding within topographic low spots. In the low risk event, surface water risk along Northfield Brook is more significant. There is also an additional surface water flow path emerging through the west of the site, which impact almost the entirety of the smallest site parcel.

Greatest flood depths in the high risk event are between 0.3 and 0.6 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Oxford Road in the high and medium risk events. There is some modelled surface water flooding to Oxford Road in the low risk event, however depths are low.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
78	11	4	7

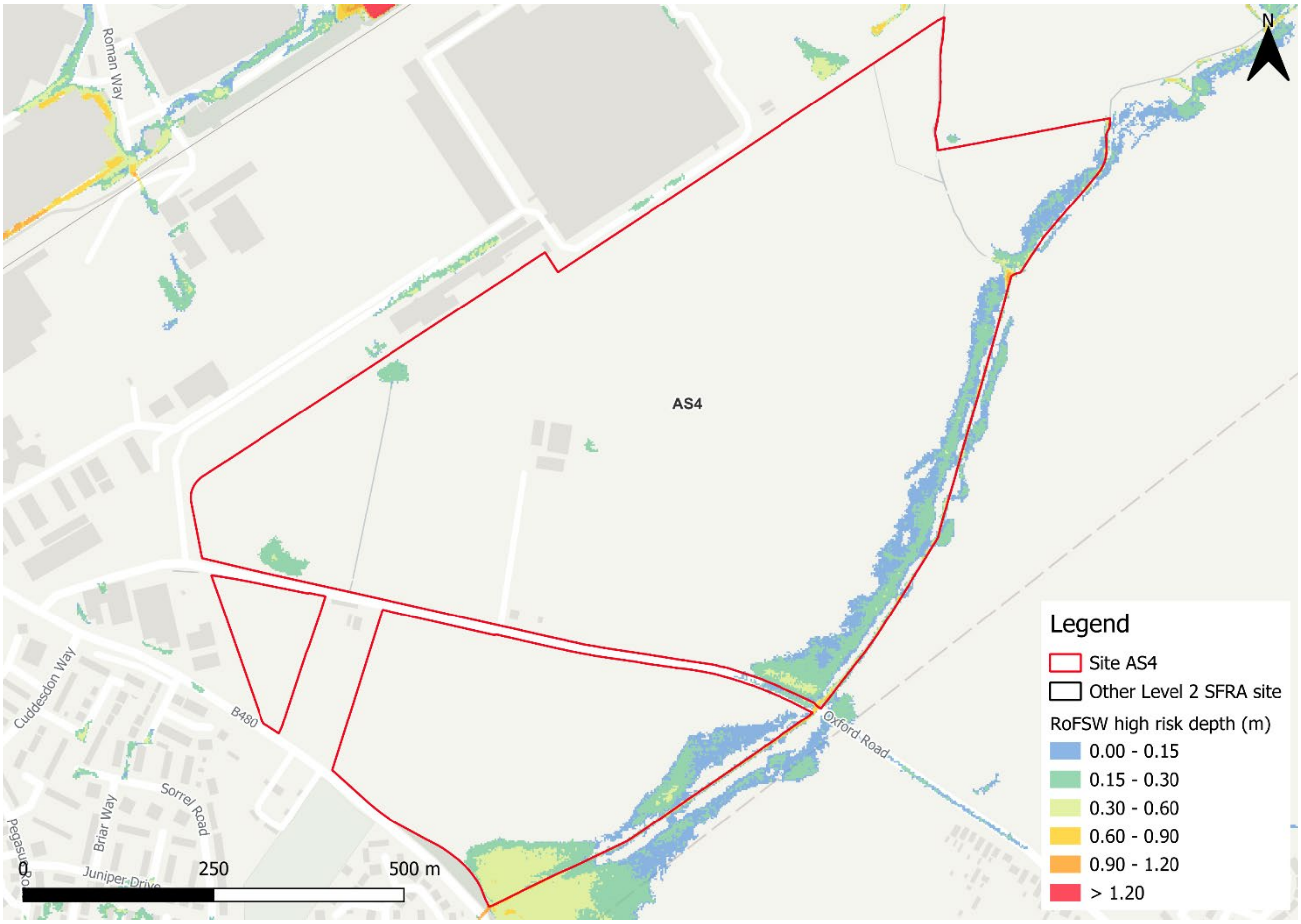

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

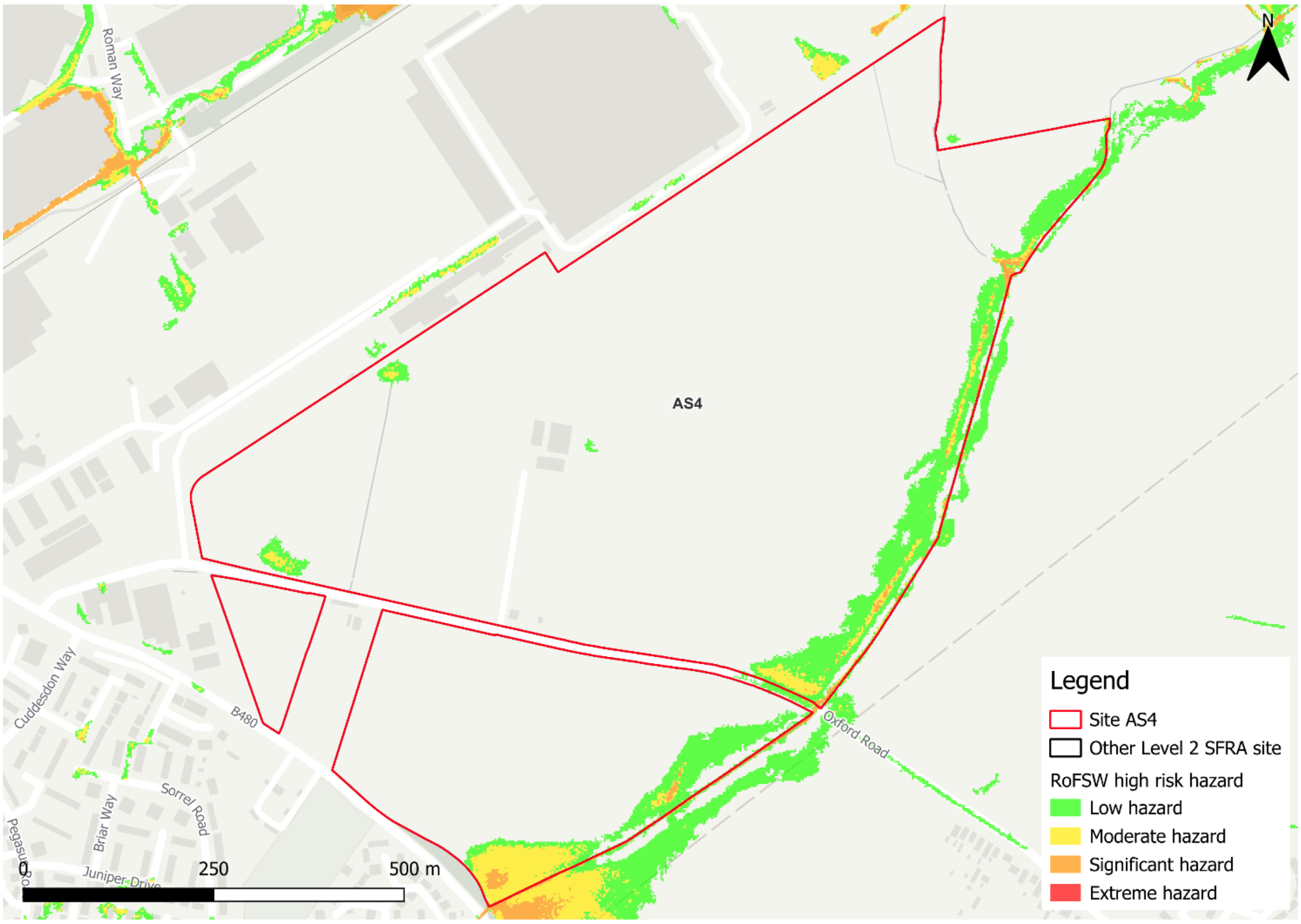

Figure 3-2: High risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along Northfield Brook and the areas of ponding. Maximum flood depths are modelled to be between 0.6 and 0.9 m, with some areas of significant hazard (Figure 3-4).

[2] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

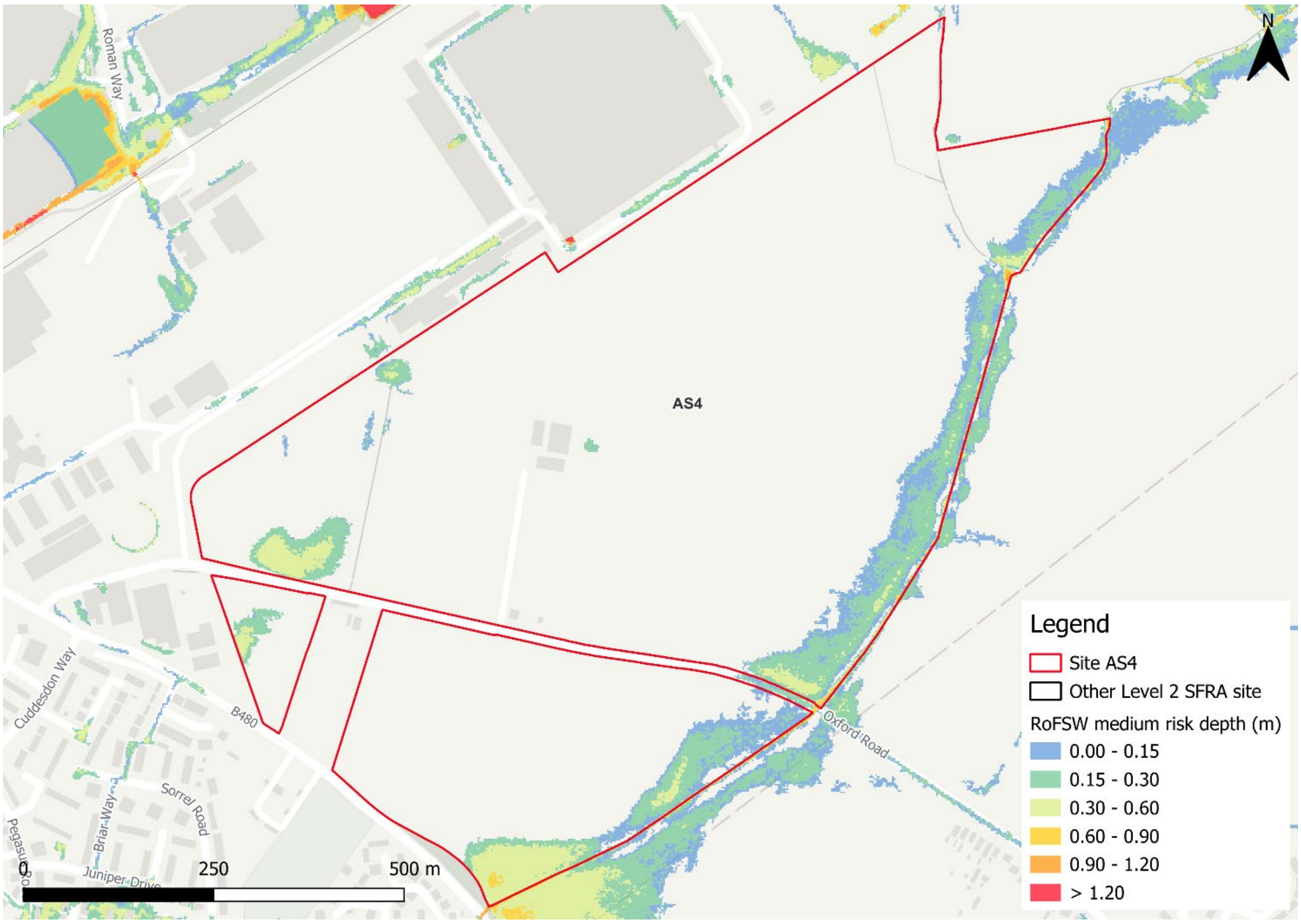

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

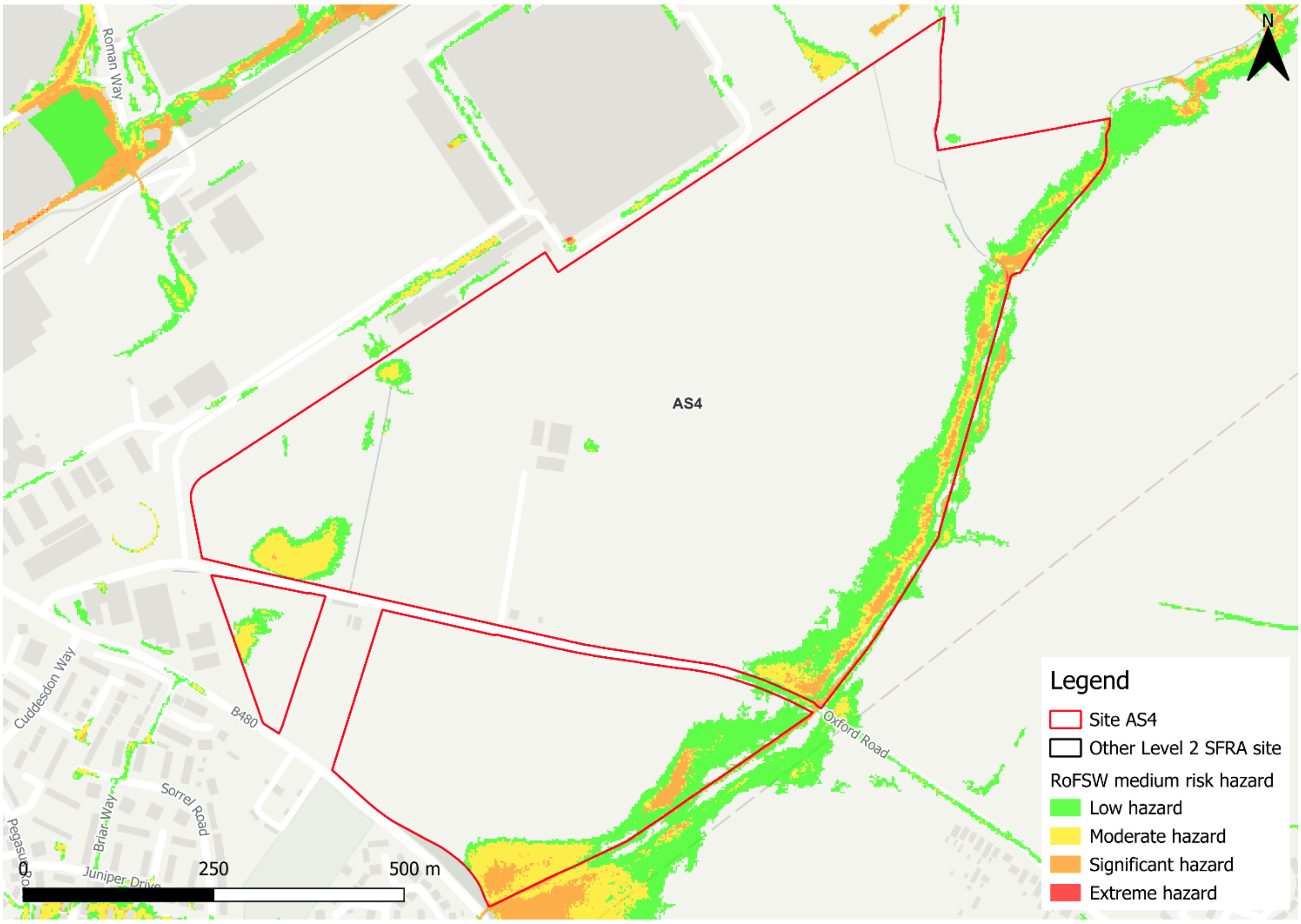

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 78% of the site being at very low surface water flood risk. Surface water risk in the high and medium risk events is present along the eastern boundary of the site adjacent to Northfield Brook.
- The extent of surface water flood risk becomes more significant in the low risk event, with an additional flow path emerging within the west of the site. Any existing flow paths should be maintained in site design.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the eastern boundary of the site.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Any development should avoid the significant surface water flow path along the eastern boundary of the site. This area is consistent with the area of the site within the functional floodplain.

- When a planning application is submitted, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map for Site AS4 (Land at Northfield, Edge of Oxford) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence is varied across the site. Across the majority of the site, there is a risk of groundwater flooding to both surface and subsurface assets. Within the centre of the larger site parcel, there is a negligible risk from groundwater flooding. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

Figure 4-1: JBA 5m Groundwater Flood Map

[3] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

Based on current information and the use of proxies to represent the impacts of climate change, this site should be able to pass the exception test. However, all the recommendations suggested in this Level 2 SFRA should be considered at the site-specific FRA stage or before any site design planning.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- There should be no vulnerable development within the area of the site covered by the functional floodplain. This should be converted to a blue / green corridor to provide ecological, amenity and social value. However, the functional floodplain is based on the Northfield & Littlemore Brooks 1% AEP undefended event as a precautionary approach.
- Updated climate change modelling of the Northfield Brook should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- This site could be allocated if development avoids the area of functional floodplain and significant surface water flow path along the eastern boundary of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from the Northfield Brook is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large area of the site.
- Groundwater conditions must be investigated further through a site-specific FRA.

[4] Para 170 National Planning Policy Framework 2023

- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should undertake a condition assessment of the culvert beneath the B480 and investigate the impact of a potential blockage of this structure.
- Any site-specific FRA should be carried out in line with the NPPF, FRCC-PPG, EA guidance, South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies, and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable: the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS5 - Land at Bayswater Brook, Edge of Oxford

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS5 - Land at Bayswater Brook, Edge of Oxford. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS5 - Land at Bayswater Brook, Edge of Oxford

- Location: Land at Bayswater Brook, Edge of Oxford (Figure 1-1)
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly residential
- Proposed site use vulnerability: More vulnerable
- Site area: 105 ha
- Proposed development impermeable area: 89.3 ha (assumed 85% of site area)
- Watercourse: Bayswater Brook. Sydlings Brook extends from the north of the site as a tributary to Bayswater Brook. Several ordinary watercourses flow south through the site, providing land drainage.
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Subject to Exception Test
    - Assess present day modelled fluvial water depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

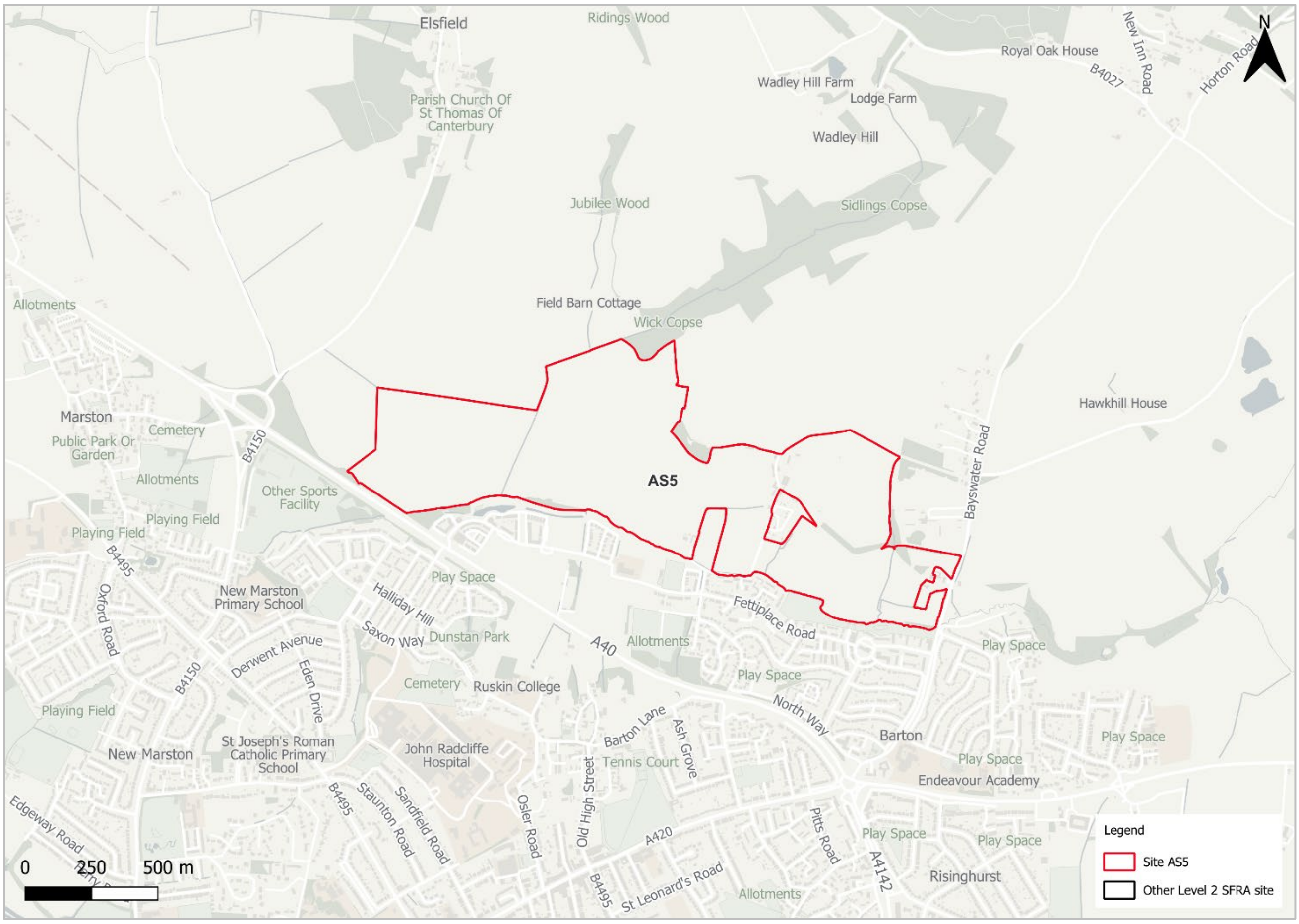

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the north at approximately 101mAOD. The lowest ground levels are located towards the south west of the site at approximately 61mAOD.

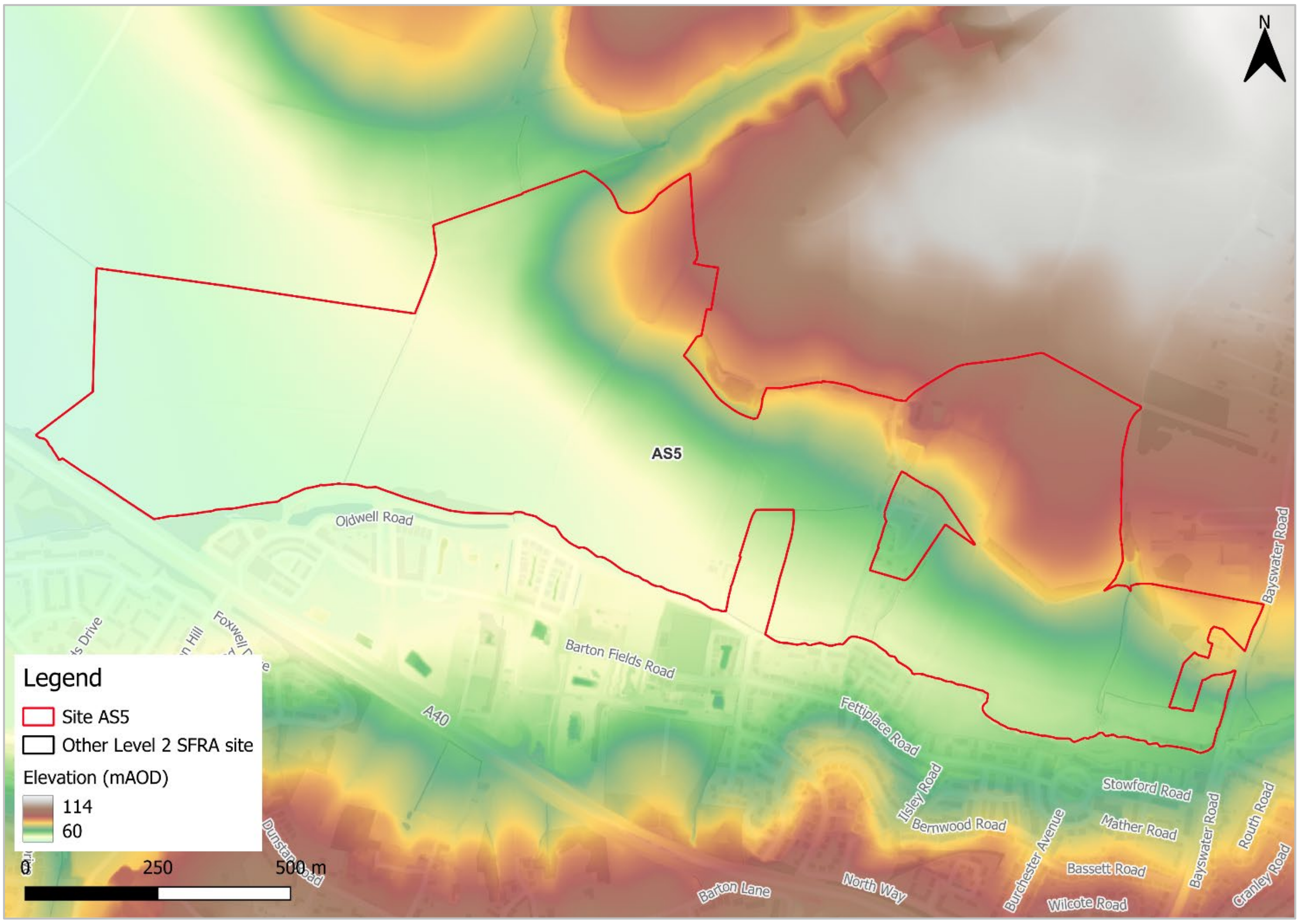

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The area along the southern boundary of the site is located within the functional floodplain, adjacent to Bayswater Brook. The site is also within the functional floodplain along Sydlings Brook extending from the north through the centre of the site. Note that Sydlings Brook has been modelled as part of the application.

A further 2% of the site is modelled to be within Flood Zone 2. There should be no vulnerable development in the area of the site within the functional floodplain. The functional floodplain in this area is based on Flood Zone 3 of the EA's Flood Map for Planning (1% AEP undefended event) and the 1% AEP Risk of Flooding from Surface Water extent, as a precautionary approach in the absence of suitable modelled data.

The EA should be consulted on the data source of the Flood Map for Planning in this location. If the Flood Map for Planning is based on a detailed model of Bayswater Brook, any updates to this Level 2 SFRA and/or any site-specific FRA should make use of this model to understand modelled depths and hazards within the site.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
88	3	0	9

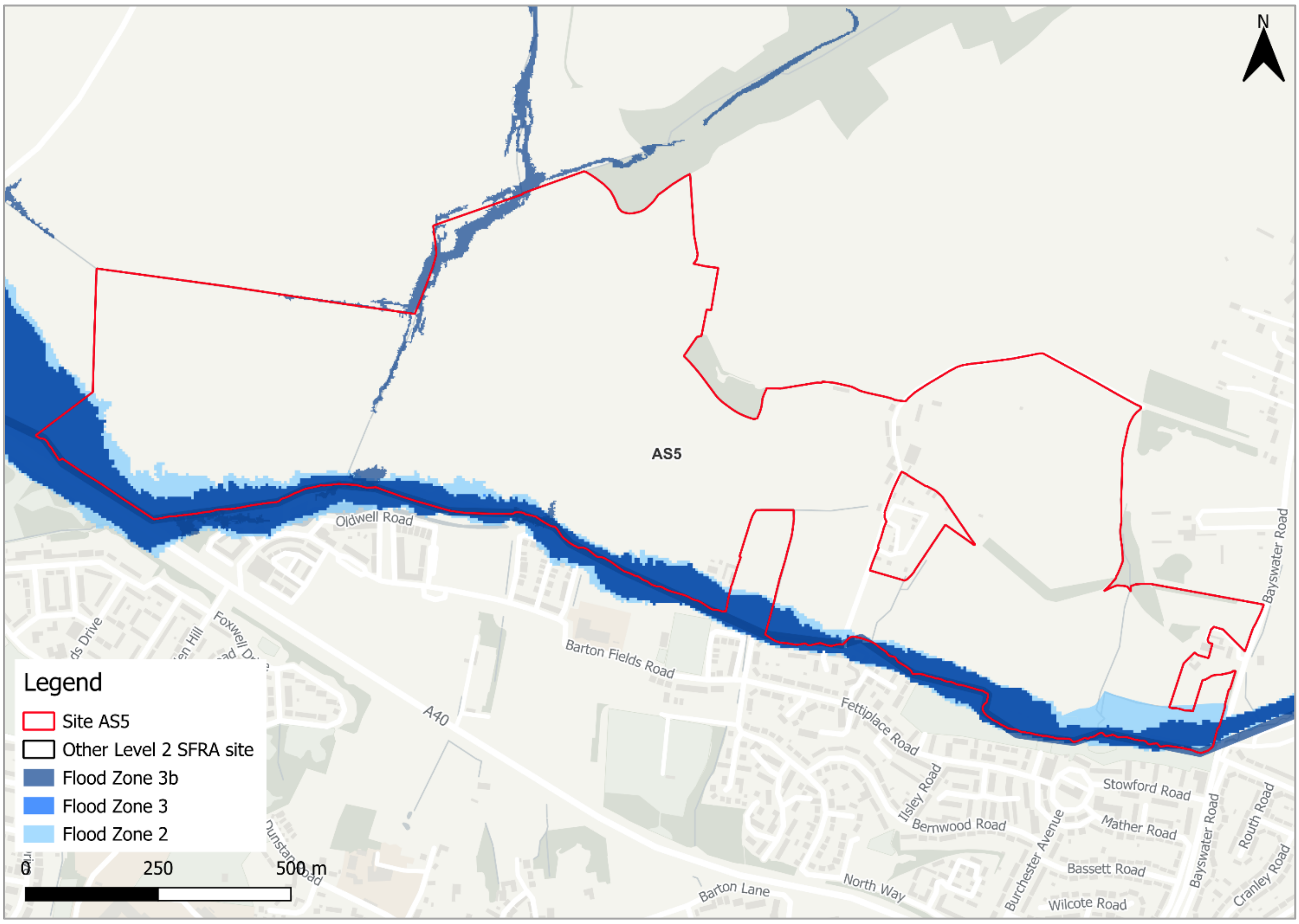

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on flood risk from Bayswater Brook have not been modelled for this SFRA, as a model covering Bayswater Brook was not made available for consideration. Therefore, in the absence of modelled climate change information, Flood Zone 2 of the Flood Map for Planning (based on the 0.1% AEP undefended event) can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar to the present day Flood Zone 3, with a slightly greater extent of flooding within the west and east of the site (Figure 2-1).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. The EA should be consulted on the data source of the Flood Map for Planning in this location. If the Flood Map for Planning is based on a detailed model of Bayswater Brook, any updates to this Level 2 SFRA and/or any site-specific FRA should make use of this model and include for the most up to date climate change allowances.

2.3 Flood risk management

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset. There are however areas of natural high ground along the banks of Bayswater Brook to the south of the site boundary.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS5 (Land at Bayswater Brook, Edge of Oxford) is located within one catchment, namely; Bayswater Brook. This is ranked as a medium sensitivity catchment. Planning considerations for sites at medium sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there is the potential for tree planting to slow floodwaters, reduce flood peak height and reduce sediment delivery to the watercourse. There is also potential for floodplain reconnection along the banks of Bayswater Brook, to allow water to be stored during times of flood. These areas are shown on Figure 2-2.

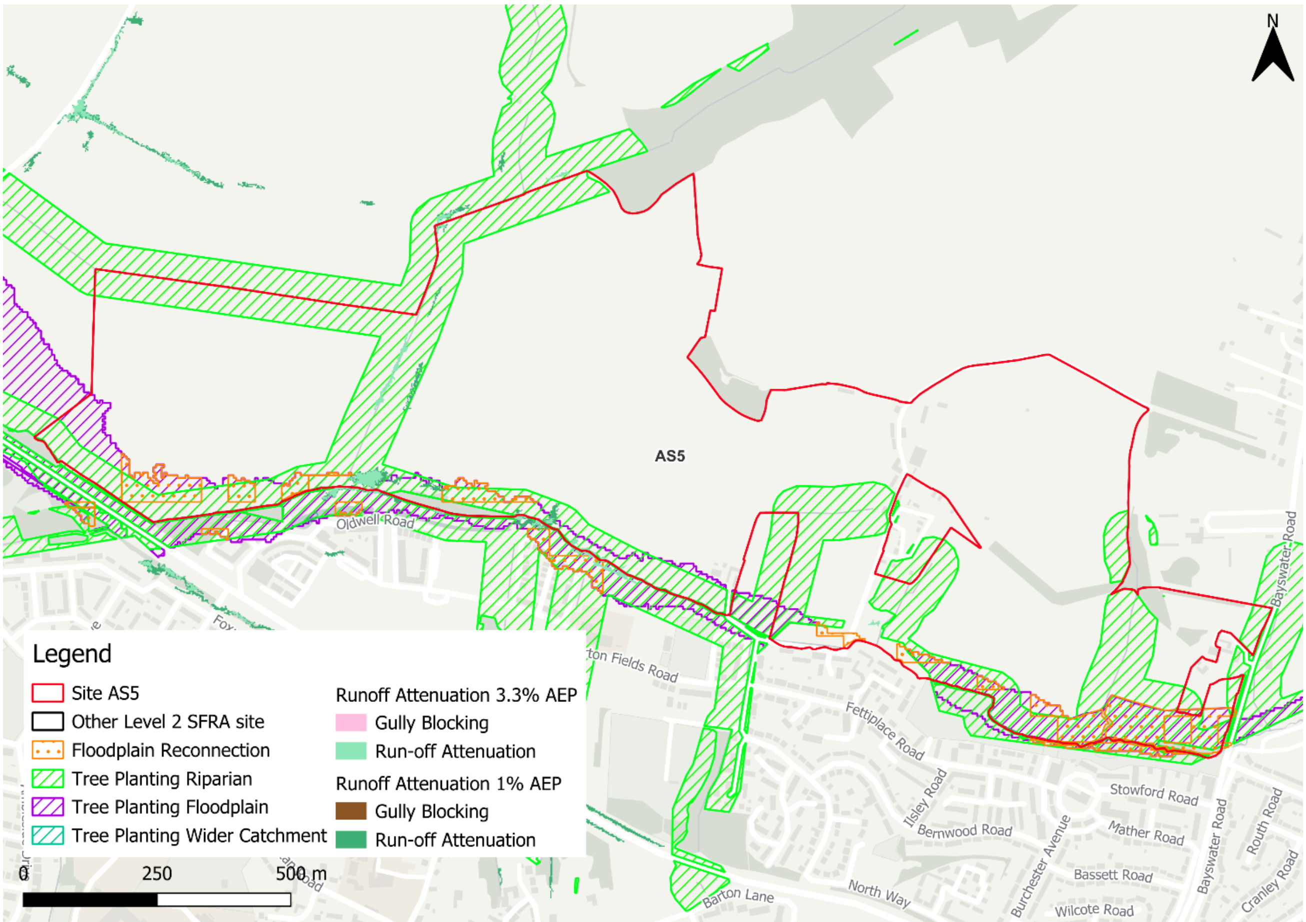

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is not modelled to be at risk of flooding from reservoirs.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. Historic risk to the site is shown in Figure 2-3 which shows that an area within the south east of the site has been subject to flooding in the past. The RFO dataset references that the historic event occurred in Autumn 1992 due to channel capacity exceedance of Bayswater Brook.

The LPA historic flood incident records indicate that Barton Village Road to the south of the site has experienced flooding in the past, partially as a result of a restriction in flow along Bayswater Brook at a road crossing.

Figure 2-3: Recorded historic flood events onsite and around the site

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Based on the FMfP, safe access and escape routes should be achievable via Bayswater Road to the east of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain adjacent to Bayswater Brook and through the centre of the site. Vulnerable development is not permitted within the functional floodplain. However, the functional floodplain in this area is based on Flood Zone 3 and the 1% AEP Risk of Flooding from Surface Water extent, as a precautionary approach.
- There should be no development within 8m of Bayswater Brook apart from permitted access. The EA recommend for a 8m no development buffer for all main rivers to enable access for maintenance activities. If feasible, this area

would be used as a green / blue corridor which can provide ecological, social and amenity value.

- A flood risk activity permit may be required if development is planned within 8m of the riverbank. The EA can advise on whether a permit will be required. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- The EA's Flood Zone 2 extent has been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with a slightly larger extent of flooding in the east and west of the site.
- The EA should be consulted on the data source of the Flood Map for Planning in this location. If the Flood Map for Planning is based on a detailed model of the Bayswater Brook, any updates to this Level 2 SFRA and/or any site-specific FRA should make use of this model and include for the most up to date climate change allowances.
- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Given the historic flood risk to Barton Village Road, site design should aim to provide improvements to drainage within the site to reduce risk to the road.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 2% of the site is within the high risk surface water flood zone. A further 1% is at medium surface water risk, and a further 5% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is largely confined to two distinct flow paths through the site. One along the channel of Bayswater Brook and the other extending through the site from the north. There are also some scattered areas of surface water ponding within topographic low spots. In the low risk event, the extent of surface water flood risk is more significant, with a large area in the east of the site being impacted.

Greatest flood depths in the high risk event are between 0.6 and 0.9 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Bayswater Road in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
79	13	3	5

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

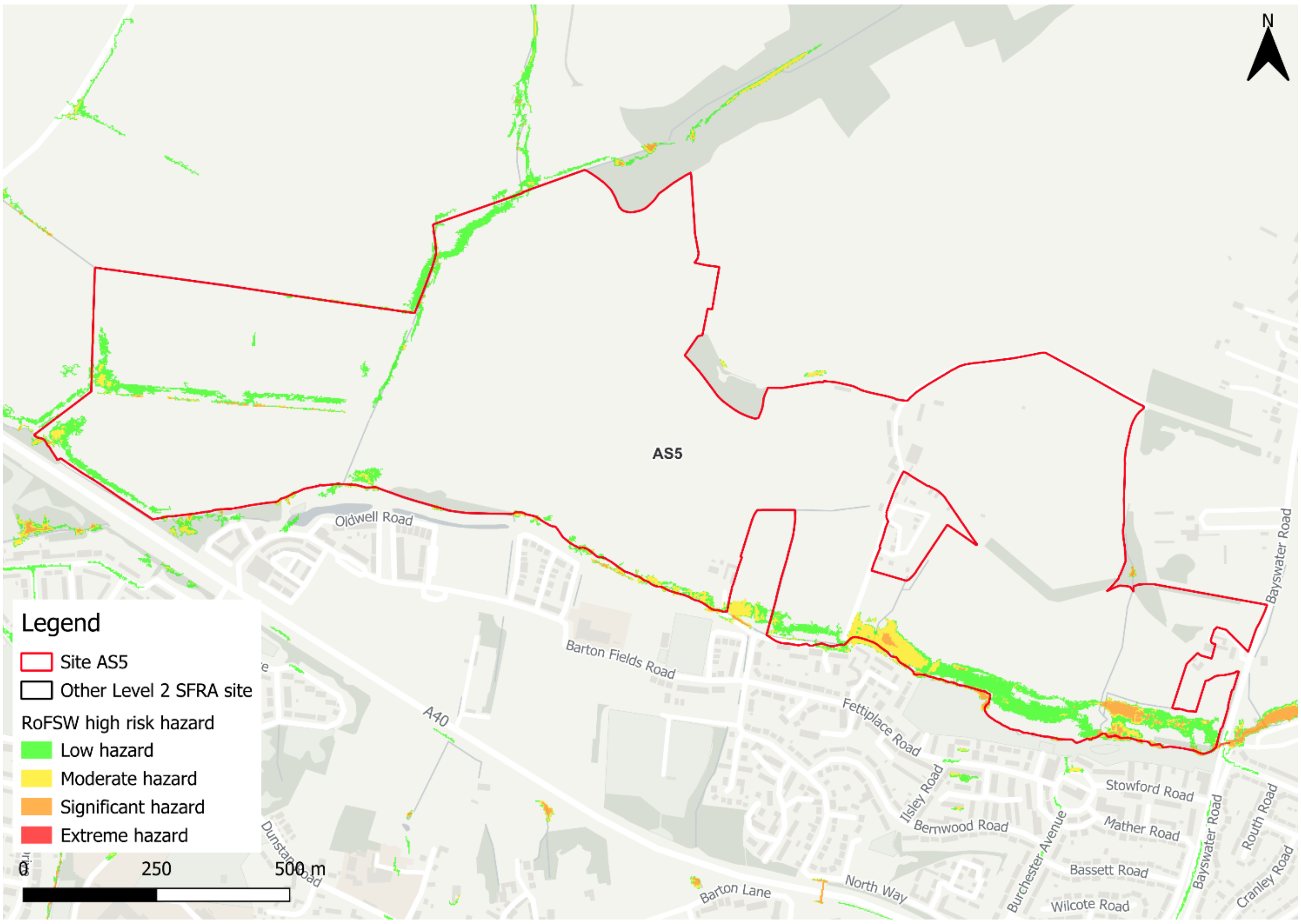

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the flow paths through the site. Maximum flood depths are modelled to be between 0.6 and 0.9 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

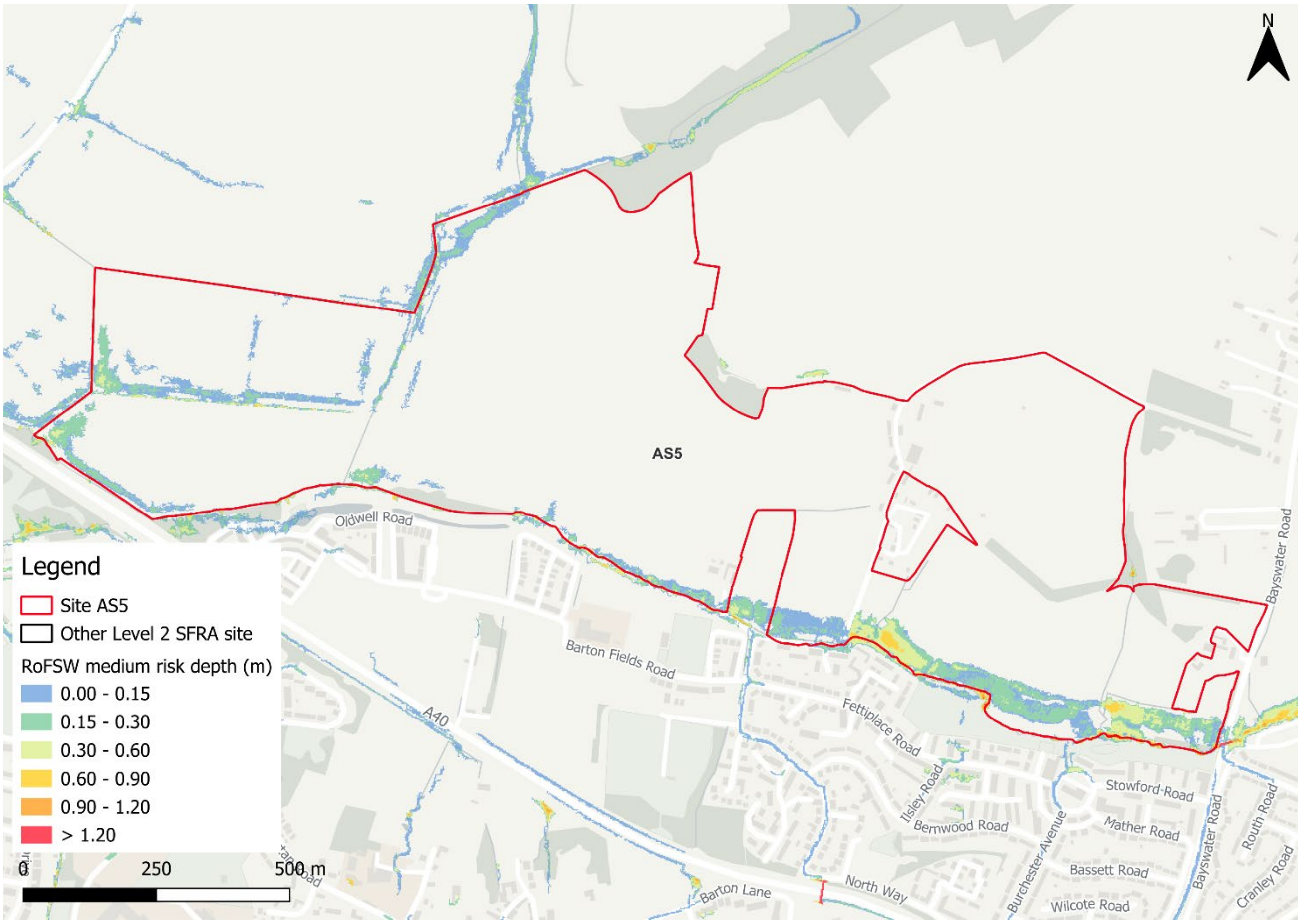

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with approximately 79% of the site being at very low risk. Surface water risk in the high and medium risk events is present along two distinct flowpaths within the south of the site and from the north, with some scattered areas of ponding across the site. Any existing flow paths should be maintained in site design.
- Surface water risk in the low risk event is significantly greater.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the flow paths through the site.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Ideally, any development would avoid the two surface water flow paths through the site in the high and medium risk events, subject to detailed modelling through a drainage strategy.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a

result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site AS5 (Land at Bayswater Brook, Edge of Oxford) and the surrounding areas and Table 4-1 explains the risk classifications.

The majority of the site is in an area where there is negligible groundwater risk. There are areas to the west and north of the site where there is a risk of groundwater flooding to both surface and subsurface assets. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

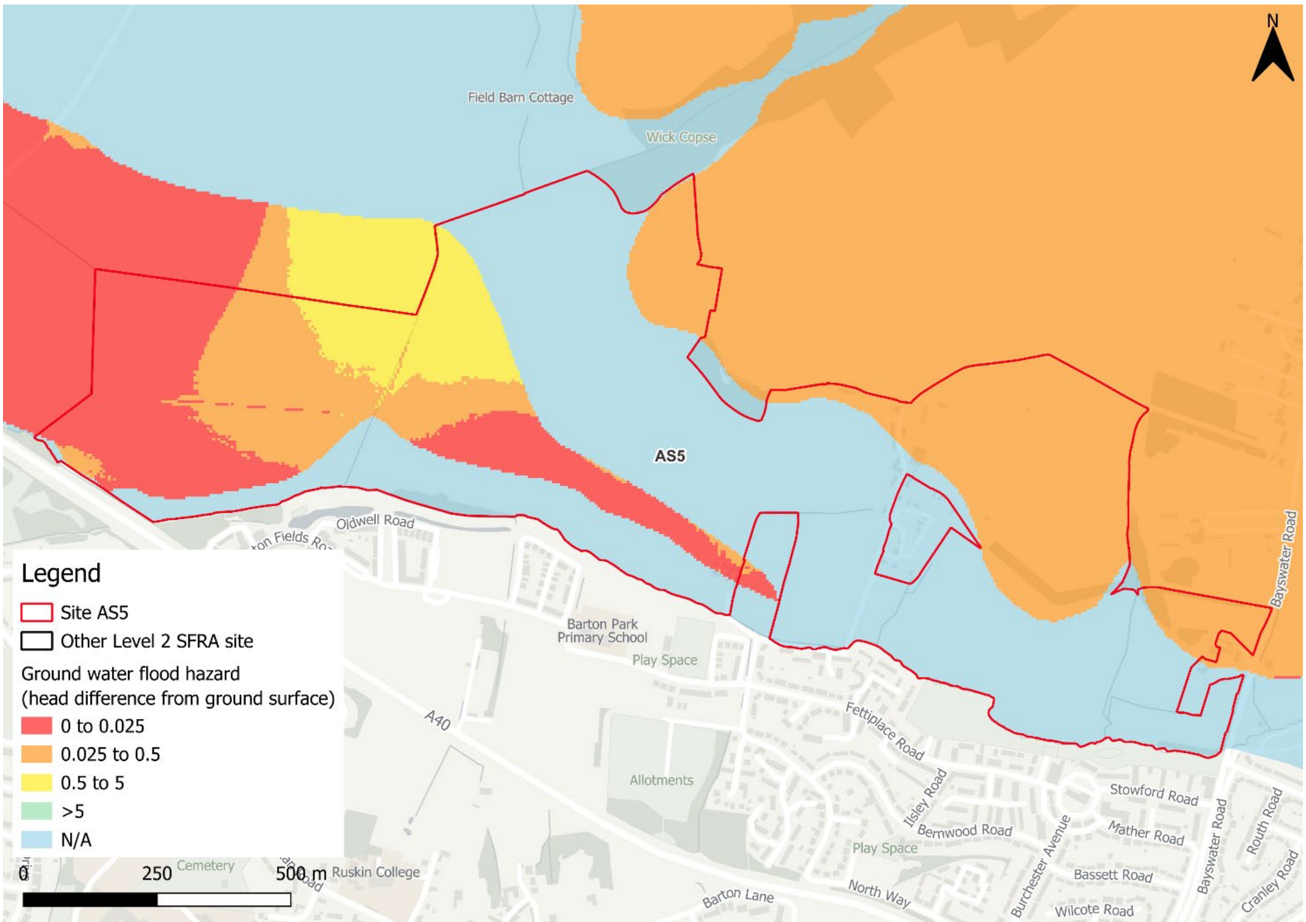

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- There should be no vulnerable development within the functional floodplain. However, the functional floodplain in this area is based on Flood Zone 3 and the 1% AEP Risk of Flooding from Surface Water extent, as a precautionary approach.
- There should be no development within 8m of Bayswater Brook apart from permitted access. The EA recommend for an 8m no development buffer for all main rivers to enable access for maintenance activities. This should be converted to a blue / green corridor to provide ecological, amenity and social value.
- Updated present day and climate change modelling of Bayswater Brook and Sydlings Brook should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated if development avoids the area at modelled fluvial and surface water risk.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on existing and future flood risk from Bayswater Brook and Sydlings Brook is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large area of the site.
- Groundwater conditions must be investigated further.

[3] Para 170 National Planning Policy Framework 2023

- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.
- Given the historic flood risk to Barton Village Road, site design should aim to provide improvements to drainage within the site to reduce risk to the road.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out full detailed flood modelling of the site for Bayswater Brook and Sydlings Brook, if detailed models are not available, and include for the most up to date climate change allowances
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should consider improvements within site design to reduce flood risk to Barton Village Road.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS6 - Rich's Sidings and Broadway, Didcot

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

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List of Tables

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS6 - Rich's Sidings and Broadway, Didcot. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS6 - Rich's Sidings and Broadway, Didcot

- Location: Rich’s Sidings and Broadway, Didcot (Figure 1-1)
- Existing site use: Brownfield; retail / commercial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More vulnerable
- Site area: 2.96 ha
- Proposed development impermeable area: 2.6 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

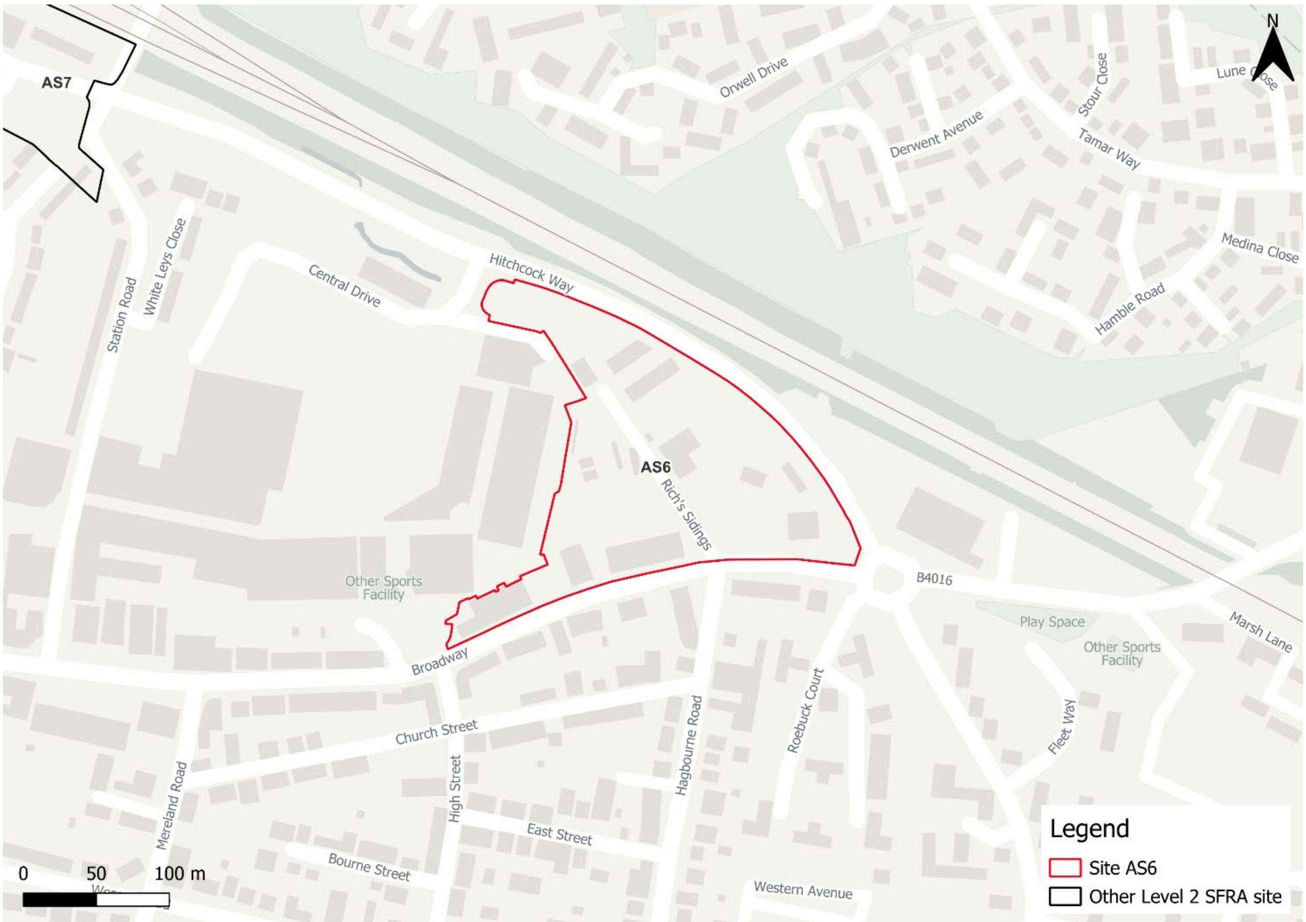

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the south at approximately 60mAOD. The lowest ground levels are located towards the east of the site at approximately 52mAOD.

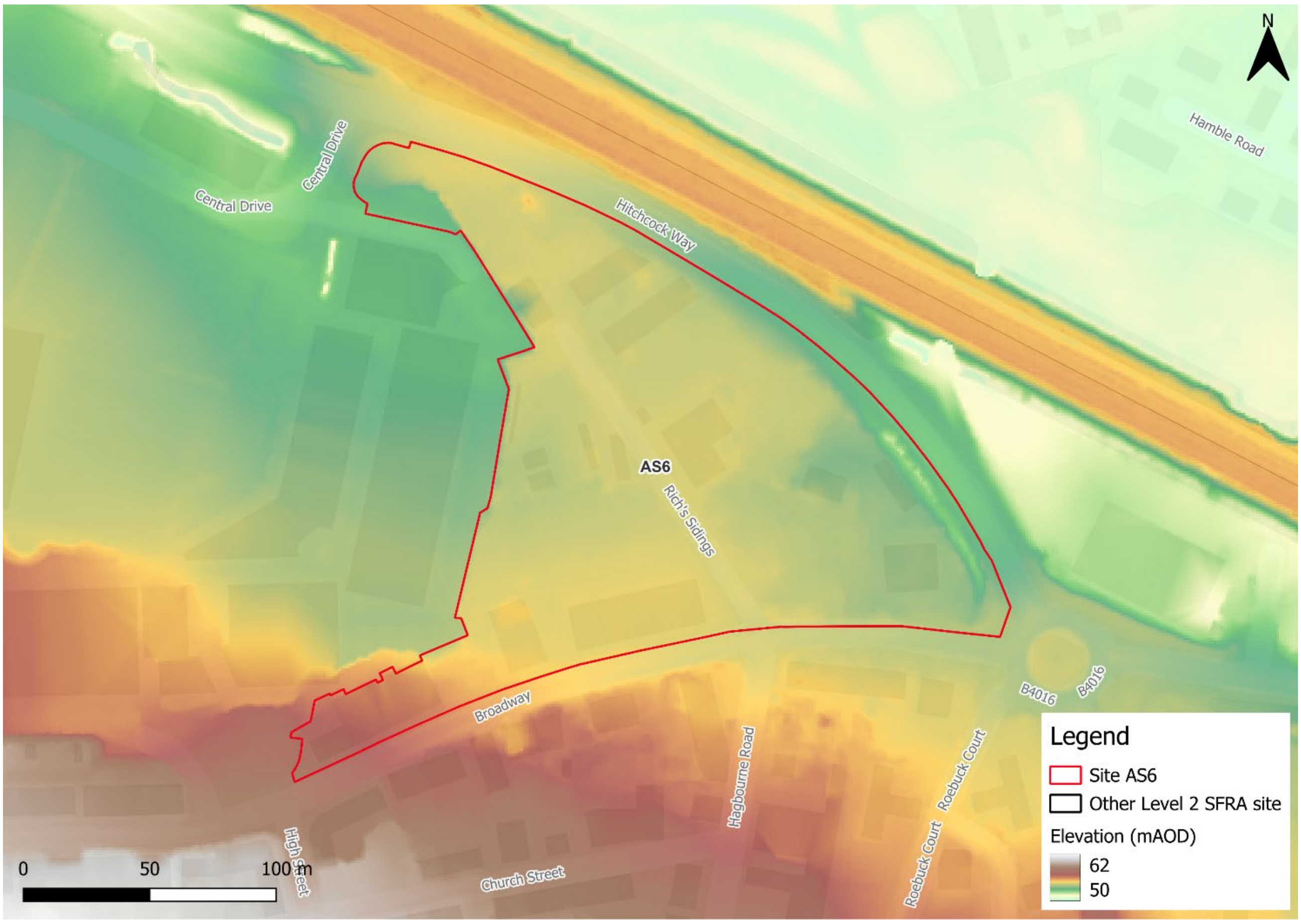

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS2 (Rich's Sidings and Broadway, Didcot) is located within one catchment, namely; Moor Ditch and Ladygrove Ditch. This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are not any applicable areas that could benefit this site.

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via Broadway to the south of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 2% of the site is within the high risk surface water flood zone. A further 1% is at medium surface water risk, and a further 5% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is largely confined to a short flow path along the eastern boundary of the site. There are also some scattered areas of surface water ponding within topographic low spots. In the low risk event, risk is slightly greater with more scattered locations of ponding and is constrained by the existing development within the site. A strategic surface water culvert is present within the north west of the site, which extends beneath Central Drive and under the railway to the north. The culvert contributes to the drainage of south Didcot to the watercourses in Ladygrove.

Greatest flood depths in the high risk event are between 0.6 and 0.9 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Broadway in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
92	5	1	2

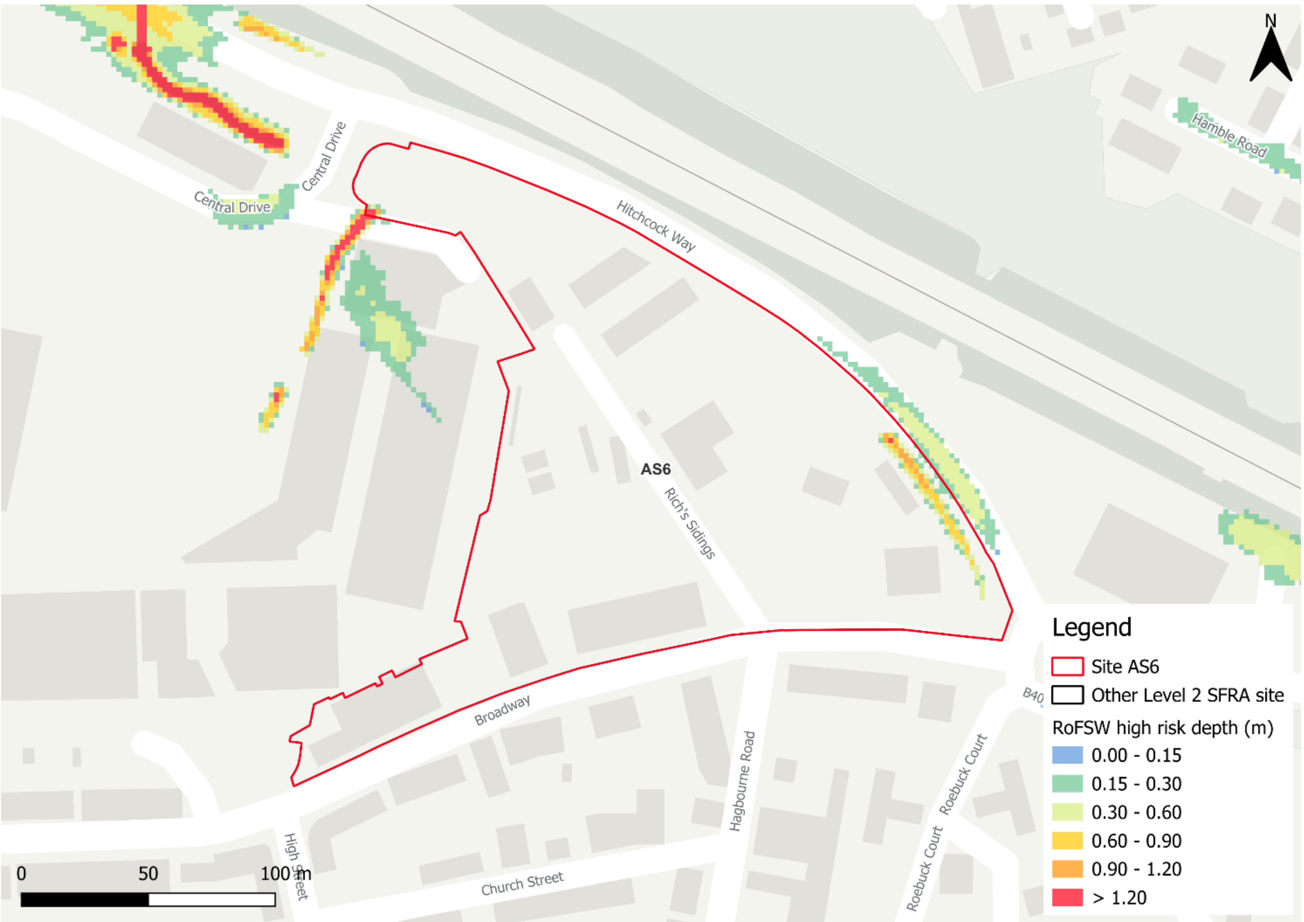

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

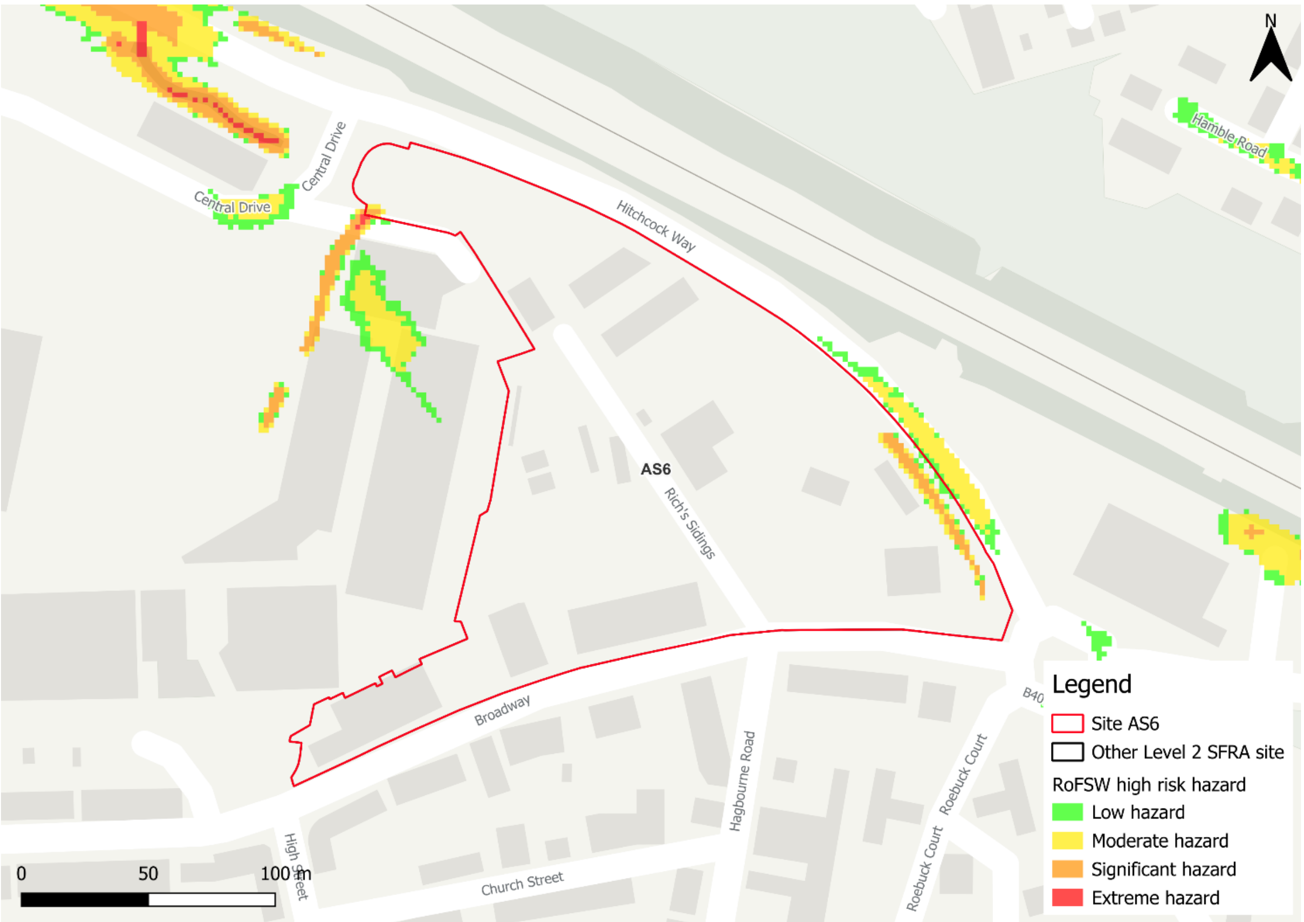

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the eastern boundary of the site and the areas of ponding. Maximum flood depths are modelled to be > 1.2 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

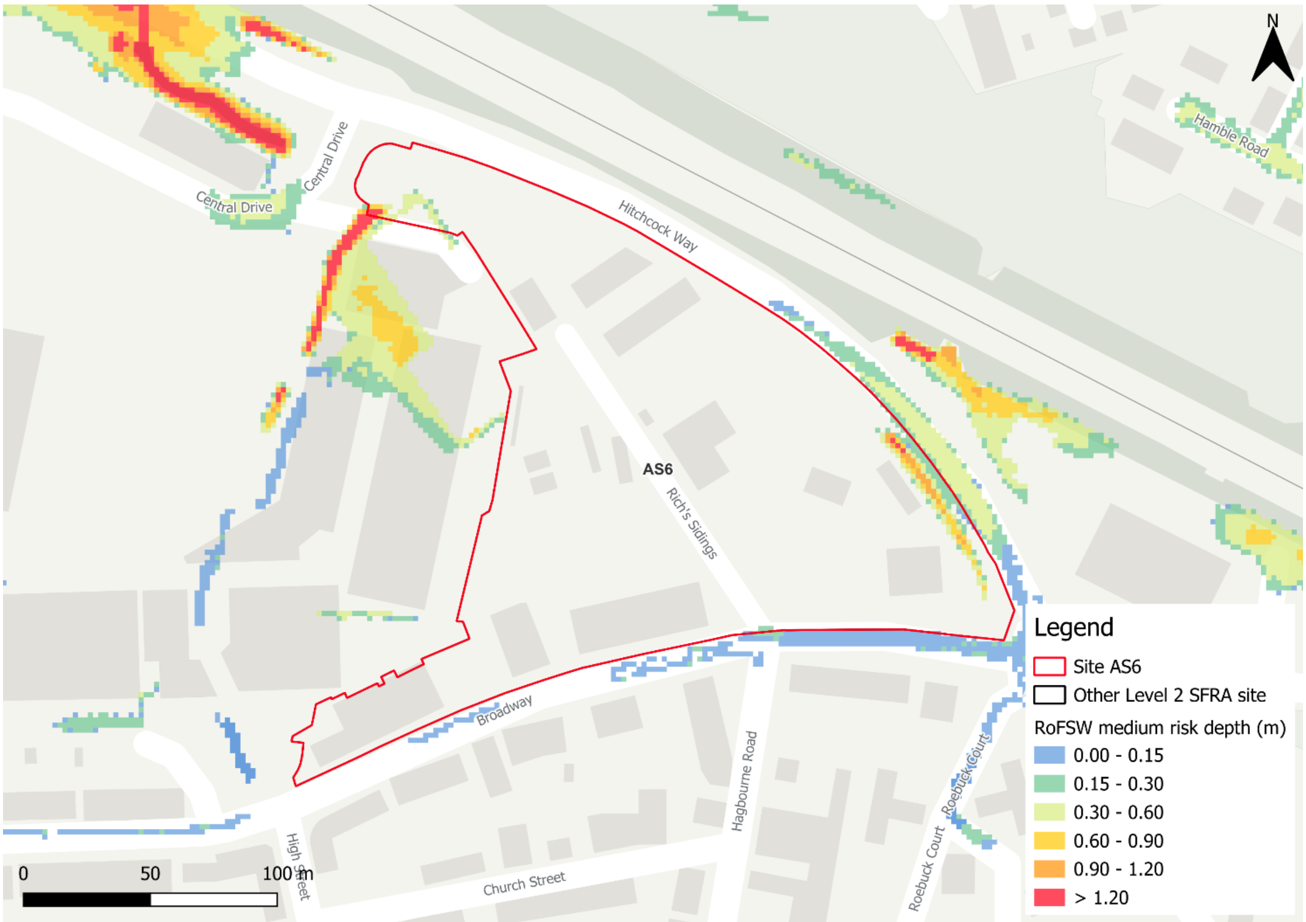

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

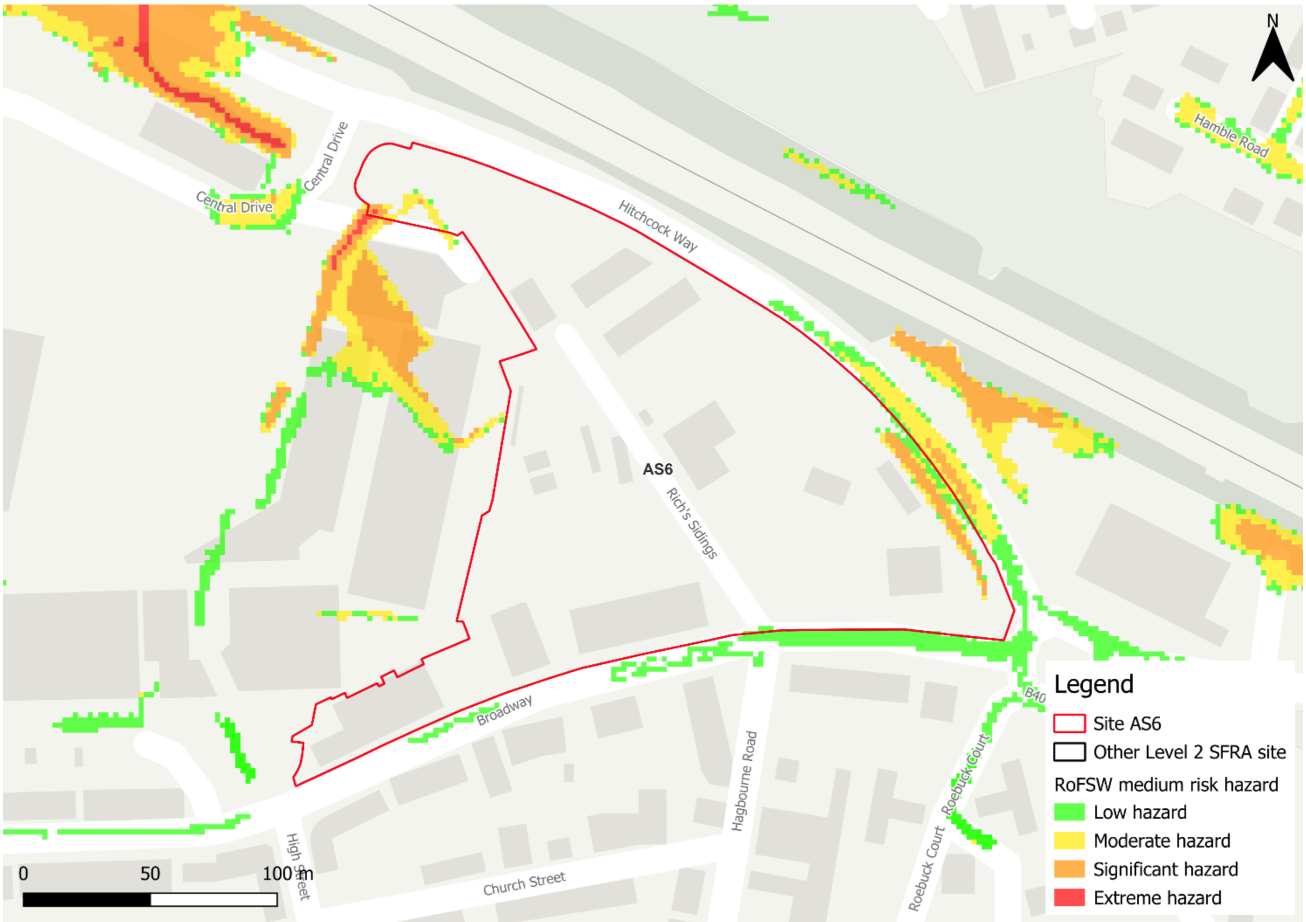

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with only 5% of the site being at low surface water flood risk. Surface water risk in the high and medium risk events is present along the eastern boundary of the site, with some scattered areas of ponding across the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a precautionary proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the eastern boundary of the site. Any existing flow paths should be maintained in site design.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Ideally, any development would avoid the short surface water flow path along the eastern boundary of the site, subject to detailed modelling through a drainage strategy.
- Site design should include for appropriate access to the culvert inlet for maintenance and should also include for suitable easements.

- The Groundwater Flood Map (Figure 4-1) indicates that ground conditions may be suitable for infiltration SuDS. This should be further explored through appropriate ground survey as part of the site-specific FRA and drainage strategy.
- It is assumed the current structures will be demolished for new housing units. A drainage strategy would therefore be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site AS6 (Rich's Sidings and Broadway, Didcot) and the surrounding areas and Table 4-1 explains the risk classifications.

The entirety of the site is in an area where there is negligible groundwater risk. Groundwater conditions may therefore be suited to infiltration SuDS.

Figure 4-1: JBA 5m Groundwater Flood Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess surface water risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated if development avoids the short surface water flow path along the eastern boundary of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future surface water flood risk is fully ascertained.
- A drainage strategy will be required for any new development. The use of infiltration SuDS should be investigated.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must further consider surface water flood risk, including a drainage strategy.
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA must include appropriate access to the culvert inlet for maintenance and should also include for suitable easements within site design.

[3] Para 170 National Planning Policy Framework 2023

- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS7 - Didcot Gateway, Didcot

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

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Document Status

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Prepared by	Georgina Williams BSc MSc Assistant Analyst
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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Georgina Williams of JBA Consulting carried out this work.

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1.1 Site AS7 - Didcot Gateway, Didcot

- Location: Didcot Gateway, Didcot (Figure 1-1)
- Existing site use: Brownfield; commercial and car park
- Existing site use vulnerability: Less Vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More Vulnerable
- Site area: 4.34 ha
- Proposed development impermeable area: 3.7 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Site has partial planning permission
    - Assess present day and future surface water depths, hazards
    - Climate change proxy assessment

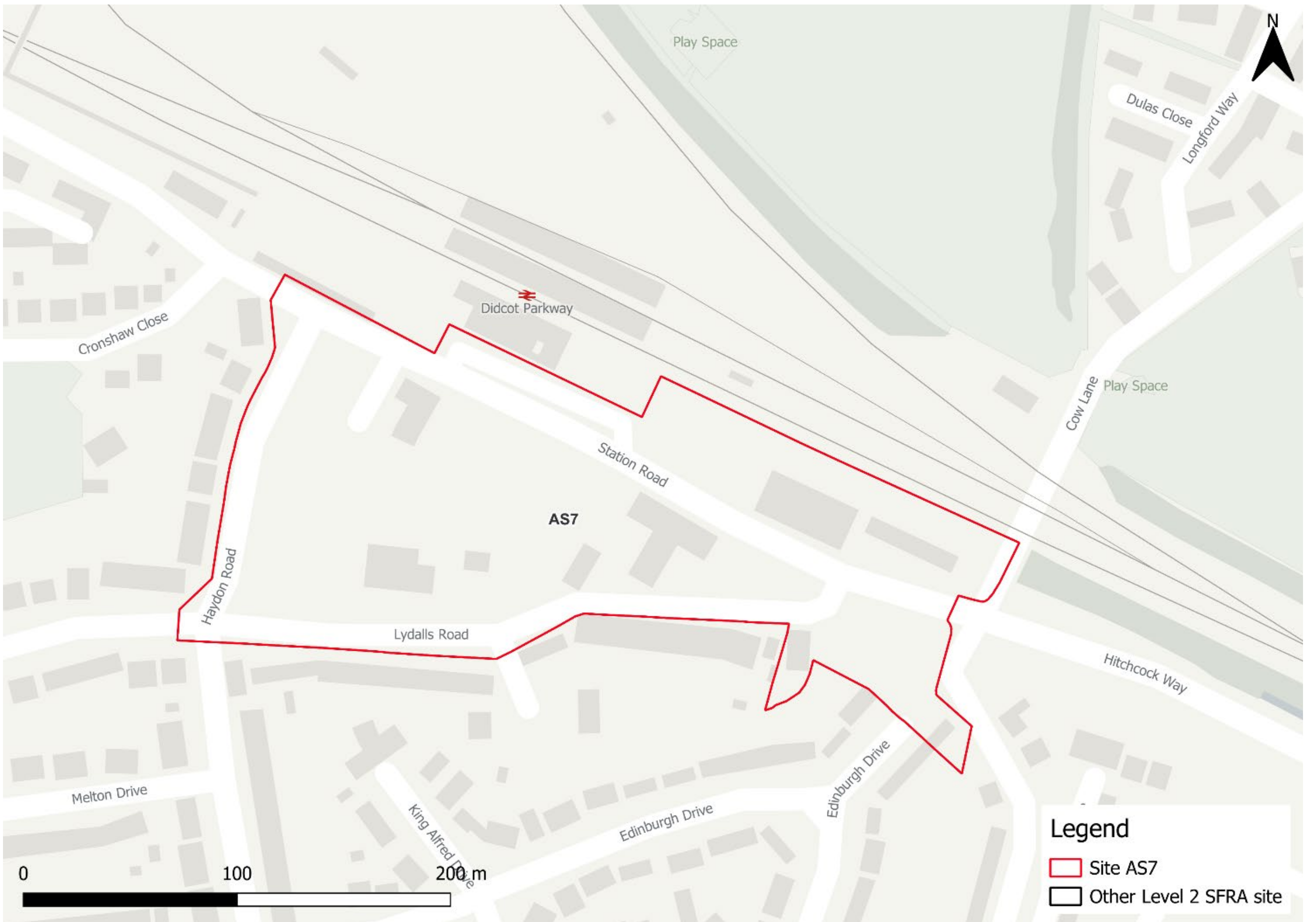

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the south west at approximately 59mAOD. The lowest ground levels are located towards the east of the site at approximately 53mAOD.

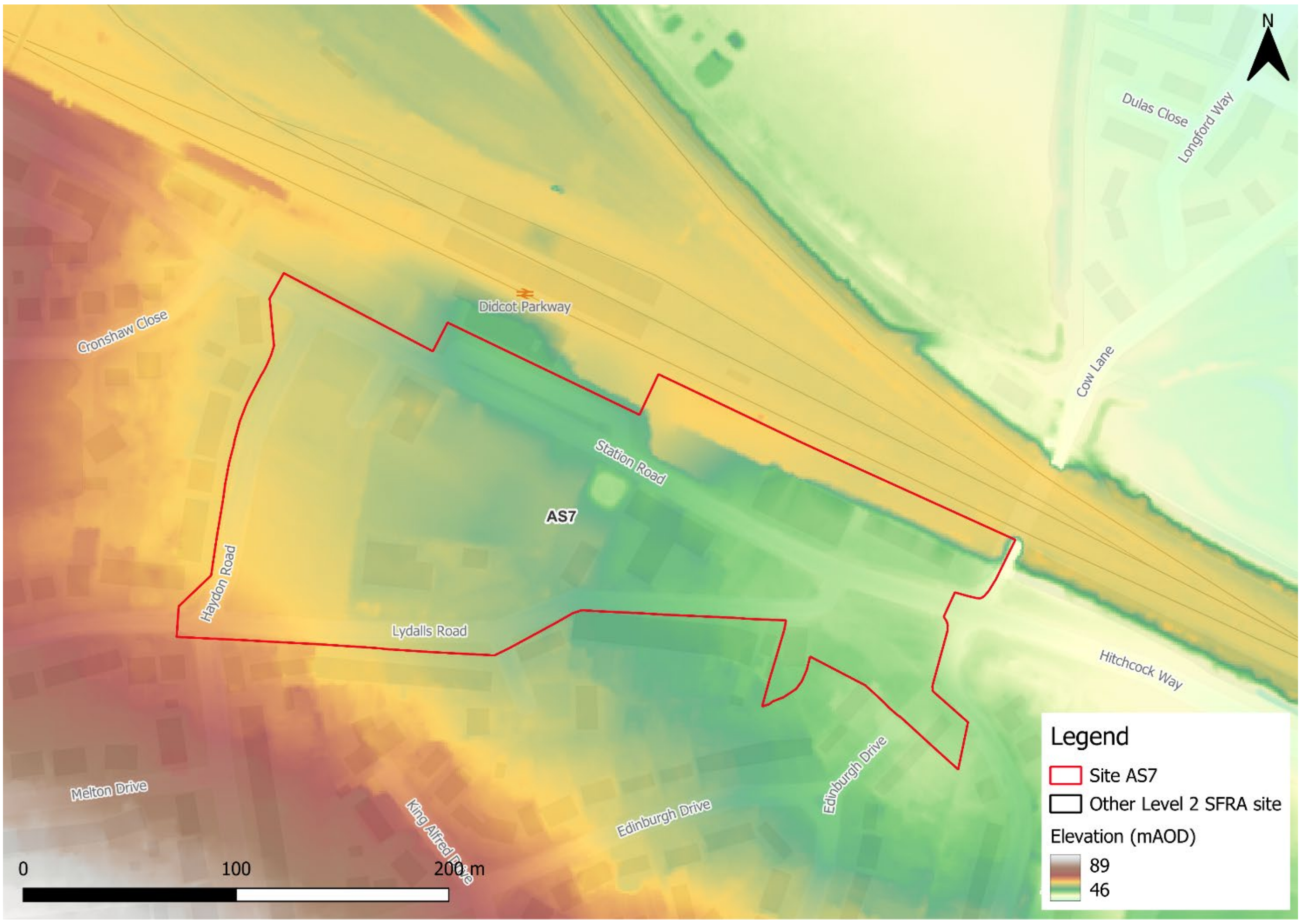

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS7 (Didcot Gateway, Didcot) is located within one catchment, namely; Moor Ditch and Ladygrove Ditch. This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are not any applicable areas that could benefit this site.

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

The LPA historic flood records indicate that flooding has been experienced at the end of Edinburgh Drive, along the boundary of the site, in 2016. Additionally, it is noted that Didcot railway station experienced flooding in 2018.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via Haydon Road to the west of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly low. Approximately 10% of the site is within the high risk surface water flood zone. A further 10% is at medium surface water risk, and a further 26% is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is largely confined to the hardstanding road through the site. There is also an area of ponding adjacent to the Didcot Parkway station building. Surface water risk becomes more significant in the medium risk event, with some additional areas of ponding across the site. In the low risk event, risk is significantly greater across the entire site. Surface water risk is constrained by the existing development within the site.

Greatest flood depths in the high risk event are between 0.6 and 0.9 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes may be possible via Lydalls Road in the high and medium risk events. Safe access and escape routes may be challenging to achieve in the low risk event.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
54	26	10	10

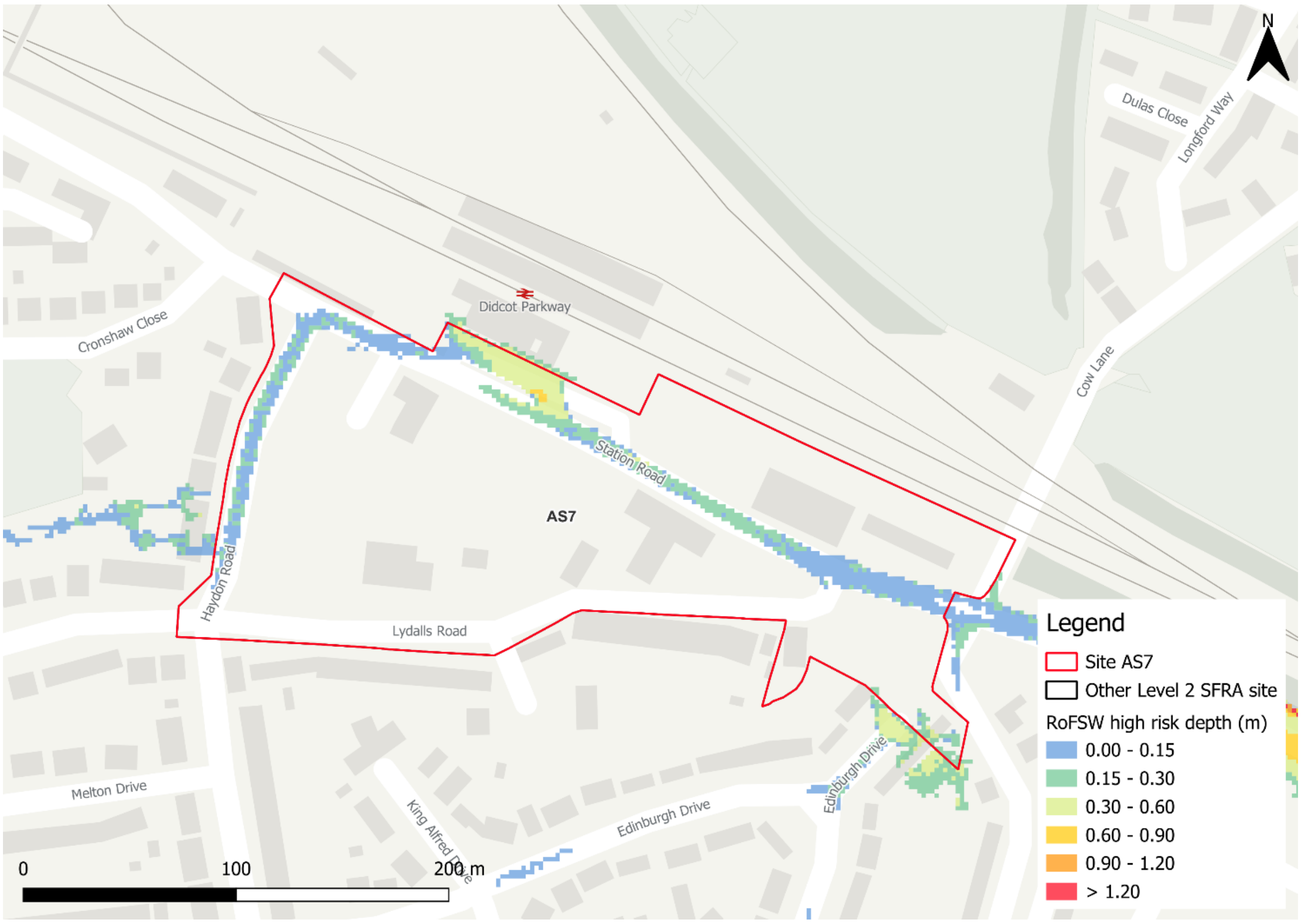

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

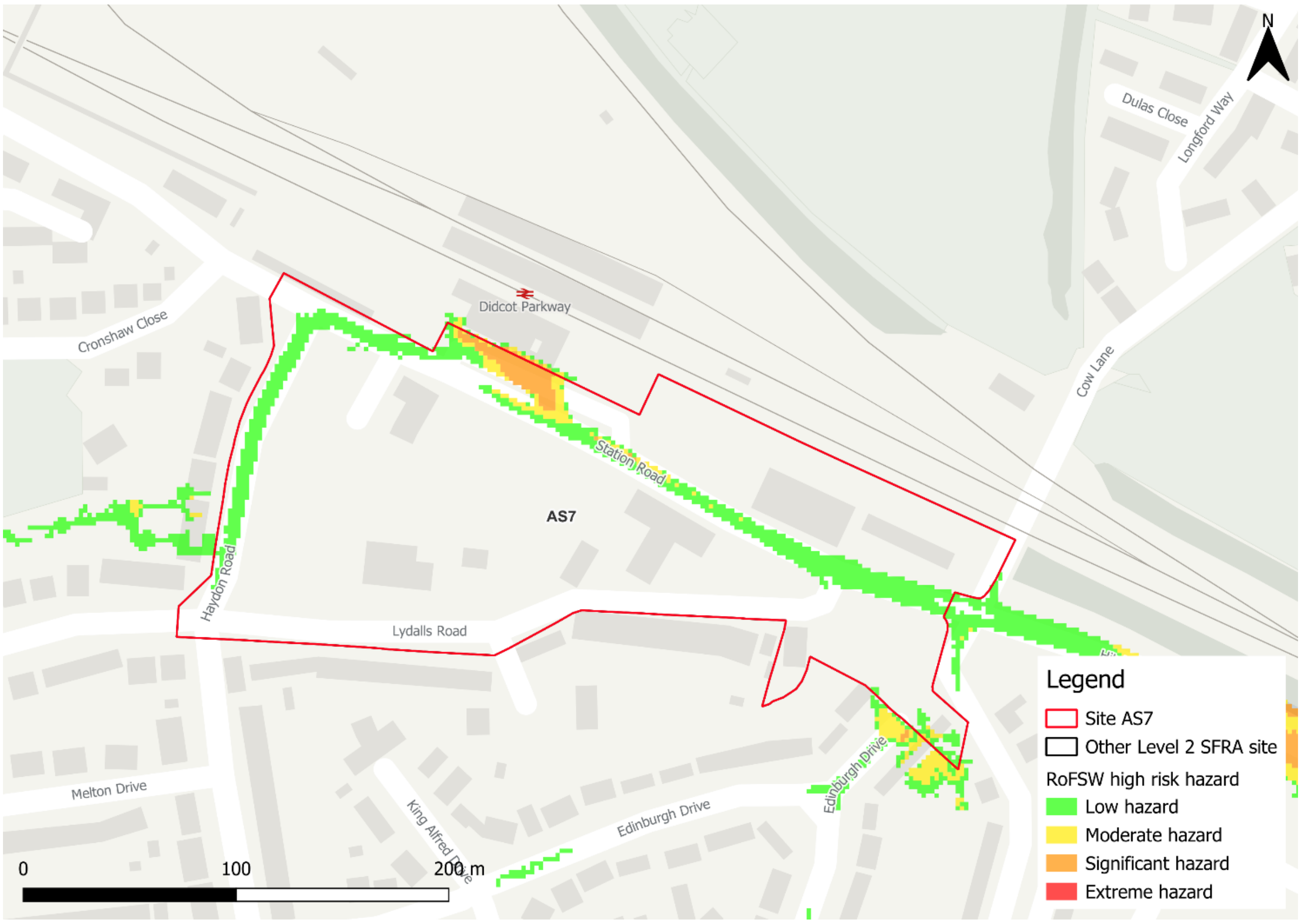

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is greater than in the high risk event, with a greater extent and depth of flooding along the hardstanding roads through the site. Maximum flood depths are modelled to be 0.6m and 0.9m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

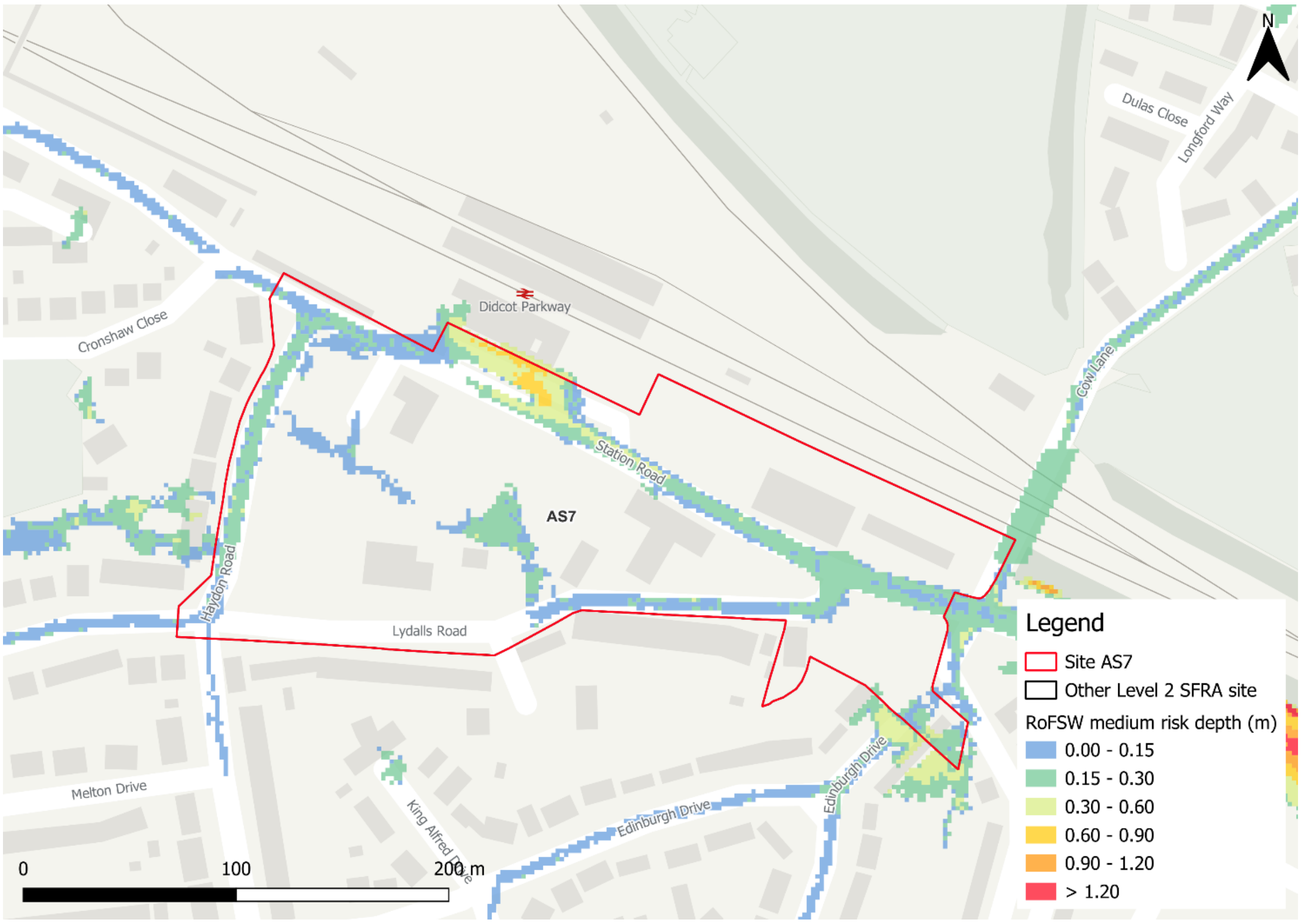

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

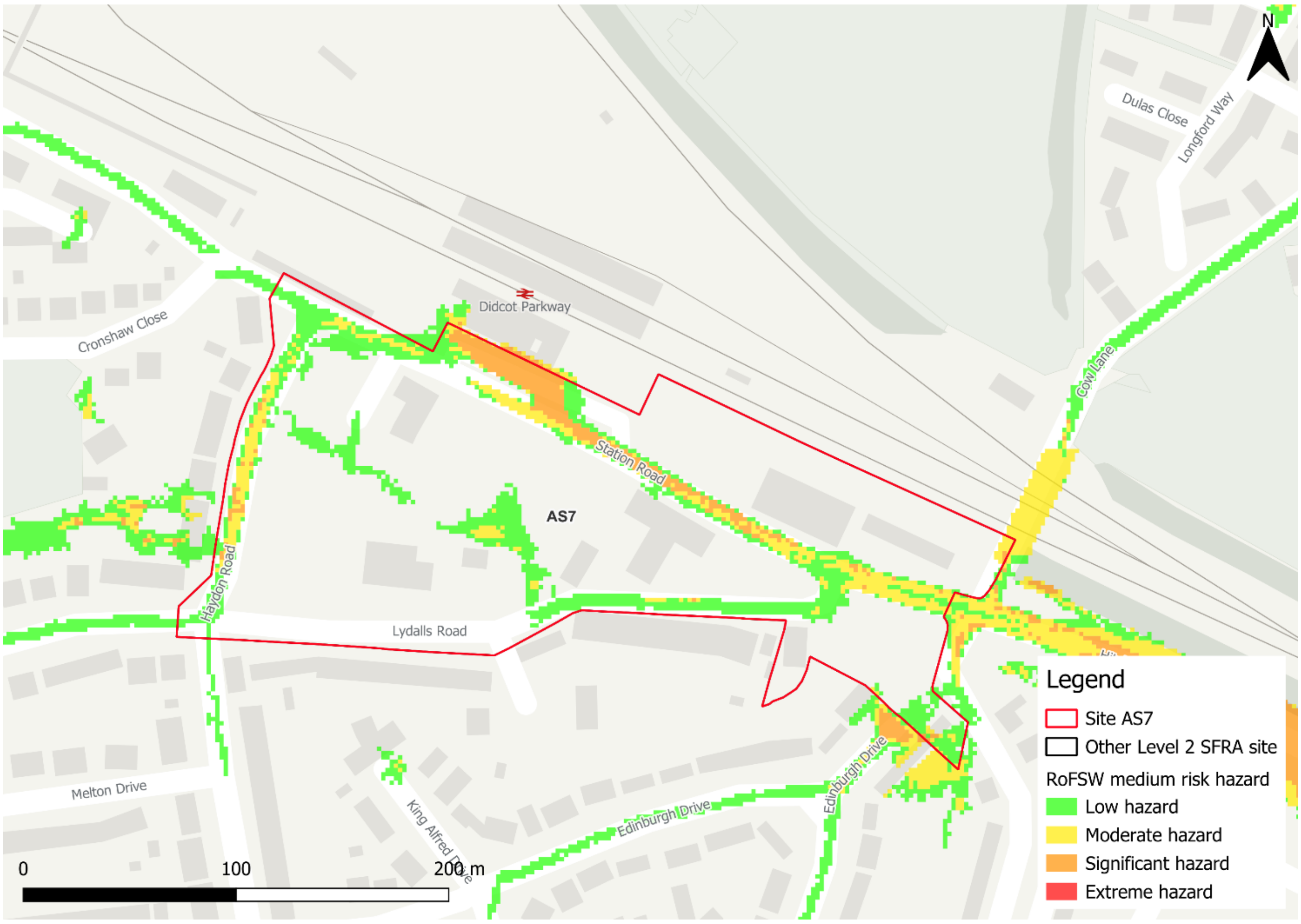

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly low. 10% of the site is modelled to be at risk in the high risk surface water event. In the high risk event, surface water risk is confined to the hardstanding roads through the site and an area of ponding adjacent to the station building.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is greater than the high risk event, with a greater extent of flooding along the hardstanding roads and areas of ponding. Any existing flow paths should be maintained in site design.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Surface water risk to surrounding roads and discharge rates from this site will require carefully considered design through a drainage strategy for the site. Safe access and escape routes in the low risk event should be considered further.
- The Groundwater Flood Map (Figure 4-1) indicates that ground conditions may be suitable for infiltration SuDS. This should be further explored through appropriate ground survey as part of the site-specific FRA and drainage strategy.

- It is assumed the current structures will be demolished for new housing units. A drainage strategy would therefore be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required. Discharge rates from the site should be returned to greenfield rates as a minimum due to historic flooding downstream.
- The Council highways department should be consulted, along with Thames Water and the LLFA regarding existing highway drainage networks, surface water sewers and LLFA assets, and whether increased capacities may be required to enable sustainable development in the long term.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 show the map for Site AS7 (Didcot Gateway, Didcot) and the surrounding areas and Table 4-1 explains the risk classifications.

The entirety of the site is in an area where there is negligible groundwater risk. Groundwater conditions may therefore be suited to infiltration SuDS.

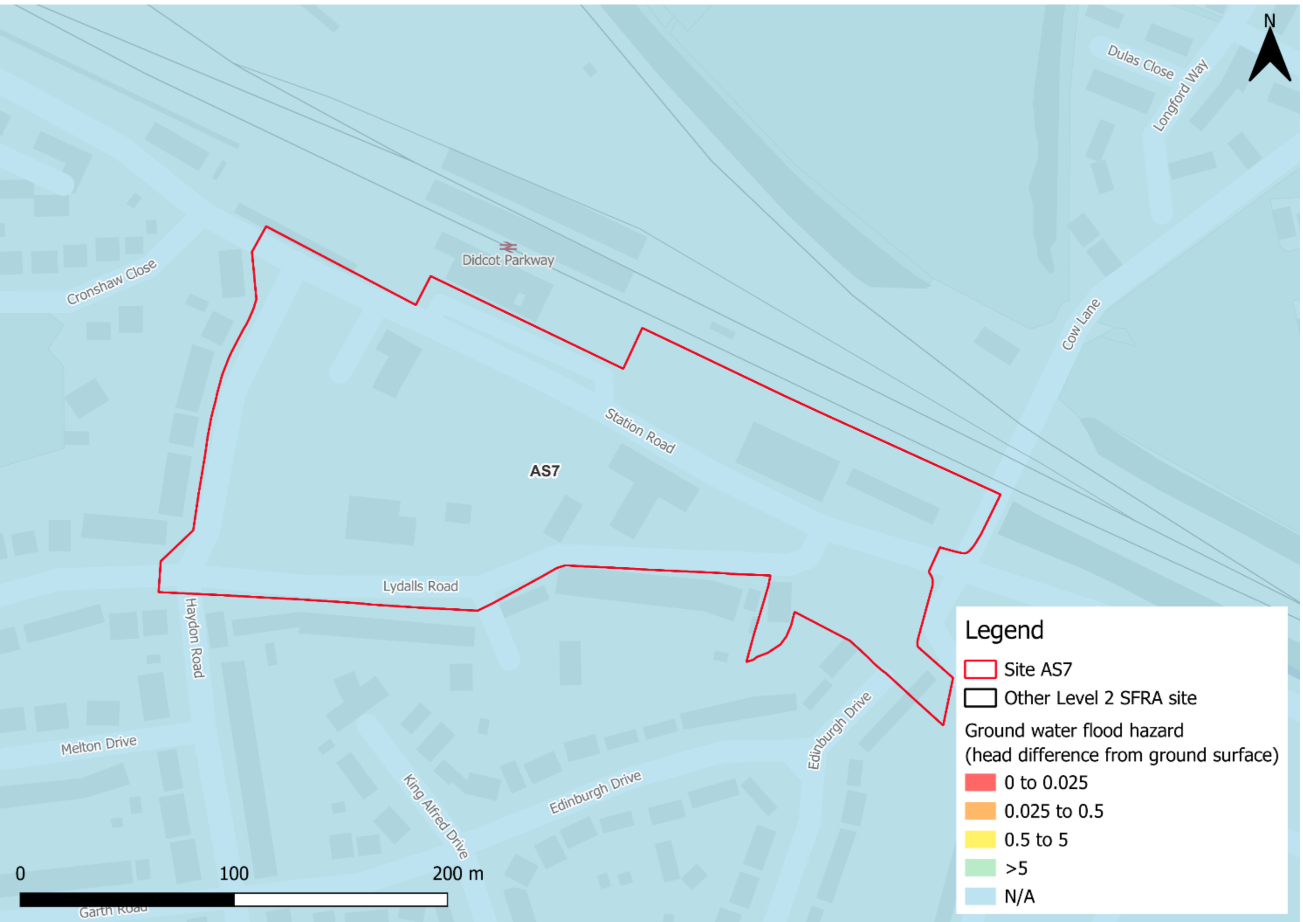

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of future surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Safe access and escape routes should be considered further to ensure safe evacuation of site users during the low risk surface water flood event.
- Based on current information, this site could be allocated if development avoids the area at modelled surface water flood risk.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- A drainage strategy will be required for any new development. The use of infiltration SuDS should be investigated.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must further consider surface water flood risk, including a drainage strategy. Discharge rates should be returned to greenfield rates at a minimum.
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.

[3] Para 170 National Planning Policy Framework 2023

- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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1.1 Site AS8 - North West of Grove, Grove

- Location: North West of Grove, Grove (Figure 1-1)
- Existing site use: Greenfield
- Existing site use vulnerability: Water compatible
- Proposed site use: Mainly residential
- Proposed site use vulnerability: More vulnerable
- Site area: 28.35 ha
- Proposed development impermeable area: 24.1 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the west at approximately 80mAOD. The lowest ground levels are located towards the east of the site at approximately 71mAOD.

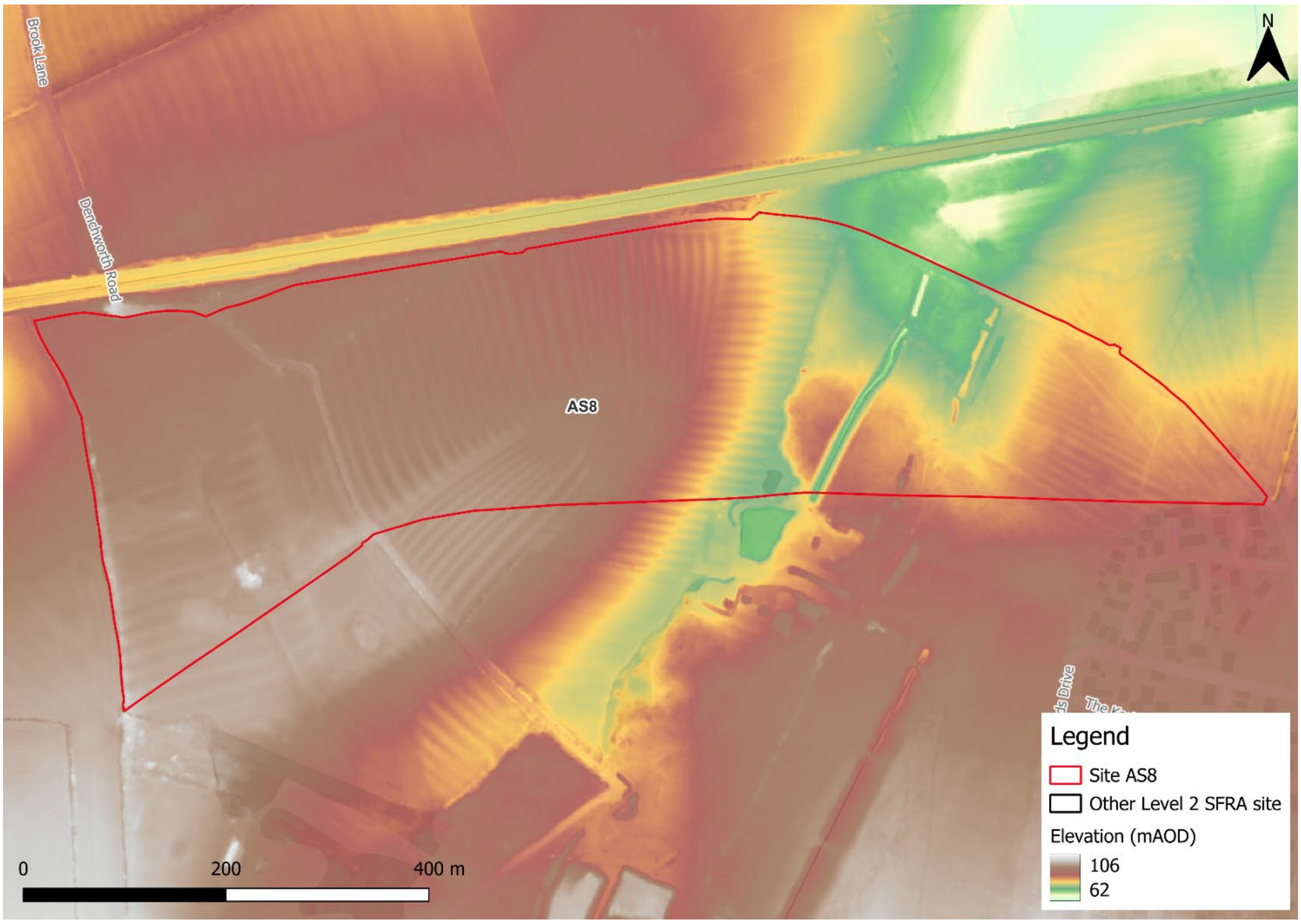

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS8 (North West of Grove, Grove) is located within one catchment, namely; Childrey and Woodhill Brooks. This is ranked as a low sensitivity catchment. Planning considerations for sites at low sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there are significant opportunities for tree planting to reduce runoff. There are also opportunities for runoff attenuation features, to slow the rate of runoff downstream. These areas are shown in Figure 2-2.

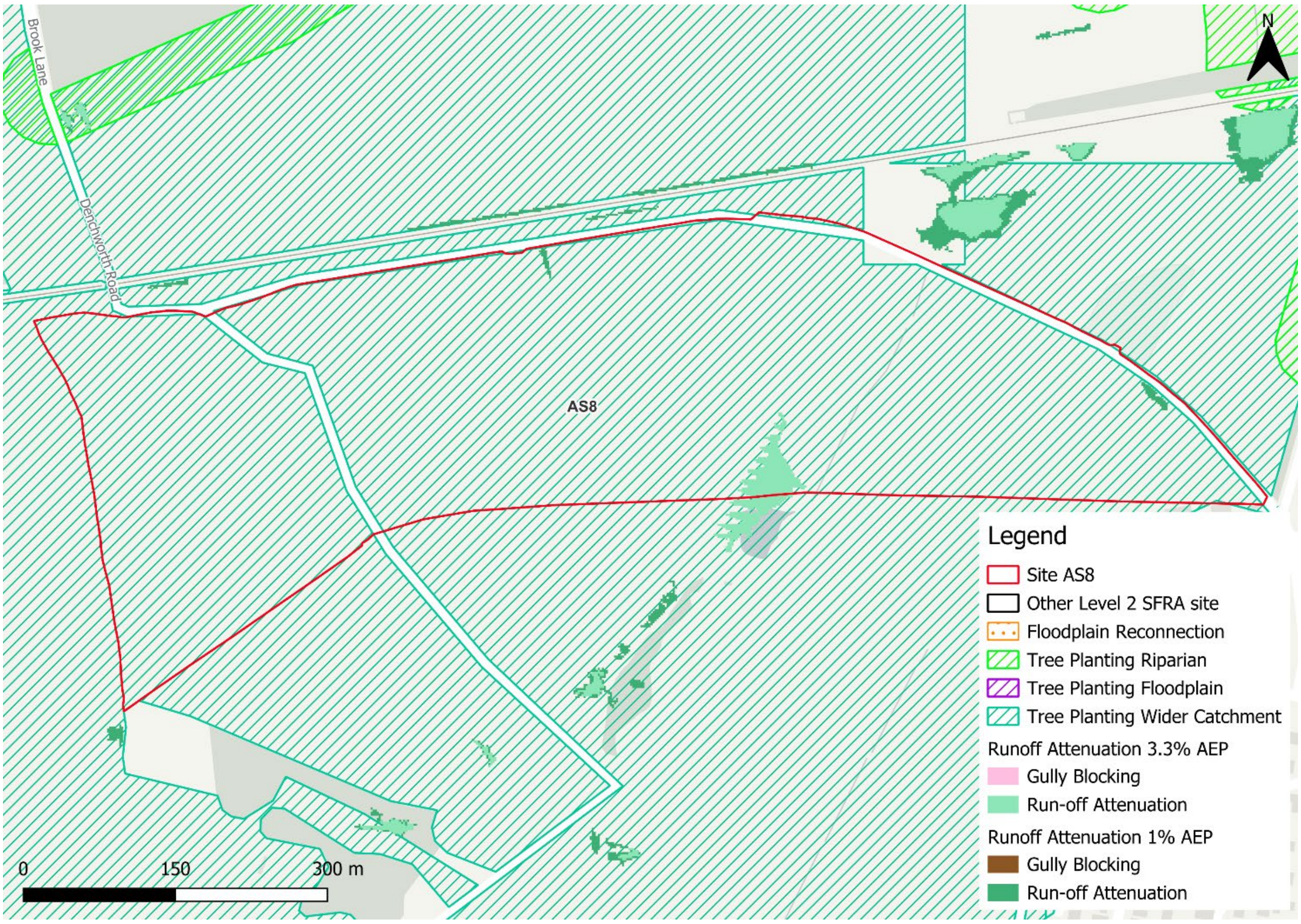

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via Denchworth Road to the north of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the high risk surface water flood zone. A further 1% is at medium surface water risk, and a further 6% is at low surface water risk, as shown in Table 3-1.

In the high event, surface water risk is confined to an area of ponding within a topographic low spot along the southern boundary of the site. This area becomes greater in extent in the medium risk event. In the low risk event, this ponding develops into a surface water flow path through the centre of the site, along with some additional larger areas of risk.

Greatest flood depths in the high risk event are between 0.6 and 0.9 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Denchworth Road in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
92	6	1	1

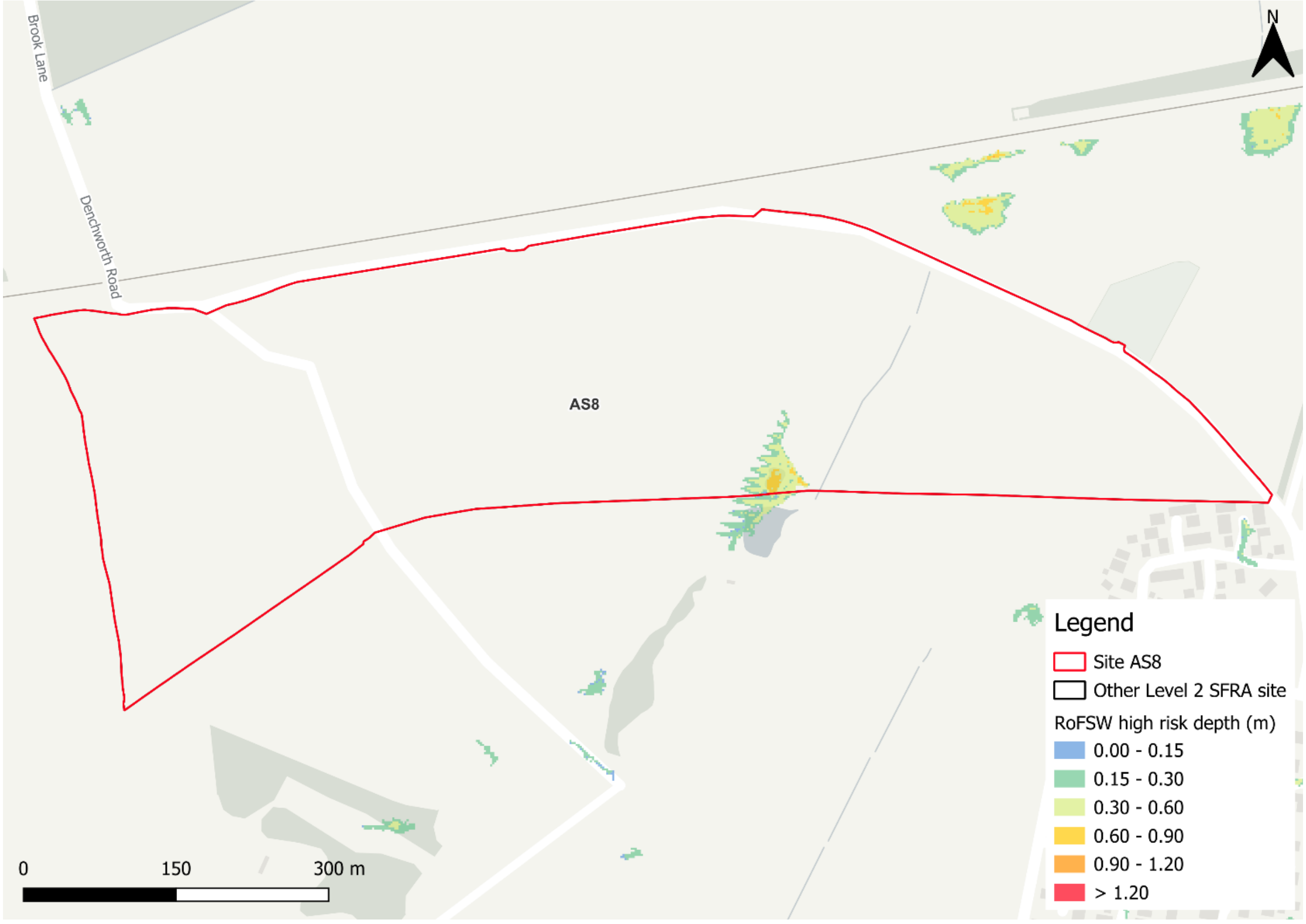

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

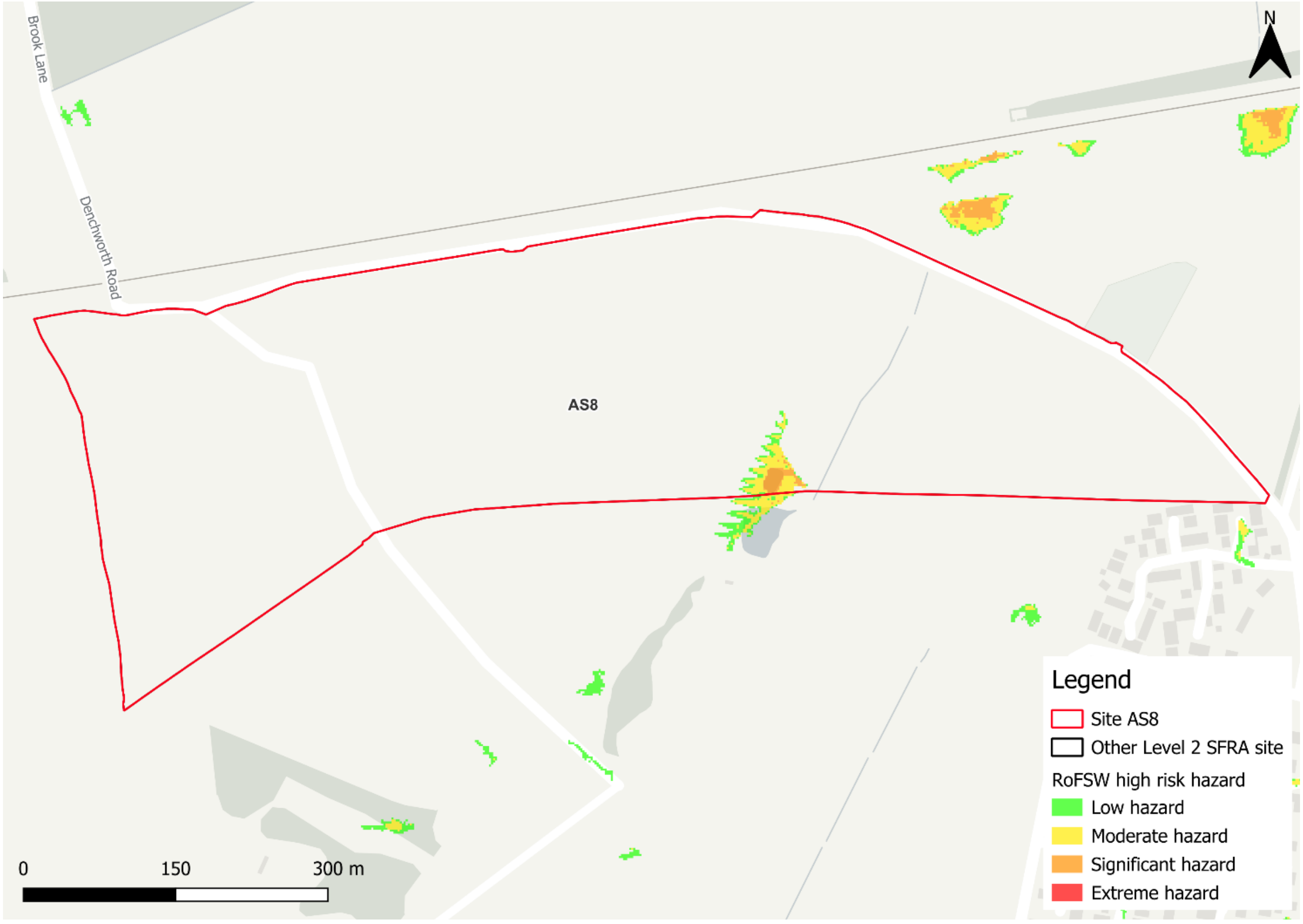

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding along the southern boundary of the site. There are also some additional areas of shallow ponding within the north and east of the site. Maximum flood depths are modelled to be between 0.9 and 1.2 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

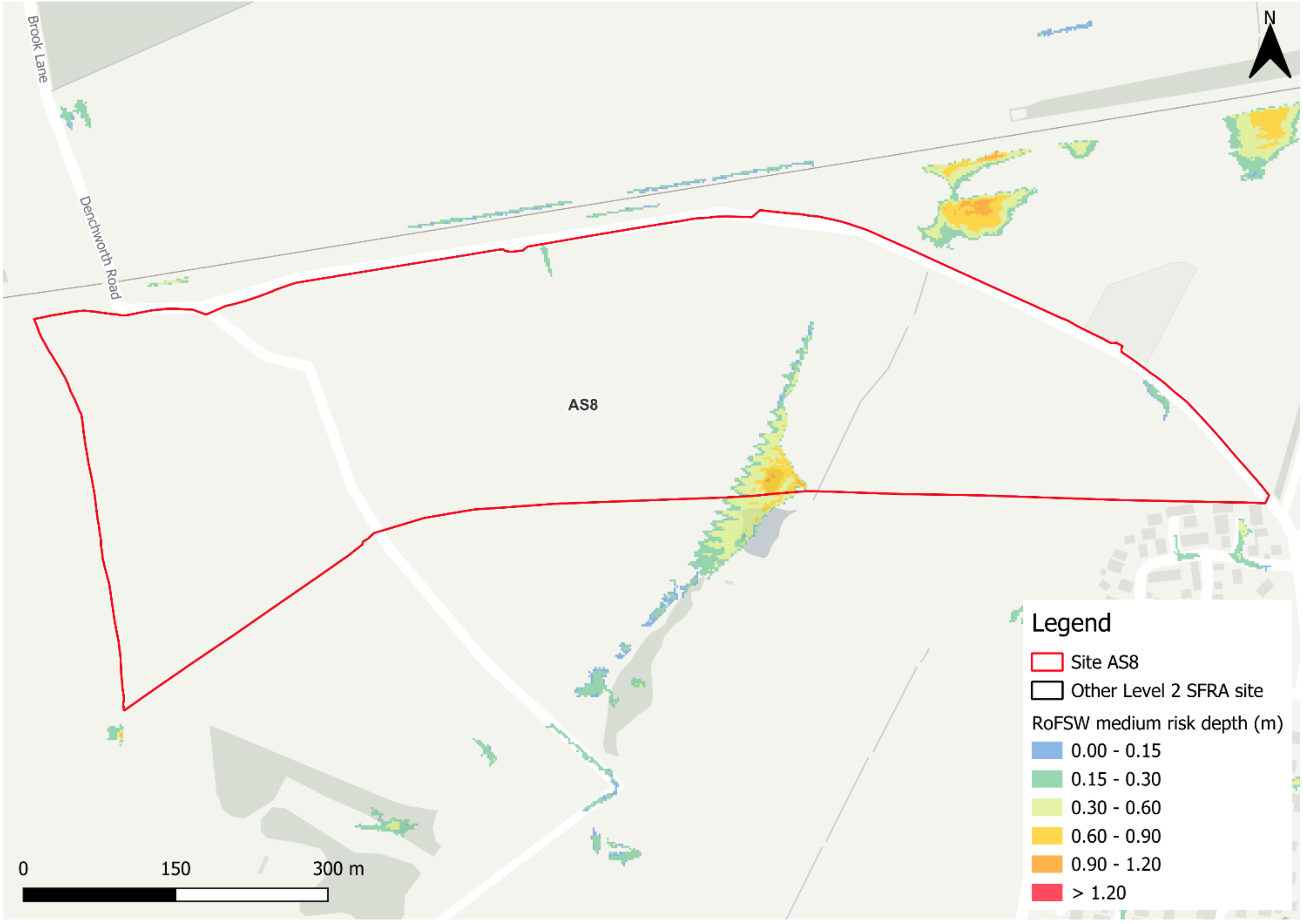

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

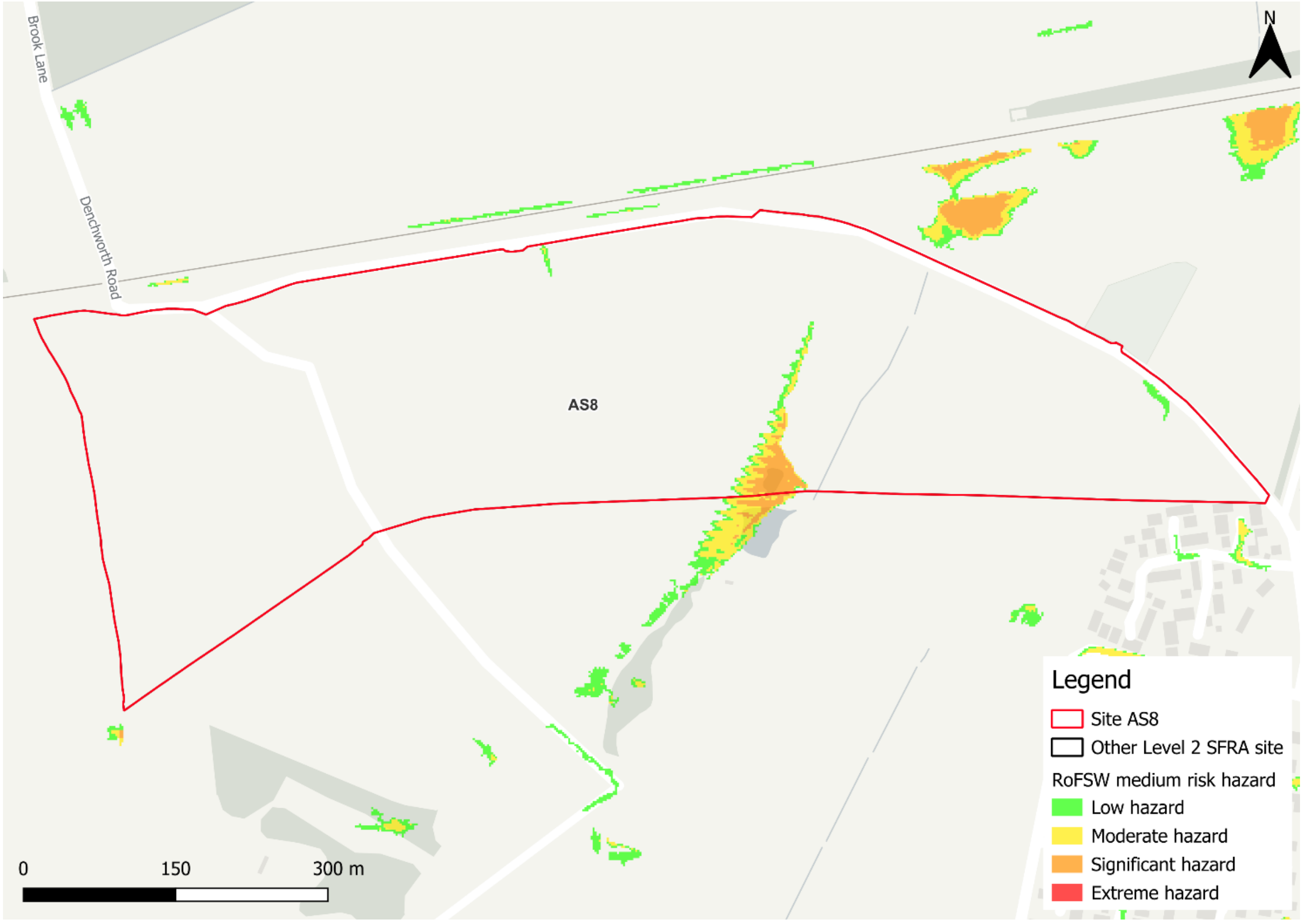

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with only 6% of the site being at low surface water flood risk. Surface water risk in the high risk events is present along the southern boundary of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent and depth of ponding along the southern boundary, with some scattered areas of ponding across the north and east of the site.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Ideally, any development would avoid the significant area of ponding along the southern boundary of the site, subject to detailed modelling through a drainage strategy.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site AS8 (North West of Grove, Grove) and the surrounding areas and Table 4-1 explains the risk classifications.

The risk of groundwater emergence varies across the site. Within large areas of the site, there is a risk of groundwater flooding to surface and subsurface assets. There is negligible groundwater risk through the centre of the site. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from water compatible to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of future surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated if development avoids the area of surface water ponding along the southern boundary of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- A drainage strategy will be required for any new development.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must further consider surface water flood risk, including a drainage strategy.
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.

[3] Para 170 National Planning Policy Framework 2023

- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS9 - North West of Valley Park, Didcot

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS9 - North West of Valley Park, Didcot. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS9 - North West of Valley Park, Didcot

- Location: North West of Valley Park, Didcot (Figure 1-1)
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly residential
- Proposed site use vulnerability: More vulnerable
- Site area: 33.25 ha
- Proposed development impermeable area: 28.3 ha (assumed 85% of site area)
- EA model: Didcot Valley Park 2019 / Moor Ditch (Didcot to Thames Confluence) 2007
- Watercourse: Unnamed drain
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the south west at approximately 80mAOD. The lowest ground levels are located towards the north of the site at approximately 57mAOD.

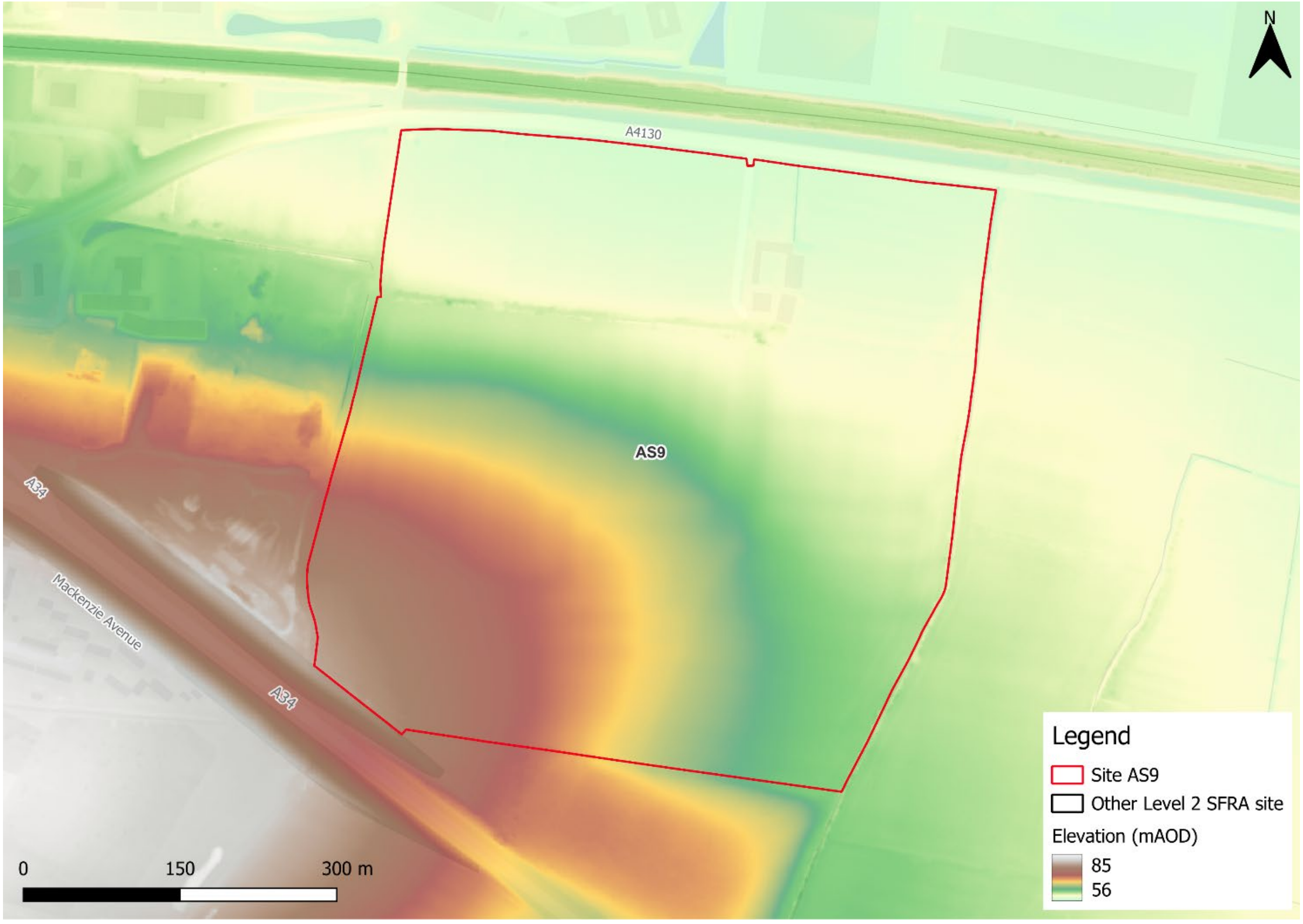

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The areas along the northern and eastern boundaries of the site are located within Flood Zone 3b. The area of functional floodplain onsite should be left free of vulnerable development. The functional floodplain in this location is based on the 1% AEP undefended event from the Didcot Valley Park 2019 and Moor Ditch (Didcot to Thames Confluence) 2007 models, as a precautionary approach in the absence of suitable modelled data. There is an additional area along the eastern boundary of the site within Flood Zone 2. The rest of the site is within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
83	3	0	14

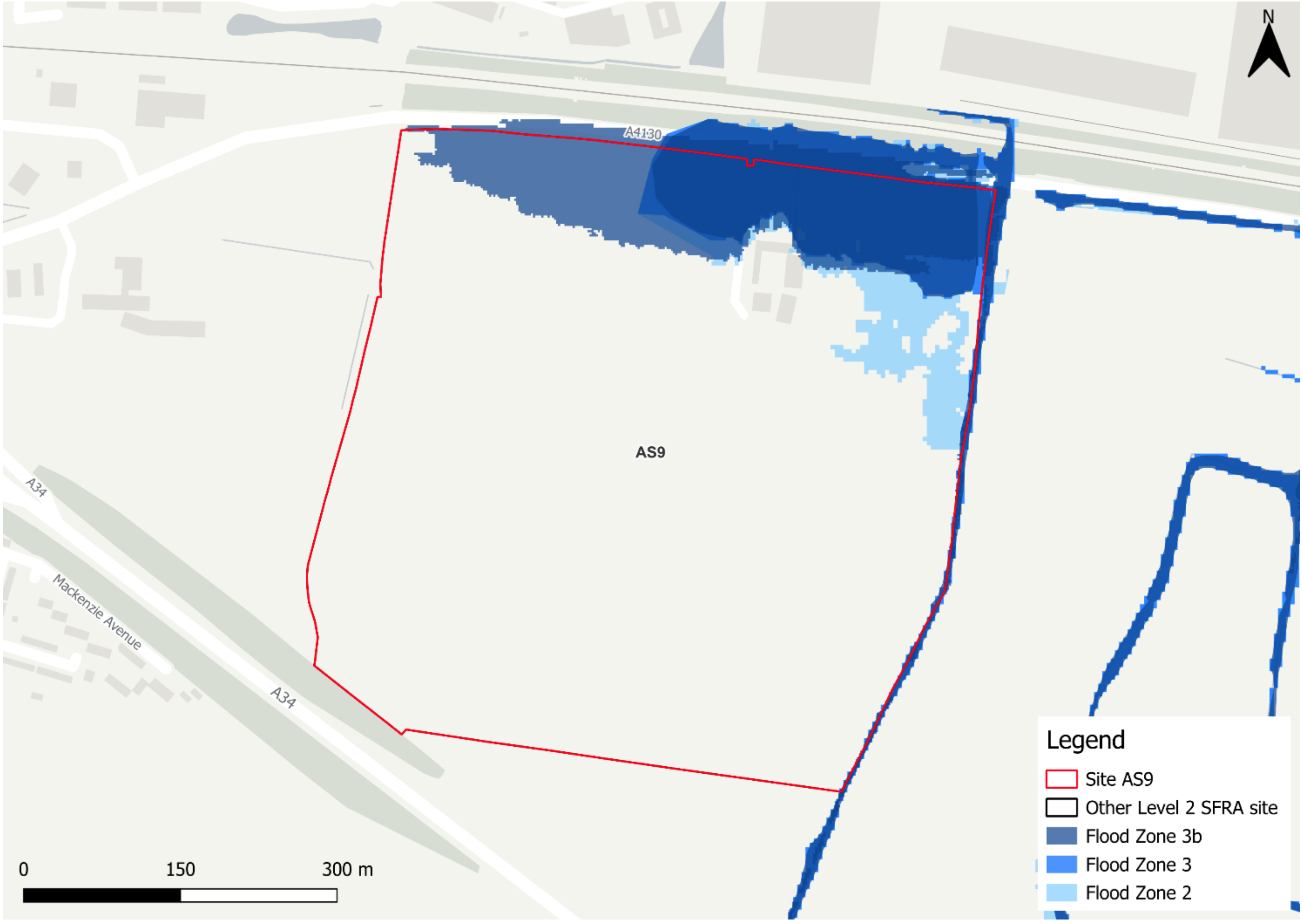

Figure 2-1: Existing risk from rivers to the site

2.1.2 Didcot Valley Park 2019 model outputs

The Didcot Valley Park 2019 model cannot be used to fully inform this SFRA, due to required results files not being provided for consideration. The fluvial risk information to inform the suitability for allocation of this site, and all other sites in the model domain, is therefore limited. The information required for the SFRA that is not available includes:

- Flood depth information
- Flood hazard information

The only modelled fluvial flood risk information available for consideration for this site is the flood extent for the 1% AEP undefended event provided by the EA.

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is similar to Flood Zone 3 in the vicinity of the site, with the area along the northern and eastern boundaries of the site modelled to be at risk. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event.

The Didcot Valley Park 2019 model has superseded the Moor Ditch (Didcot to Thames Confluence) 2007 model in the location of site AS9 (North West of Valley Park, Didcot). However, as modelled flood depths are available for the Moor Ditch model, they have been included within this assessment as an indicative estimation of modelled flood depths. Note that this information was modelled in 2007 thus is likely to be based on outdated hydrology, terrain data and channel and structure survey. The Moor Ditch (Didcot to Thames Confluence) 2007 model results are discussed in Section 2.1.3.

Modelled flood depth and hazard information for the Didcot Valley Park 2019 model must be considered to inform on flood risk to the site. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA should include for deriving this modelled information.

Figure 2-2: Flood extent for 1% AEP undefended flood event

2.1.3 Moor Ditch (Didcot to Thames Confluence) 2007 model outputs

Flood depth information is available for present day flood events, derived through a 1D mapping process. However, as discussed above, this information has now been superseded by the Didcot Valley Park 2019 model and is only included within this assessment as an indication of modelled flood depths in the absence of modelled depths from the most recent modelling.

Figure 2-3 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Maximum modelled flood depths within the area of the site modelled to be at risk in the Didcot Valley Park 2019 model are between 0.6 and 0.9 m. Flood hazards are not available for the Moor Ditch (Didcot to Thames Confluence) 2007 model.

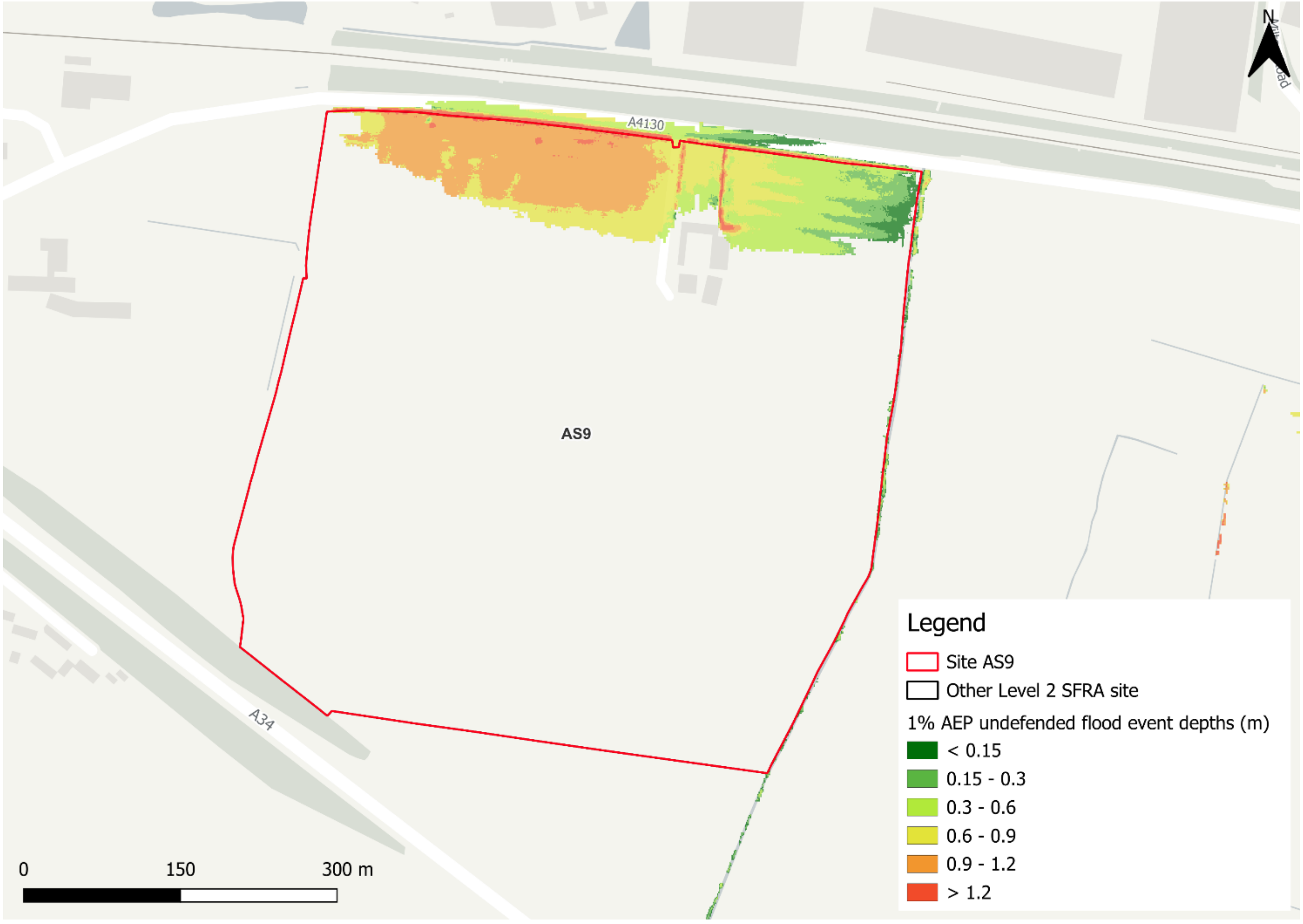

Figure 2-3: Flood depths for 1% AEP undefended flood event based on the superseded Moor Ditch 2007 model

2.2 Impacts from climate change

The impacts of climate change on flood risk from the unnamed drain (Didcot Valley Park 2019 model) has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3 (Figure 2-4).

The Didcot Valley Park 2019 model has superseded the Moor Ditch (Didcot to Thames Confluence) 2007 model in the location of site AS9 (North West of Valley Park, Didcot). However, as modelled flood depths are available for the Moor Ditch model, they have been included within this assessment as an indicative estimation of the 0.1% AEP undefended modelled flood depths as a proxy for the 1% AEP undefended event plus climate change.

Maximum modelled flood depths within the area of the site modelled to be at risk in the Didcot Valley Park 2019 model are between 0.9 and 1.2 m. Flood hazards are not available for the Moor Ditch (Didcot to Thames Confluence) 2007 model.

The impacts of climate change on flood risk from the unnamed drain (Didcot Valley Park 2019 model) must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA should include for the most up to date climate change allowances.

Figure 2-4: Flood extent for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

Figure 2-5: Flood depths for 0.1% AEP undefended flood event based on the superseded Moor Ditch 2007 model (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS9 (North West of Valley Park, Didcot) is located within one catchment, namely; Moor Ditch and Ladygrove Ditch. This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there are significant opportunities for tree planting to reduce runoff downstream. There is also potential to reconnect the channel to the floodplain, allowing flood water to be stored. There are some additional areas within the site that have the potential for runoff attenuation features. These areas are shown in Figure 2-6.

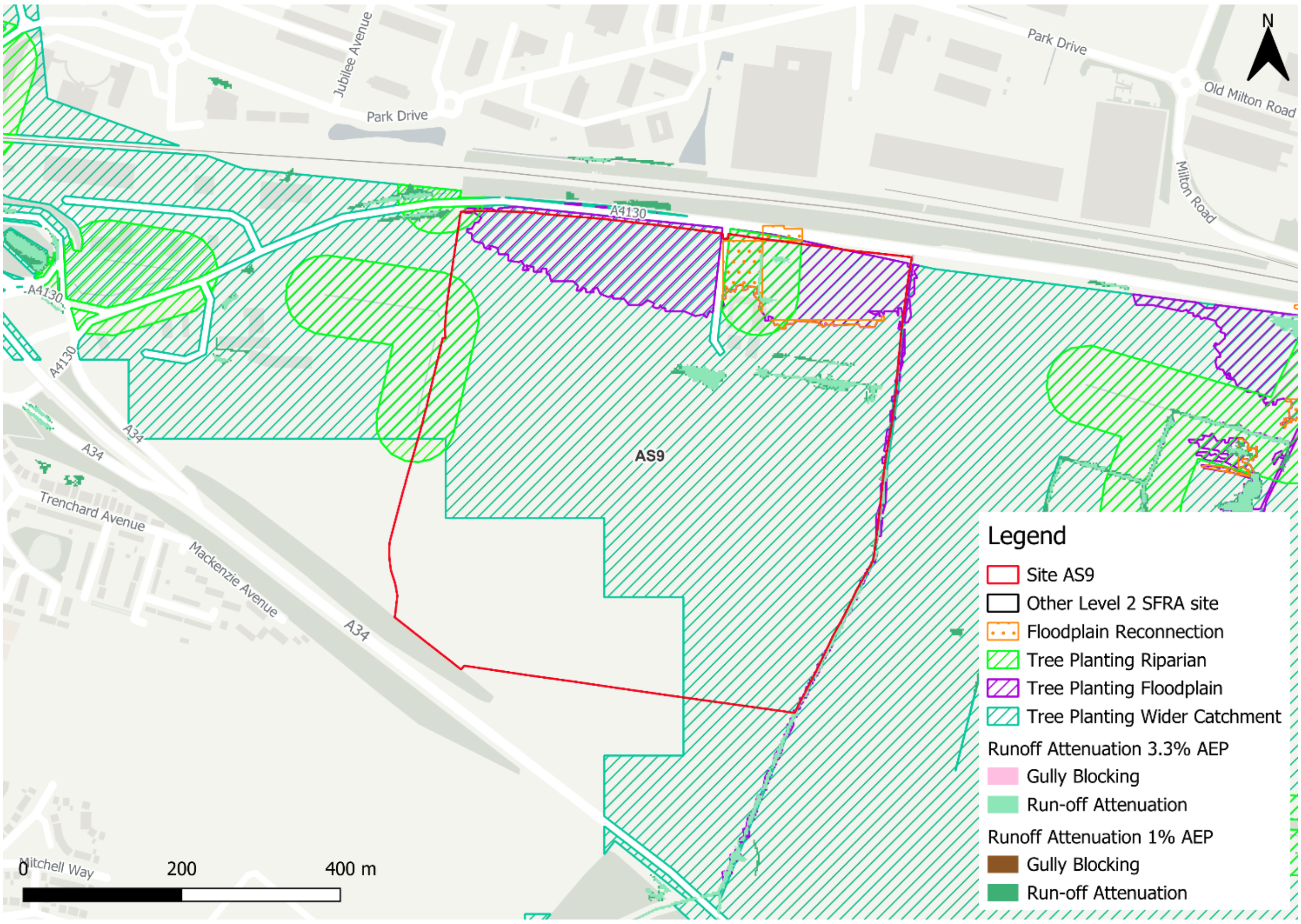

Figure 2-6: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. Site AS9 (North West of Valley Park, Didcot) is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is located within one FAA, along the northern boundary of the site, namely 061WAF23Ginge - Ginge Brook.

Safe access and escape routes could likely be achieved during a flood event via the A4130 to the north of the site. Access roads may need to be situated to the west of the site given the potential impact of flooding along the northern boundary of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the northern and eastern boundaries of the site. Vulnerable development is not permitted within the area of functional floodplain based on the Didcot Valley Park 2019 model. This should be converted to a blue / green corridor to provide ecological, amenity and social value. However, the functional floodplain in this area is based on 1% AEP undefended event from the Didcot Valley Park 2019 and Moor Ditch (Didcot to Thames Confluence) 2007 models, as a precautionary approach.
- No modelled flood depth or hazard information is available for the Didcot Valley Park 2019 model. The superseded Moor Ditch (Didcot to Thames Confluence) 2007 model outputs have been used to provide an indicative idea of flood depths within the area at risk. Maximum modelled flood depths within the area of the site modelled to be at risk in the Didcot Valley Park 2019 model are between 0.6 and 0.9 m.
- Modelled depth and hazard information was not available for the Didcot Valley Park 2019 model. This should be considered as part of a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, based on the Didcot Valley Park 2019 model extents. However, climate change must be modelled to inform whether the site can be safe for its lifetime.

- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The EA flood alert areas should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape routes are available from the A4130 to the north of the site based on current information.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 2% of the site is within the high risk surface water flood zone. A further 2% is at medium surface water risk, and a further 2% is at low surface water risk, as shown in Table 3-1.

In all events, surface water risk is largely confined to the north of the site. There is an area of ponding along the northern boundary of the site which is likely a result of the topographic low spot behind the raised A4130 road infrastructure. There are some additional small areas of ponding.

Greatest flood depths in the high risk event range between 0.6 and 0.9 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via the A4130 in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
94	2	2	2

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding within the topographic low spots. Maximum flood depths are modelled to be between 0.6 and 0.9 m, with areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

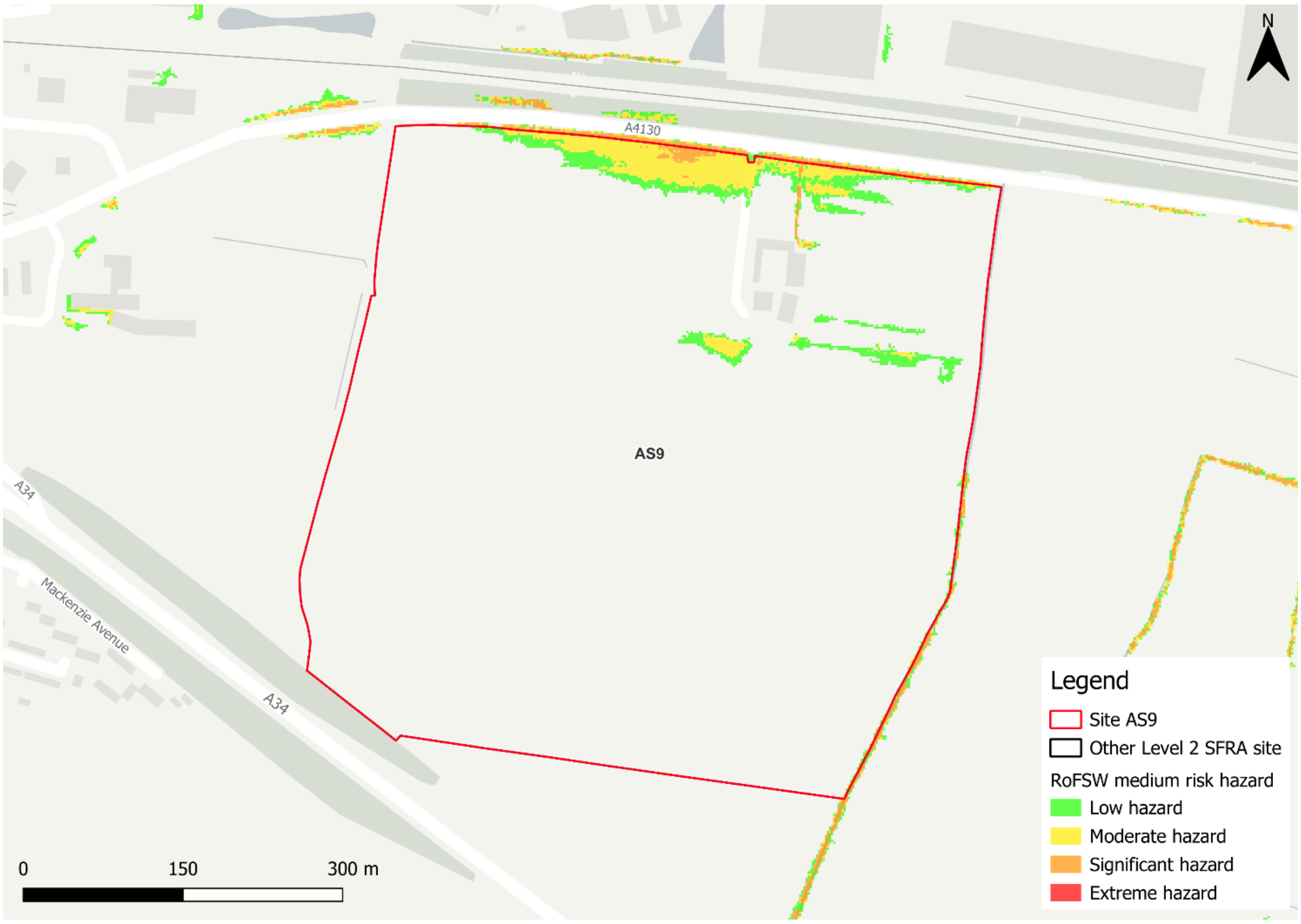

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 94% of the site being at very low surface water flood risk. Surface water risk in all events is confined to areas of ponding within topographic low spots in the north of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding within the topographic low spots.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- The Groundwater Flood Map (Figure 4-1) indicates that ground conditions may be suitable for infiltration SuDS. This should be further explored through appropriate ground survey as part of the site-specific FRA and drainage strategy.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site AS9 (North West of Valley Park, Didcot) and the surrounding areas and Table 4-1 explains the risk classifications.

The entirety of the site is in an area where there is negligible groundwater risk. Groundwater conditions may therefore be suited to infiltration SuDS.

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a, and it is expected that vulnerable development will avoid the area of functional floodplain.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe for its lifetime and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- There should be no vulnerable development within the area of the site within the functional floodplain. This should be converted to a blue / green corridor to provide ecological, amenity and social value. However, the functional floodplain in this area is based on 1% AEP undefended event from the Didcot Valley Park 2019 and Moor Ditch (Didcot to Thames Confluence) 2007 models, as a precautionary approach.
- Present day depth and hazard information and updated climate change modelling from the Didcot Valley Park 2019 model should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated if development avoids the area of the site within the functional floodplain.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on present day and future flood risk from the unnamed drain is fully ascertained.
- A drainage strategy will be required for any new development. The use of infiltration SuDS should be investigated.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

[3] Para 170 National Planning Policy Framework 2023

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the present day and future fluvial depths and hazards from the Didcot Valley Park 2019 model.
- Any site-specific FRA must further consider surface water flood risk, including a drainage strategy.
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should undertake a condition assessment of the culvert beneath the railway and investigate the impact of a potential blockage of this structure.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS10 - Land at Dalton Barracks Garden Village, Shippon

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Georgina Williams of JBA Consulting carried out this work.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS10 - Land at Dalton Barracks Garden Village, Shippon. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS10 - Land at Dalton Barracks Garden Village, Shippon

- Location: Land at Dalton Barracks Garden Village, Shippon (Figure 1-1)
- Existing site use: Brownfield; mixed use. Eastern third of the site currently developed for residential uses.
- Existing site use vulnerability: More vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More vulnerable
- Site area: 145.41 ha
- Proposed development impermeable area: 76.9 ha (assumed 85% of site area, outside of the area provided as open green space)
- EA model: N/A
- Watercourse: Sandford Brook
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment
    - Potential residual risk from the culvert under Grange Mill Lane

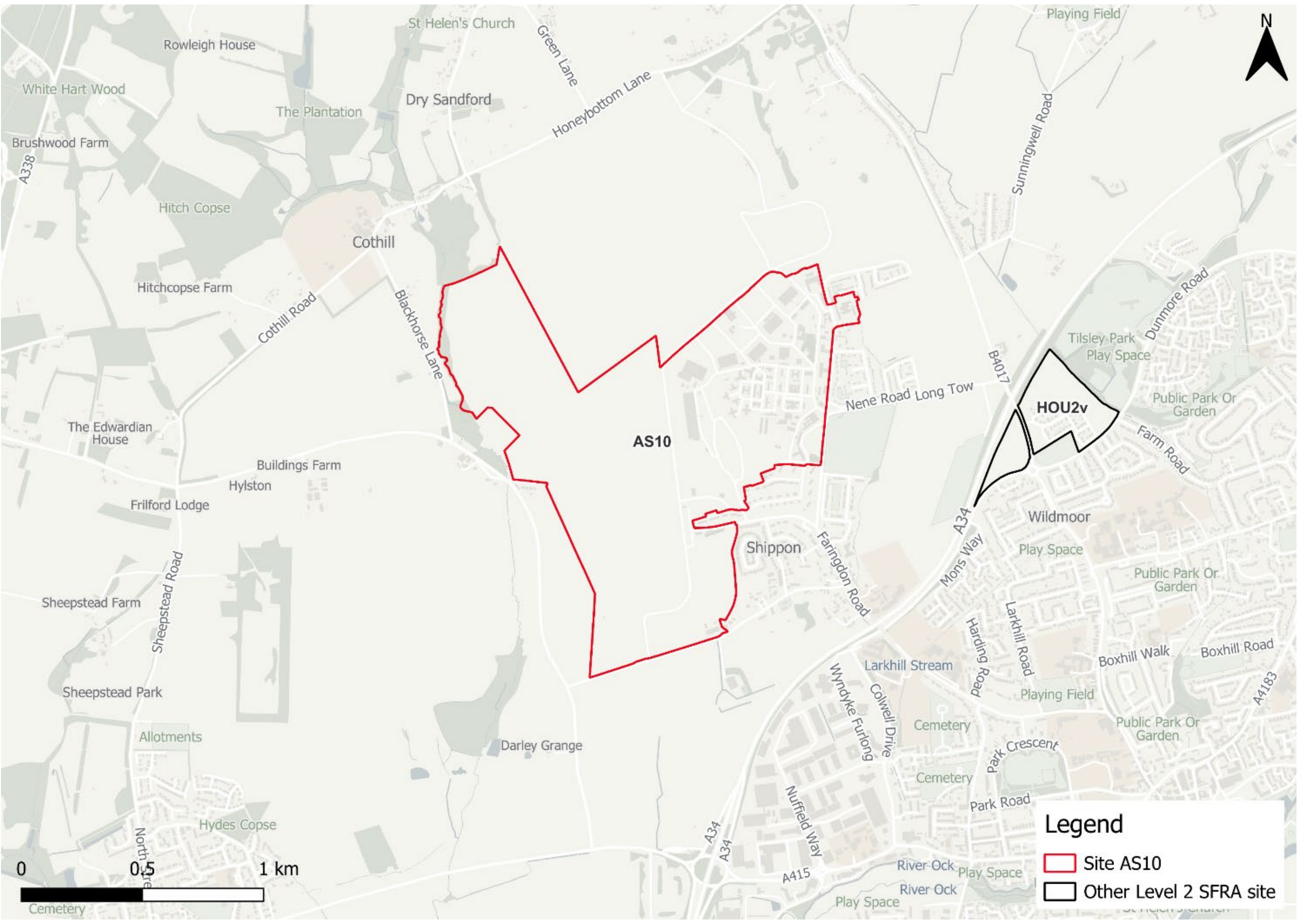

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the north at approximately 79mAOD. The lowest ground levels are located towards the south of the site at approximately 61mAOD.

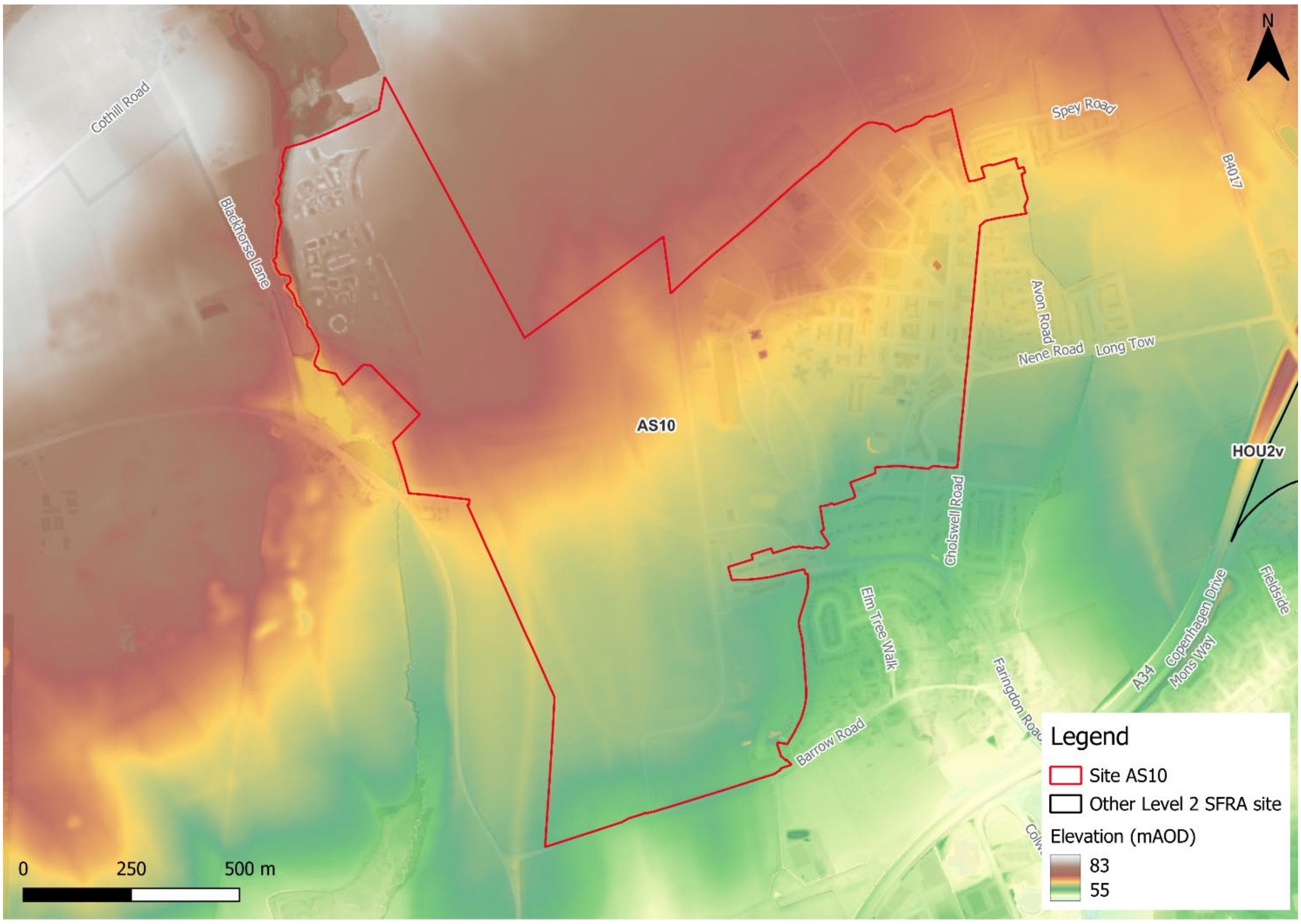

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The majority of the site is located within Flood Zone 1. Flood Zone 3b is present along the north western boundary of the site, however this is less than 1% of the total site area. There should be no vulnerable development in the area of the site within the functional floodplain. The functional floodplain in this location is based on Flood Zone 3 of the EA's Flood Map for Planning (1% AEP undefended event), as a precautionary approach in the absence of suitable modelled data.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
99.6	0.0	0.0	0.4

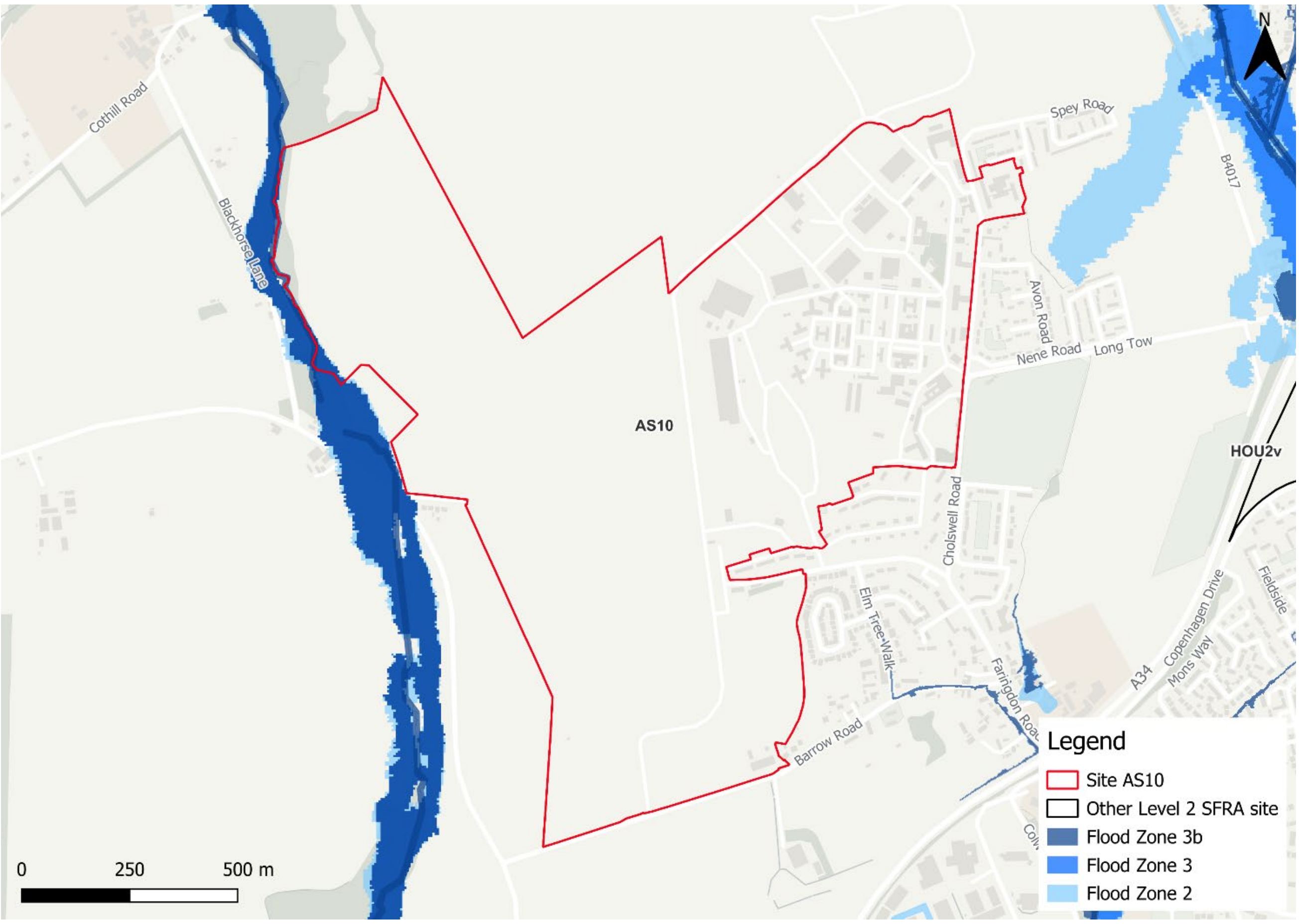

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impact of climate change on flood risk from Sandford Brook has not been modelled for this SFRA, as a model covering Sandford Brook was not made available for consideration. Therefore, in the absence of modelled climate change information, Flood Zone 2 of the Flood Map for Planning (based on the 0.1% AEP undefended event) can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3 (Figure 2-1).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. The EA should be consulted on the data source of the Flood Map for Planning in this location. If the Flood Map for Planning is based on a detailed model of Sandford Brook, any updates to this Level 2 SFRA and/or any site-specific FRA should make use of this model and include for the most up to date climate change allowances.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset. There are however areas of natural high ground along Sandford Brook to the south of the site.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS10 (Land at Dalton Barracks Garden Village, Shippon) is located within two catchments, namely; Sandford Brook (source to Ock) and Ock and tributaries (Land Brook confluence to Thames). The majority of the site is located within a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Along the western boundary of the site, there is potential for woodland planting, which can slow flows, reduce sediment delivery to the watercourse and reduce bankside erosion. Along Sandford Brook, there is also potential for runoff attenuation features. These areas are shown in Figure 2-2.

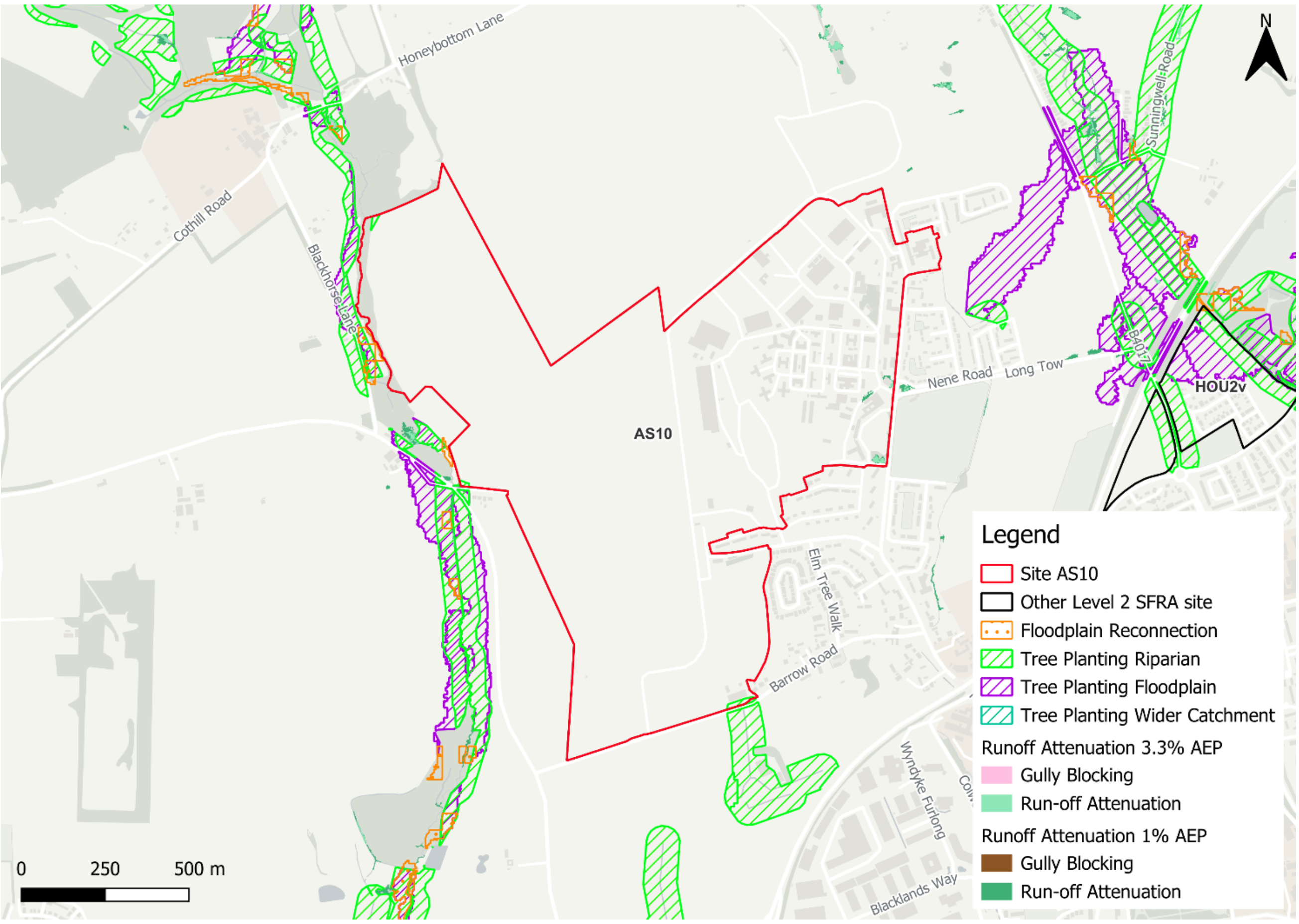

Figure 2-2: Natural Flood Management (NFM) opportunities mapping

2.4 Residual risk

There is potential residual risk to the site from a possible blockage of the culvert along Sandford Brook which runs beneath Faringdon Road to the west of the site (Figure 2-3). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA, as there is no available flood model for the watercourse. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on residual flood risk to the site.

Figure 2-3: Potential blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is not modelled to be at risk of flooding from reservoirs.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flooding incidents to the site. Historic flood incidents within the vicinity of the site are shown in Figure 2-4, which indicates areas to the east and south of the site have been subject to flooding in the past. The RFO dataset references that a historic event occurred in 2007 due to surface water flooding or channel capacity exceedance.

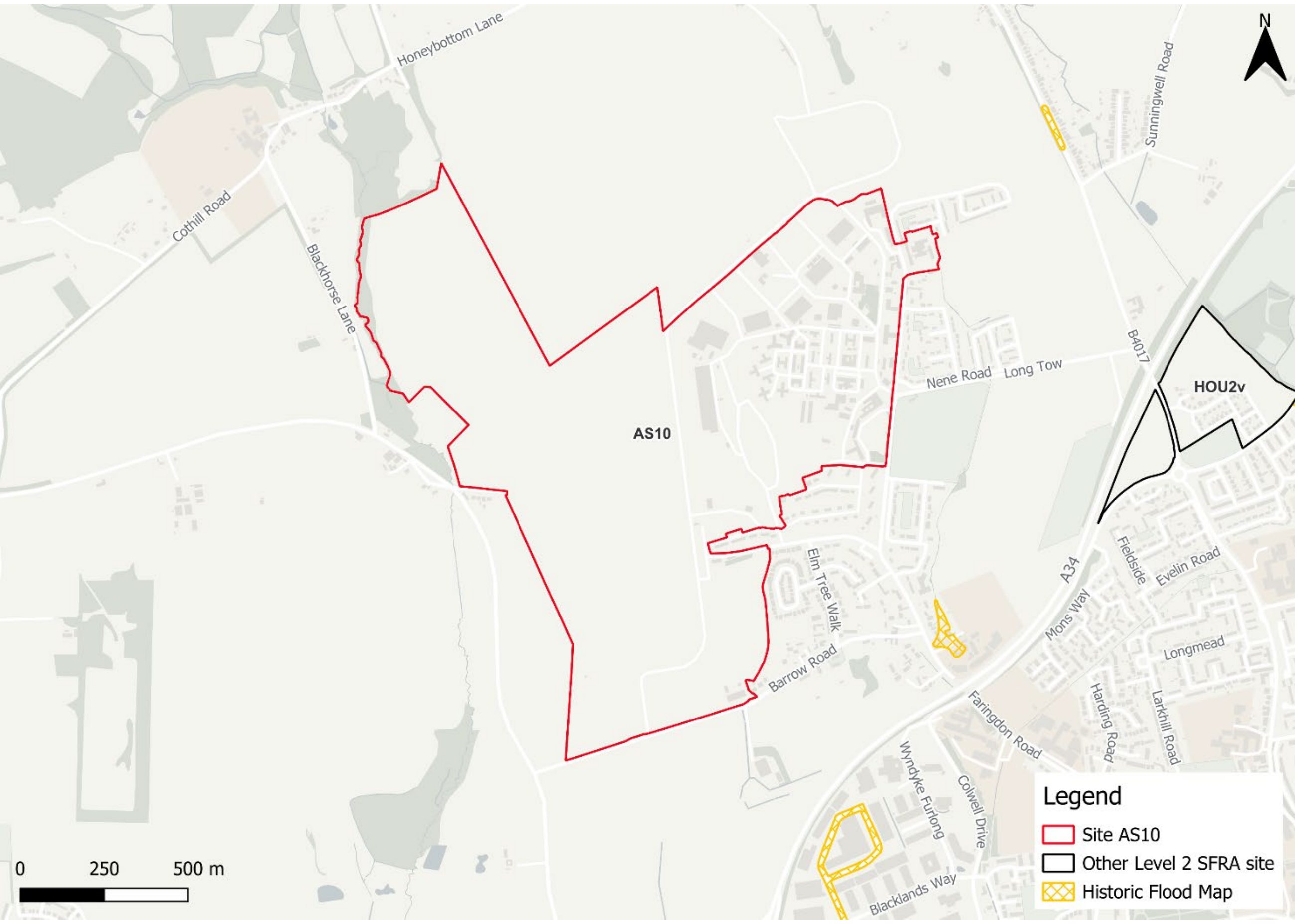

Figure 2-4: Recorded historic flood events onsite and around the site

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. The site is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. A small area to the north west of the site is located within a FAA, namely 061WAF17Ock - River Ock catchment.

Based on the Flood Map for Planning (FMfP), safe access and escape routes could likely be achieved during a flood event via Barrow Road and Farington Road.

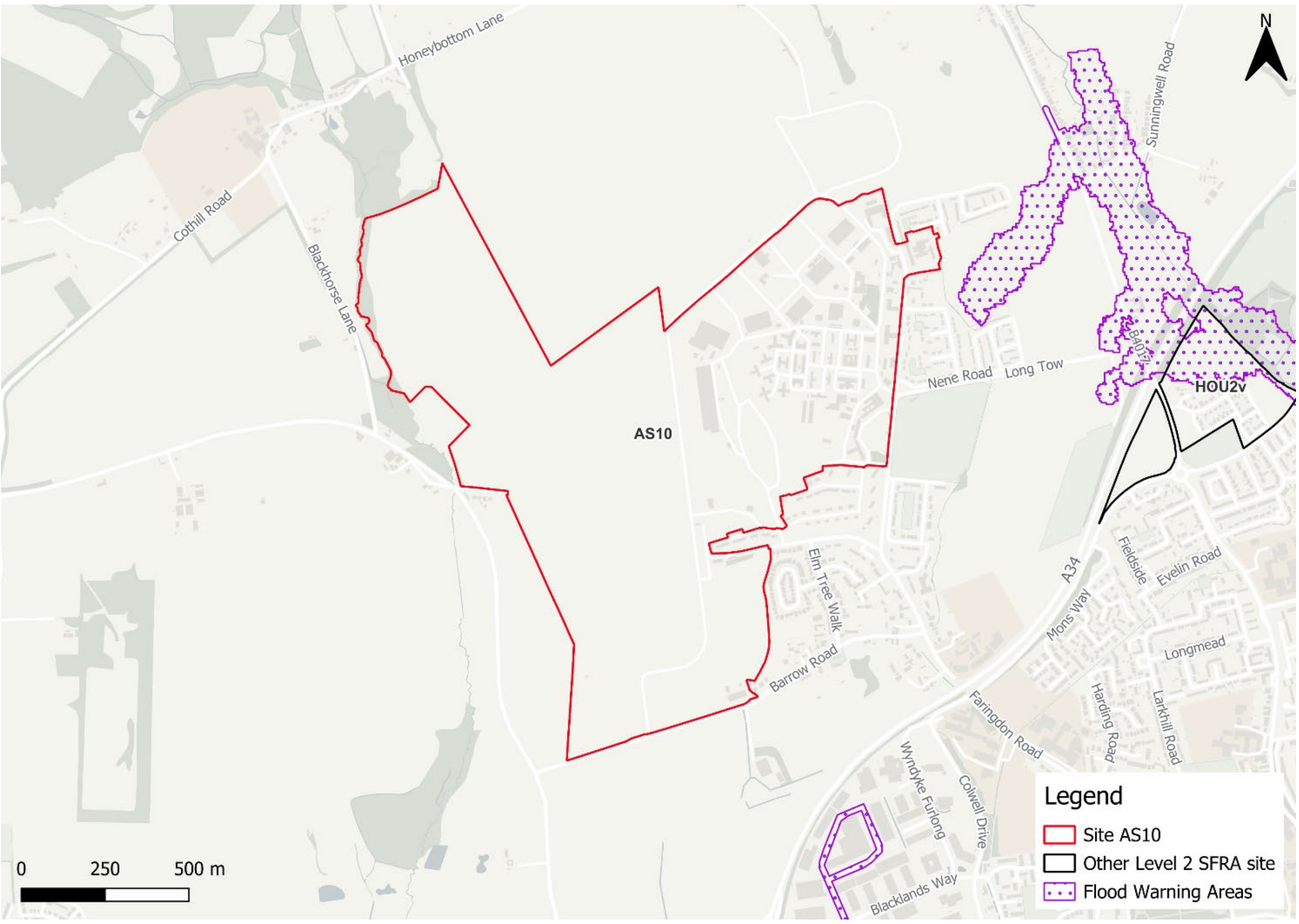

Figure 2-5: EA Flood Warning Areas

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be nominally within the functional floodplain along the north-western boundary of the site, adjacent to Sandford Brook. Vulnerable development is not permitted within the functional floodplain. However, the functional floodplain in this area is based on Flood Zone 3, as a precautionary approach, and comprises less than 1% of the total site area.
- There should be no development within 8m of Sandford Brook apart from permitted access. The EA recommend for a 8m no development buffer for all main rivers to enable access for maintenance activities. This should cover the area within the functional floodplain. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- A flood risk activity permit may be required if development is planned within 8m of the riverbank. The EA can advise on whether a permit will be required. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- The EA's Flood Zone 2 extent has been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent

to the present day Flood Zone 3, with a slightly larger extent of flooding. However, climate change must be modelled at the site-specific FRA stage.

- Modelled flood depths and hazards were not available at the time of writing, therefore any update to the Level 2 SFRA and/or any site-specific FRA should include for modelling of Sandford Brook. Climate change must be modelled at the site-specific FRA stage.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the medium risk surface water flood zone, which is largely located to the east of the site. A further 3% is at low surface water risk, as shown in Table 3-1.

In the medium risk event, surface water risk is largely confined to a flow path within the east of the site. There are also some scattered areas of surface water ponding within topographic low spots across the eastern half of the site. Surface water flood risk is constrained by the existing development within the site. In the low risk event, risk is slightly greater with more scattered locations of ponding.

Greatest surface water flood depths in the medium risk event are > 1.2 m (Figure 3-1) with some areas of moderate hazard (Figure 3-2). Safe access and escape routes should be possible via Barrow Road to the southwest of the site during all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
96	3	1	0

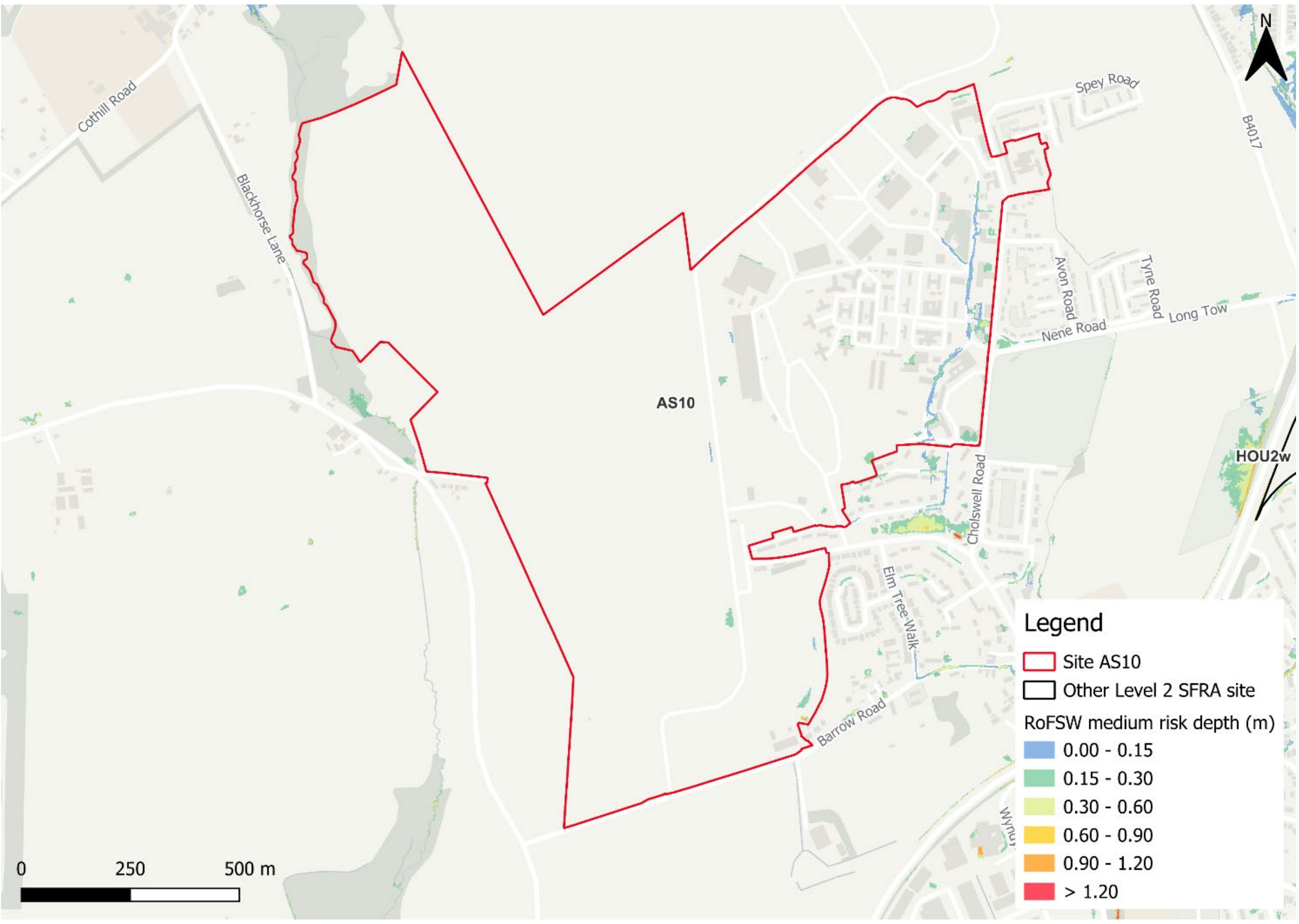

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

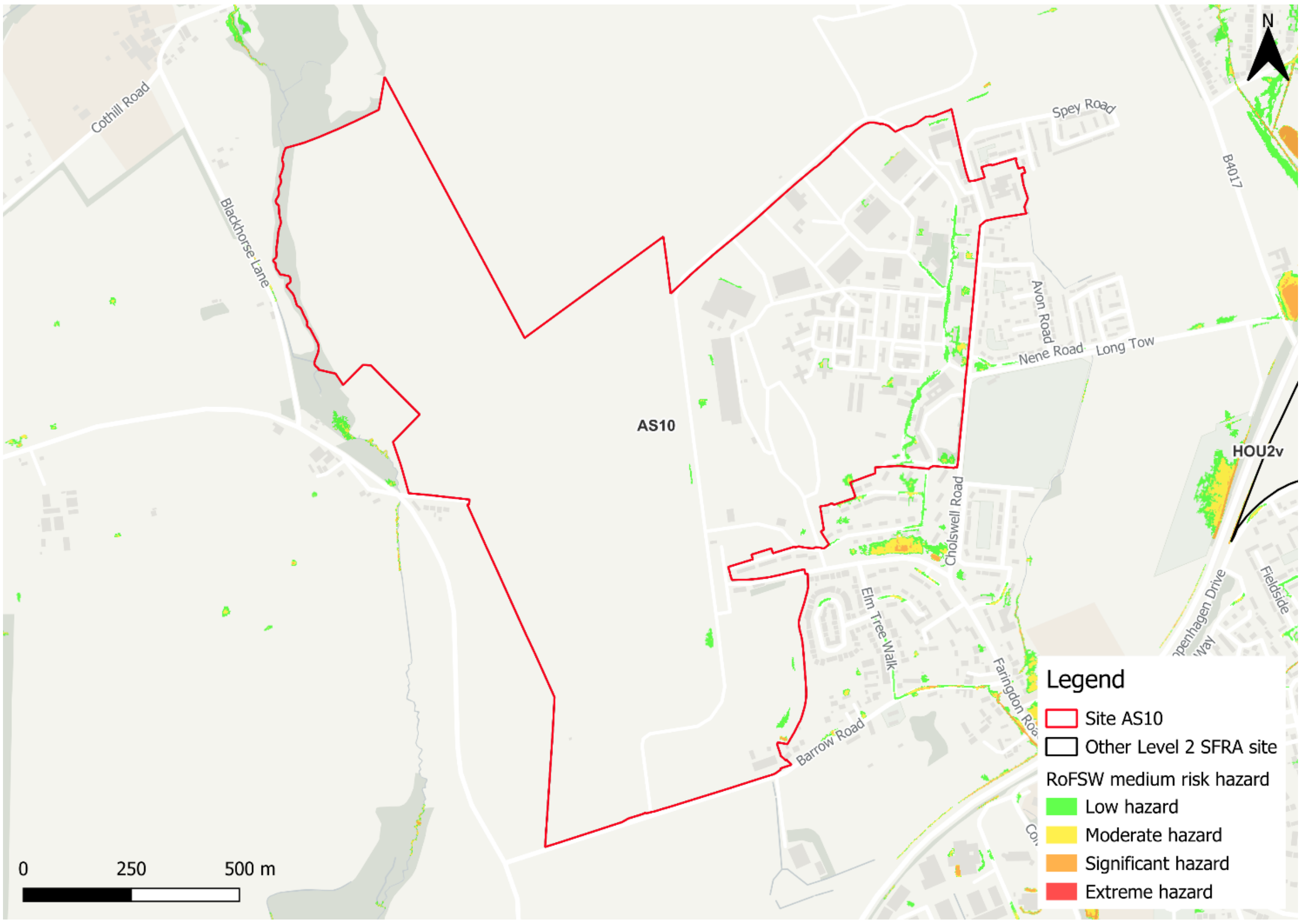

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled low risk event can be used as a precautionary proxy for the medium risk surface water event plus climate change.

Figure 3-3 shows the low risk surface water flood depths, as a proxy for the medium risk surface water event plus climate change. There are a number of additional surface water flow paths within the low risk event, in comparison to the medium risk event. There are also some additional areas of scattered surface water ponding. Natural flow paths and topographical depressions should be maintained, if possible, through site layout and design. Significant flow paths exist in the currently developed area in the east of the site along current roads. Maximum flood depths are modelled to be > 1.2 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

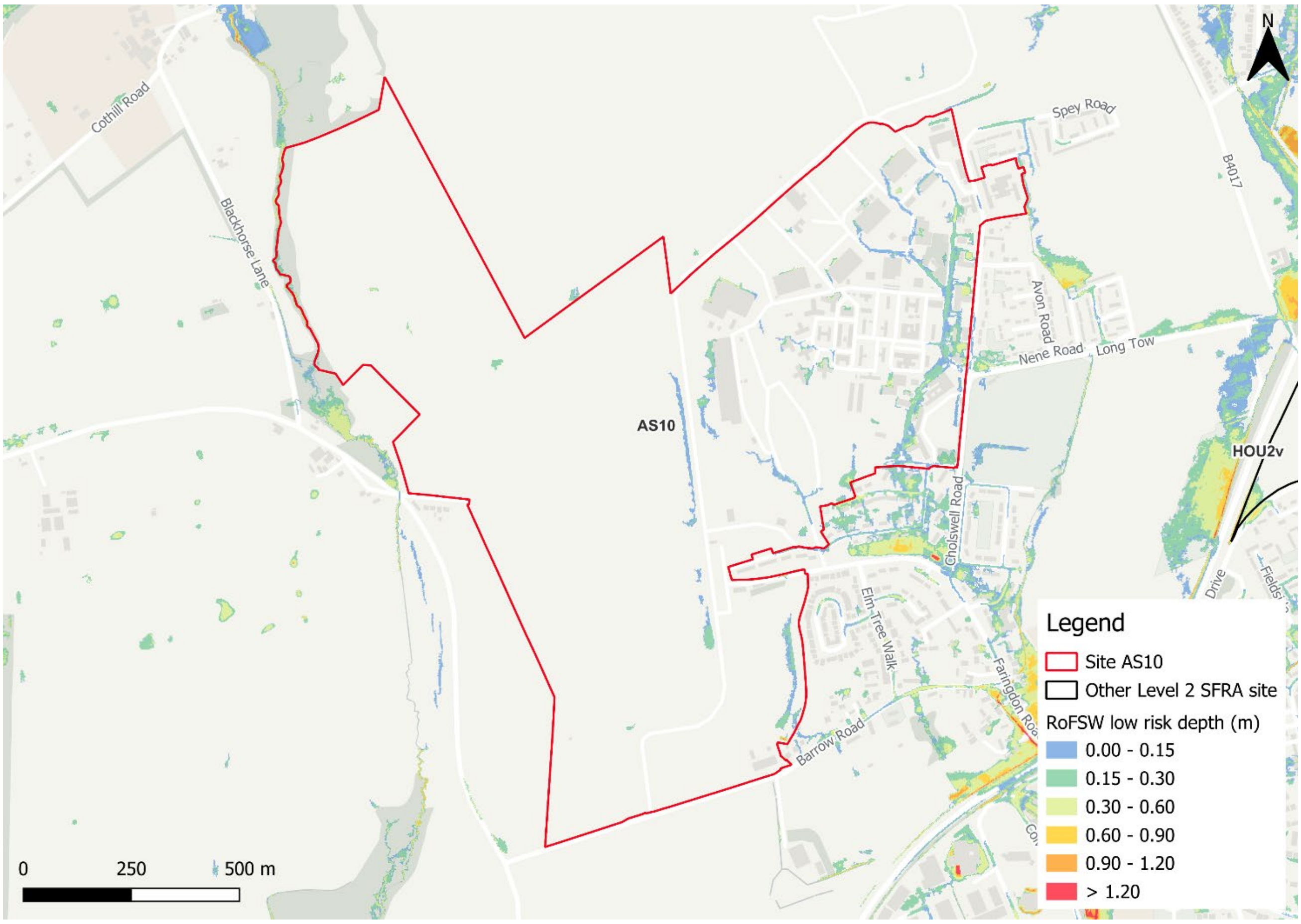

Figure 3-3: Low risk event surface water flood depths (as a proxy for the medium risk event plus climate change)

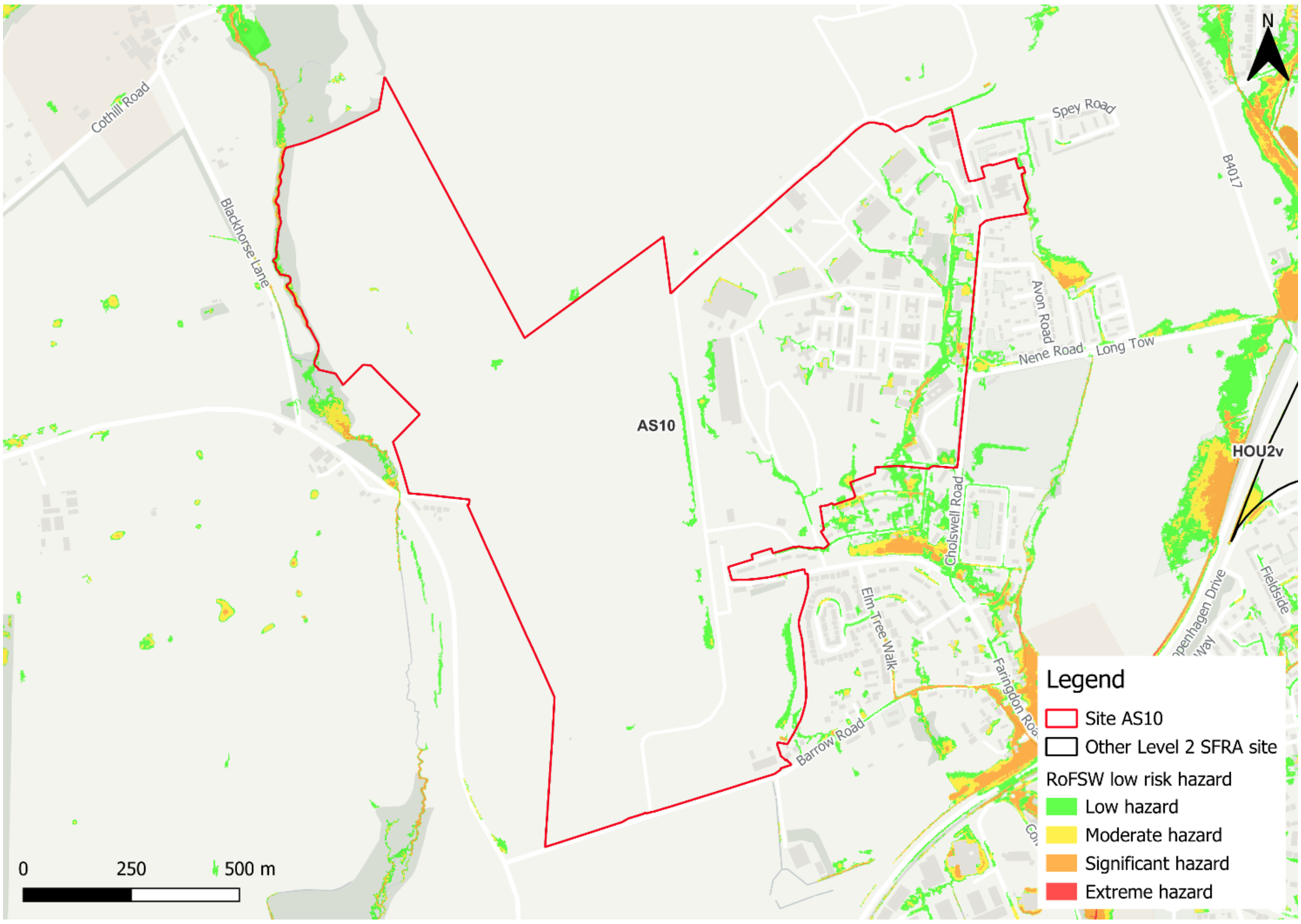

Figure 3-4: Low risk event surface water flood hazards (as a proxy for the medium risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 96% of the site being at very low surface water flood risk. In all events, surface water risk is largely confined to the eastern side of the site, with some scattered areas of ponding across the site. Surface water risk is constrained by the existing development within the site. Safe access and escape routes should be achievable via Barrow Road in all events.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. There are a number of additional surface water flow paths and areas of ponding within the low risk event, in comparison to the medium risk event. Any existing flow paths and ponds should be maintained in site design, if possible.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could

accommodate the proposed development or whether further capacity will be required.

- A full detailed drainage strategy will be required to inform site design and layout. Surface water runoff should be attenuated onsite.
- The existing flow path within the east of the site drains through Shippon. Where surface water flow paths extend south of Farringdon Road, there has been flooding at the culvert to Barrow Road. Any discharge from the site to this network will need to suitably assess the existing capacity. Reductions in discharge rates should be sought through a site-specific FRA and a detailed drainage strategy.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2].

Figure 4-1 show the map for Site AS10 (Land at Dalton Barracks Garden Village, Shippon) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. The majority of the site is within an area where there is risk of groundwater flooding to both surface and subsurface assets. The north west of the site is within an area where there is potential for groundwater to emerge at the surface locally. Within the south of the site, there is a negligible risk from groundwater flooding. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

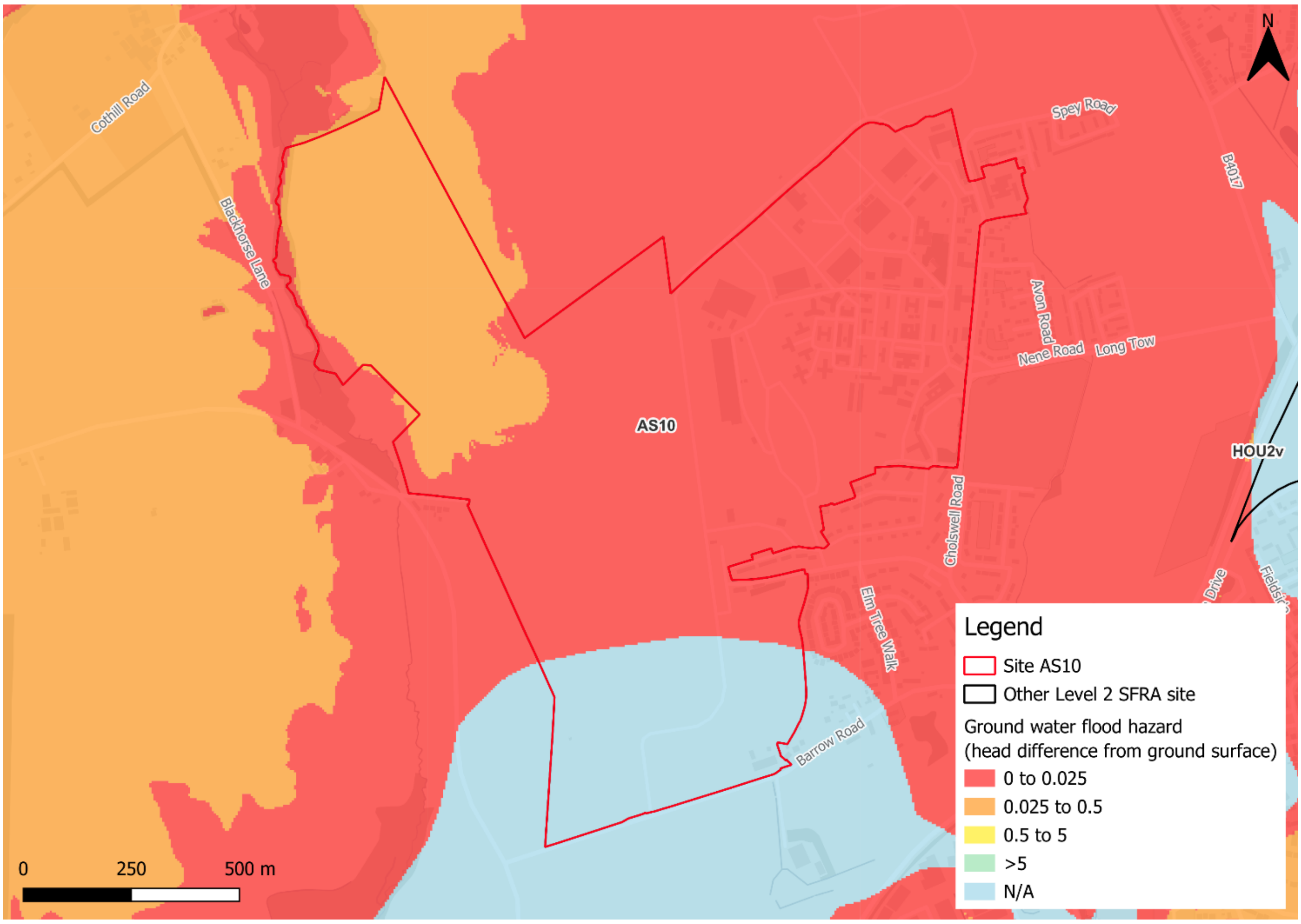

Figure 4-1: JBA 5m Groundwater Flood Map

2 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a and it is expected that vulnerable development will avoid the area of functional floodplain.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- Updated present day and climate change modelling of Sandford Brook should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and surrounding areas. It would be acceptable to update the modelling at the site-specific FRA stage.
- Based on current information, this site could be allocated if development avoids the area at modelled fluvial risk in the 1% AEP undefended event. Development would also ideally avoid the surface water flow path in the eastern area of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on existing and future flood risk from Sandford Brook is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the flow paths and ponds present on a large site.
- Groundwater conditions must be investigated further.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out full detailed flood modelling of the site for Sandford Brook.
- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.

[3] Para 170 National Planning Policy Framework 2023

- Any site-specific FRA should undertake a condition assessment of the culvert beneath Faringdon Road and investigate the impact of a potential blockage of this structure.
- Any site-specific FRA should investigate the existing on site drainage and discharge routes. An assessment of the flow paths indicated within the East of the site, and how these interact with the downstream network.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS11 - Culham Campus

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

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JBA Project Code	2024s0278

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1.1 Site AS11 - Culham Campus

- Location: Culham Campus (Figure 1-1)
- Existing site use: Brownfield; industrial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 77.29 ha
- Proposed development impermeable area: 65.8 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Site has partial planning permission
    - Assess present day and future surface water depths, hazards
    - Climate change proxy assessment

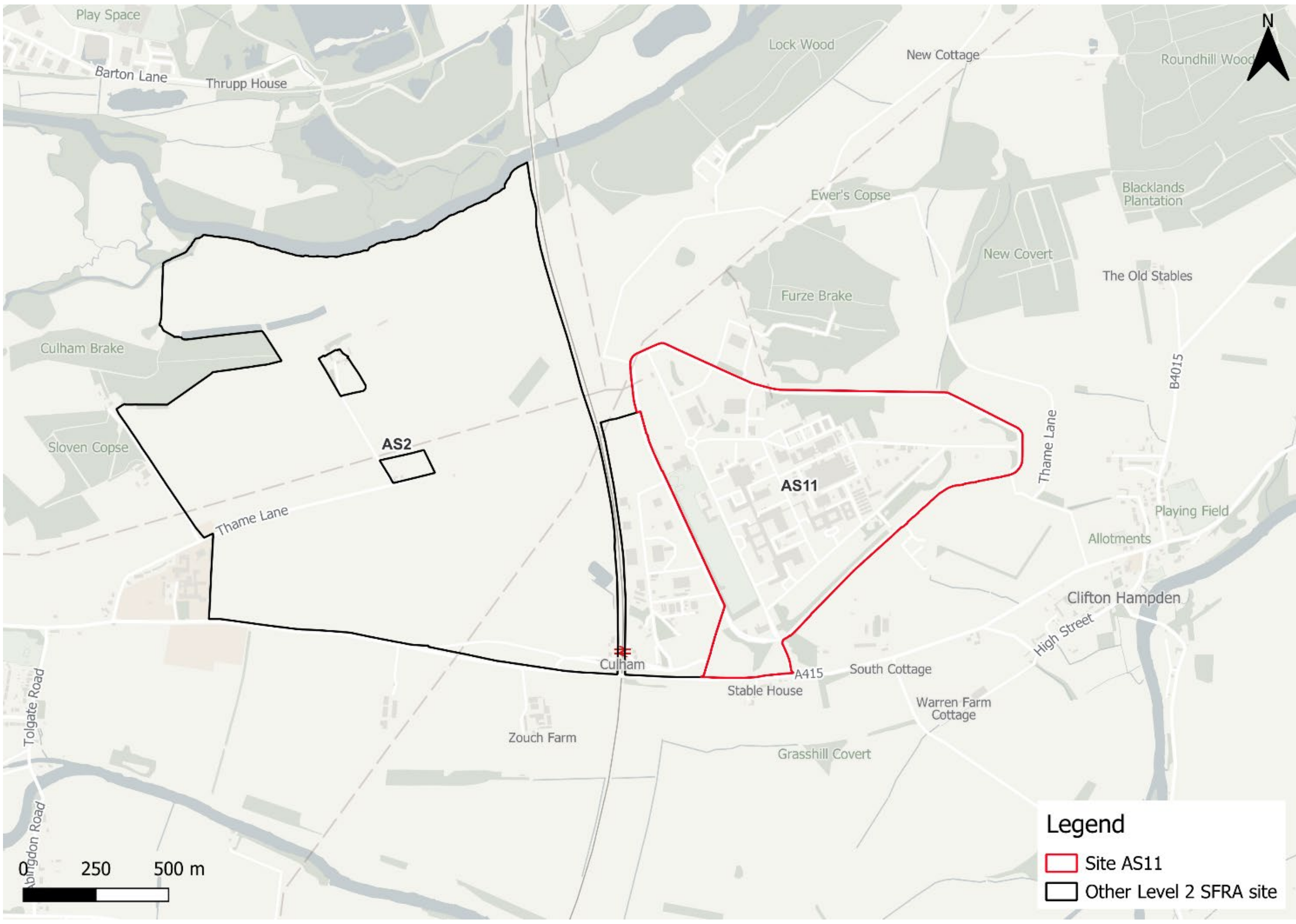

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the north at approximately 65mAOD. The lowest ground levels are located towards the east of the site at approximately 55mAOD.

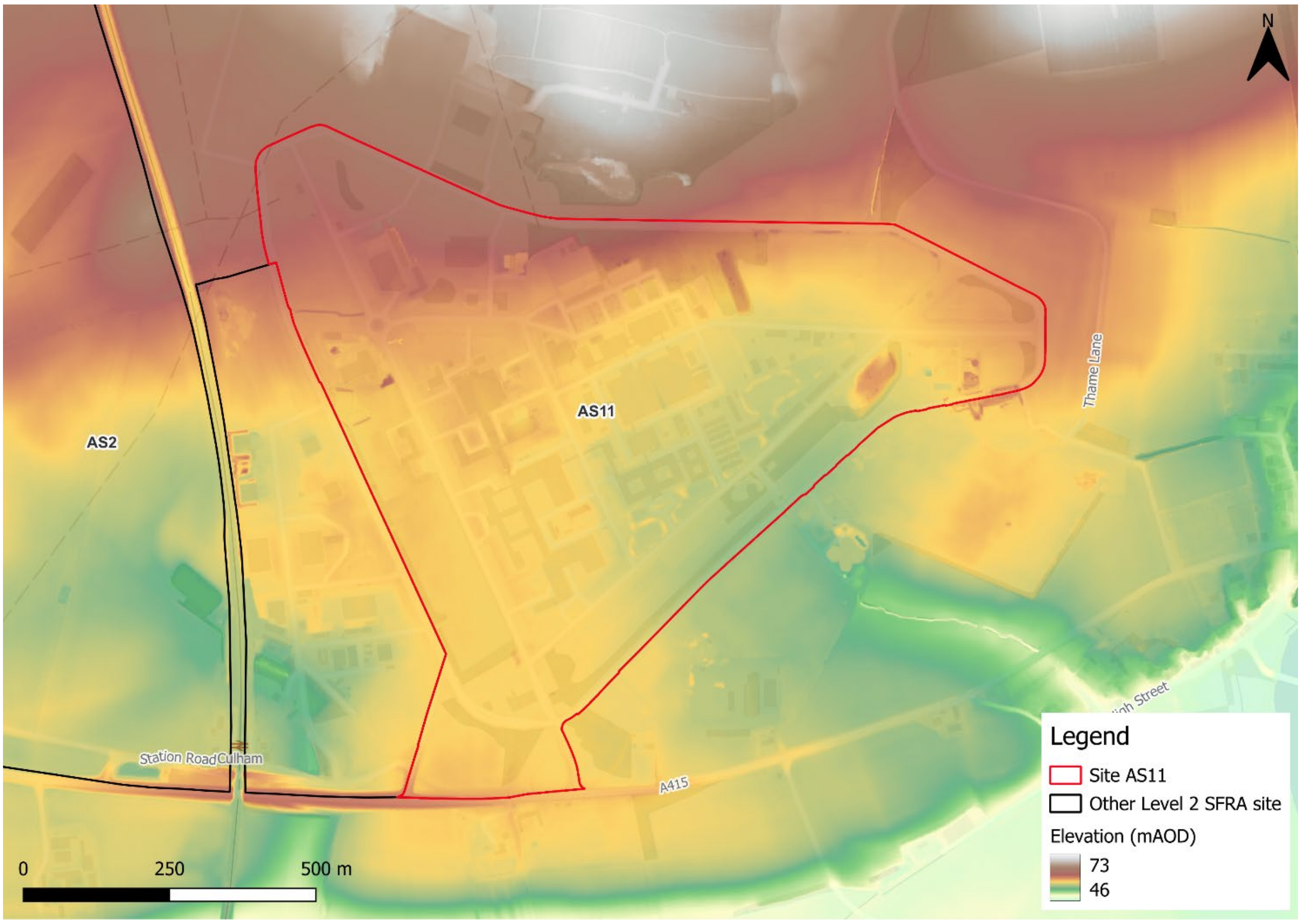

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS11 (Culham Campus) is located within one catchment, namely; Thames (Evenlode to Thame). This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both upstream of and within the site, there are opportunities for tree planting to reduce runoff. There is also a small area within the east of the site with potential for runoff attenuation features. These areas are shown in Figure 2-2.

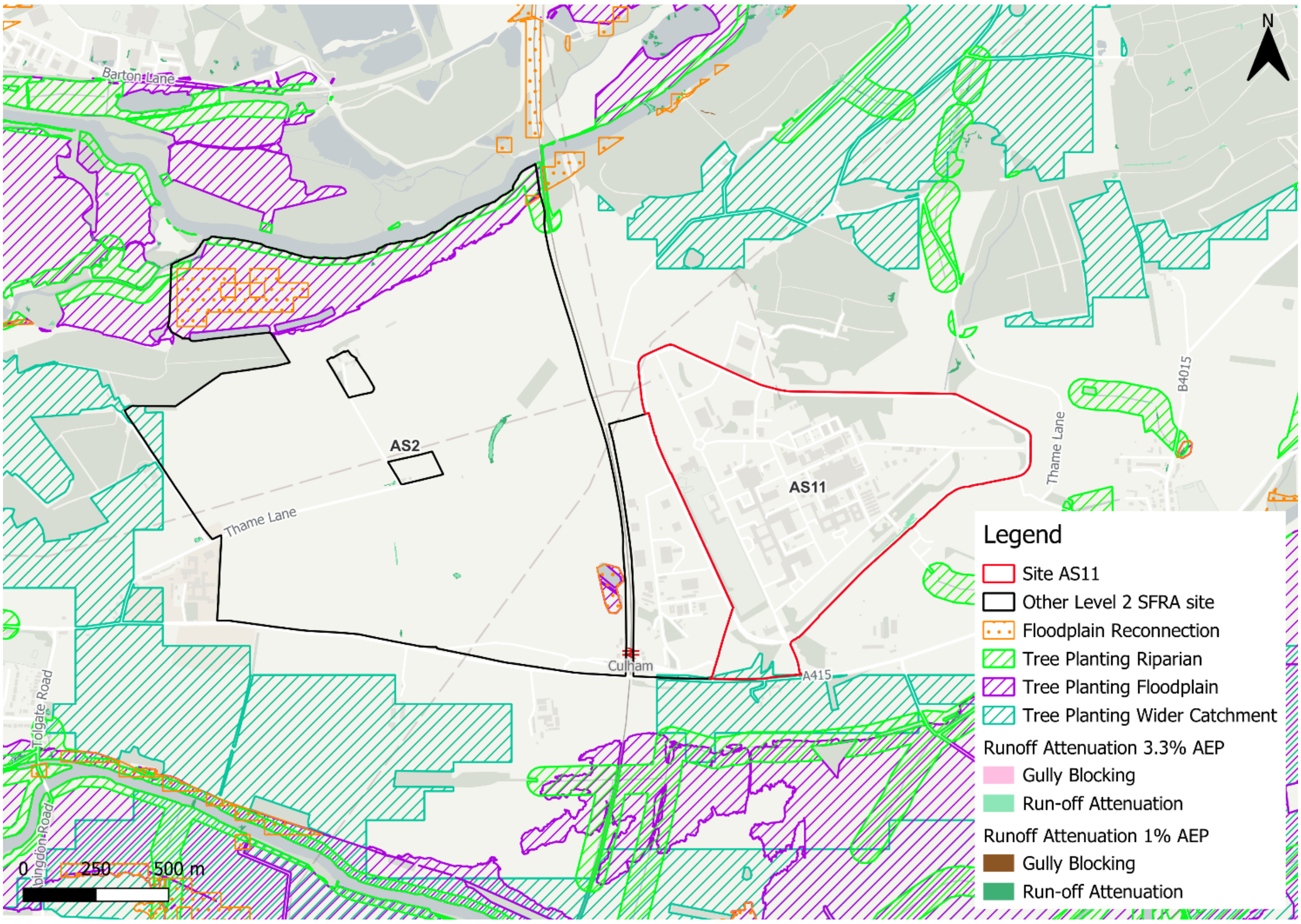

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via the A415 to the south of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the high risk surface water flood zone. A further 1% is at medium surface water risk, and a further 8% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, there is a surface water flow path through the east of the site, constrained by the existing development within the site. There are also some scattered areas of surface water ponding within topographic low spots. In the low risk event, risk is slightly greater through the east of the site with more scattered areas of ponding across the site.

Greatest flood depths in the high risk event are between 0.9 and 1.2m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via the A415 to the south of the site in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
90	8	1	1

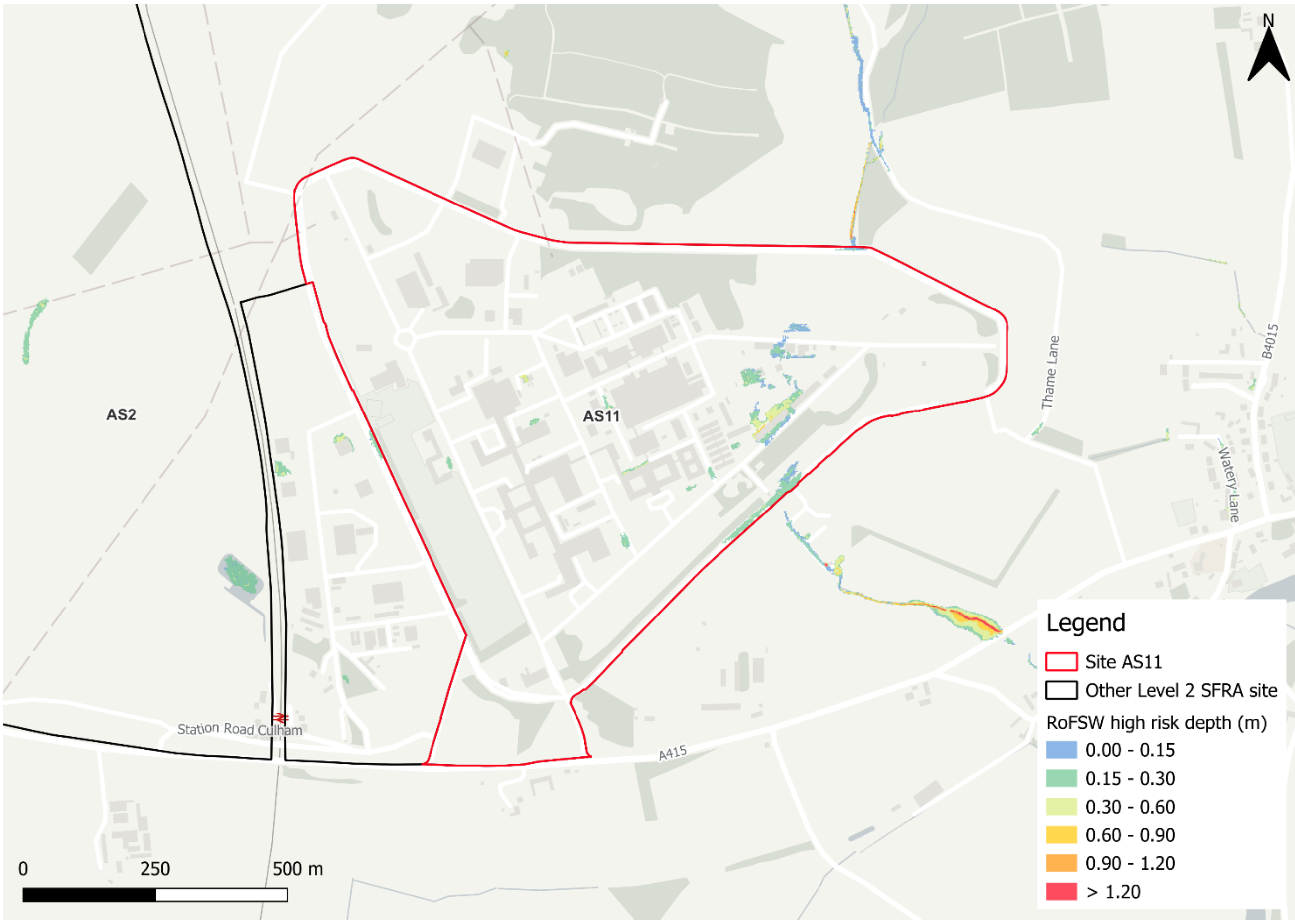

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

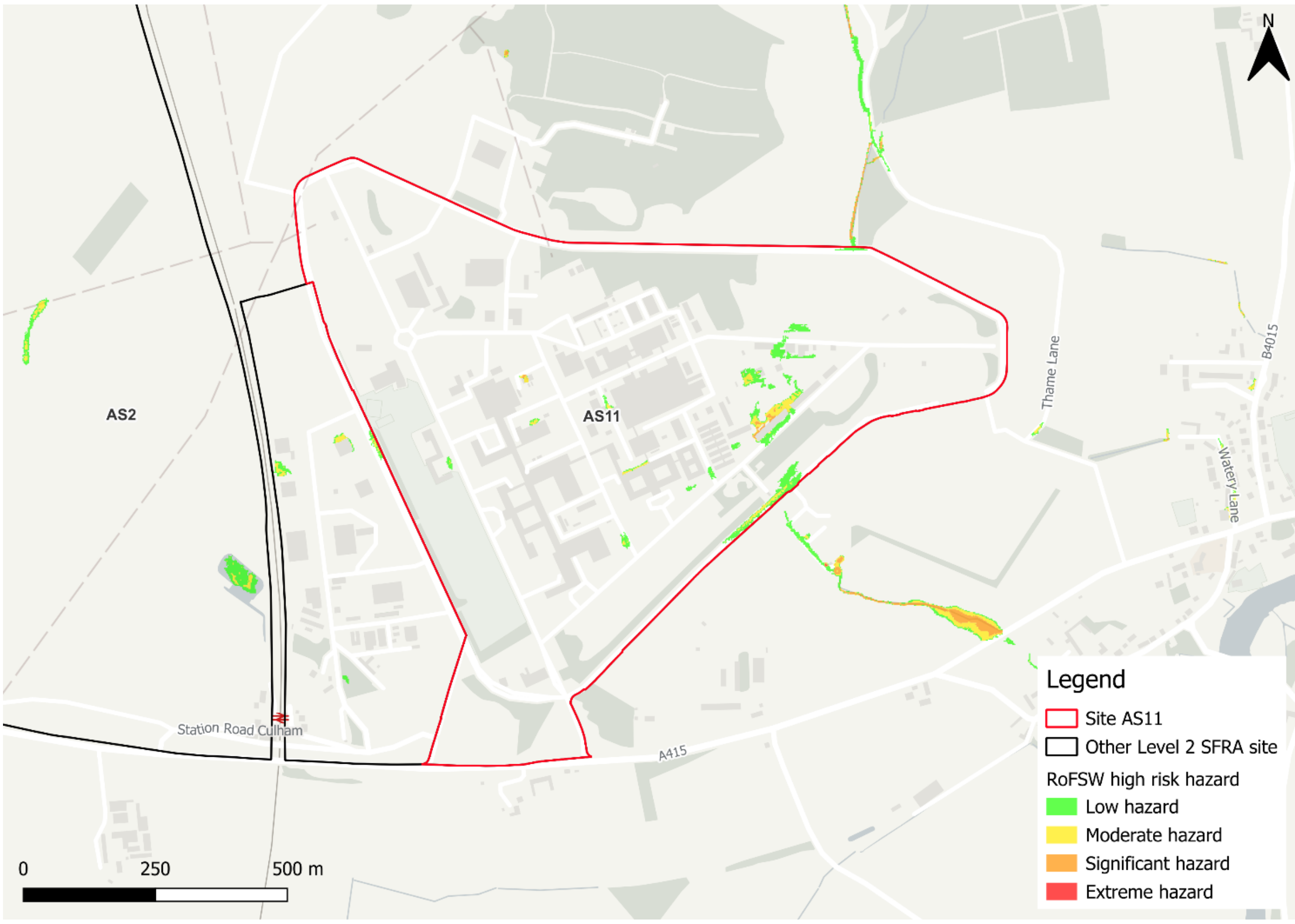

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along the flow path through the east of the site. Maximum flood depths are modelled to be 0.9m and 1.2 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

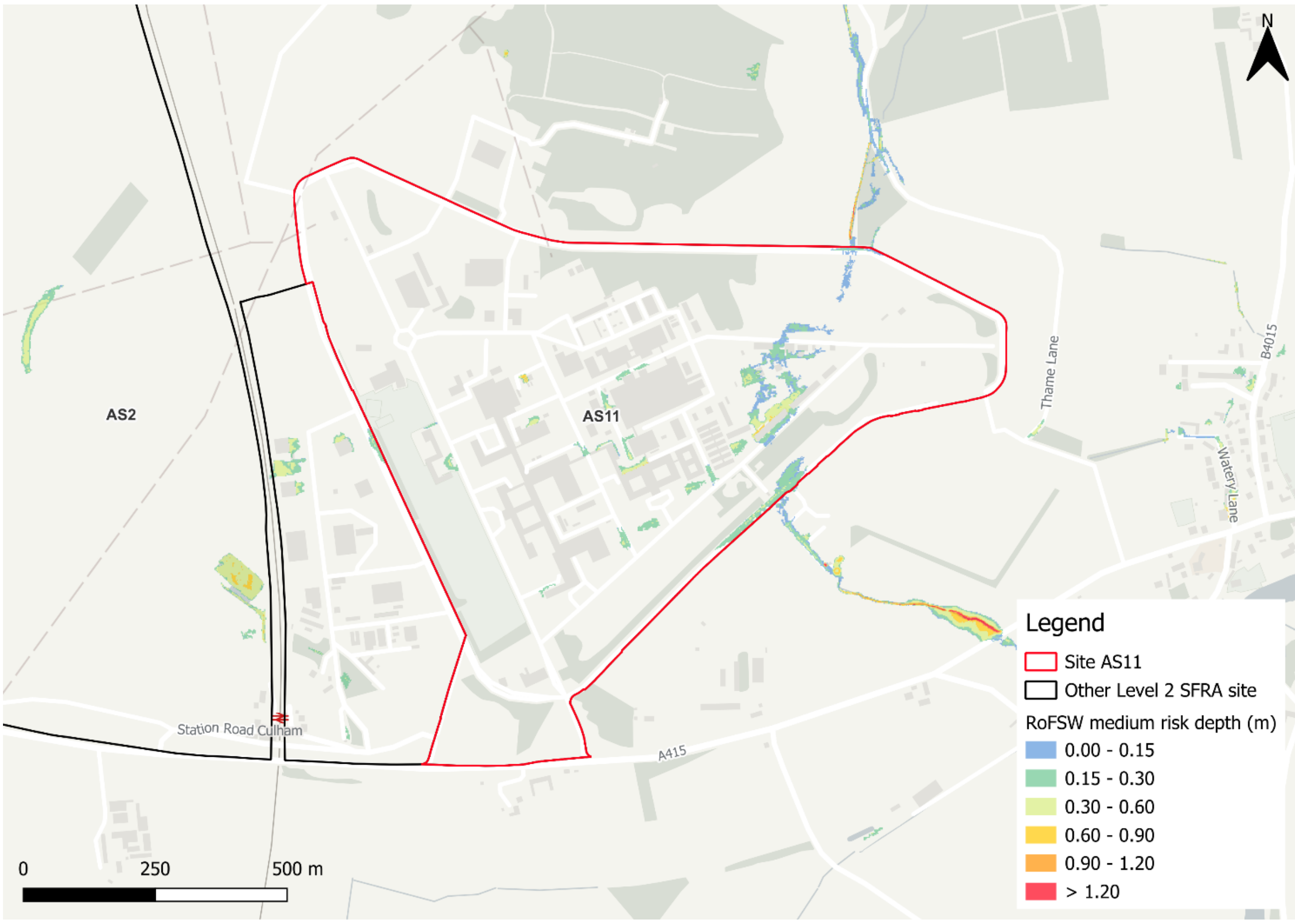

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

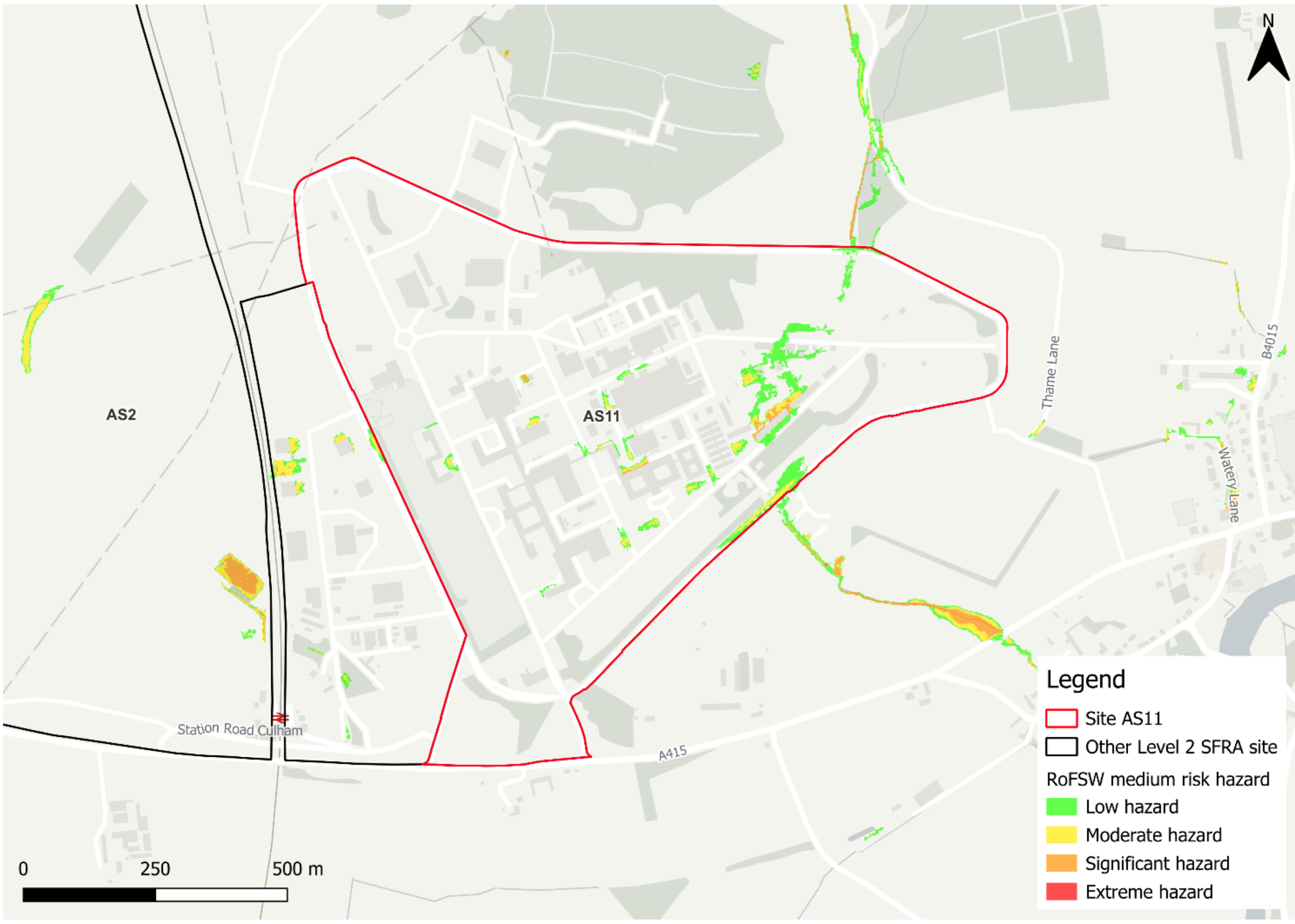

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with only 8% of the site being at low surface water flood risk. Surface water risk in the high and medium risk events is present along a flow path through the east of the site, with some scattered areas of ponding across the site, constrained by the existing development. Flow paths and ponds should be maintained onsite.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding in the eastern area of the site. Any existing flow paths should be maintained in site design.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 show the map for Site S11 and the surrounding areas and Table 4-1 explains the risk classifications.

Across the majority of the site there is a risk of groundwater flooding to surface and subsurface assets. There are some areas within the north of the site where there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

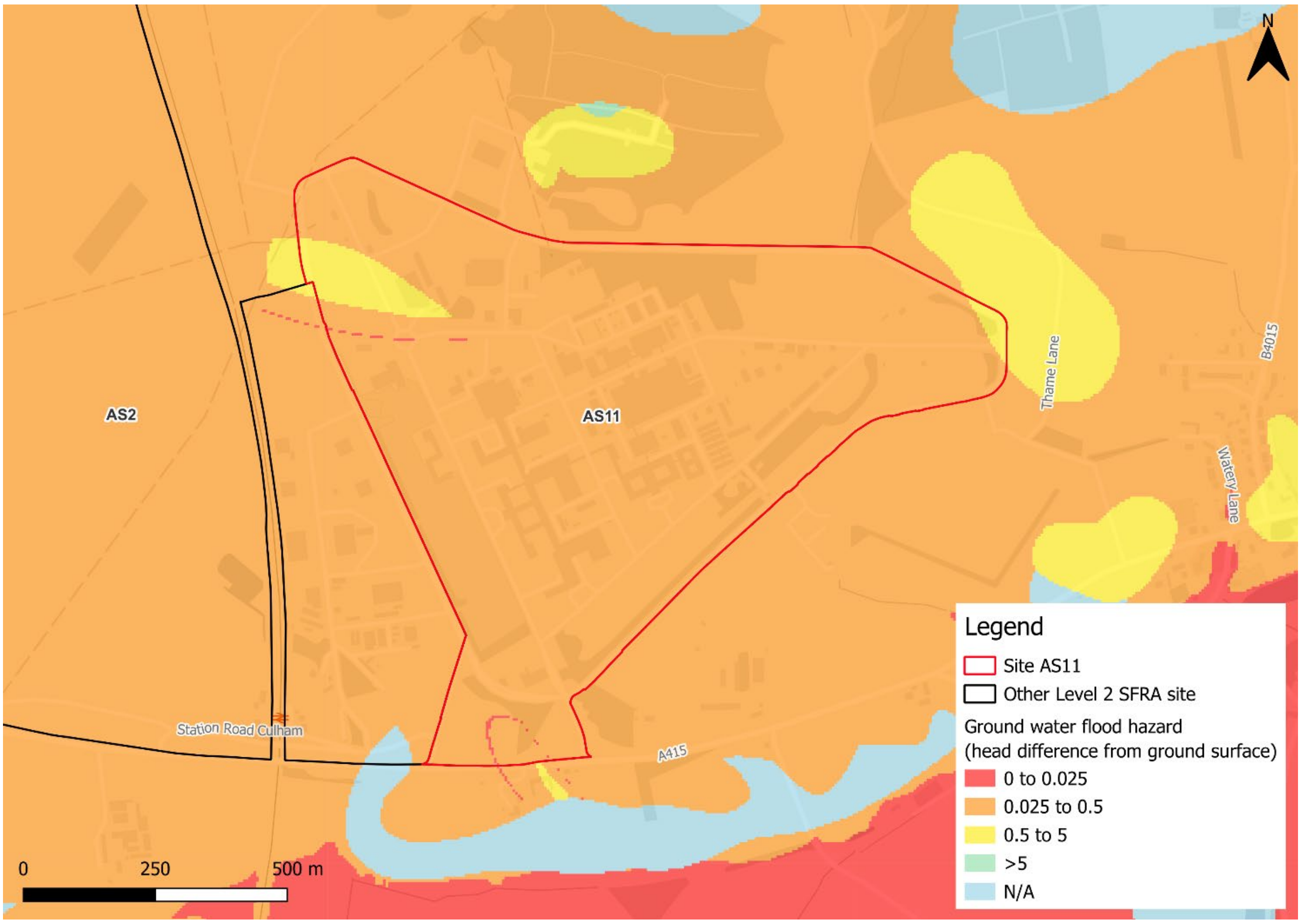

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess surface water risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated given its location within Flood Zone 1.
- Development design and layout should include for the surface water flow path through the east of the site. A detailed drainage strategy will be required for any new development, given the large area of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- Groundwater conditions must be investigated further.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.

[3] Para 170 National Planning Policy Framework 2023

- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS12 - Harwell Campus

Final Report

September 2024

Prepared for:

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1.1 Site AS12 - Harwell Campus

- Location: Harwell Campus (Figure 1-1)
- Existing site use: Brownfield; industrial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 282.05 ha
- Proposed development impermeable area: 240 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Site has partial planning permission
    - Assess present day and future surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the south at approximately 155mAOD. The lowest ground levels are located towards the north of the site at approximately 106mAOD.

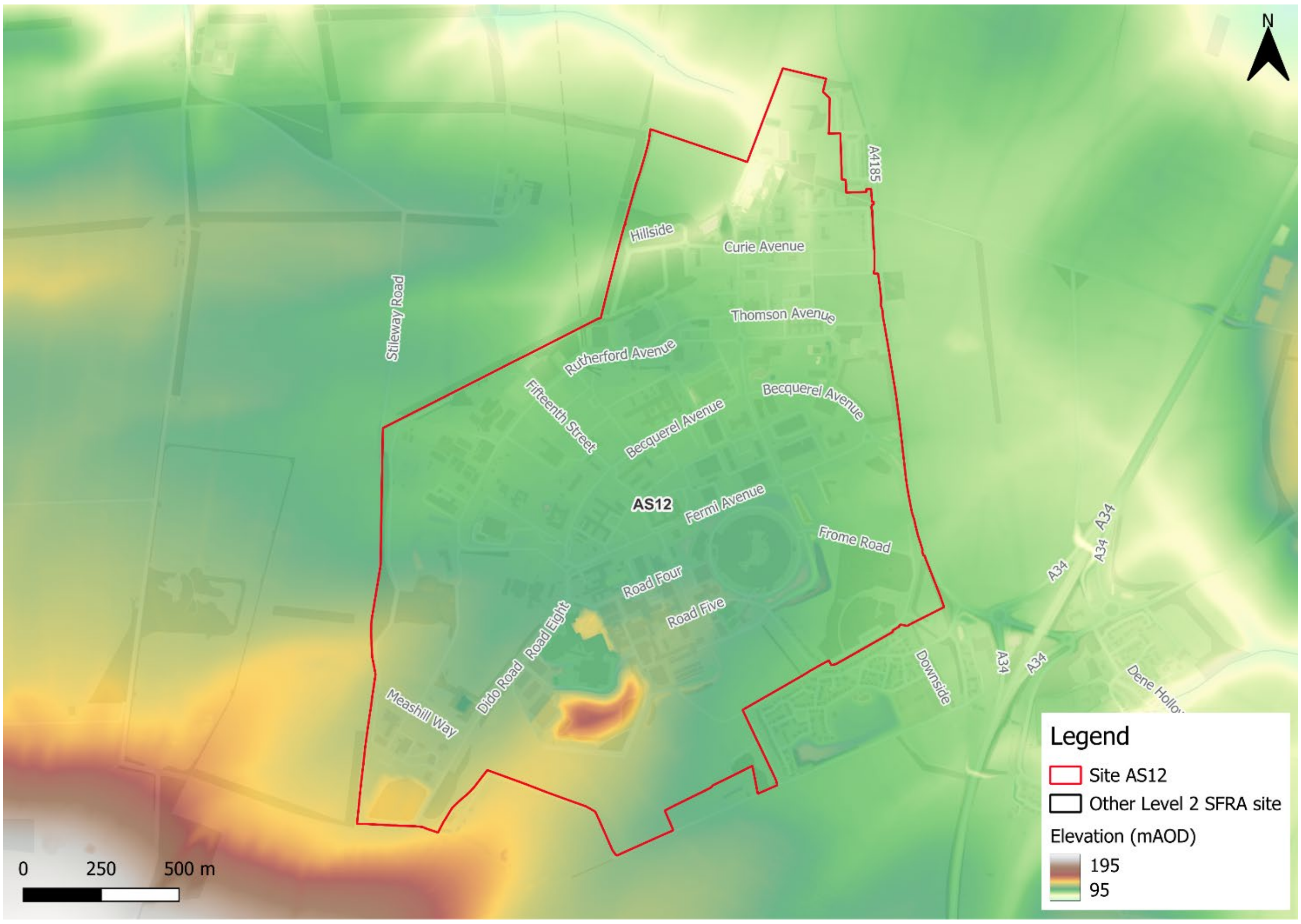

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS12 (Harwell Campus) is located within two catchments, namely; Ginge Brook and Mill Brook and Mill Brook and Bradfords Brook system, Wallingford. The majority of the site is located within a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are not any applicable areas that could benefit this site.

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via the A4185 to the east of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 0.3% of the site is within medium risk surface water flood zone. A further 3.2% is at low surface water risk, as shown in Table 3-1.

In the medium risk event, surface water risk is confined to some very small areas of ponding within topographic low spots across the site. In the low risk event, risk is greater with more scattered locations of ponding. Surface water flood risk is constrained by the existing development within the site.

Greatest flood depths in the medium risk event are modelled to be between 0.9 and 1.2 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via the A4185 to the east of the site in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
96.5	3.2	0.3	0

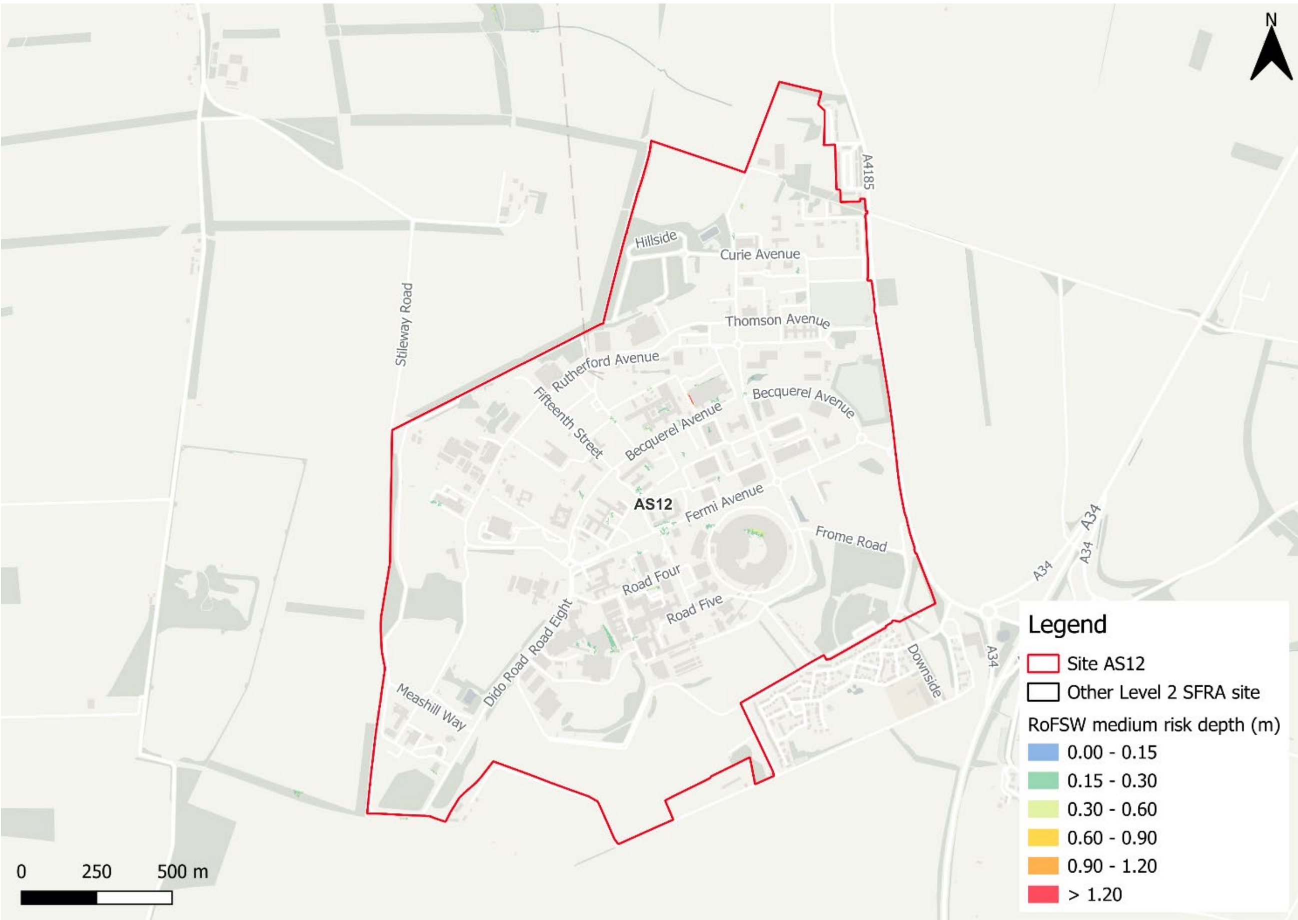

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

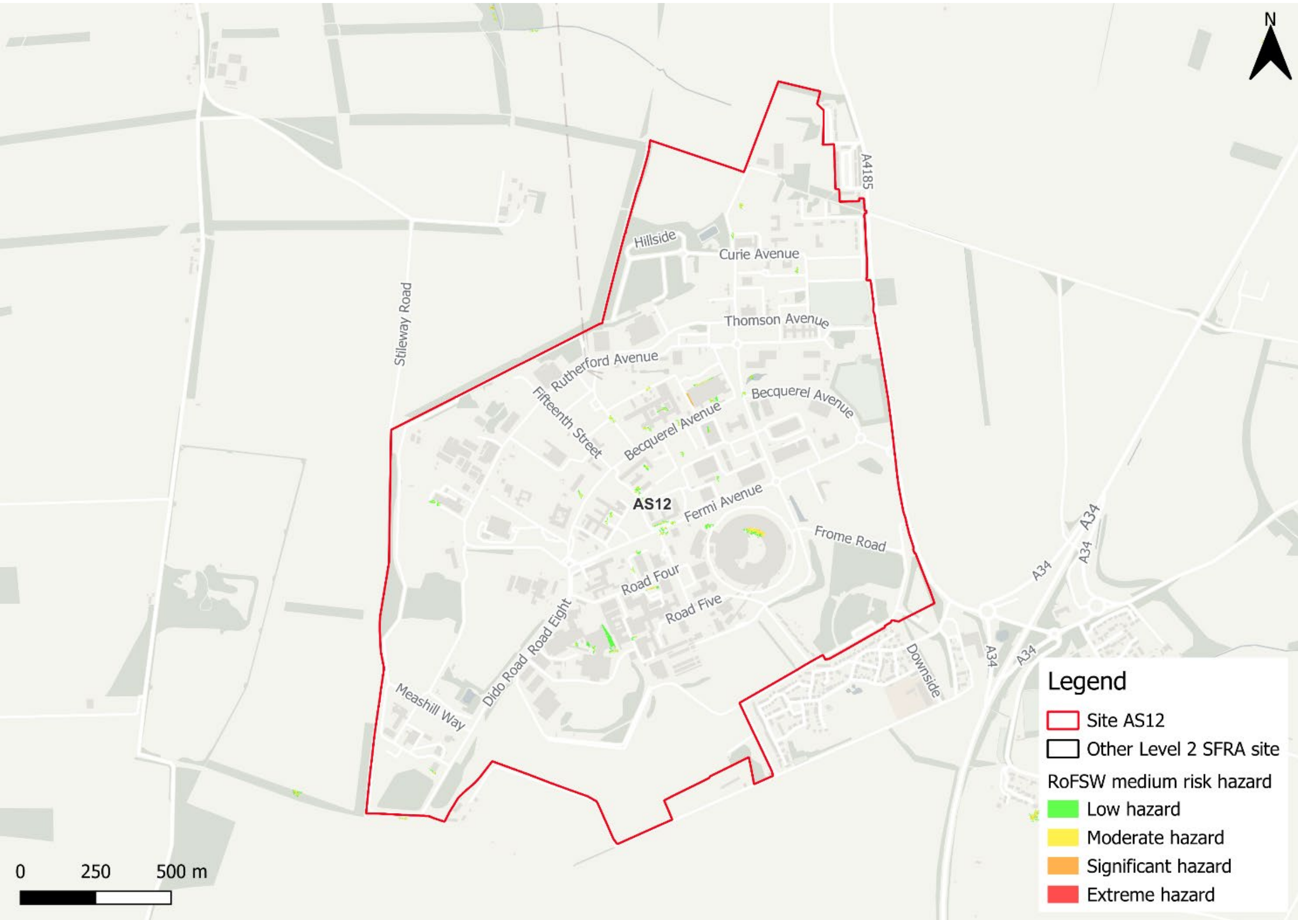

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled low risk event can be used as a precautionary proxy for the medium risk surface water event plus climate change.

Figure 3-3 shows the low risk surface water flood depths, as a proxy for the medium risk surface water event plus climate change. Risk is much greater with more scattered locations of ponding and is constrained by the existing development within the site. Maximum flood depths are modelled to be > 1.2 m, with some areas of extreme hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

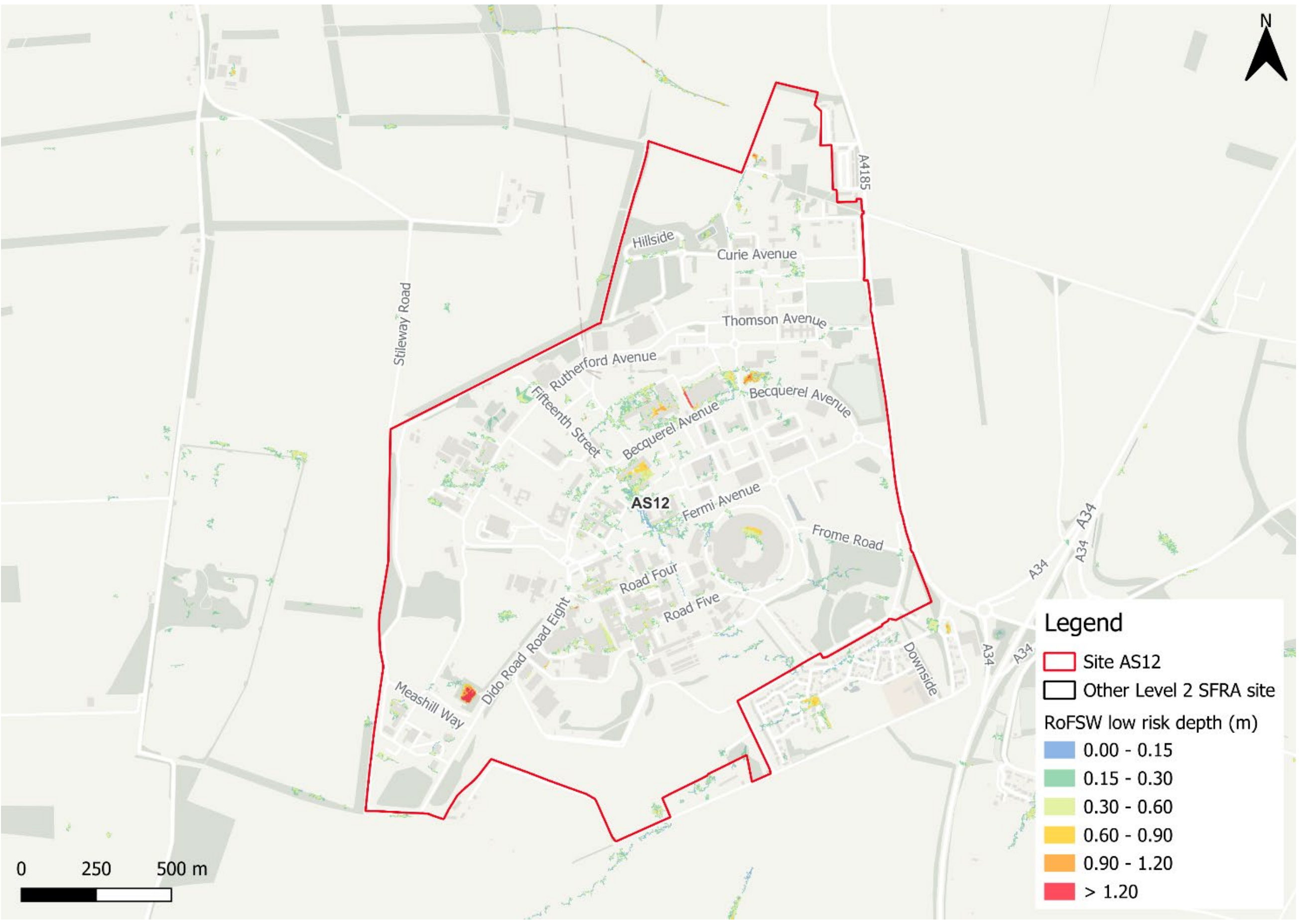

Figure 3-3: Low risk event surface water flood depths (as a proxy for the medium risk event plus climate change)

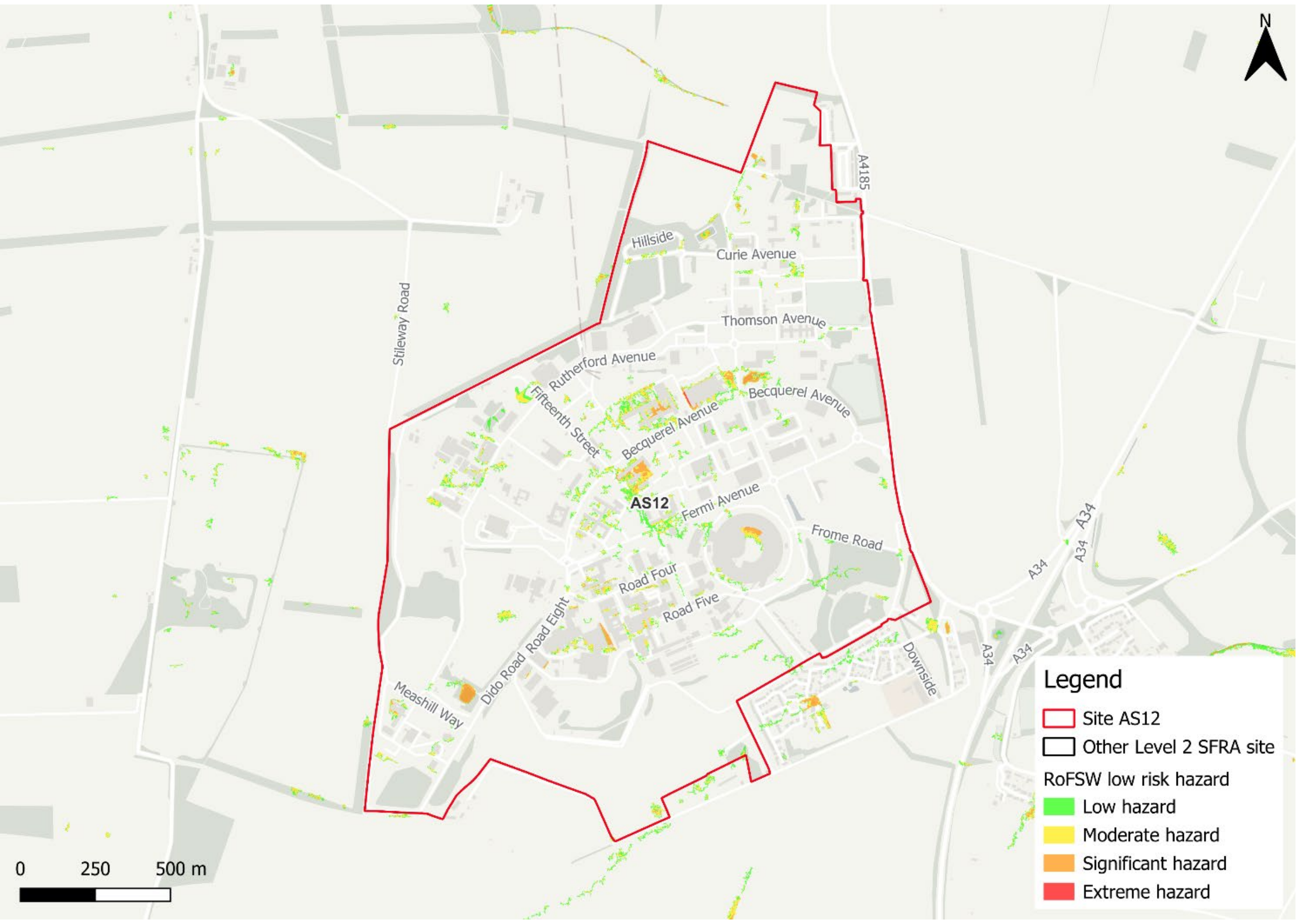

Figure 3-4: Low risk event surface water flood hazards (as a proxy for the medium risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 96% of the site being at very low surface water flood risk. Surface water risk in the medium risk event is present as very small, scattered locations of ponding within topographic low spots across the site and is constrained by the existing development. Safe access and escape routes should be achievable via the A415 in all events.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. Risk is much greater than for the medium risk event, with a number of additional, larger areas of topographic ponding across the site.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- The Groundwater Flood Map (Figure 4-1) indicates that ground conditions may be suitable for infiltration SuDS across some areas of the site. This should be further explored through appropriate ground survey as part of the site-specific FRA and drainage strategy.

- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed development or whether further capacity will be required.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 show the map for Site AS12 (Harwell Campus) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. The majority of the site is within an area where there is risk of groundwater flooding is unlikely. Within the east of the site, there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. Groundwater conditions may therefore be suited to infiltration SuDS in some locations.

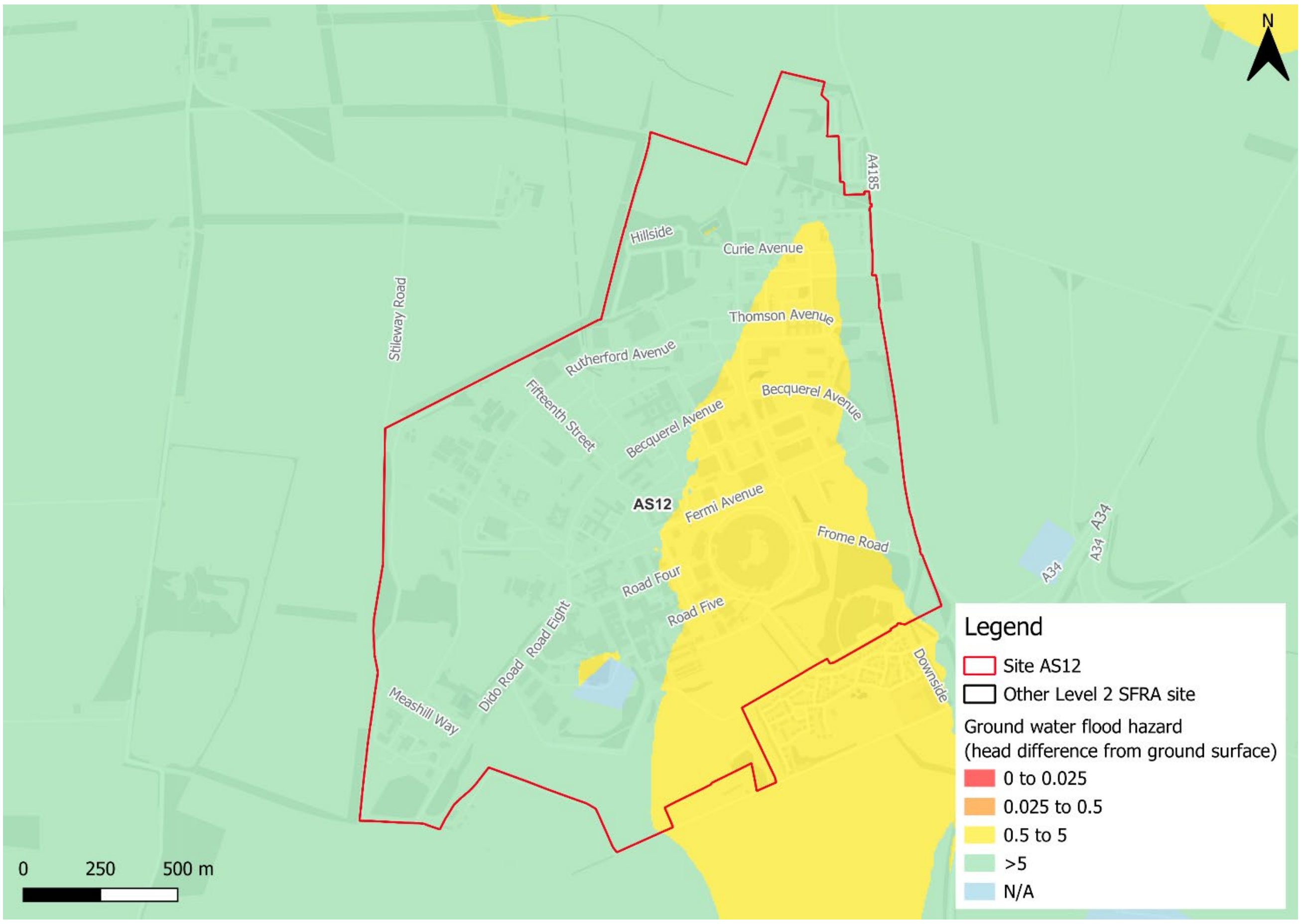

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess surface water risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- It should be appropriate for this site to be allocated, given the very low fluvial and surface water flood risk to the site. However, were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large area of the site. The use of infiltration SuDS should be investigated.

5.3 Site-specific FRA requirements and further work.

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA must further consider surface water flood risk, including a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

[3] Para 170 National Planning Policy Framework 2023

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site AS16 - Vauxhall Barracks, Didcot

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

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List of Tables

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site AS16 - Vauxhall Barracks, Didcot. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site AS16 - Vauxhall Barracks, Didcot

- Location: Vauxhall Barracks, Didcot (Figure 1-1)
- Existing site use: Brownfield; mixed use
- Existing site use vulnerability: More vulnerable
- Proposed site use: Mixed use; mainly residential and employment
- Proposed site use vulnerability: More vulnerable
- Site area: 9.87 ha
- Proposed development impermeable area: 8.4 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Assess present day and future surface water depths, hazards
    - Climate change proxy assessment

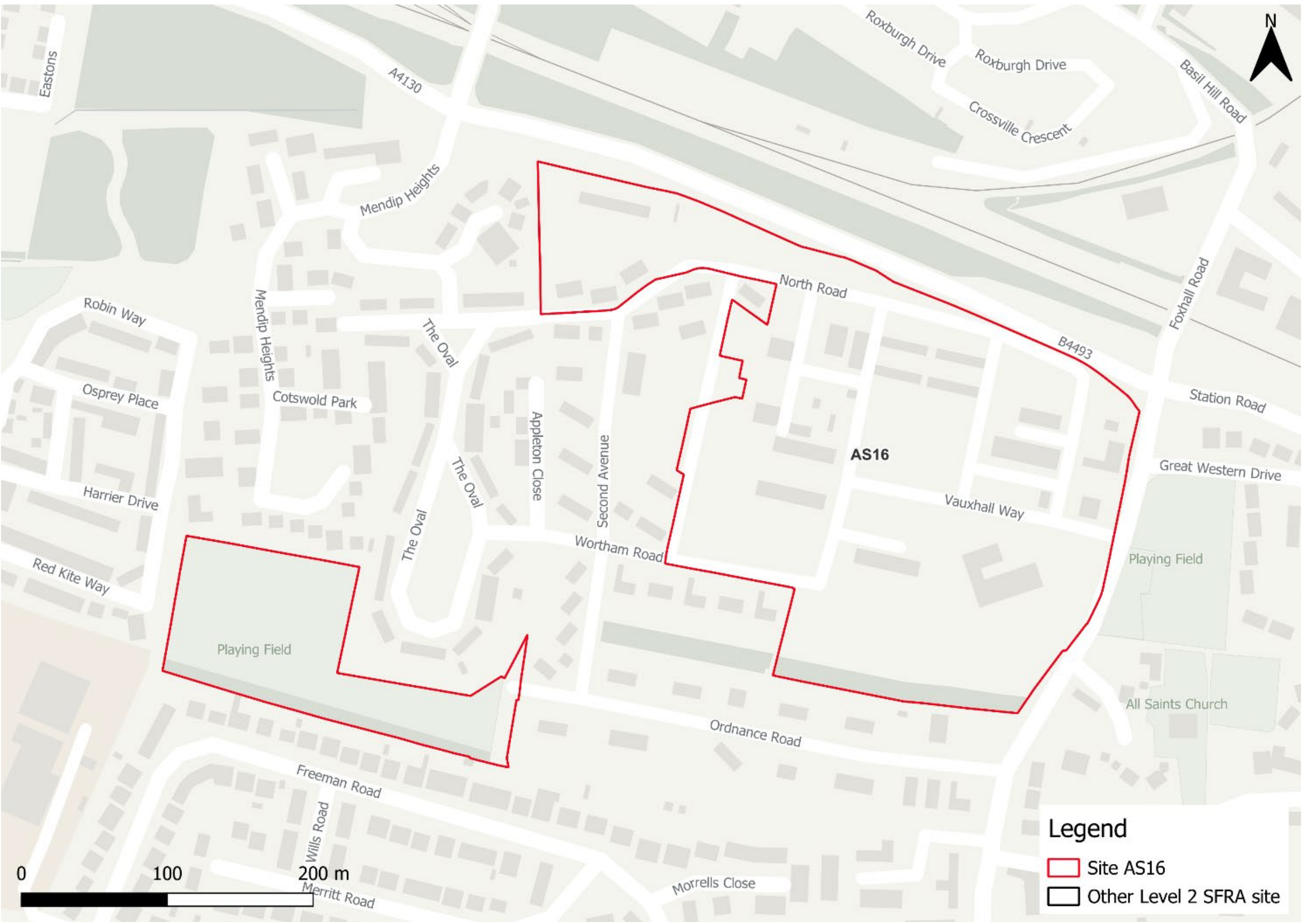

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the southern site parcel at approximately 83mAOD. The lowest ground levels are located towards the north of the site at approximately 67mAOD.

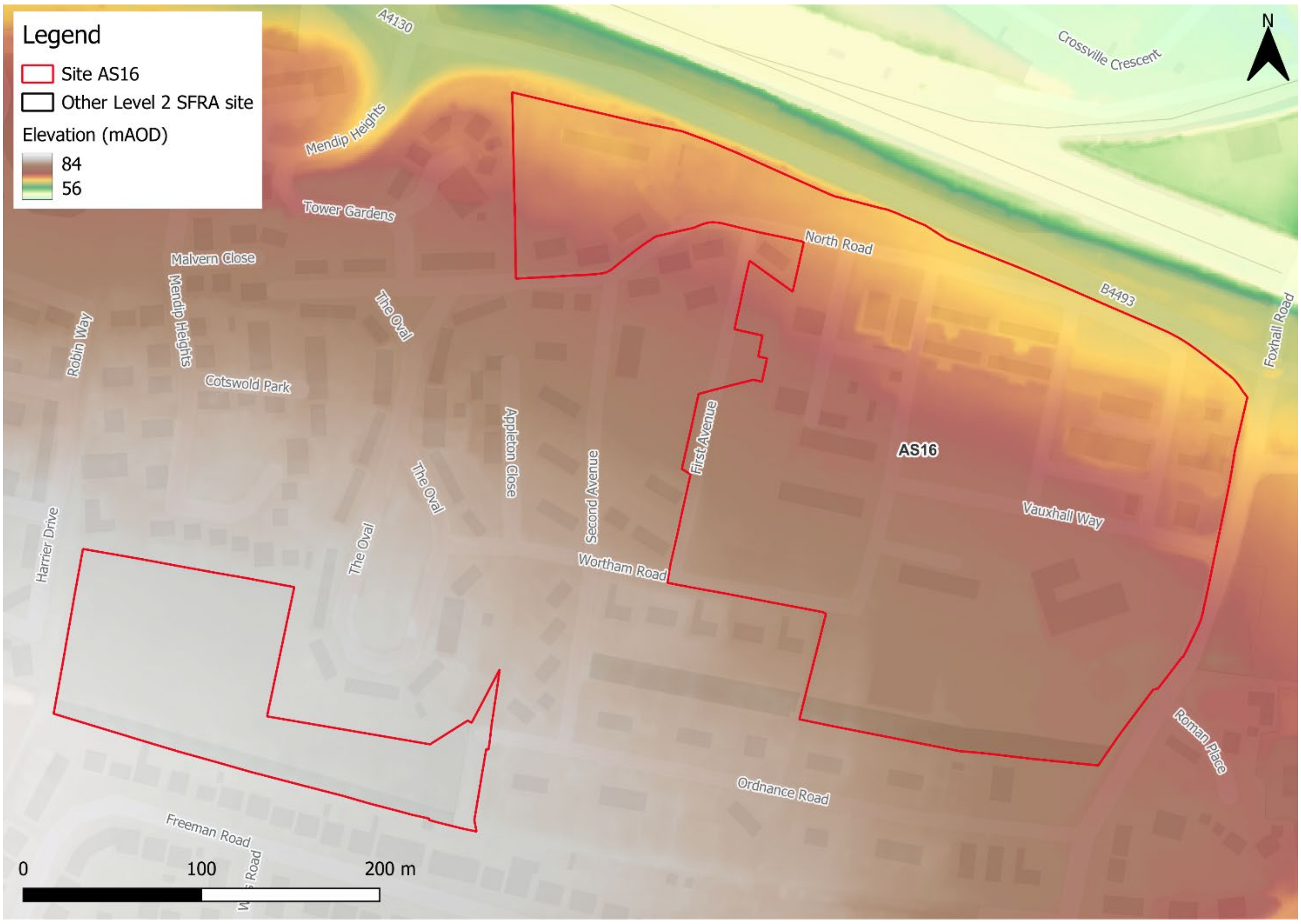

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

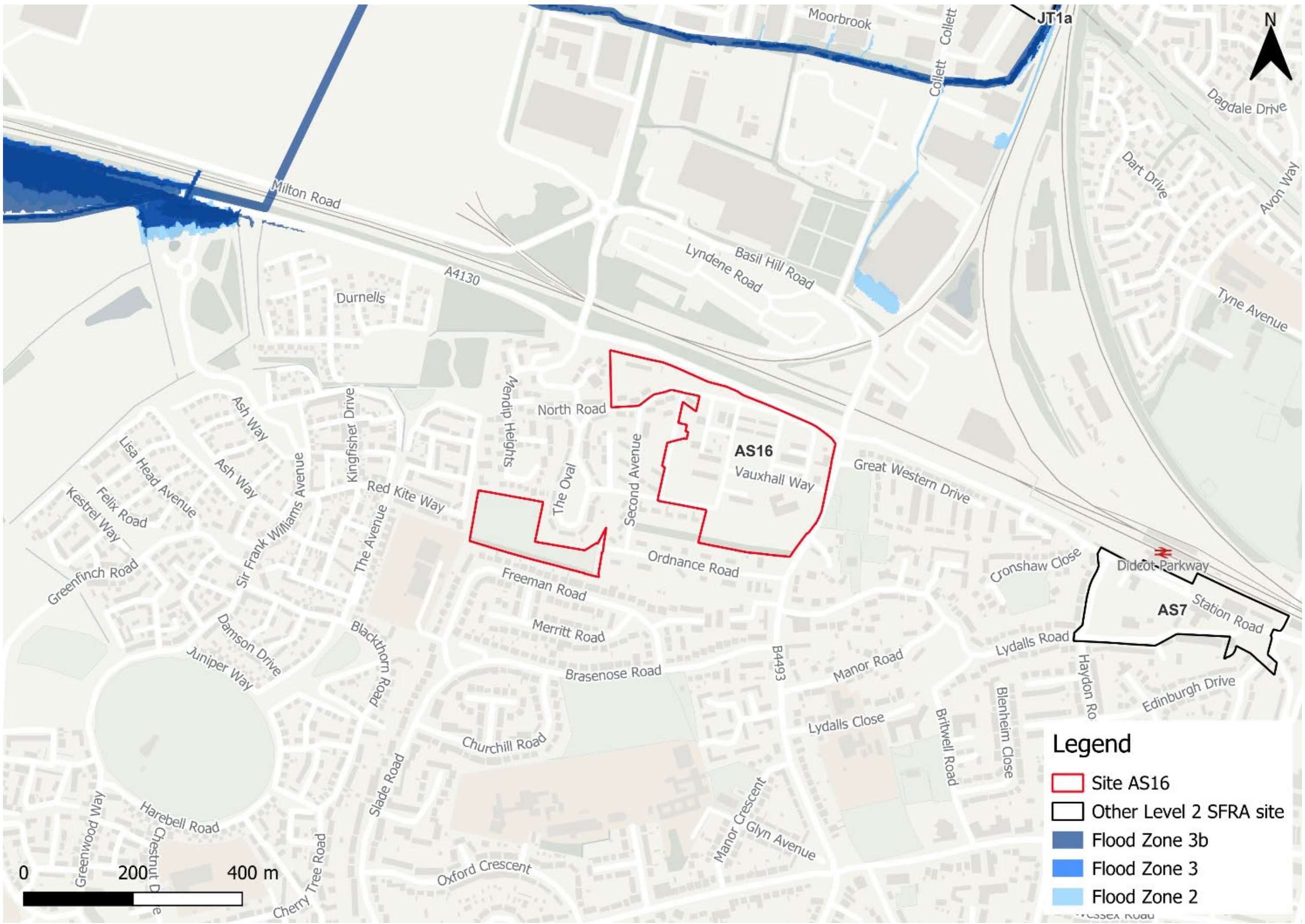

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site AS16 (Vauxhall Barracks, Didcot) is located within one catchment, namely; Moor Ditch and Ladygrove Ditch. This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are not any applicable areas that could benefit this site.

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via Foxhall Road to the east of the larger site parcel and Ordnance Road to the east of the smaller site parcel.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 0.3% of the site is within the high risk surface water flood zone. A further 0.5% is at low surface water risk, and a further 3.6% is at low surface water risk as shown in Table 3-1.

Surface water risk is confined to the larger site parcel to the east in all events. In the high and medium risk events, surface water risk is largely confined to some small, scattered areas of surface water ponding within topographic low spots. In the low risk event, surface water risk is present along the hardstanding roads through the site, with some additional areas of ponding. Surface water risk is constrained by the existing development within the site.

Greatest flood depths in the high risk event are between 0.3 and 0.6 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Wortham Road to the west of the larger site parcel.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
95.6	3.6	0.5	0.3

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along North Road. Maximum flood depths are modelled to be 0.3m and 0.6m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

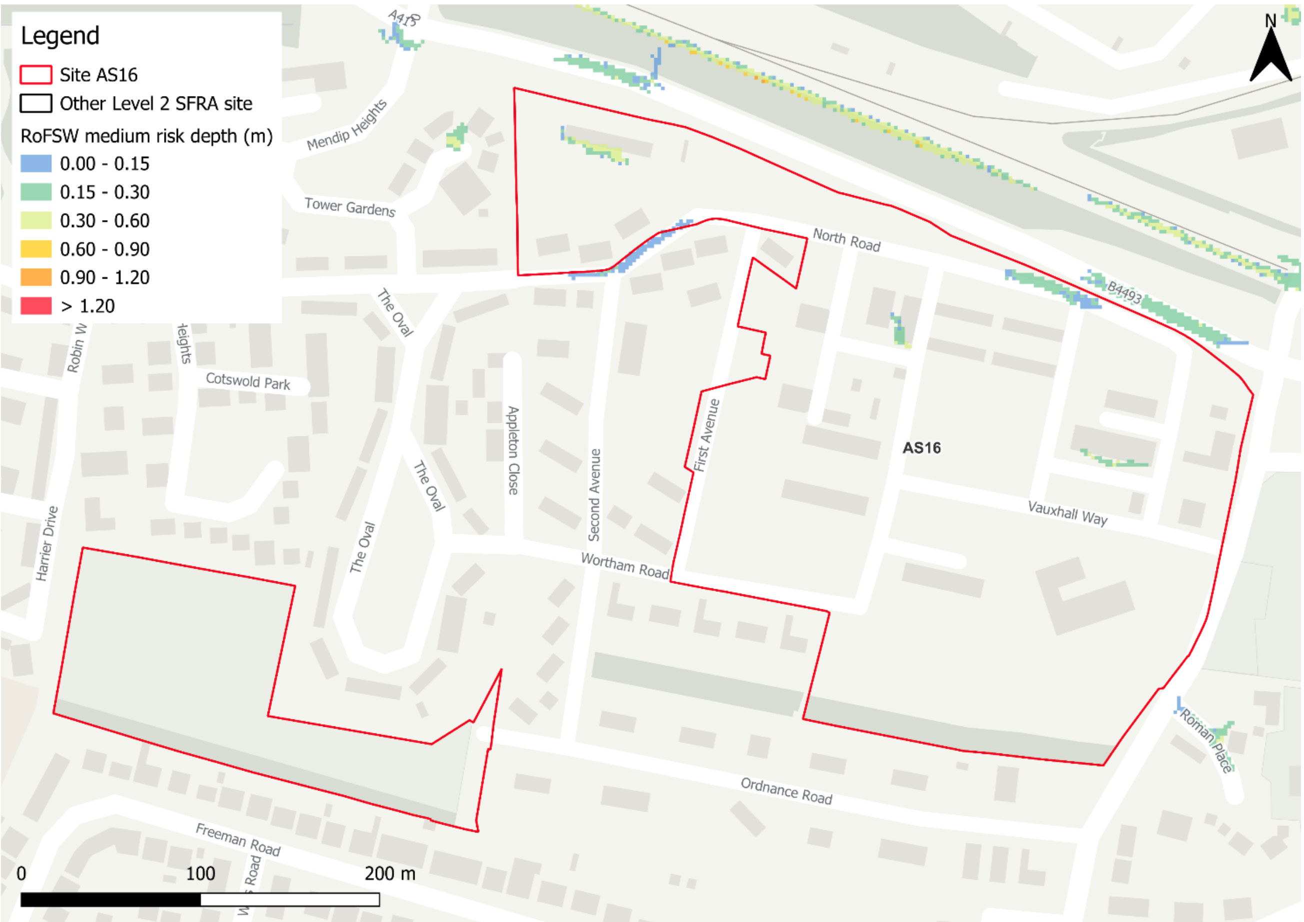

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 95.6% of the site being at very low surface water flood risk. Surface water risk in the high risk event is present along North Road, with some scattered areas of ponding across the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of flooding along North Road. Any existing flow paths should be maintained in site design.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- The Groundwater Flood Map (Figure 4-1) indicates that ground conditions may be suitable for infiltration SuDS. This should be further explored through appropriate ground survey as part of the site-specific FRA and drainage strategy.
- It is assumed the current structures will be demolished for new housing units. A drainage strategy would therefore be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will

require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.
- The Council highways department should be consulted, along with Thames Water and the LLFA regarding existing highway drainage networks, surface water sewers and LLFA assets, and whether increased capacities may be required to enable sustainable development in the long term.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site AS16 (Vauxhall Barracks, Didcot) and the surrounding areas and Table 4-1 explains the risk classifications.

The entirety of the site is in an area where there is negligible groundwater risk. Groundwater conditions may therefore be suited to infiltration SuDS.

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is not located within Flood Zone 3a.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess surface water risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- It should be appropriate for this site to be allocated, given the very low fluvial and surface water flood risk to the site. However, were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- A drainage strategy will be required for any new development. The use of infiltration SuDS should be investigated.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must further consider surface water flood risk, including a drainage strategy.
- Any site-specific FRA must consider the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

[3] Para 170 National Planning Policy Framework 2023

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site HOU2v - North West of Abingdon-on-Thames

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

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Authorised by	Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM Associate Director

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JBA disclaims any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to JBA's attention after the date of the Report.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Contents

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site HOU2v - North West of Abingdon-on-Thames. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' and is therefore familiar with the terminology used in this report.

Note that the north eastern parcel of the site already has planning permission and is built out. The south western parcel remains available for development.

1.1 Site HOU2v - North West of Abingdon-on-Thames

- Location: North West of Abingdon-on-Thames (Figure 1-1)
- Existing site use: Brownfield; mixed use
- Existing site use vulnerability: More vulnerable
- Proposed site use: Mainly residential
- Proposed site use vulnerability: More vulnerable
- Site area: 12.6 ha
- Proposed development impermeable area: 10.7 ha (assumed 85% of site area)
- EA model: Stert (A34 to Thames Confluence) 2012
- Watercourse: River Stert
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Subject to Exception Test
    - Assess present day and future modelled fluvial depths, hazards
    - Assess present day and future surface water depths, hazards
    - Climate change proxy assessment
    - Potential residual risk from River Stert culvert

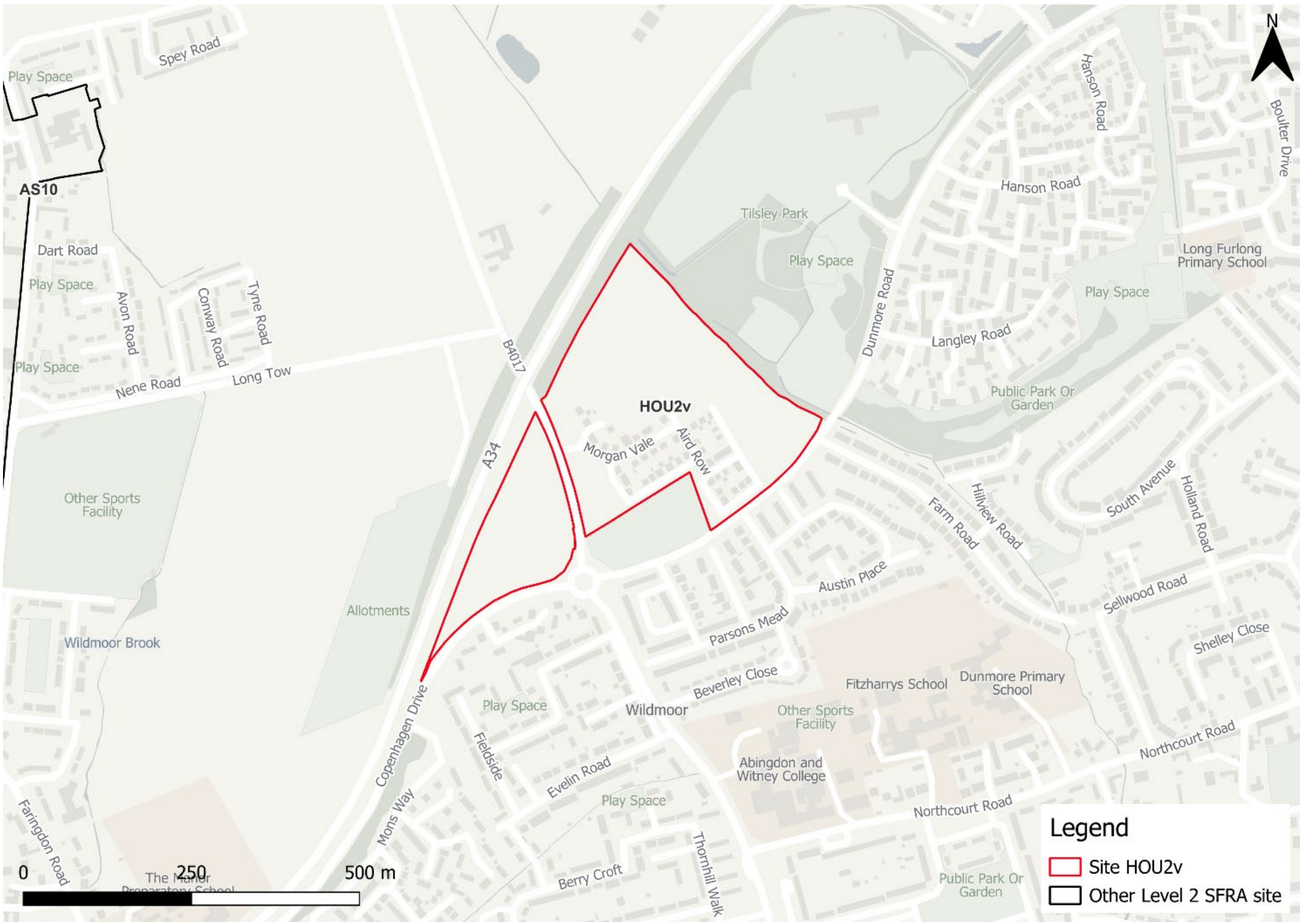

Figure 1-1: Site location

1.2 Topography

The EA Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the north at approximately 69mAOD. The lowest ground levels are located towards the east of the site at approximately 61mAOD.

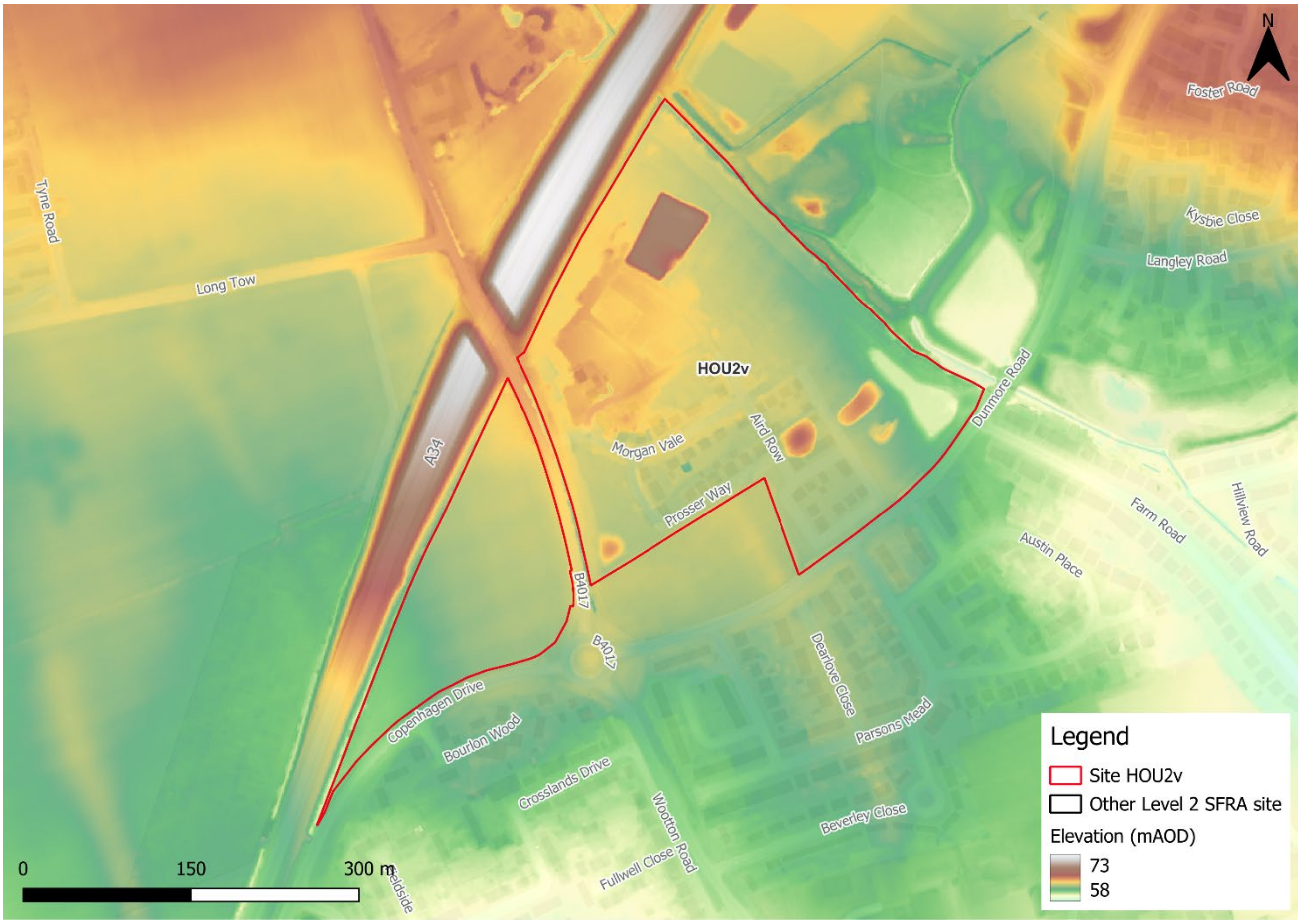

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

Flood Zone 3b is present along the north eastern boundary of the northern site parcel adjacent to the River Stert. The functional floodplain is based on the 1% AEP defended event from the Stert (A34 to Thames Confluence) 2012 model, as a precautionary approach in the absence of suitable modelled data. Flood Zone 3a and Flood Zone 2 are also present within the north of the northern site parcel.

The developable area of the site, within the south western site parcel, is within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
71	20	7	2

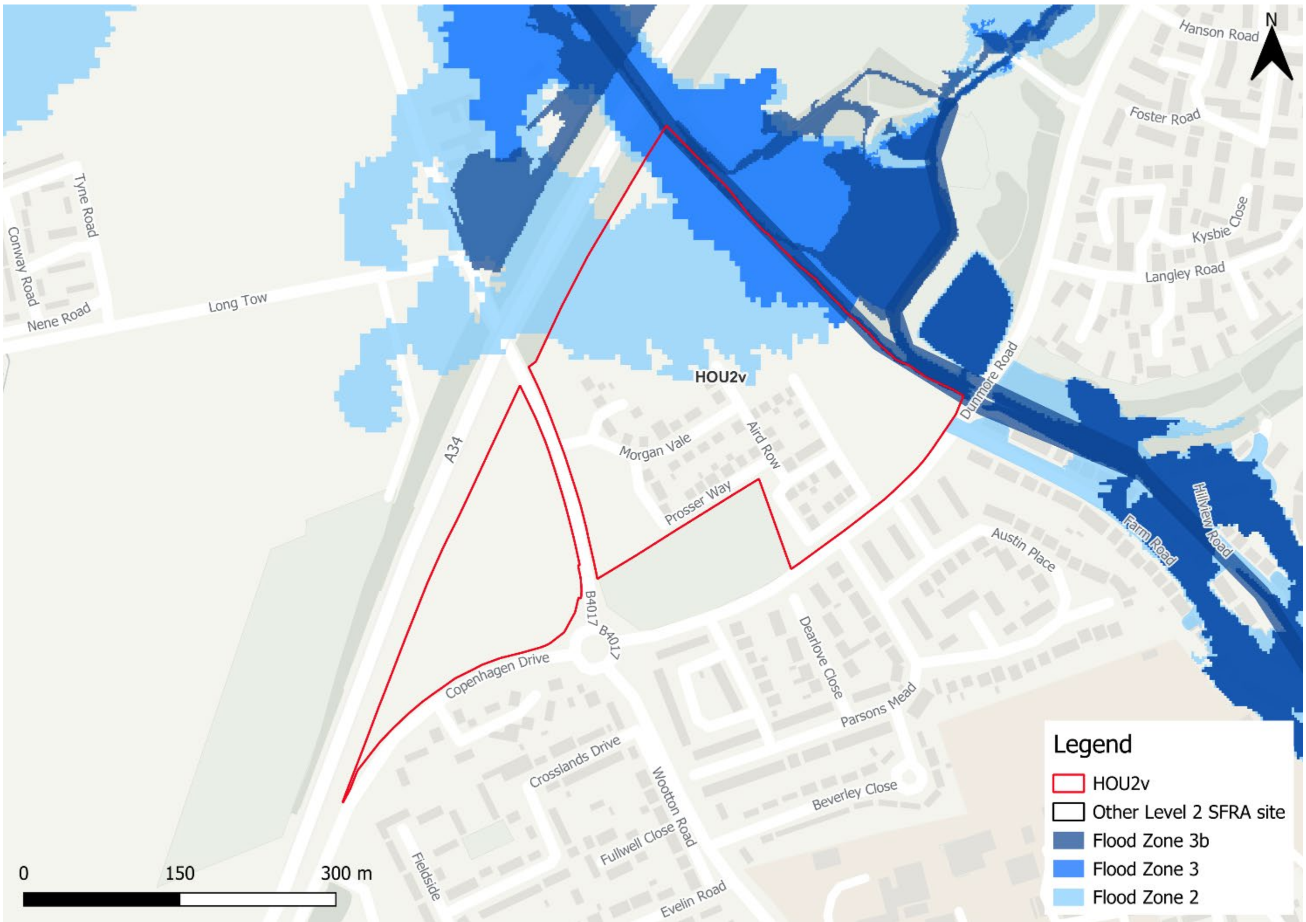

Figure 2-1: Existing risk from rivers to the site

2.1.2 Stert (A34 to Thames Confluence) 2012 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is confined to the north eastern boundary of the site. Maximum flood depths within the site are modelled to be between 0.6 and 0.9 m. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard in the area of the site at fluvial flood risk is categorised as 'Danger for some'. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event. However, note that the 1% AEP modelled event is different to Flood Zone 3 in this catchment, indicating the Flood Map for Planning is likely based on other modelled data.

The developable area of the site, within the south western parcel, is not located within the modelled Stert (A34 to Thames Confluence) 2012 outputs.

Figure 2-2: Flood depths for 1% AEP undefended flood event

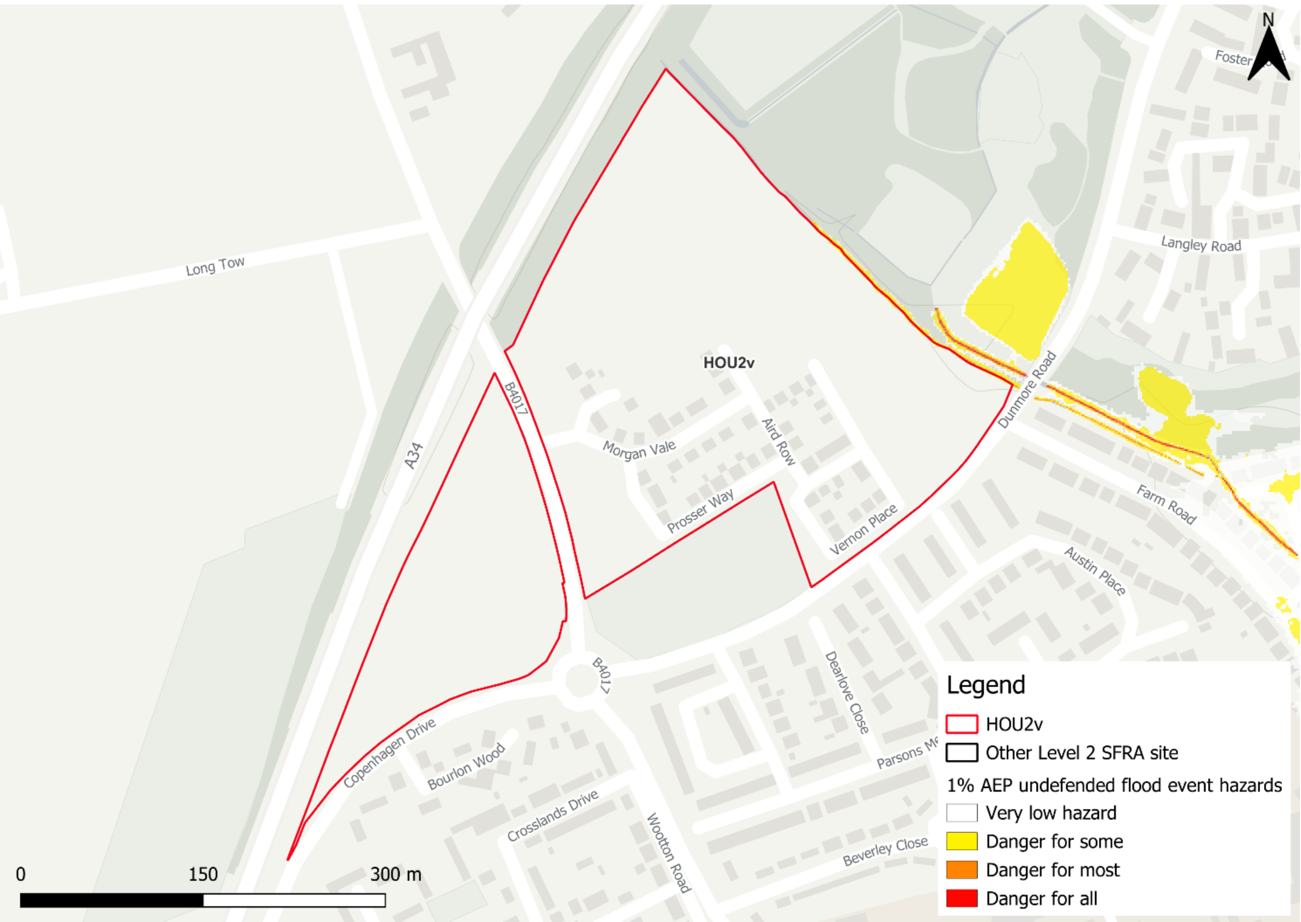

Figure 2-3: Flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from the River Stert has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain similar in extent to the present day 1% undefended event, with some slightly greater depths (Figure 2-4) and hazards (Figure 2-5).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA should include for the most up to date climate change allowances.

[1] Fluvial hazard ratings based on Table 4 of the Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008. Environment Agency.

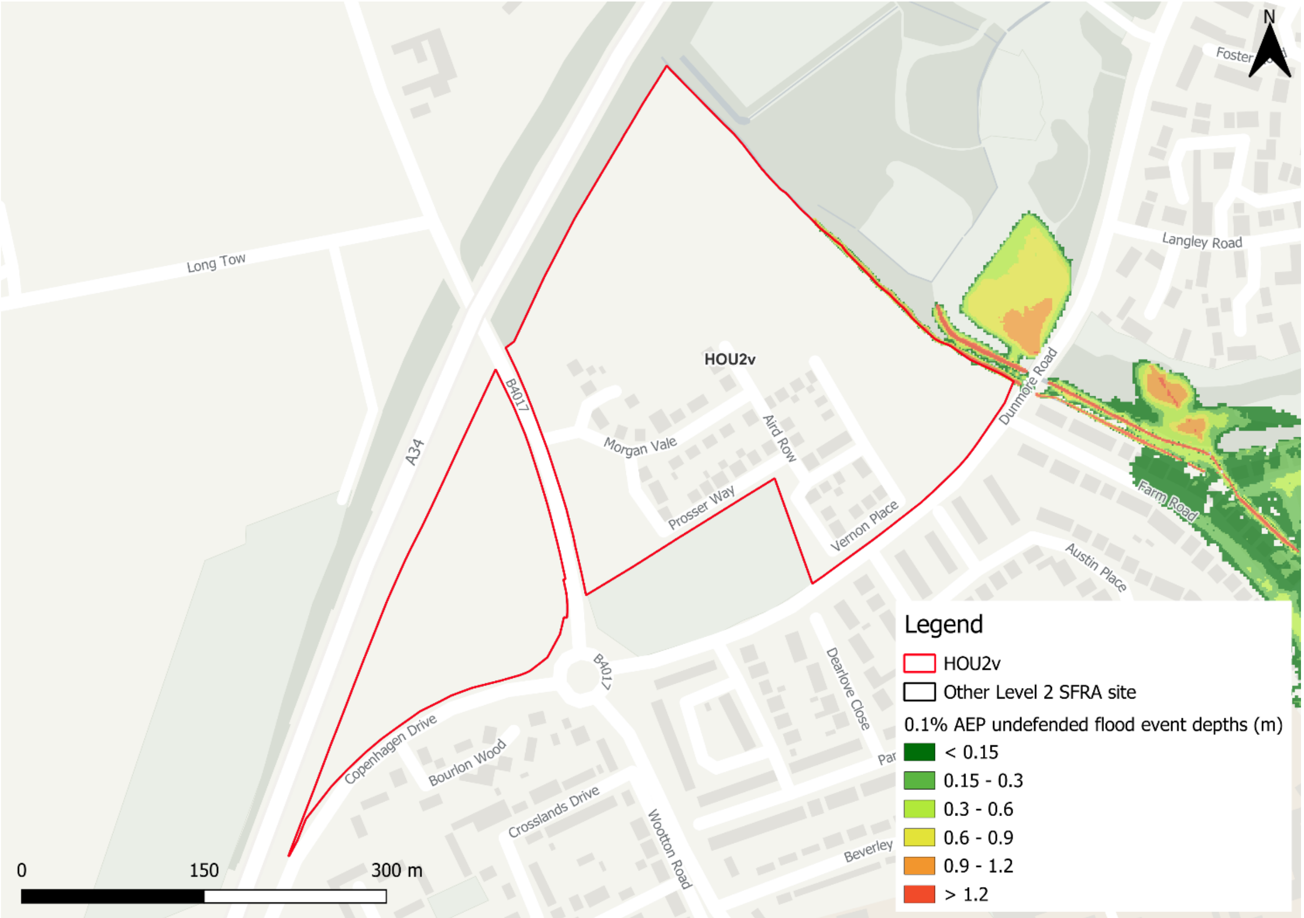

Figure 2-4: Flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

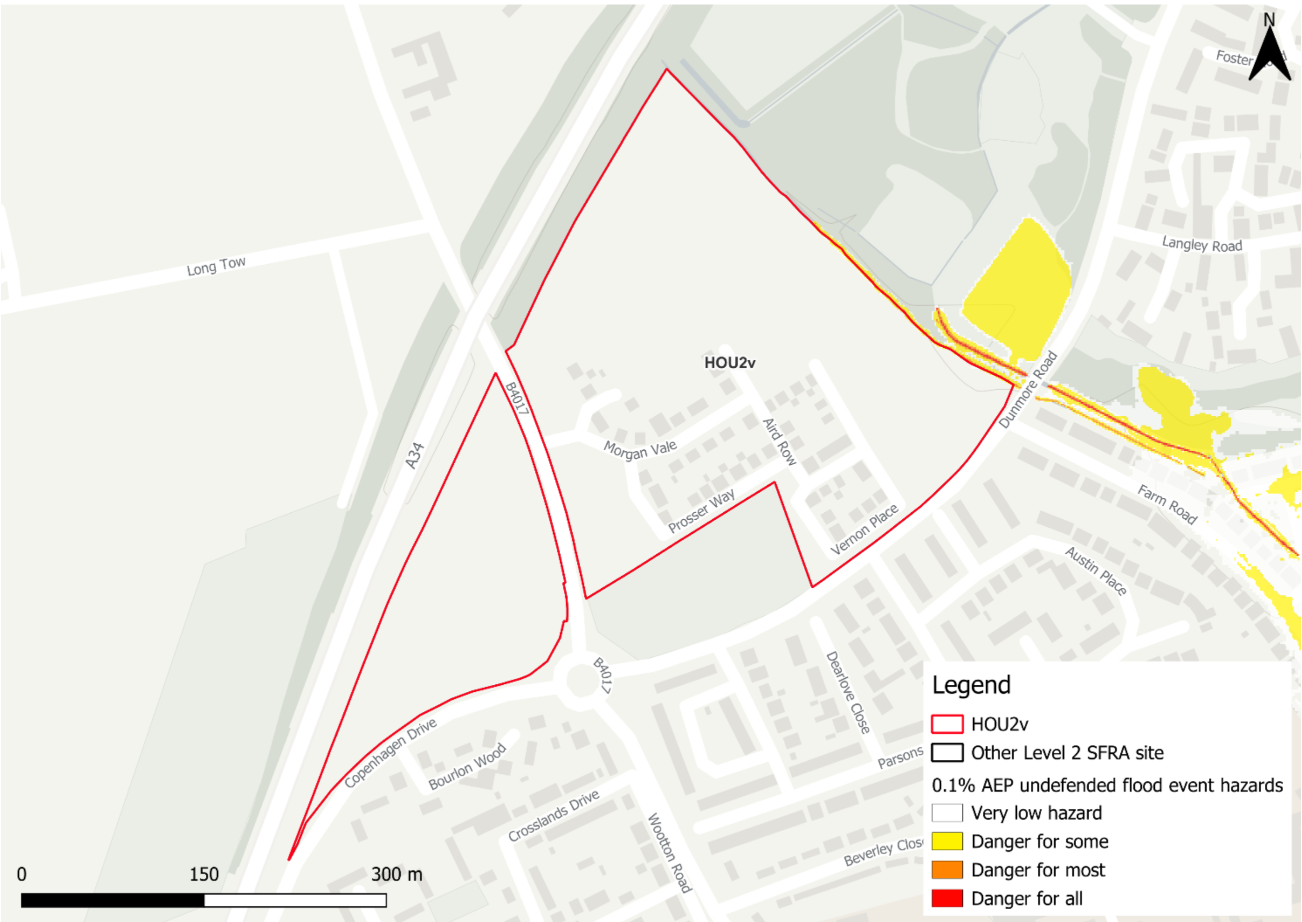

Figure 2-5: Flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset. There are however areas of natural high ground along the banks of the River Stert adjacent to the north east of the northern site boundary.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site HOU2v (North West of Abingdon-on-Thames) is located within two catchments, namely; Ock and tributaries (Land Brook confluence to Thames), and Thames (Evenlode to Thame). These are ranked as a higher sensitivity catchments. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Both within and upstream of the site, there is significant potential for tree planting to reduce runoff downstream. There are also areas with potential to reconnect the channel to the floodplain, allowing floodwater to be stored. In addition, there are opportunities for runoff attenuation feature. These areas are shown in Figure 2-6.

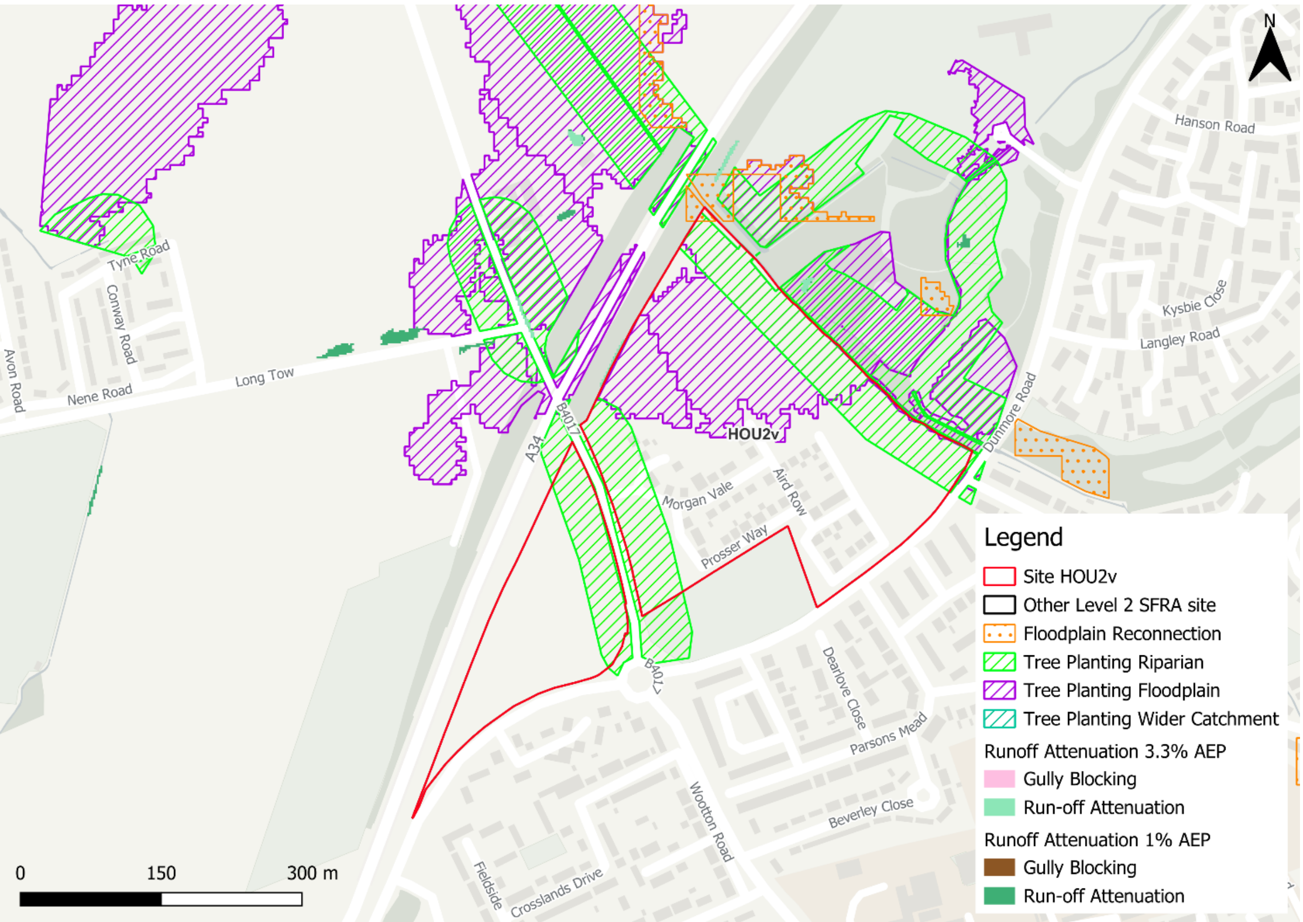

Figure 2-6: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

There is potential residual risk to the site from a possible blockage of the River Stert culvert beneath Dunmore Road to the east of the site (Figure 2-7). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on flood risk to the site.

Figure 2-7: Potential culvert blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. Historic risk to the site is shown in Figure 2-8 which shows that the area adjacent to the eastern boundary of the site, along Farm Road, has been subject to flooding in the past. The RFO dataset references that this event occurred in summer 2007 as a result of the channel capacity of the main river being exceeded.

Figure 2-8: Recorded historic flood events onsite and around the site

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. Site HOU2v (North West of Abingdon-on-Thames) is partially located within a FWA; 061FWF23StertAb - River Stert at Abingdon, as shown in Figure 2-9.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is also partially located within a FAA, namely 061WAF23Stert - River Stert in Abingdon.

Safe access and escape routes could likely be achieved via the B4017 which is located between the two site parcels.

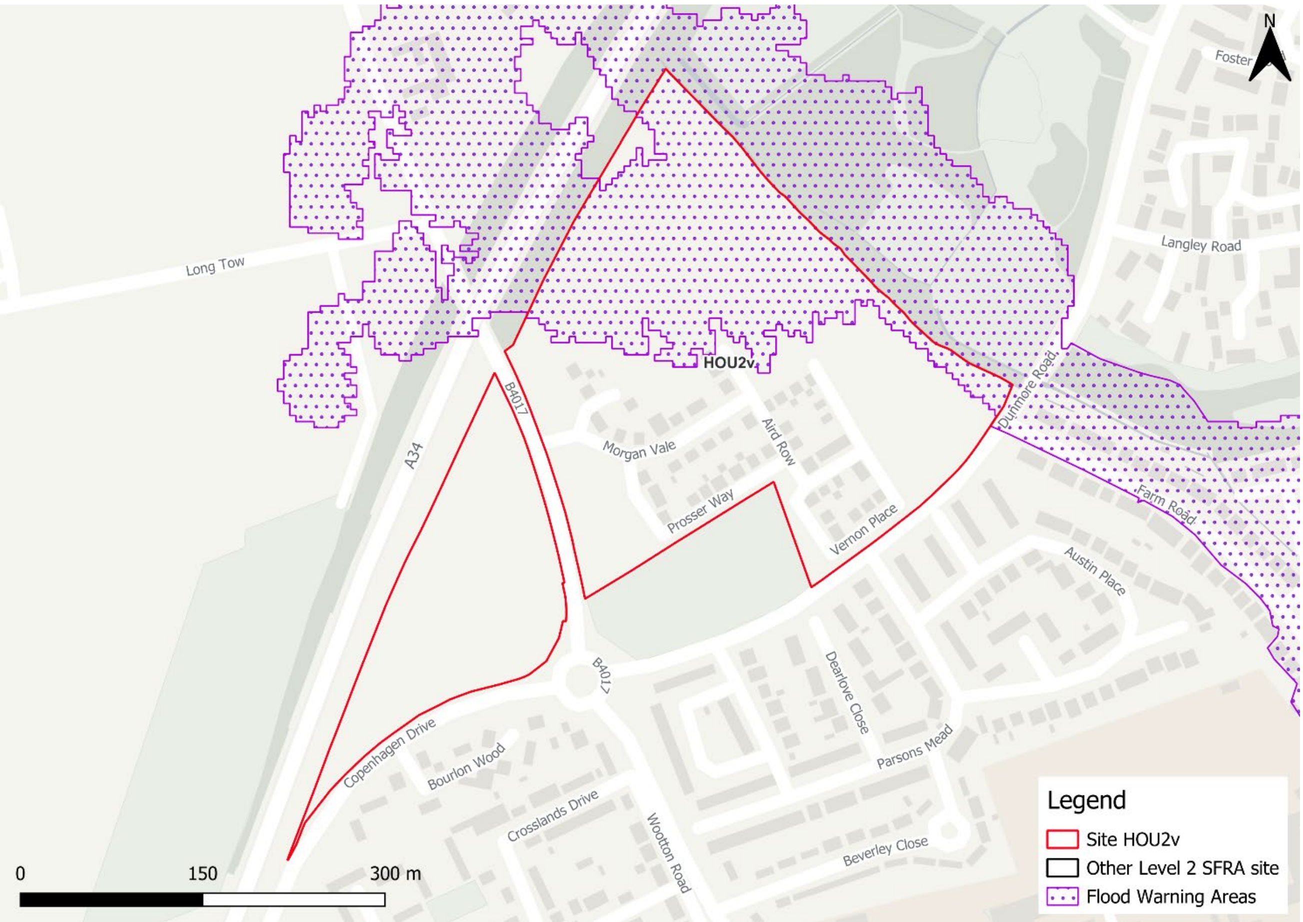

Figure 2-9: EA Flood Warning Areas

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the north eastern boundary of the northern site parcel, adjacent to the River Stert. Vulnerable development is not permitted within the functional floodplain. However this is based on the 1% AEP defended event from the Stert (A34 to Thames Confluence) 2012 model, as a precautionary approach. The developable area of the site, within the south western site parcel, is within Flood Zone 1.
- There should be no development within 8m of the River Stert apart from permitted access. The EA recommend for a 8m no development buffer for all main rivers to enable access for maintenance activities. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- A flood risk activity permit may be required if development is planned within 8m of the riverbank. The EA can advise on whether a permit will be required. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- The site is partially located in Flood Zone 3, as indicated by the EA's Flood Map for Planning and the Stert (A34 to Thames Confluence) 1% AEP undefended event outputs. Greatest depths within the site boundary are modelled to be

between 0.6 and 0.9 m. However, note that the 1% AEP modelled event is different to Flood Zone 3 in this catchment, indicating the Flood Map for Planning is based on other modelled data. More vulnerable development should be directed away from the area of the site within Flood Zone 3.

- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with some slightly greater depths. However, note that the 0.1% AEP modelled event is different to Flood Zone 2 in this catchment, indicating the Flood Map for Planning is based on other modelled data. Climate change must be modelled at the site-specific FRA stage.
- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The EA flood warnings should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape routes are available from several locations based on current information.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the high risk surface water flood zone. A further 1% is at medium surface water risk, and a further 4% is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is confined to the boundaries of the site. This is similar with the medium risk event, however there is an additional area of shallow ponding along Prosser Way. In the low risk event, there are some additional areas of ponding within the south of the southern site parcel and a greater extent of flooding along Prosser Way.

The developable area of the site, within the south western site parcel, is at very low risk of surface water flooding.

Greatest flood depths in the high risk event range between 0.6 and 0.9 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via the B4017 between the two site parcels in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
94	4	1	1

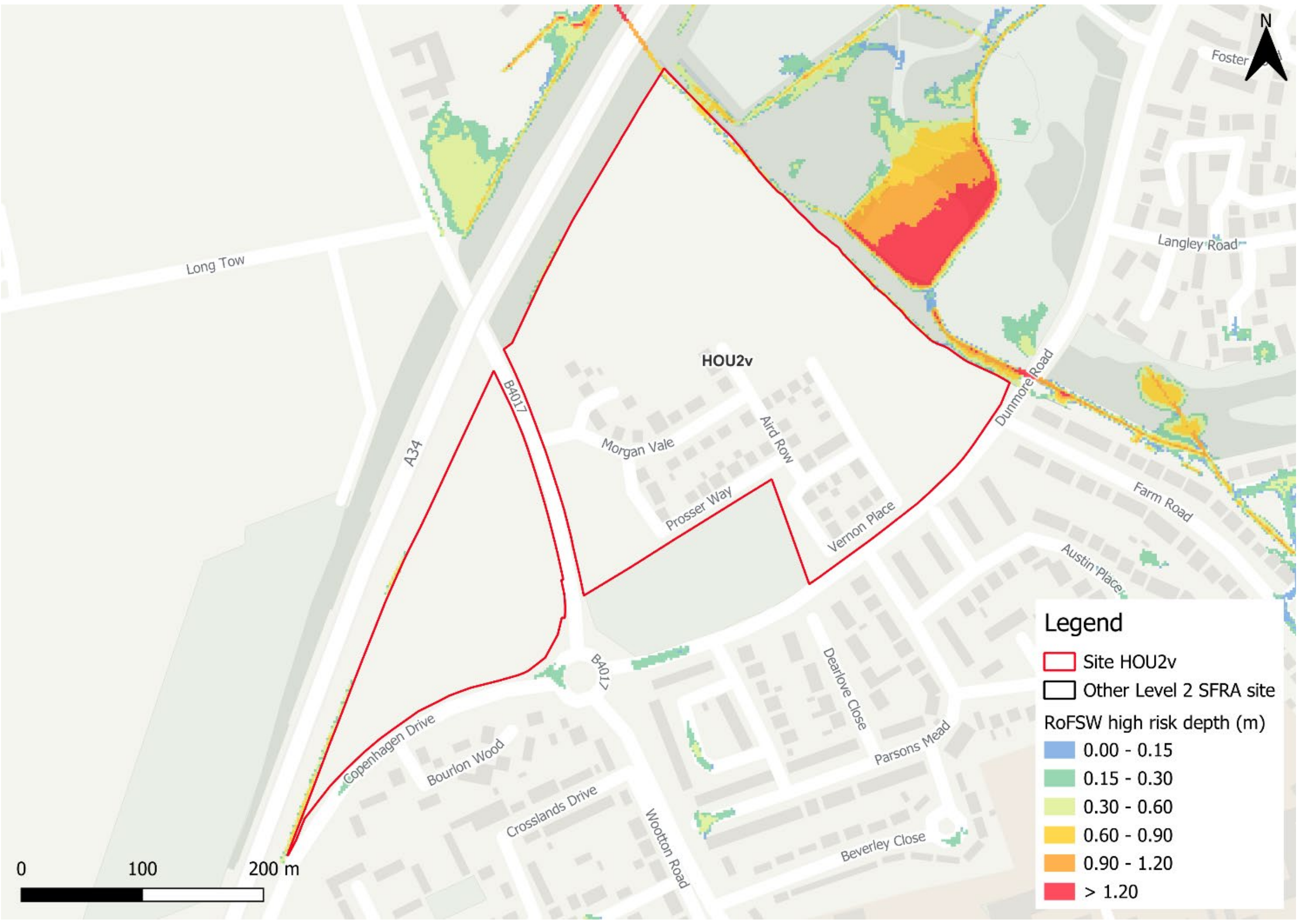

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

Figure 3-2: High risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with an additional area of ponding along Prosser Way within the south of the northern site parcel. Maximum flood depths are modelled to be between 0.9 and 1.2 m with some areas of significant hazard (Figure 3-4).

[2] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

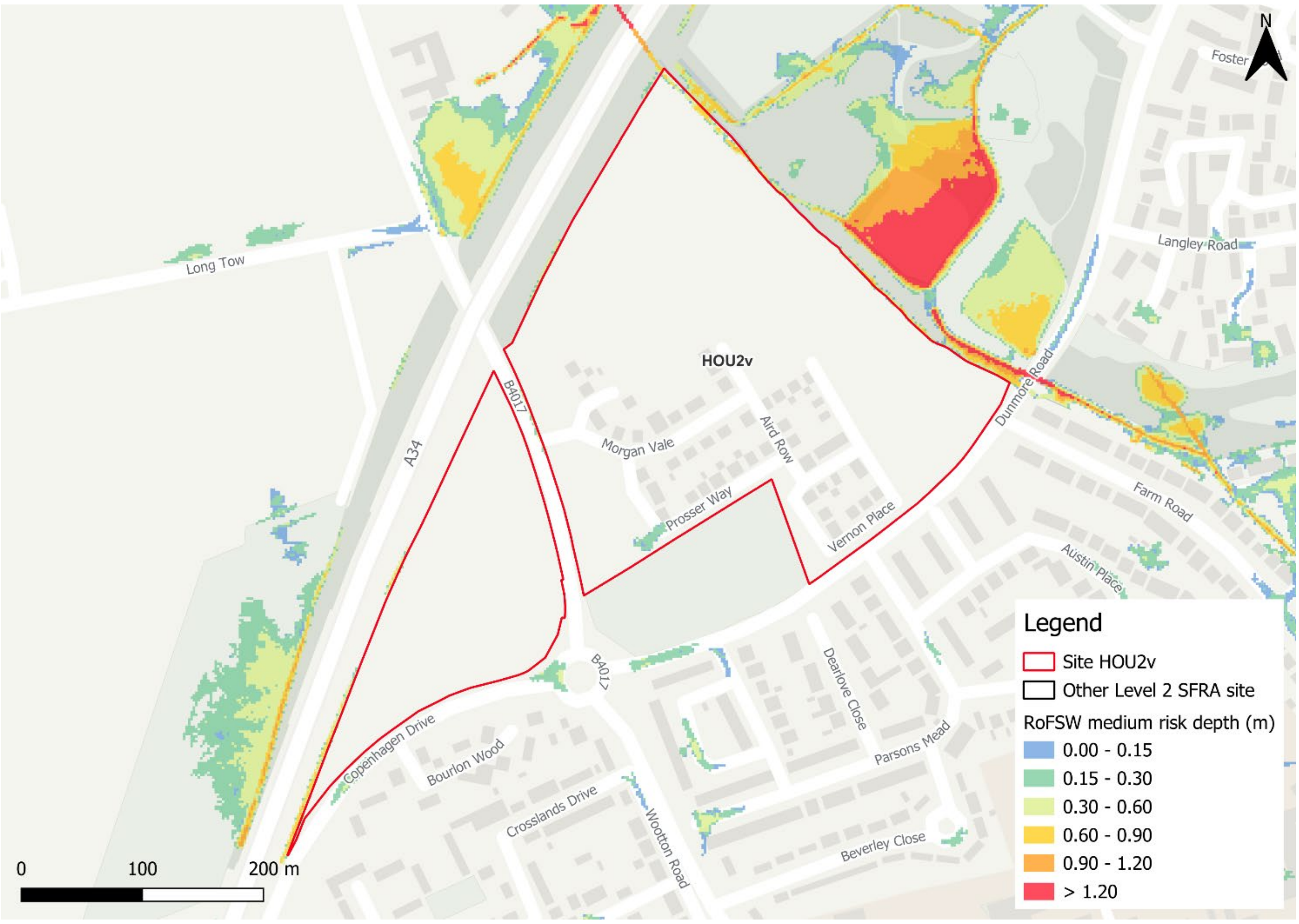

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

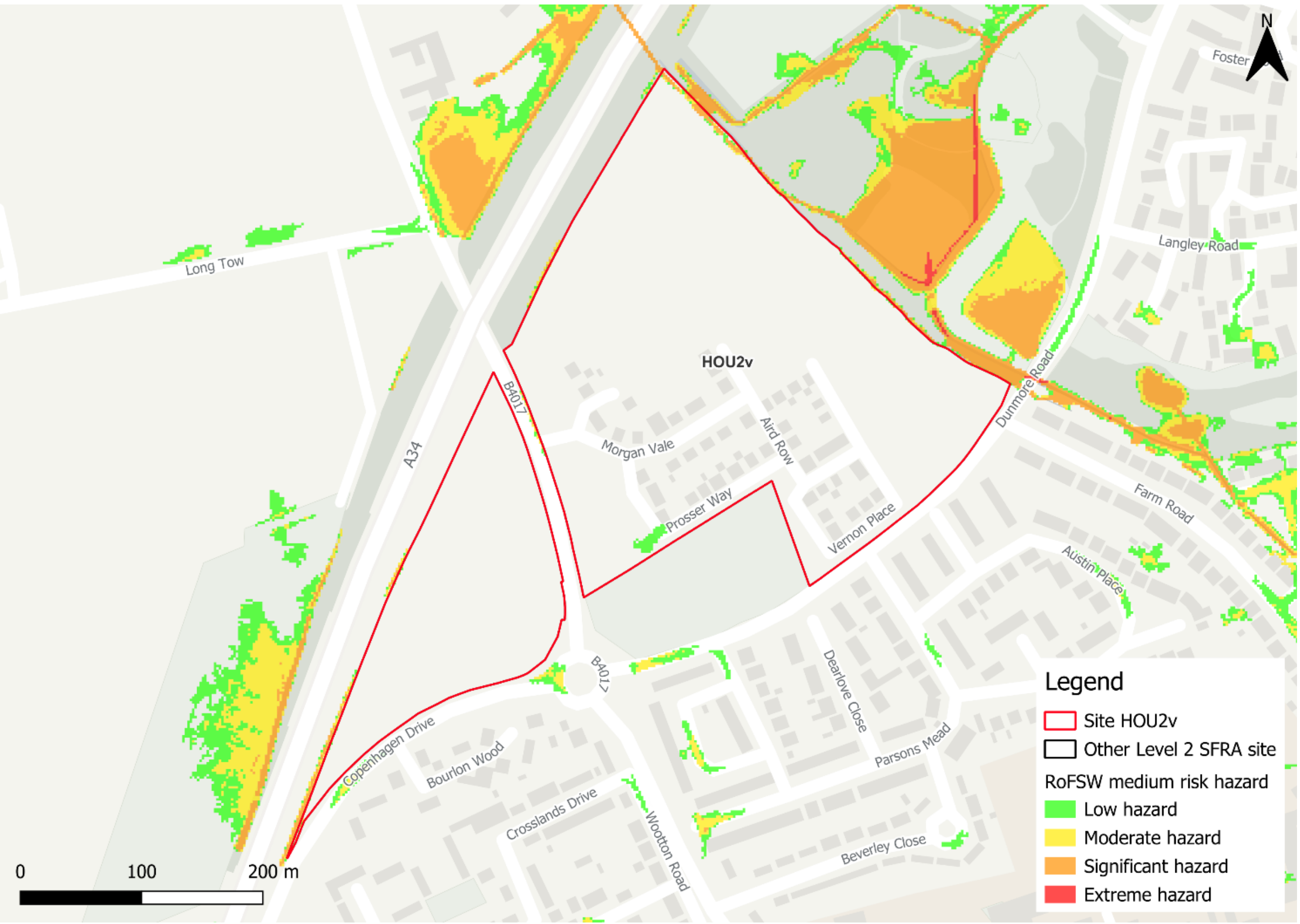

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 94% of the site being at very low surface water flood risk. Surface water risk in the high risk event is confined to the boundaries of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with an additional area of shallow ponding along Prosser Way.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- The developable area of the site, within the south western site parcel, is at very low risk of surface water flooding.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could

accommodate the proposed residential development or whether further capacity will be required.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map for Site HOU2v (North West of Abingdon-on-Thames) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. Across the majority of the site there is negligible risk of groundwater flooding. Within the centre of the northern site parcel and the south of the southern site parcel, there is a risk of groundwater flooding to both surface and subsurface assets. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

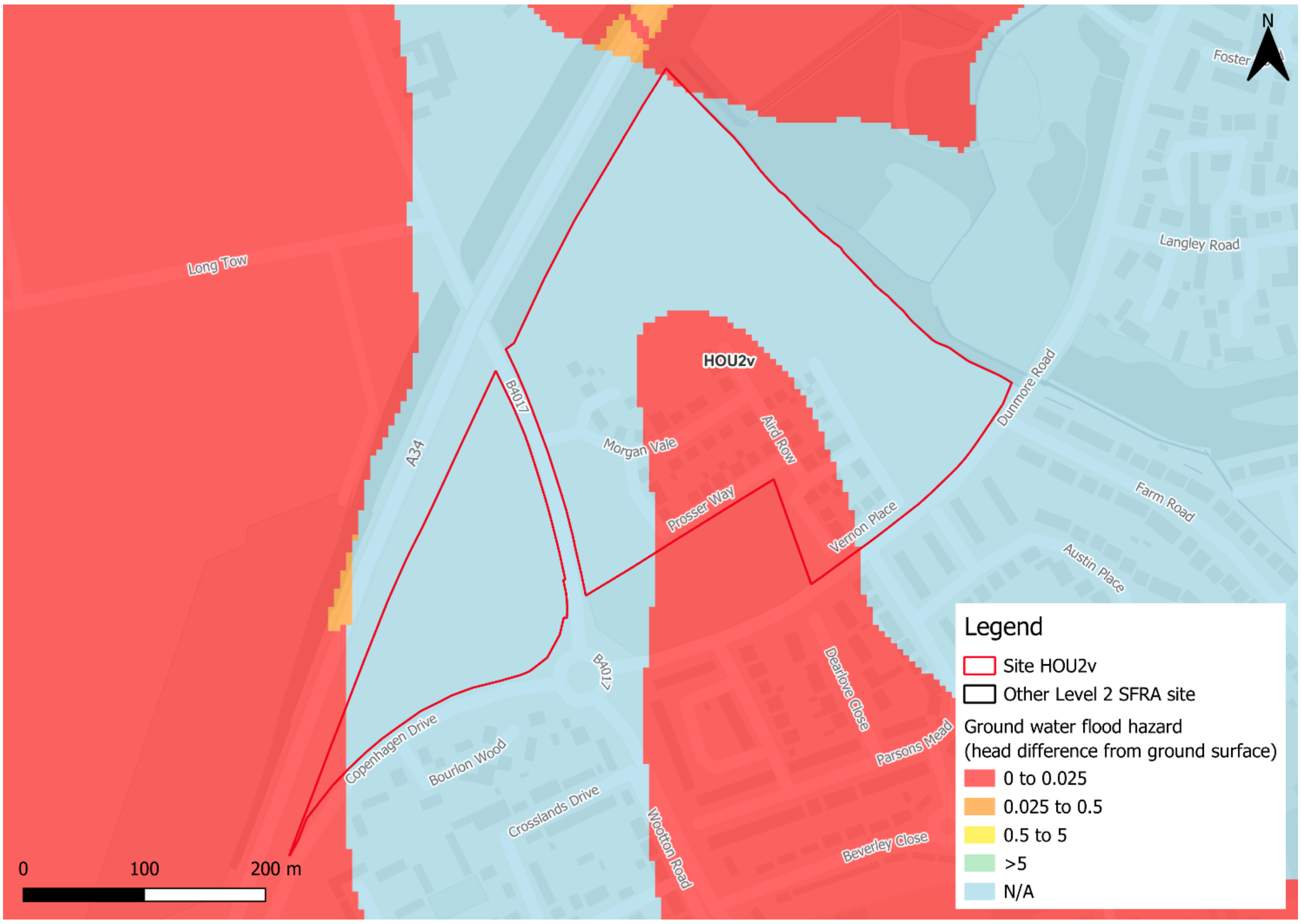

Figure 4-1: JBA 5m Groundwater Flood Map

[3] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

Based on current information and the use of proxies to represent the impacts of climate change, this site should be able to pass the exception test. However, all the recommendations suggested in this Level 2 SFRA should be considered at the site-specific FRA stage or before any site design planning.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- There should be no vulnerable development within the area of the site covered by the functional floodplain. There should be no development within 8m of the River Stert apart from permitted access. The EA recommend for an 8m no development buffer for all main rivers to enable access for maintenance activities. This should be converted to a blue / green corridor to provide ecological, amenity and social value.
- Updated climate change modelling along the River Stert should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of future flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update
- The developable area of the site, within the south western site parcel, is within Flood Zone 1. Therefore, based on current information, this site could be allocated for more vulnerable development. Note that the 1% AEP modelled event is different to Flood Zone 3 in this catchment, indicating the Flood Map for Planning is based on other modelled data.
- A full drainage strategy will be required for any new development.
- Groundwater conditions must be investigated further.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.

---

[4] Para 170 National Planning Policy Framework 2023

- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should undertake a condition assessment of the culvert beneath Dunmore Road and investigate the impact of a potential blockage of this structure.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site JT1a - Southmead Industrial Estate, Didcot

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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1 Background

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1.1 Site JT1a - Southmead Industrial Estate, Didcot

- Location: Southmead Industrial Estate, Didcot (Figure 1-1)
- Existing site use: Brownfield; industrial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 2.64 ha
- Proposed development impermeable area: 2.2 ha (assumed 85% of site area)
- EA model: Moor Ditch (Didcot to Thames Confluence) 2007
- Watercourse: Moor Ditch
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the west at approximately 54mAOD. The lowest ground levels are located towards the east of the site at approximately 51mAOD.

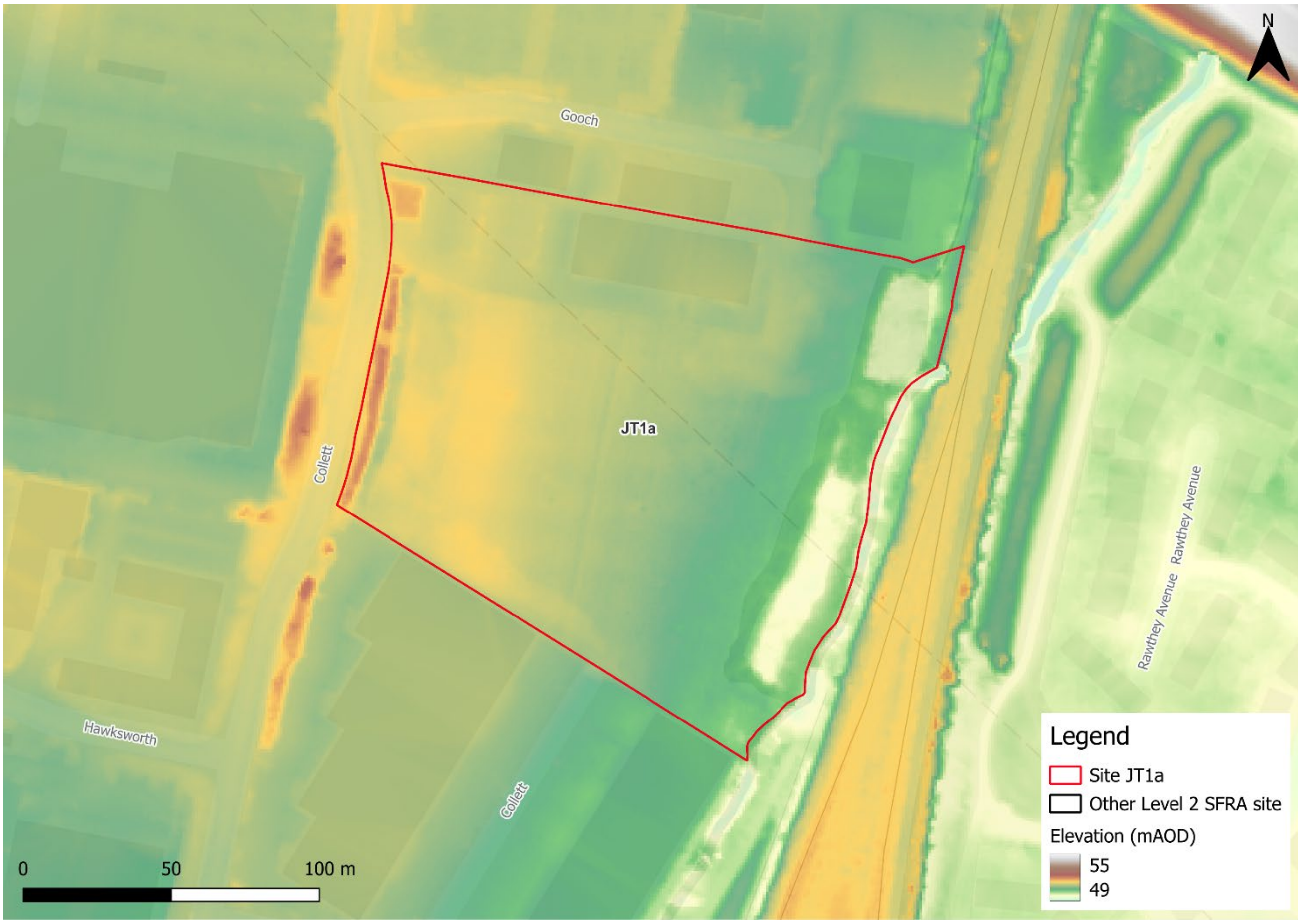

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The area along the eastern boundary of the site is located within Flood Zone 3b. The area of functional floodplain onsite should be left free of vulnerable development. The functional floodplain in this location is based on the 1% AEP undefended event from the Moor Ditch (Didcot to Thames Confluence) 2007 model and the 8m buffered channel, as a precautionary approach in the absence of suitable modelled data.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
97	0	0	3

Figure 2-1: Existing risk from rivers to the site

2.1.2 Moor Ditch (Didcot to Thames Confluence) 2007 model outputs

The Moor Ditch (Didcot to Thames Confluence) 2007 model cannot be used to fully inform this SFRA, due to required results files not being provided for consideration. The fluvial risk information to inform the suitability for allocation of this site, and all other sites in the floodplain of the Moor Ditch model domain, is therefore limited. The information required for the SFRA that is not available includes:

- Flood hazard information

Flood depth information is available for present day flood events, derived through a 1D mapping process. However, this information was modelled in 2007 thus is likely to be based on outdated hydrology, terrain data and channel and structure survey.

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is similar to Flood Zone 3 in the vicinity of the site, with the area along the eastern boundary of the site modelled to be at risk. Maximum flood depths within the site are modelled to be < 0.15 m. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event.

Figure 2-2: Flood depths for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from Moor Ditch has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with maximum depths modelled to be between 0.3 and 0.6 m (Figure 2-3).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA should include for the most up to date climate change allowances.

Figure 2-3: Flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset. There are however areas of natural high ground along the banks of Moor Ditch to the east of the site boundary.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site JT1a (Southmead Industrial Estate, Didcot) is located within one catchment, namely; Moor Ditch and Ladygrove Ditch. This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Upstream of the site, there are opportunities to reconnect the channel to the floodplain, allowing flood water to be stored. This area is shown in Figure 2-4.

Figure 2-4: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

There is potential residual risk to the site from a possible blockage of Moor Ditch which is culverted beneath the railway to the east of the site (Figure 2-5). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on residual flood risk to the site.

Figure 2-5: Potential culvert blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

The LPA historic flooding records indicate that the units upstream of the site have experienced flooding in the past. The drainage network in this location drains into Moor Ditch.

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. Site JT1a (Southmead Industrial Estate, Didcot) is not located within a FWA.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is located within one FAA, along the eastern boundary of the site, namely 061WAF23Ginge - Ginge Brook.

Safe access and escape routes could likely be achieved during a flood event via Collett to the west of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the eastern boundary of the site, adjacent to Moor Ditch. Vulnerable development is not permitted within the functional floodplain. However, the functional floodplain in this area is based on the 1% AEP undefended event from the Moor Ditch (Didcot to Thames Confluence) 2007 model, as a precautionary approach.
- There should be no development within 8m of Moor Ditch apart from permitted access. The EA recommend for a 8m no development buffer for all main rivers to enable access for maintenance activities. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- A flood risk activity permit may be required if development is planned within 8m of the riverbank. The EA can advise on whether a permit will be required. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- The site is partially located in Flood Zone 3, as indicated by the Moor Ditch (Didcot to Thames Confluence) 1% AEP undefended event outputs. Greatest depths within the site boundary are modelled to be < 0.15 m. More vulnerable development should be directed away from the area of the site within Flood Zone 3.
- Modelled hazard information was not available for the Moor Ditch model. This should be considered as part of a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with some slightly greater depths. However, climate change must be modelled to inform whether the site can be safe for its lifetime.

- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- The EA flood alert areas should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape routes are available from Collett based on current information.
- Given the historic flooding upstream of the site, the capacity of the receiving watercourse for discharge from the development will need to be assessed. A condition survey of the watercourse along the eastern boundary of the site should also be assessed as part of a site-specific FRA to ensure flows can be conveyed.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 1% of the site is within the high risk surface water flood zone. A further 5% is at medium surface water risk, and a further 6% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is largely confined to the two topographic low spots within the east of the site. In the low risk event, there is a short surface water flow path through the south of the larger site parcel. Greatest flood depths in the high risk event range between 0.3 and 0.6 m (Figure 3-1) with some areas of moderate hazard (Figure 3-2). Safe access and escape routes should be possible via Thame Lane and Collett in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
88	6	5	1

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding within the topographic low spots. Maximum flood depths are modelled to be between 0.6 and 0.9 m, with areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 88% of the site being at very low surface water flood risk. Surface water risk in the high and medium risk events is confined to areas of ponding within topographic low spots in the east of the site.
- In the low risk surface water event, there are some additional areas of shallow surface water ponding across the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent of ponding within the topographic low spots.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site JT1a (Southmead Industrial Estate, Didcot) and the surrounding areas and Table 4-1 explains the risk classifications.

Risk of groundwater emergence varies across the site. Across the western area of the site, there is a risk of groundwater flooding to both surface and subsurface assets. Within the east of the site there is a negligible risk from groundwater flooding. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

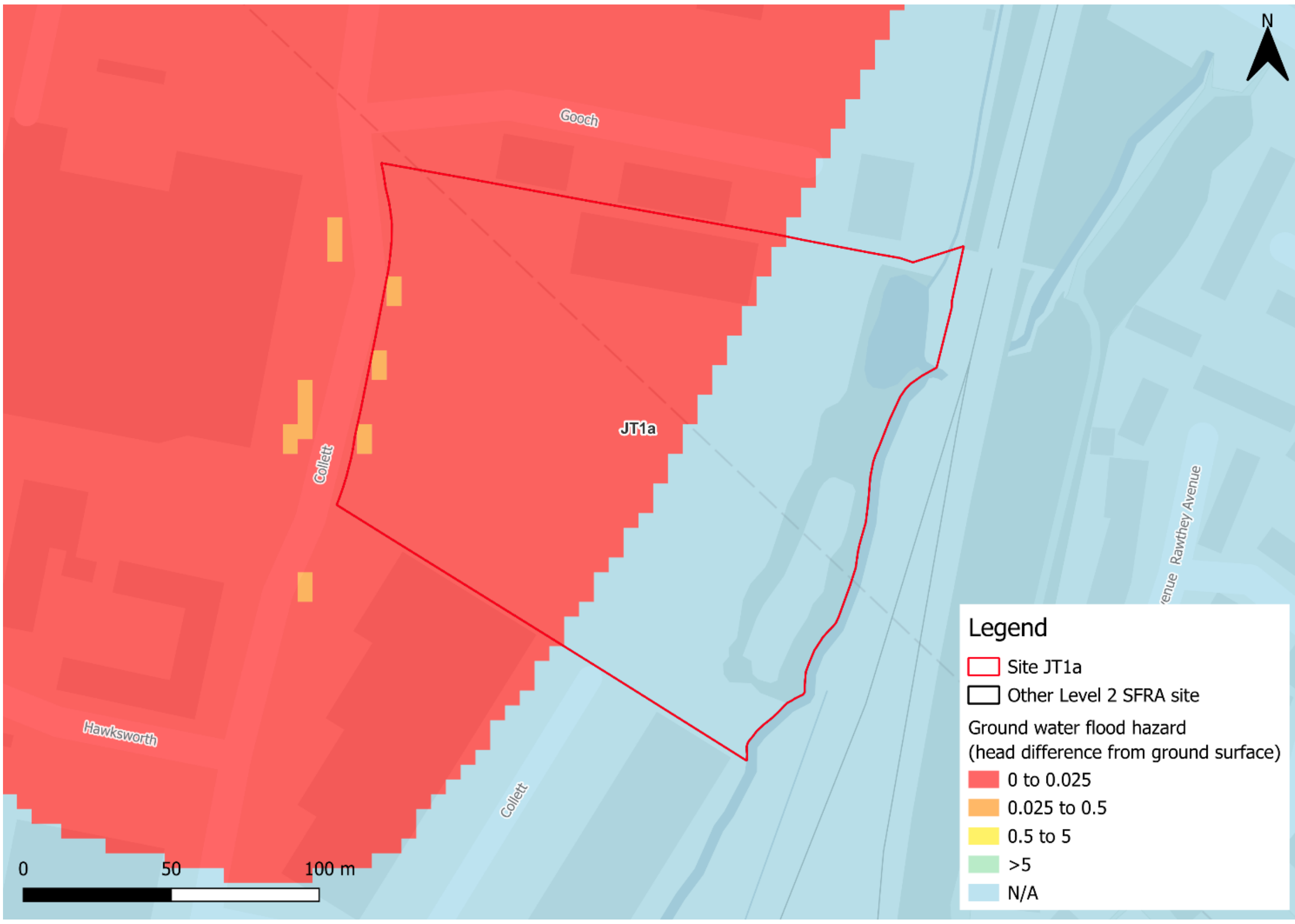

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- There should be no vulnerable development within the area of the site within the functional floodplain. However the functional floodplain in this area is based on the 1% AEP undefended event from the Moor Ditch (Didcot to Thames Confluence) 2007 model, as a precautionary approach.
- There should also be no development within 8m of Moor Ditch apart from permitted access. The EA recommend for an 8m no development buffer for all main rivers to enable access for maintenance activities. This should be converted to a blue / green corridor to provide ecological, amenity and social value.
- Present day hazard information and updated climate change modelling along Moor Ditch should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated if development avoids the area at modelled fluvial risk along the eastern boundary of the site.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from Moor Ditch is fully ascertained.
- A detailed drainage strategy will be required for any new development.
- Groundwater conditions must be investigated further.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out full detailed flood modelling of the site for Moor Ditch to understand flood hazards.

[3] Para 170 National Planning Policy Framework 2023

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should undertake a condition survey of the watercourse along the eastern boundary of the site to ensure flows can be conveyed.
- Any site-specific FRA should undertake a condition assessment of the culvert beneath the railway and investigate the impact of a potential blockage of this structure.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site JT1e - Monument Business Park, Chalgrove

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site JT1e - Monument Business Park, Chalgrove. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site JT1e - Monument Business Park, Chalgrove

- Location: Monument Business Park, Chalgrove (Figure 1-1)
- Existing site use: Greenfield and brownfield; employment
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 2.25 ha
- Proposed development impermeable area: 1.9 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

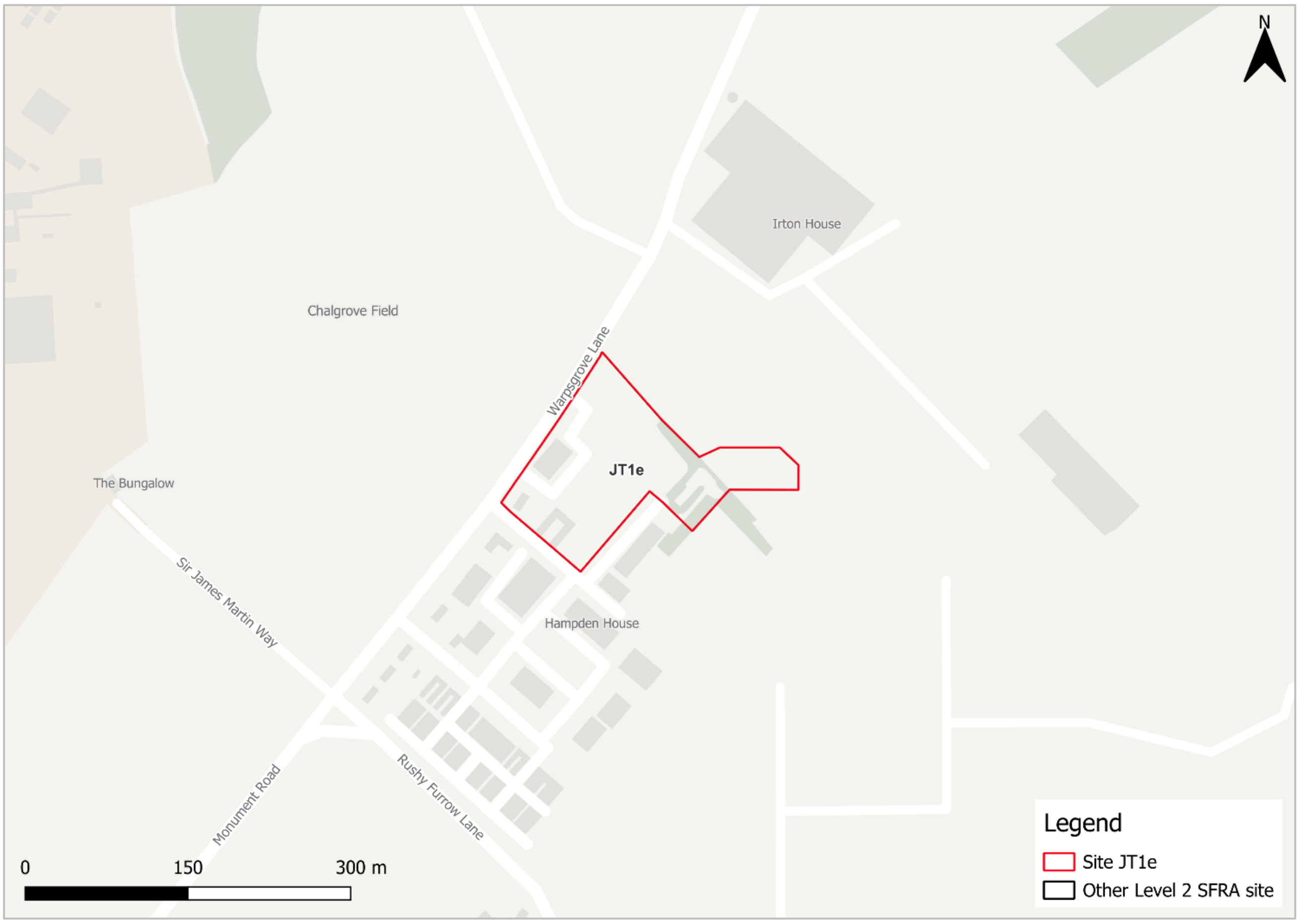

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the east at approximately 79mAOD. The lowest ground levels are located within the existing pond in the south of the site, at approximately 74mAOD.

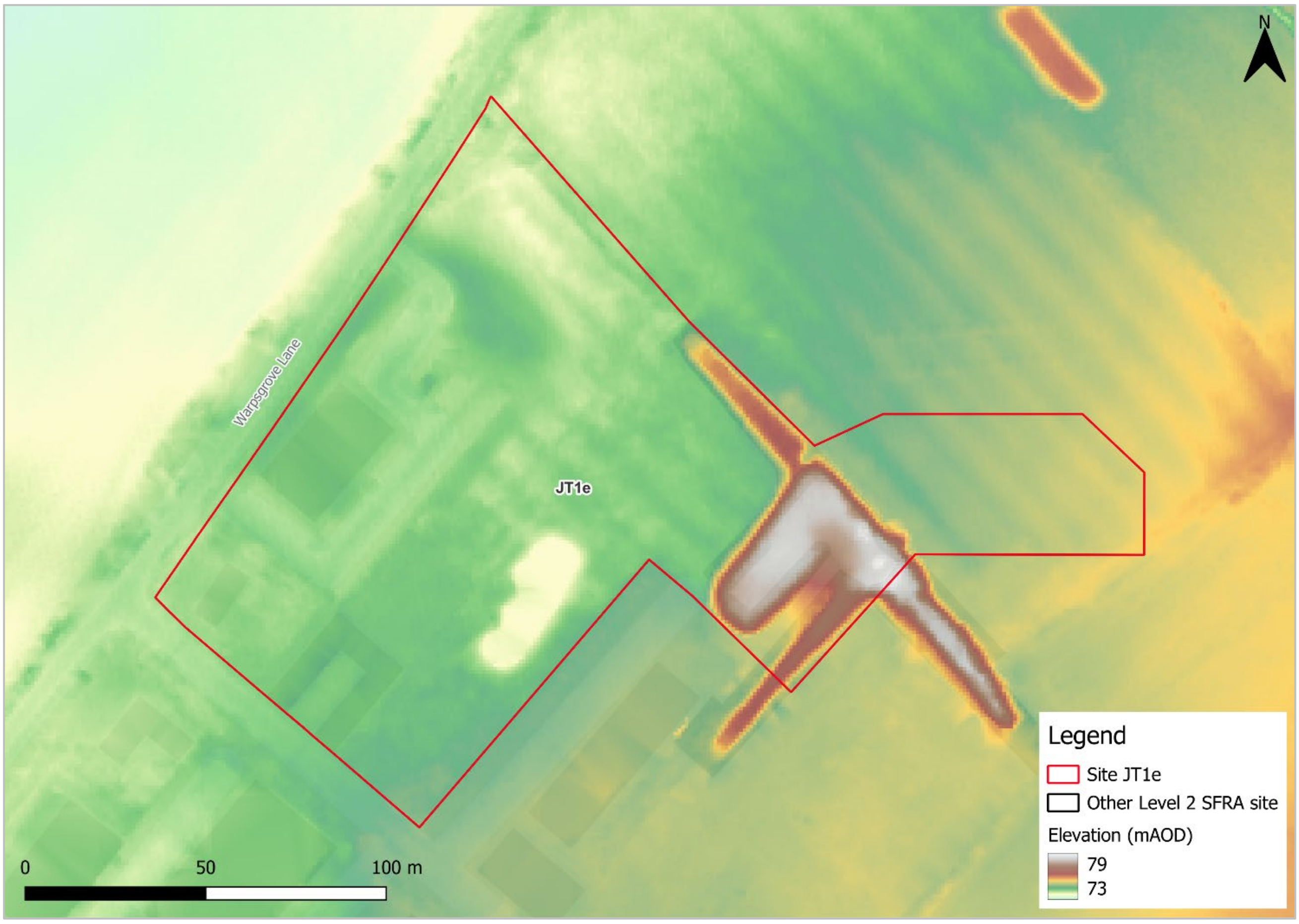

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

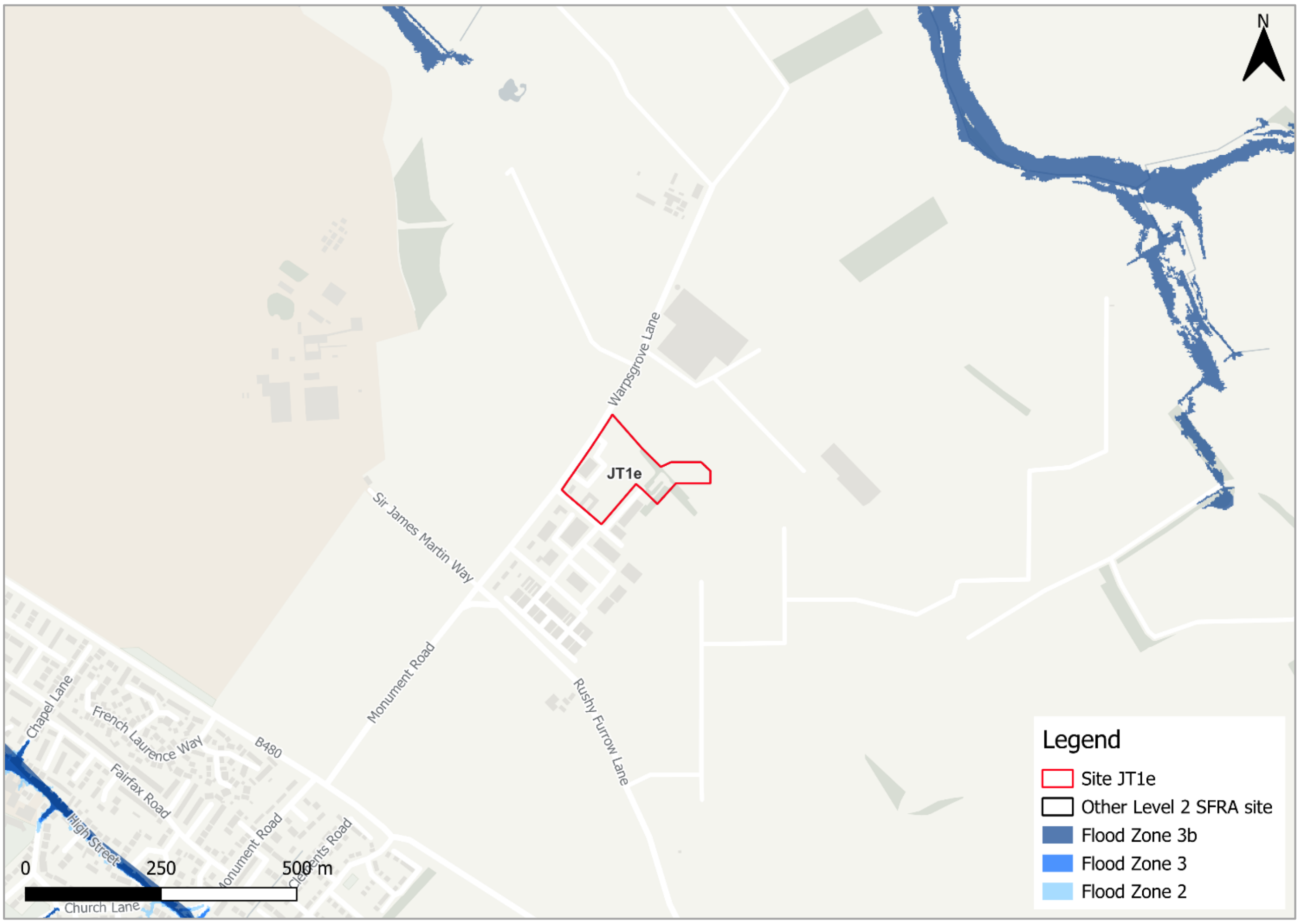

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site JT1e (Monument Business Park, Chalgrove) is located within one catchment, namely; Haseley Brook. This is ranked as a low sensitivity catchment. Planning considerations that apply to all sites in relation to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Within the site, there is significant potential for tree planting to slow floodwaters, reduce flood peak height and reduce sediment delivery to the watercourse. There is also potential for runoff attenuation features to reduce the speed of flooding downstream. These areas are shown on Figure 2-2.

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is not modelled to be at risk of flooding from reservoirs.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Based on the FMfP, safe access and escape routes should be achievable via Warpsgrove Lane to the west of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly low. Approximately 9% of the site is within the high risk surface water flood zone. A further 6% is at medium surface water risk, and a further 26% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is confined to a distinct flow path through the centre of the site. This develops into a large area of ponding within the north of the site. In the low risk event, the extent of surface water flood risk is more significant, with a large area within the centre of the site impacted.

Greatest flood depths in the high risk event are between 0.3 and 0.6 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Warpsgrove Lane in the high and medium risk events. Safe access and escape may be challenging to achieve in the low risk event.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
59	26	6	9

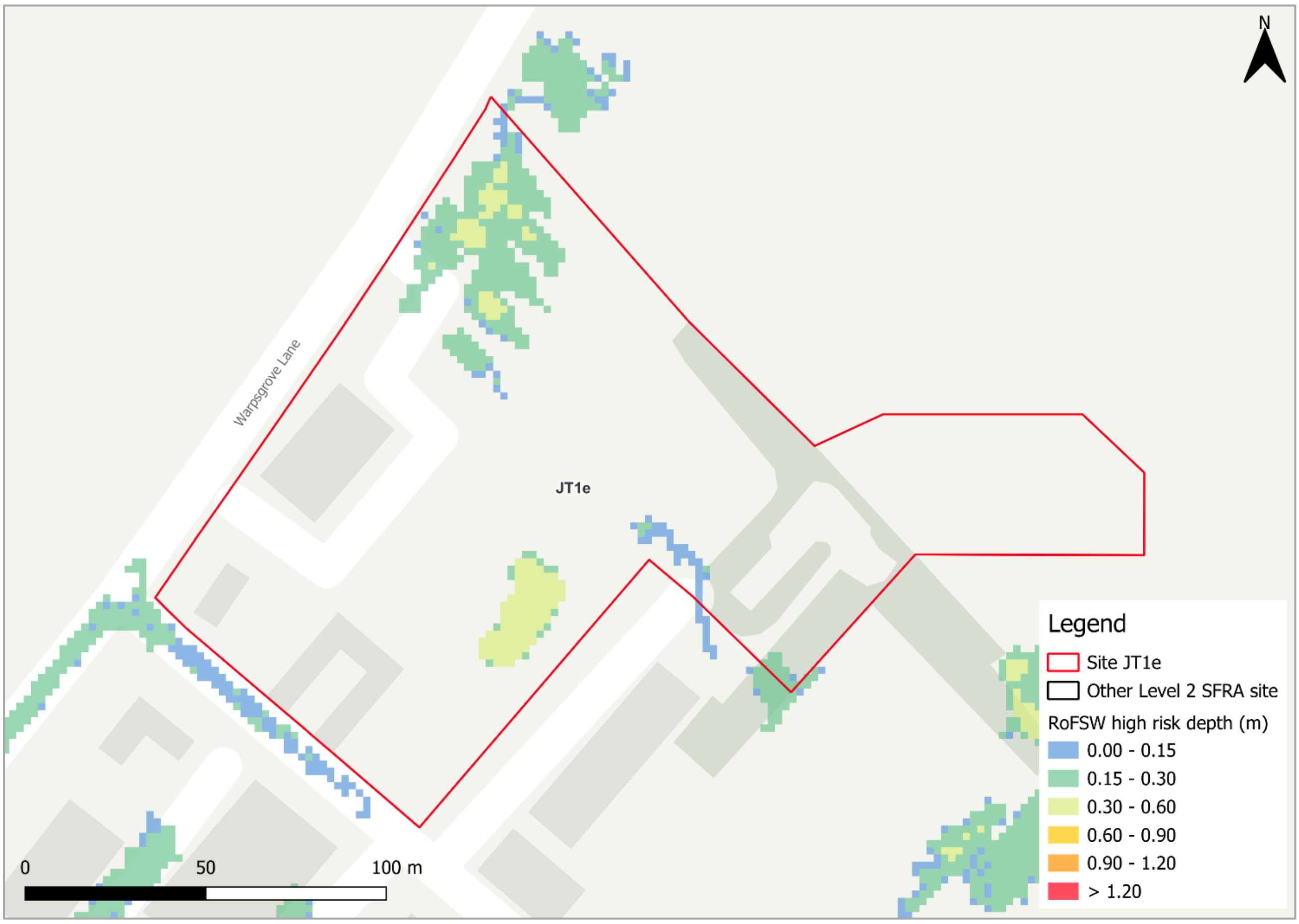

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

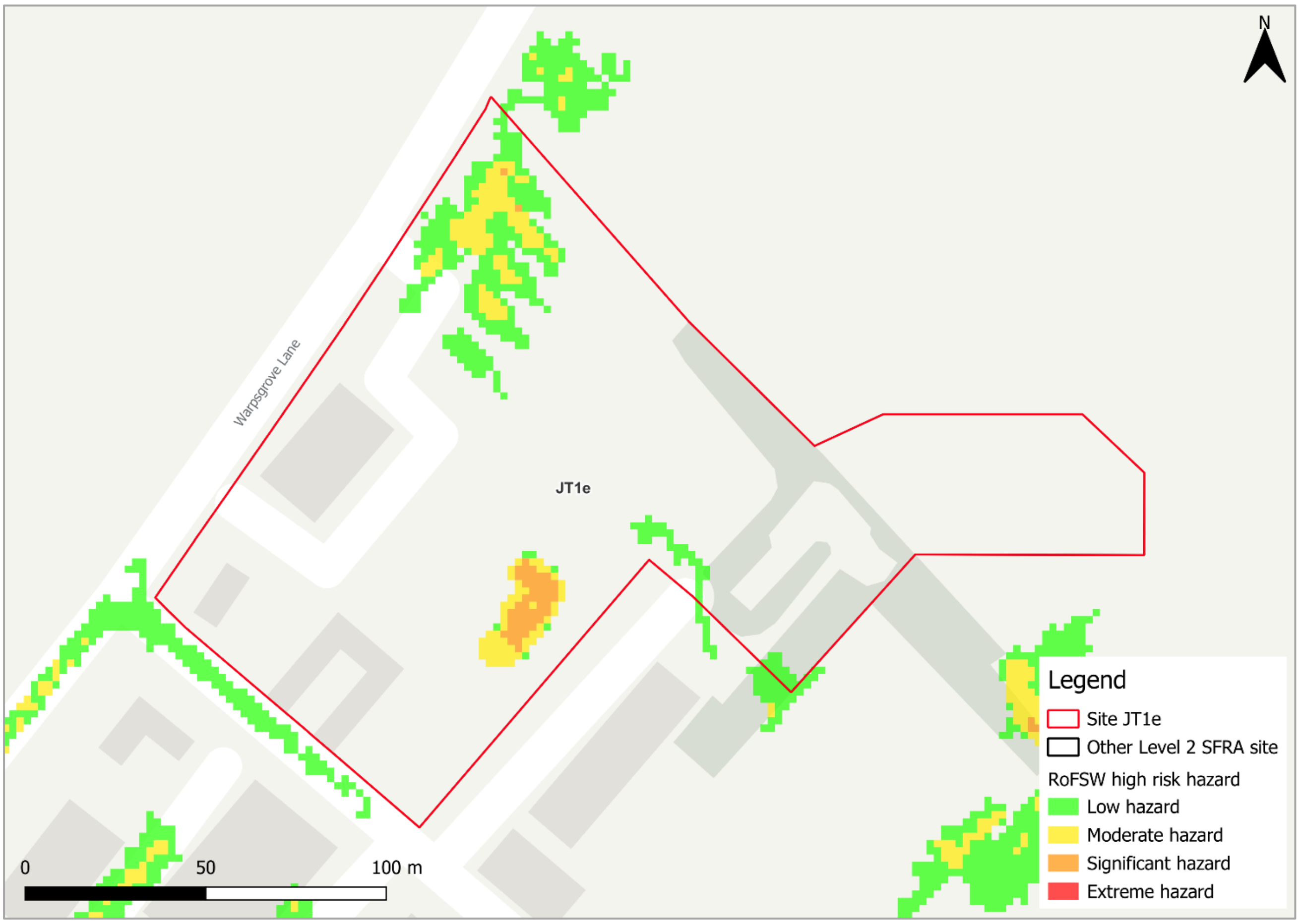

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a greater extent and depth of flooding along the flow path through the site. Maximum flood depths are modelled to be between 0.6 and 0.9 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

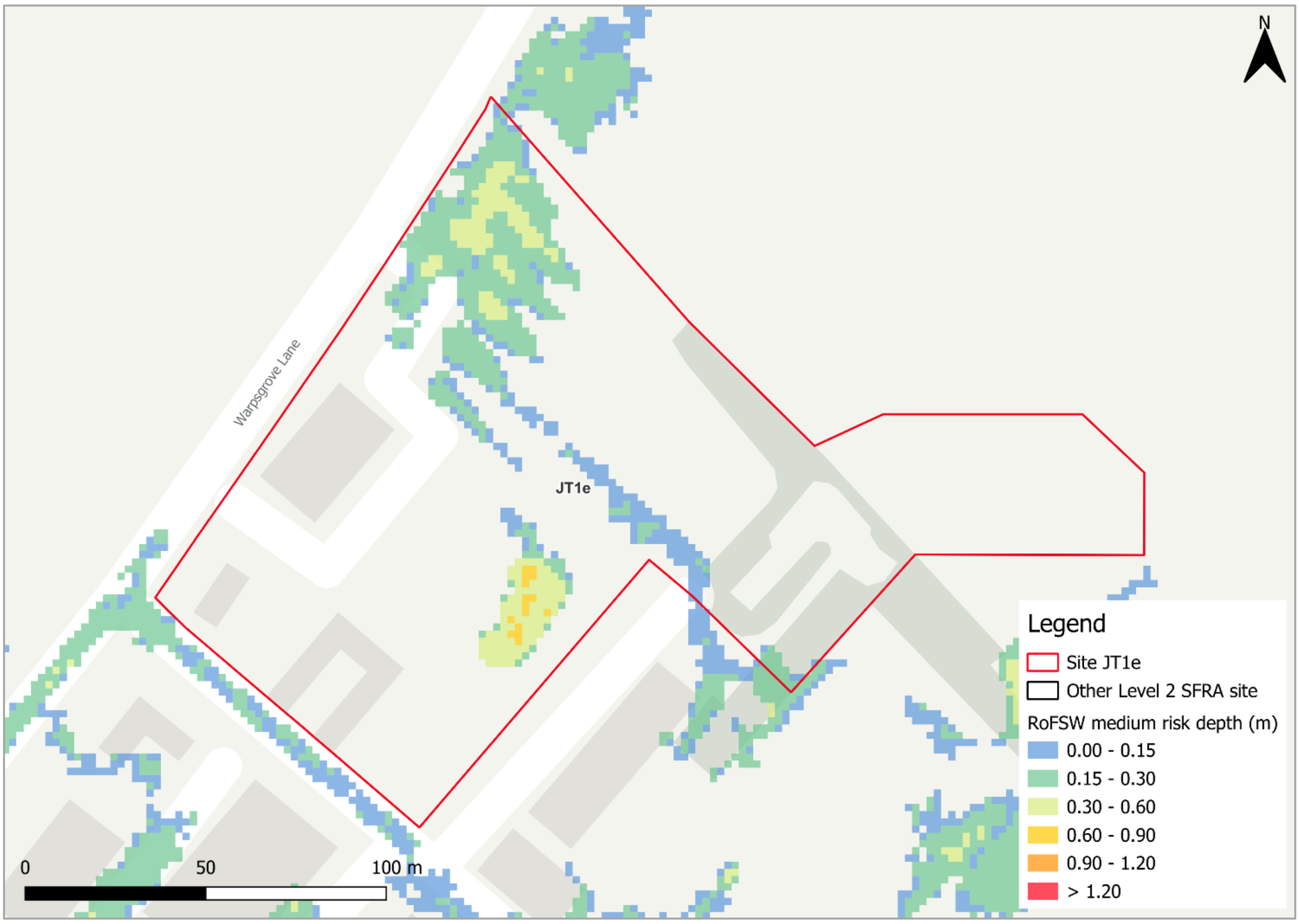

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

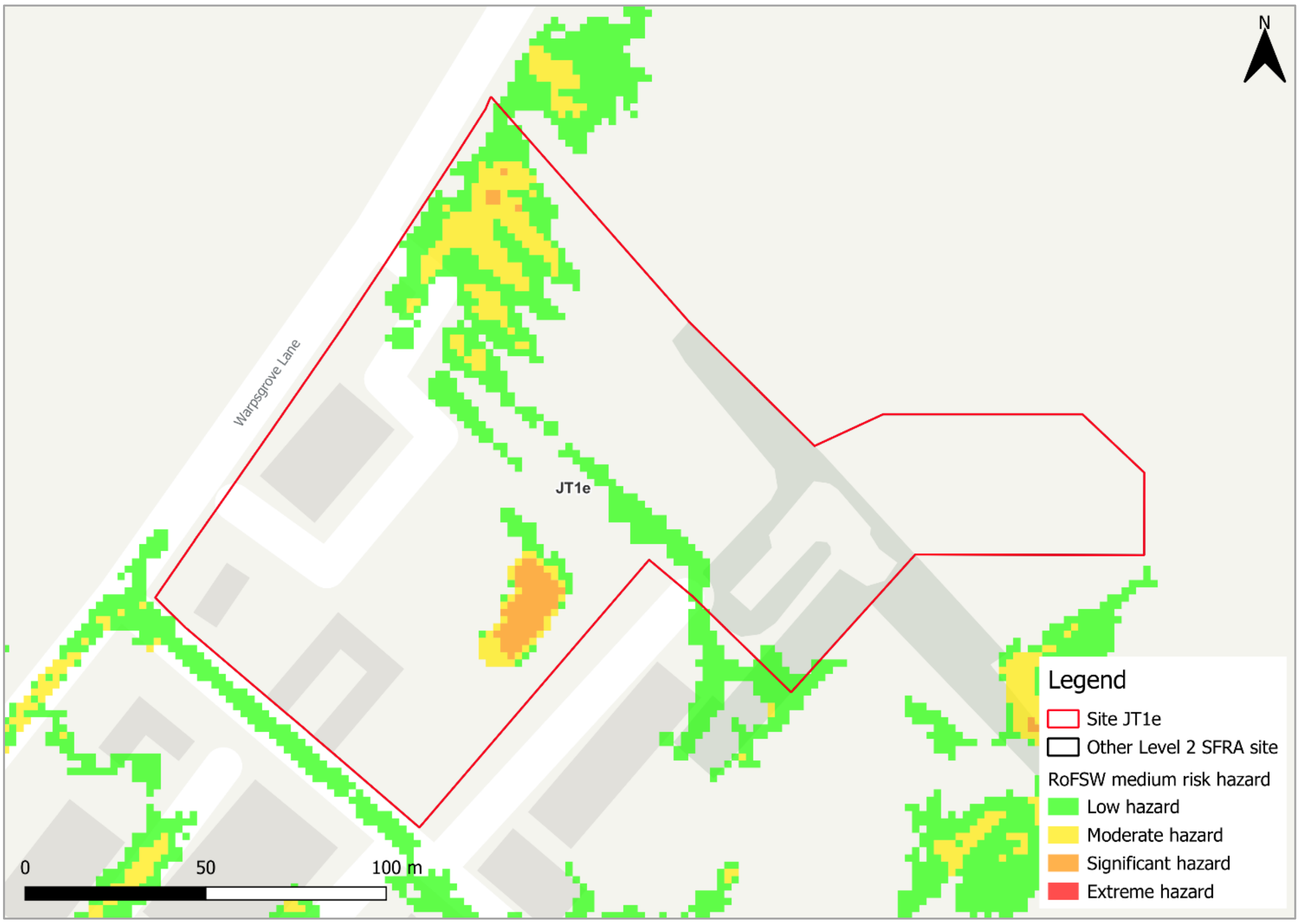

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly low, with approximately 26% of the site being at low risk. Surface water risk in the high and medium risk events is present along a distinct flow path through the centre of the site, with an area of larger ponding within the north of the site. Any existing flow paths should be maintained in site design.
- Surface water risk in the low risk event is significantly greater, encompassing a large area within the centre of the site. Safe access and escape routes must be considered further to ensure site users can escape during the extreme event.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater extent and depth of flooding along the flow path through the centre of the site.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.

- Ideally, any development would avoid the surface water flow path through the centre of the site in the high and medium risk events, subject to detailed modelling through a drainage strategy.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed development or whether further capacity will be required.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site JT1e (Monument Business Park, Chalgrove) and the surrounding areas and Table 4-1 explains the risk classifications.

The entirety of the site is in an area where there is a risk of groundwater flooding to both surface and subsurface assets. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess surface water risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated if development avoids the area at modelled surface water flood risk in the high and medium risk events. However, were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large proportion of the site at surface water risk.
- Groundwater conditions must be investigated further.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.

[3] Para 170 National Planning Policy Framework 2023

- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site JT1f - Abingdon Science Park

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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Contract

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This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

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List of Tables

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site JT1f - Abingdon Science Park. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site JT1f - Abingdon Science Park

- Location: Abingdon Science Park (Figure 1-1)
- Existing site use: Brownfield; employment
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 16.7 ha. Allocation for the JLP is 0.7 ha of the total site area.
- Proposed development impermeable area: 14.2 ha / 0.6 ha JLP allocation area (assumed 85% of site area)
- EA model: Thames (Sandford to Pangbourne) 2018
- Watercourse: River Thames / Radley Park Ditch. An unnamed drain flows out of the south of the site.
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation A)
    - Assess present day modelled fluvial depths, hazards
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels are located towards the east of the site at approximately 55mAOD. The lowest ground levels in the site are located within the west, adjacent to the Radley Park Ditch, at approximately 51mAOD.

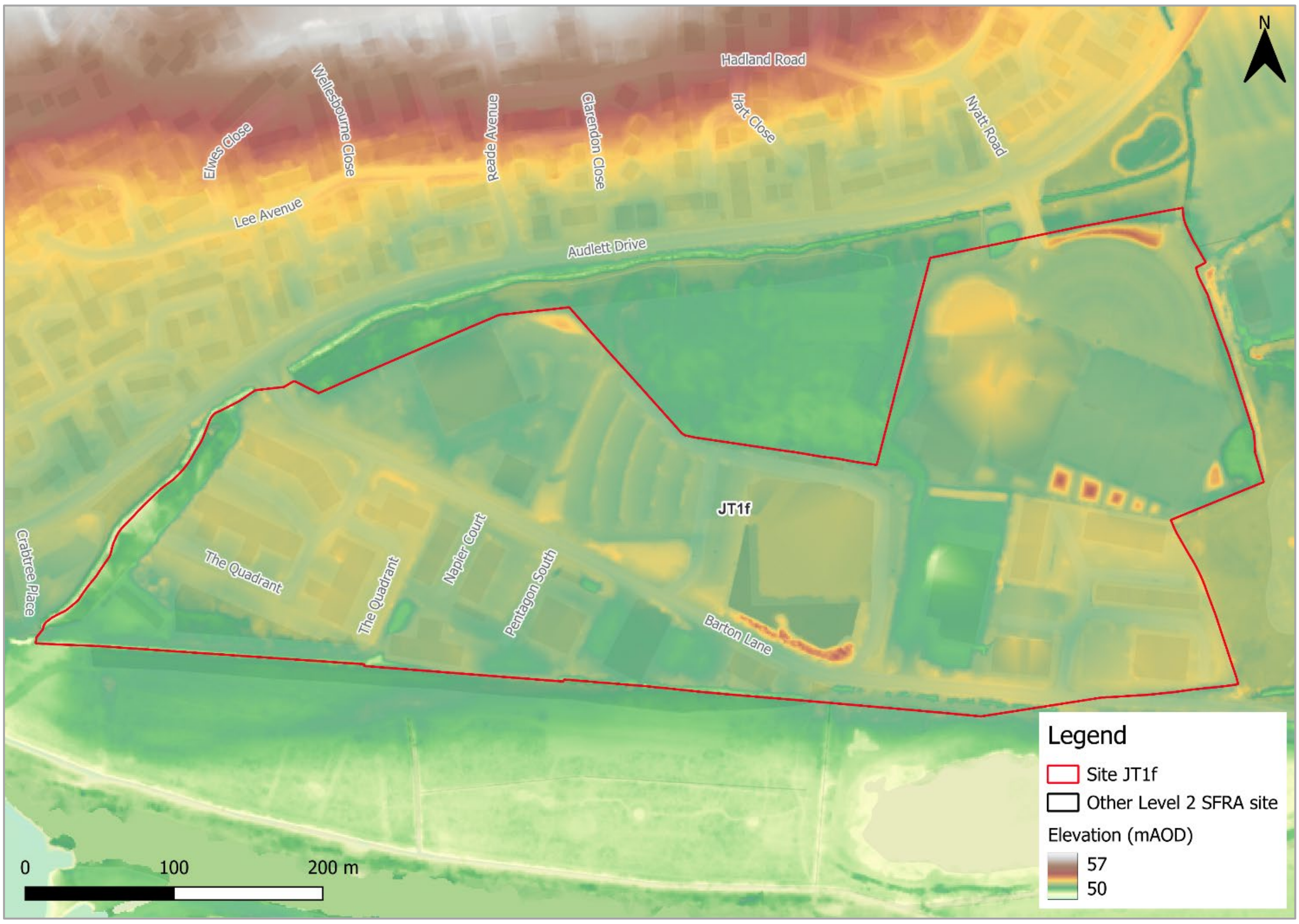

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The areas along the western and southern boundaries of the site are located within Flood Zone 3b. The area of functional floodplain onsite should be left free of vulnerable development. The functional floodplain in this location is based on the 3.3% AEP undefended event from the Thames (Sandford to Pangbourne) 2018 model and the 1% AEP Risk of Flooding from Surface Water (RoFSW) extent. There are some additional areas of fluvial risk to the west and south of the site within Flood Zone 3a and Flood Zone 2.

Note that modelled flood depths and hazards along Radley Park Ditch were not available for consideration within this Level 2 SFRA. Any site-specific FRA should include detailed flood modelling of this watercourse.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
87	10	1	2

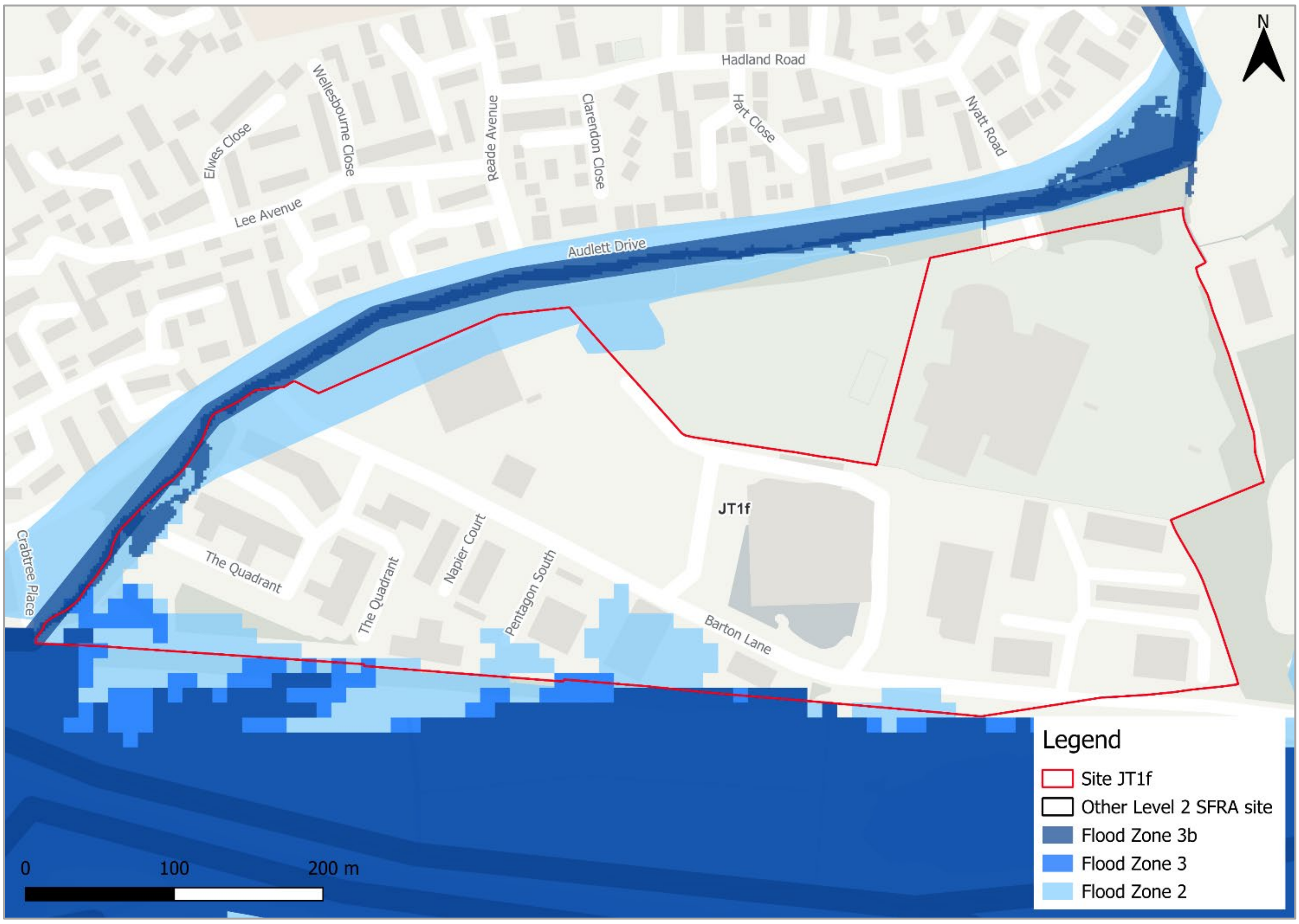

Figure 2-1: Existing risk from rivers to the site

2.1.2 Thames (Sandford to Pangbourne) 2018 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is similar to Flood Zone 3 in the vicinity of the site, with the area along the southern boundary of the site modelled to be at risk. Maximum flood depths within the site are modelled to be between 0.3 and 0.6m. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard in the area of the site at fluvial flood risk is largely categorised as 'Very low'. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event.

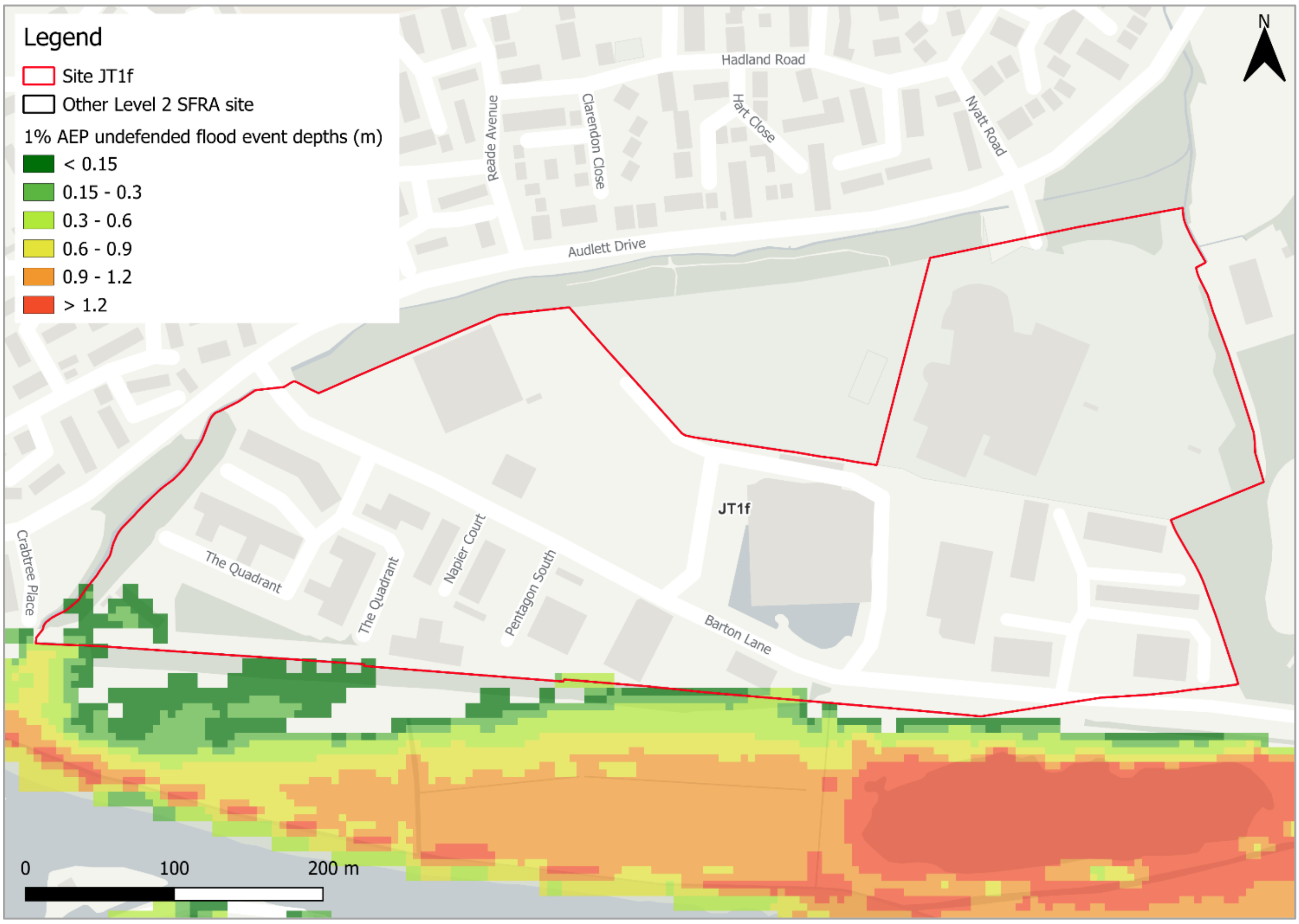

Figure 2-2: Flood depths for 1% AEP undefended flood event

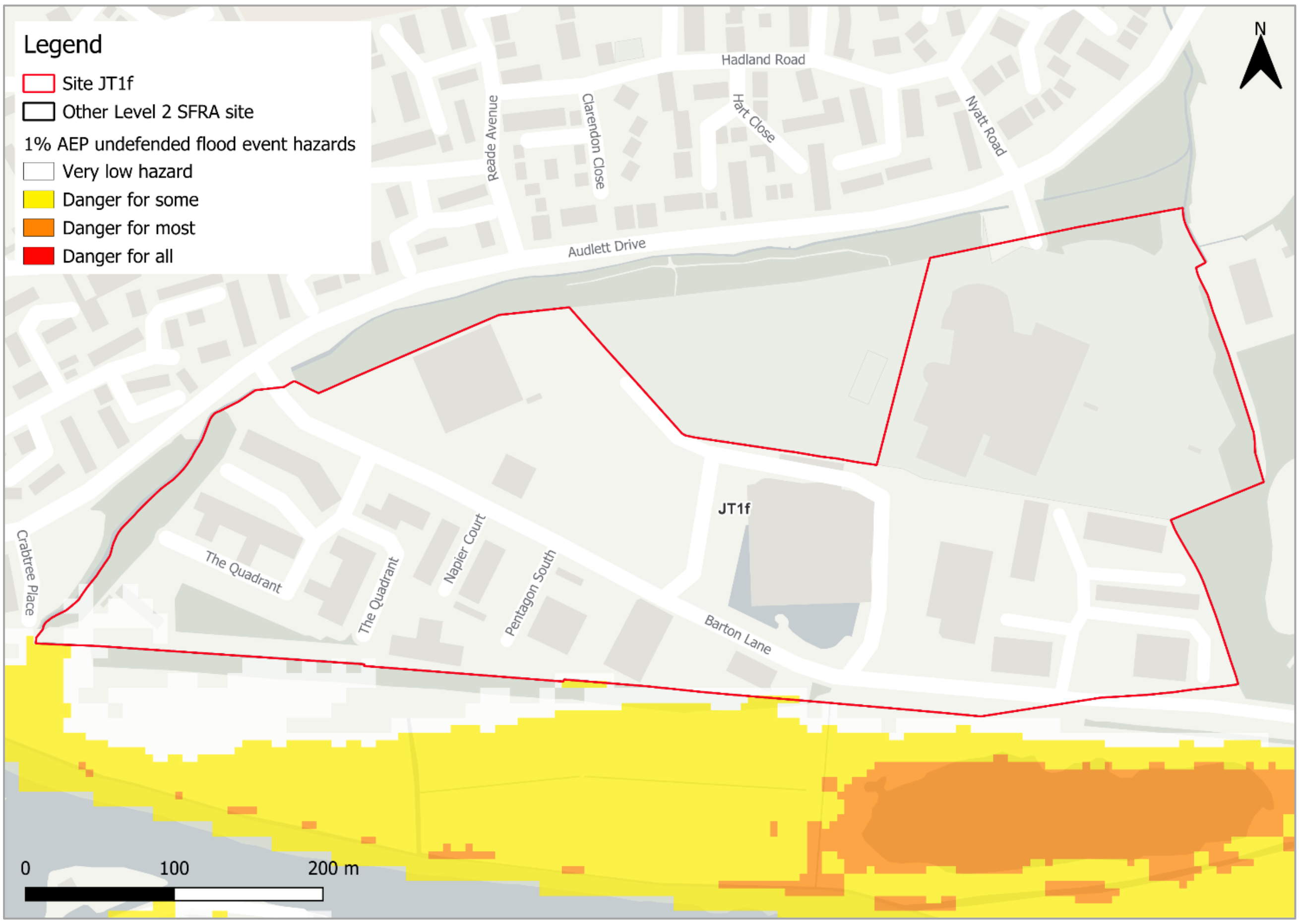

Figure 2-3: Flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from the River Thames has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled 0.1% AEP undefended event can be used as a precautionary proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to be greater in extent to the present day Flood Zone 3, with some additional areas of risk along the western boundary of the site. Maximum depths are modelled to be between 0.9 and 1.2 m (Figure 2-4) with areas of hazard classified as 'Danger for some' (Figure 2-5).

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform whether the site can be safe for its lifetime. Therefore, any updates to this Level 2 SFRA and/or any site-specific FRA produced to inform a planning application should include the most up to date climate change allowances.

[1] Fluvial hazard ratings based on Table 4 of the Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008. Environment Agency.

Figure 2-4: Flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

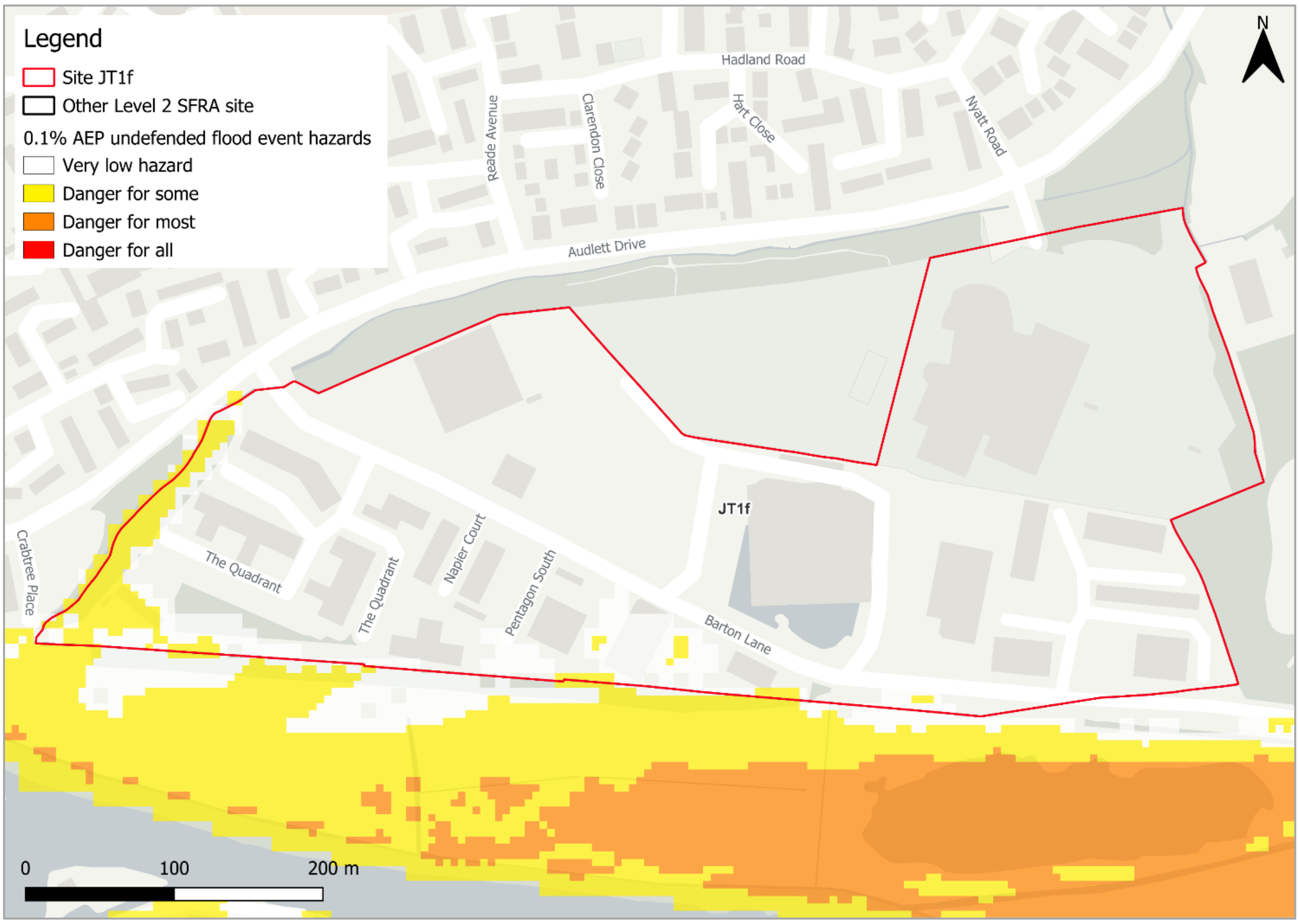

Figure 2-5: Flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

Flood defences are in place along the left bank of Radley Park Ditch, as shown in Figure 2-6. Information provided in the EA's 'Spatial Flood Defences' dataset states that this defence is a raised embankment with a design Standard of Protection (SoP) of 5 years. Actual SoP is unknown. Current condition is also unknown. The dataset states that a private individual, company or charity owns and maintains the defence.

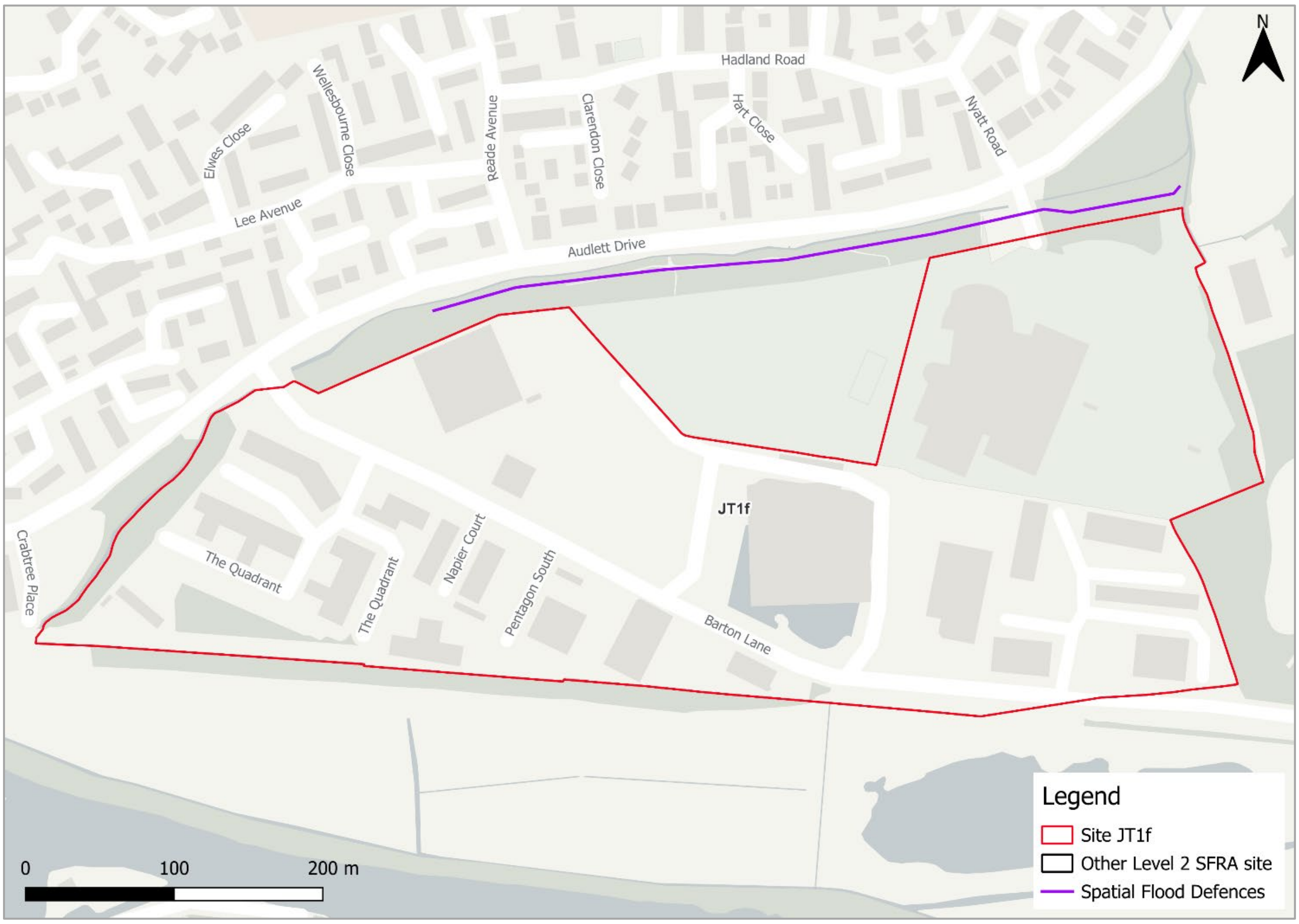

Figure 2-6: EA Spatial Flood Defences dataset

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site JT1f (Abingdon Science Park) is located within one catchment, namely; Thames (Evenlode to Thame). This is ranked as a higher sensitivity catchment. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Upstream of the site, there is potential to reconnect the channel to the floodplain, allowing flood water to be stored. Within the site, there are opportunities for runoff attenuation features to slow the rate of flood waters downstream. Within the Thames floodplain, there is significant potential for tree planting to slow floodwaters, reduce flood peak height and reduce sediment delivery to the watercourse. These areas are shown in Figure 2-7.

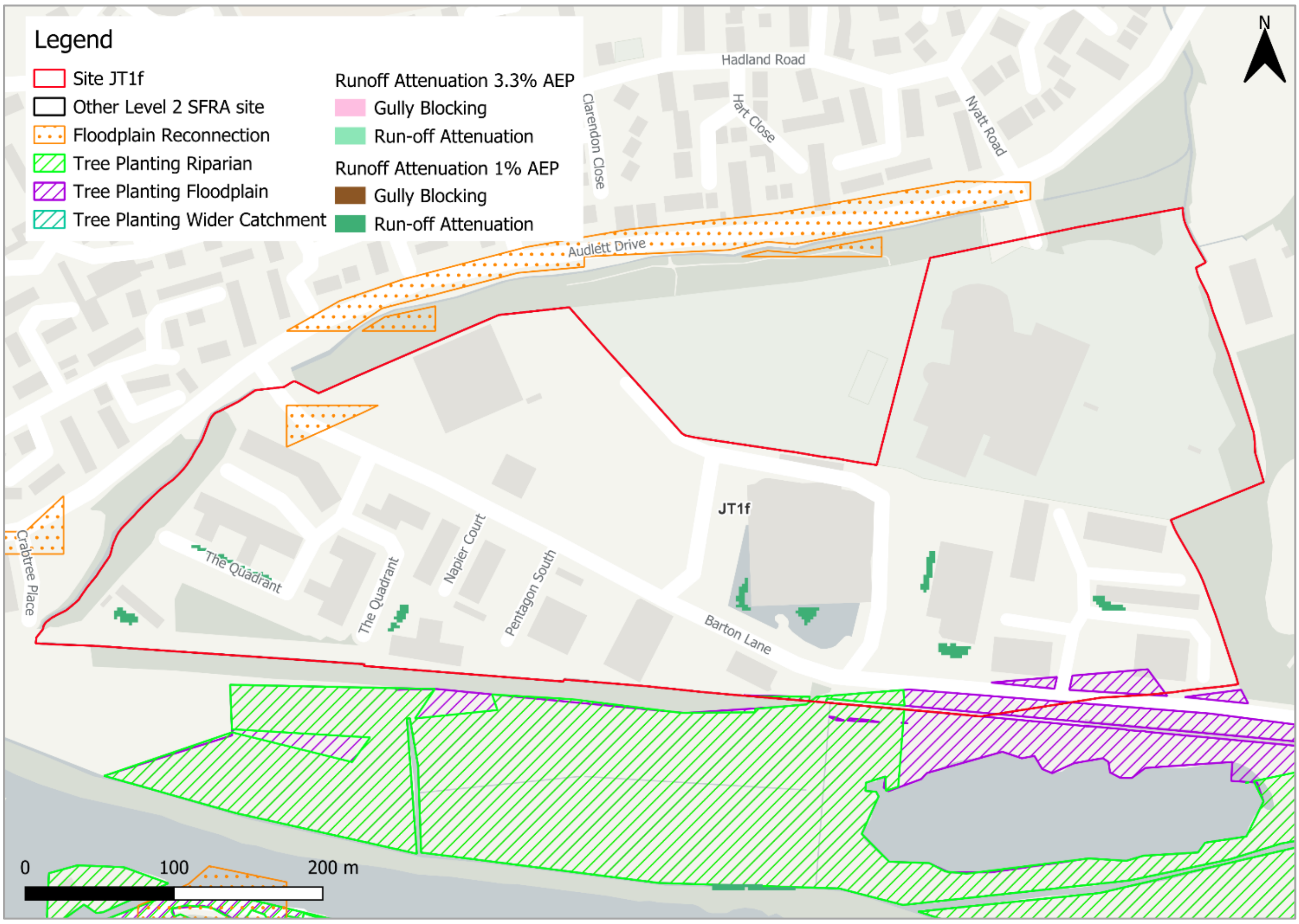

Figure 2-7: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

There is potential residual risk to the site from a possible blockage of Radley Park Ditch along the northern boundary of the site (Figure 2-8). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA, as there is no existing flood model for the watercourse. There is also potential residual risk to the site from a possible breach of the defence along the left bank of Radley Park Ditch.

It is recommended that the site-specific FRA should consider the impact of the potential blockage and breach locations on residual flood risk to the site.

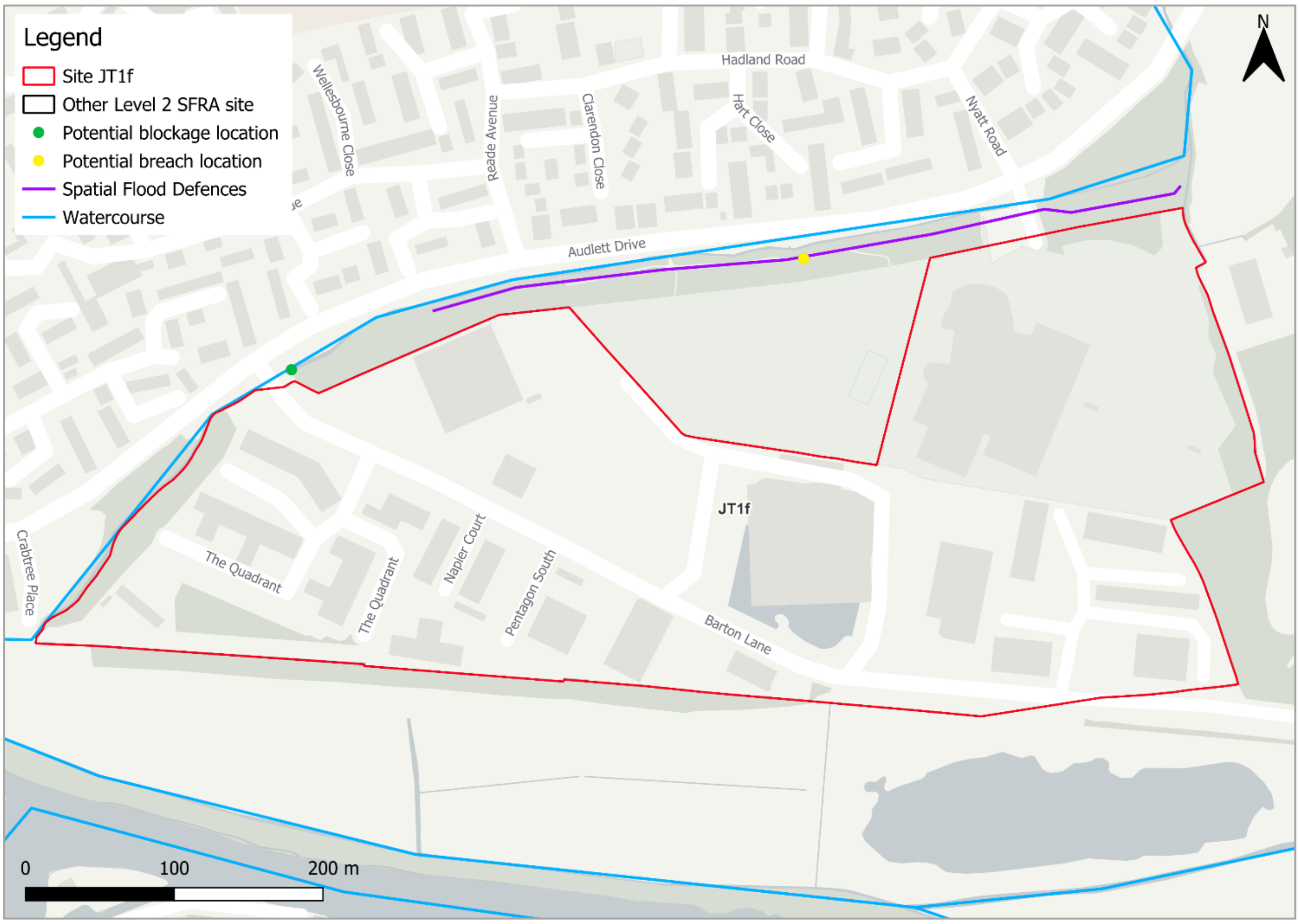

Figure 2-8: Potential culvert blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. Figure 2-9 shows the RFM in a "dry day" and "wet day" scenario. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is potentially at risk from two reservoirs which are located in Oxfordshire, namely Farmoor No.1 and Farmoor No.2. The site is also potential at risk from one reservoir located within West Northamptonshire, namely Banbury FAS.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required.

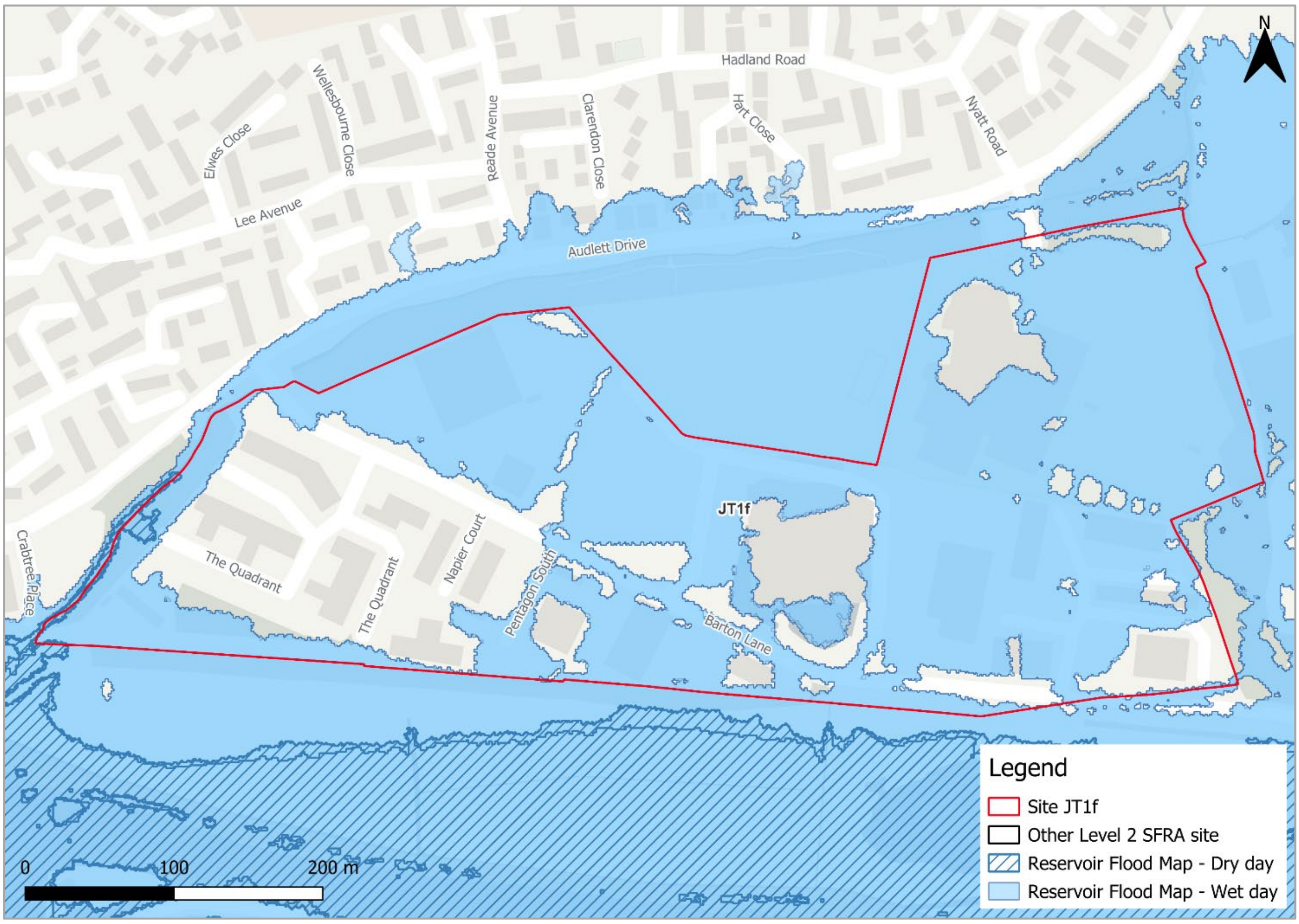

Figure 2-9: Flood risk from reservoirs

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. Historic risk to the site is shown in Figure 2-10 which shows that the area along the north western boundary of the site has been subject to flooding in the past. The RFO dataset references that this area was subject to flooding in Autumn 1992 due to fluvial flooding from the Radley Park Ditch.

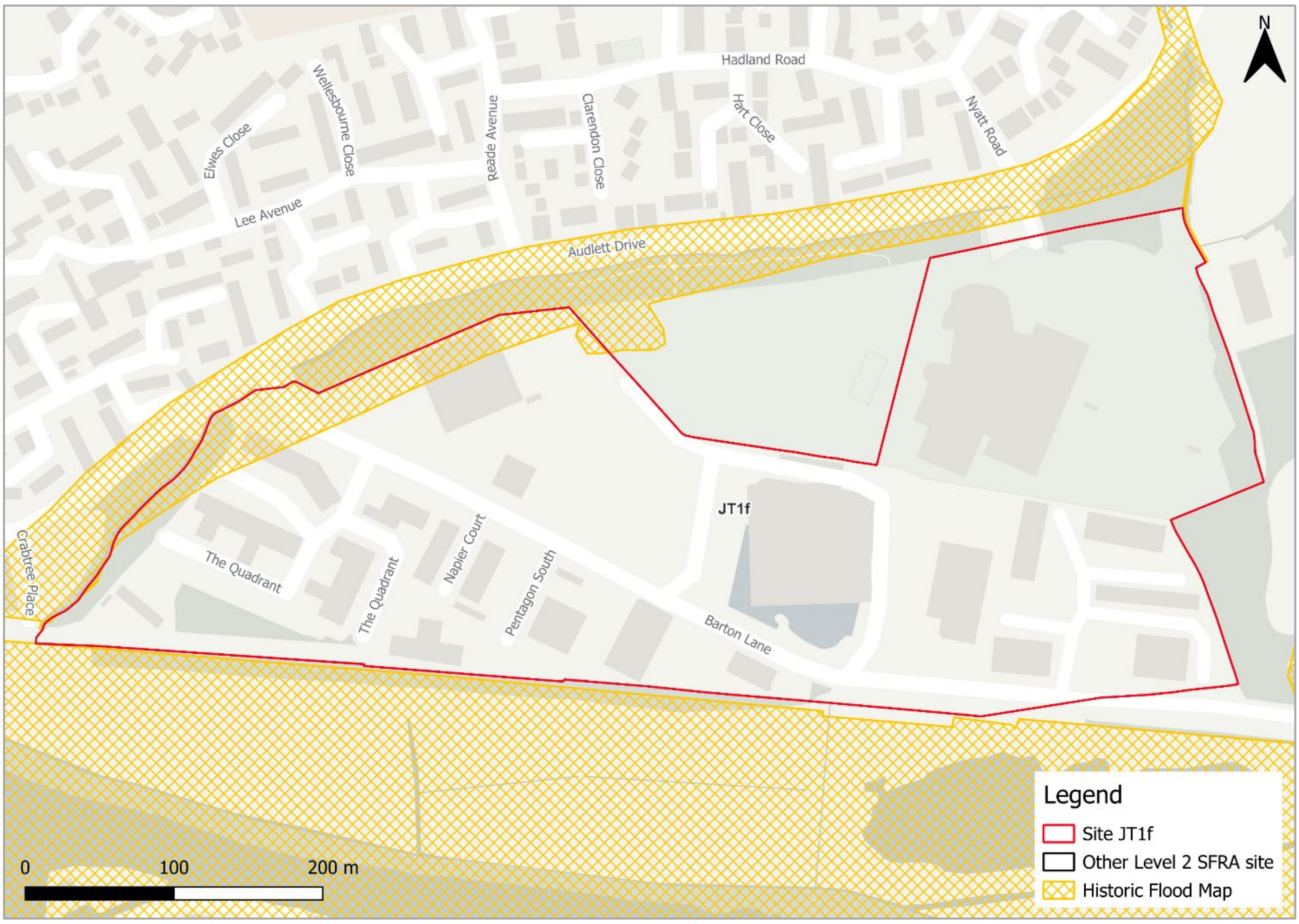

Figure 2-10: Recorded historic flood events onsite and around the site

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. Site JT1f (Abingdon Science Park) is partially located within one FWA; 061FWF23Abingdon - River Thames in Abingdon, as shown on Figure 2-11.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is also located within a FAA, namely 061WAF23Abingdon - River Thames for the Abingdon area.

Based on the FMfP and modelled flood depths and hazards, safe access and escape routes may be challenging to achieve via existing road infrastructure. Routes via the east of the site should be explored.

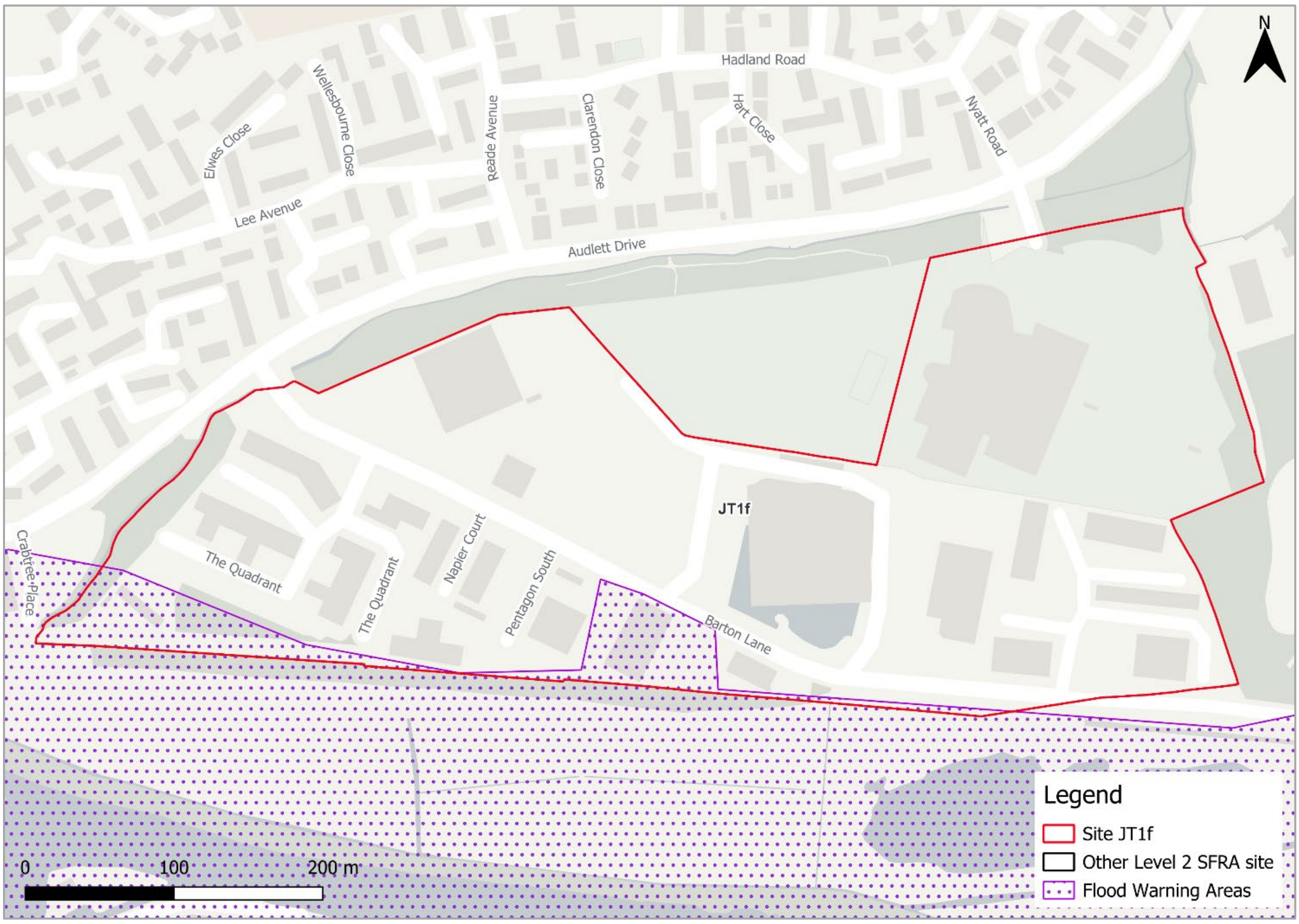

Figure 2-11: EA Flood Warning Areas

2.7 Observations, mitigation options and site suitability - fluvial

- The site is modelled to be within the functional floodplain along the western and southern boundaries of the site. Vulnerable development is not permitted within the functional floodplain.
- There should be no development within 8m of the Radley Park Ditch apart from permitted access. The EA recommend for an 8m no development buffer for all main rivers to enable access for maintenance activities. If feasible, this area would be used as a green / blue corridor which can provide ecological, social and amenity value.
- A flood risk activity permit may be required if development is planned within 8m of the riverbank. The EA can advise on whether a permit will be required.
- The site is partially located in Flood Zone 3, as indicated by the EA's Flood Map for Planning and the Thames (Sandford to Pangbourne) 1% AEP undefended event outputs. Greatest depths within the site boundary are modelled to be between 0.3 and 0.6m.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a precautionary estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain be greater in extent to

the present day Flood Zone 3, with areas of greater depths. However, climate change must be modelled at the site-specific FRA stage.

- It would be acceptable to use updated climate change modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Any site-specific FRA should also include for detailed flood modelling of Radley Park Ditch to inform flood depths and hazards along the western boundary of the site.
- The EA flood warnings should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape routes are available from several locations based on current information.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly low. Approximately 0.2% of the site is within the high risk surface water flood zone. A further 3.2% is at medium surface water risk, and a further 34.4% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is largely confined to small areas of ponding in topographic low spots scattered across the site. Risk is constrained by the existing development within the site. In the low risk event, surface water risk across the site is significant. Greatest flood depths in the high risk event range between 0.6 and 0.9m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via Barton Lane in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
62.2	34.4	3.2	0.2

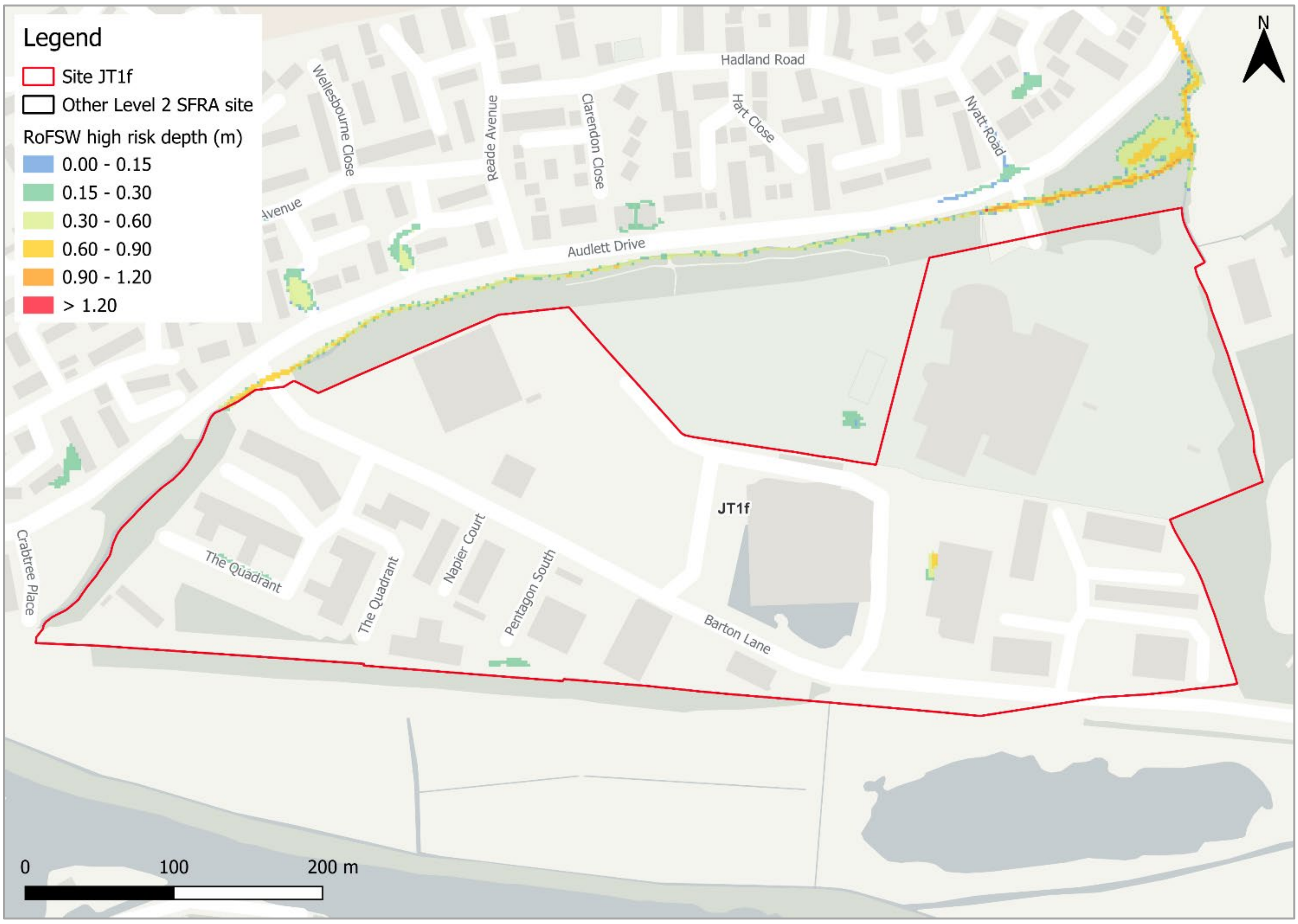

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

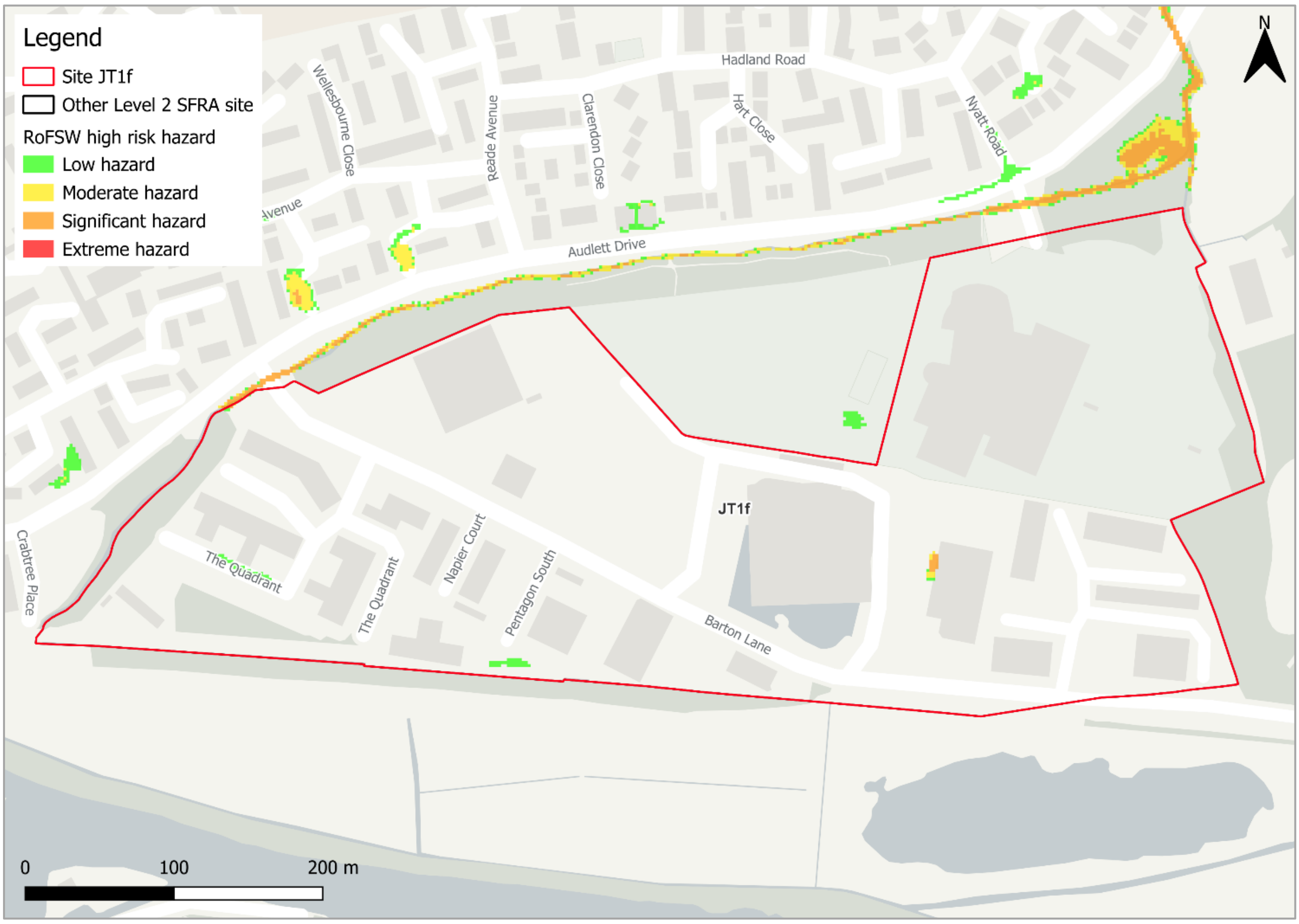

Figure 3-2: High risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with greater areas of ponding in the topographic low spots. Maximum flood depths are modelled to be between 0.9 and 1.2m, with areas of significant hazard (Figure 3-4).

[2] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

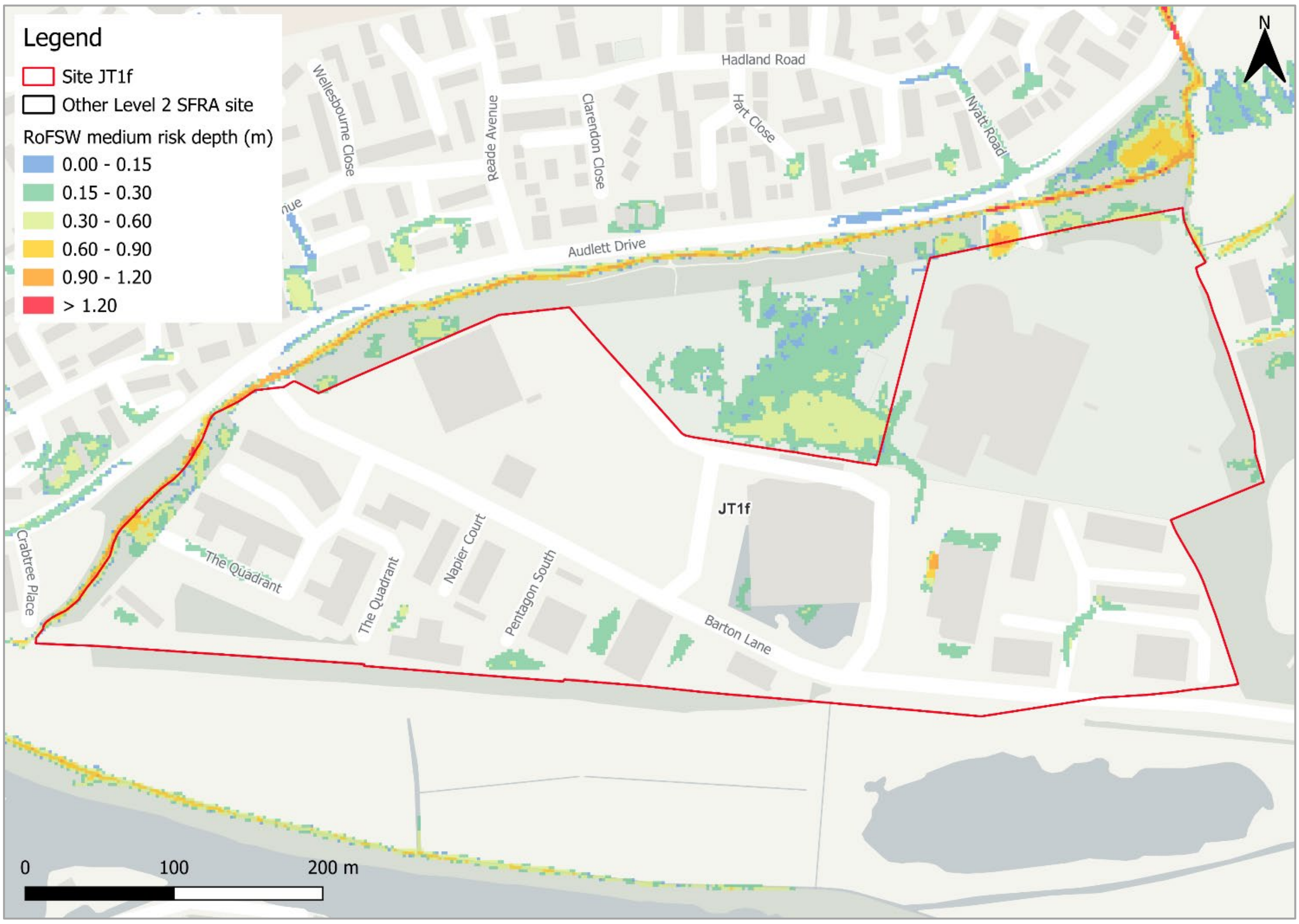

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly low, with a significant area of the site at risk in the low risk event. Surface water risk in the high and medium risk events is confined to small areas of ponding within topographic low spots scattered across the site. Risk is constrained by the existing development within the site.
- In the low risk surface water event, a large area within the centre of the site is modelled to be at risk.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with a greater area of ponding within the topographic low spots.
- The impact of climate change on surface water should be considered further through a site-specific FRA and / or an update of this Level 2 SFRA.
- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed development or whether further capacity will be required.

- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 shows the map for Site JT1f (Abingdon Science Park) and the surrounding areas and Table 4-1 explains the risk classifications.

Across the majority of the site there is a negligible risk of groundwater flooding. Within the south and west of the site, there is a risk of flooding to both surface and subsurface assets. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

Figure 4-1: JBA 5m Groundwater Flood Map

[3] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- There should be no development within 8m of Radley Park Ditch apart from permitted access. The EA recommend for an 8m no development buffer for all main rivers to enable access for maintenance activities. This should be used as a blue / green corridor to provide ecological, amenity and social value.
- Updated climate change modelling of the River Thames and Radley Park Ditch should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated in the Joint Local Plan if development avoids the area at modelled fluvial risk in the 0.1% AEP undefended event.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from the River Thames is fully ascertained.
- A detailed drainage strategy will be required for any new development, given the large area of the site.
- Groundwater conditions must be investigated further through the site-specific FRA.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.

[4] Para 170 National Planning Policy Framework 2023

- Any site-specific FRA should be carried out in line with the NPPF, FRCC-PPG, EA guidance, South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies, and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable: the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site JT1i - Former Esso Research Centre

Final Report

September 2024

Prepared for:

South Oxfordshire District Council and

Vale of White Horse District Council

www.jbaconsulting.com

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JBA Project Code	2024s0278

This report describes work commissioned by South Oxfordshire and Vale of White Horse District Councils. The Client's representative for the contract was Rebekah Goodwill of South Oxfordshire and Vale of White Horse District Councils. Laura Thompson of JBA Consulting carried out this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for South Oxfordshire and Vale of White Horse Joint Local Plan Site JT1i - Former Esso Research Centre. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA' (2024) and read the 'South Oxfordshire and Vale of White Horse District Councils Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site JT1i - Former Esso Research Centre

- Location: Former Esso Research Centre (Figure 1-1)
- Existing site use: Brownfield
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 11.01 ha
- Proposed development impermeable area: 9.4 ha (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the west at approximately 102mAOD. The lowest ground levels are located towards the north east of the site at approximately 95mAOD.

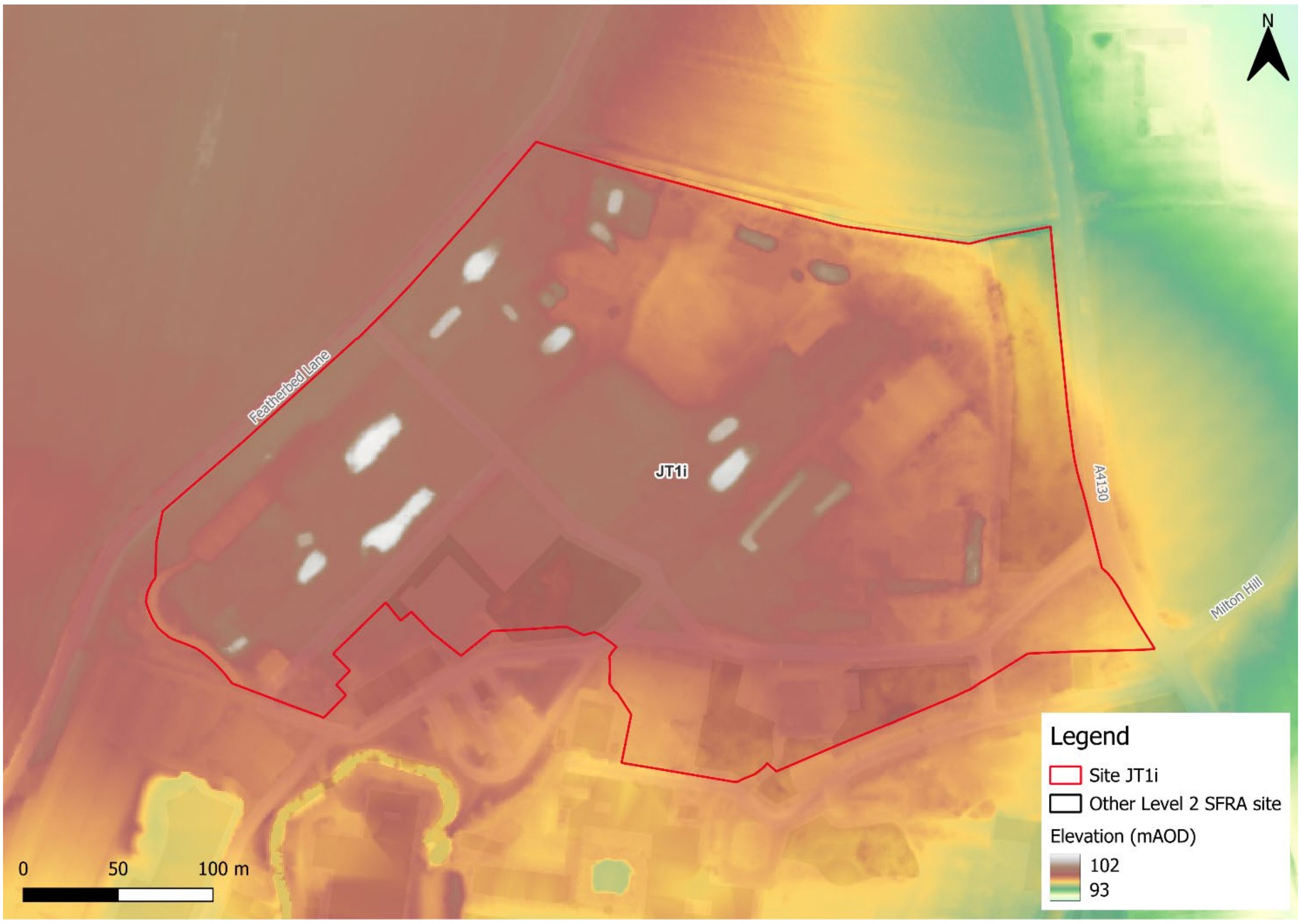

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA, the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impacts of climate change on fluvial flood risk have not been modelled for this SFRA, however given the proximity of the site to the existing present day flood zones, it may be unlikely that the site will be at risk of fluvial flooding in the future.

2.3 Flood risk management

The site doesn't benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.3.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site JT1i (Former Esso Research Centre) is located within two catchments, namely; Moor Ditch and Ladygrove Ditch and Ginge Brook and Mill Brook. The entirety of the site is located within higher sensitivity catchments. Planning considerations for sites at higher sensitivity to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.3.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Within the site, there are opportunities for tree planting to reduce runoff. This area is shown in Figure 2-2.

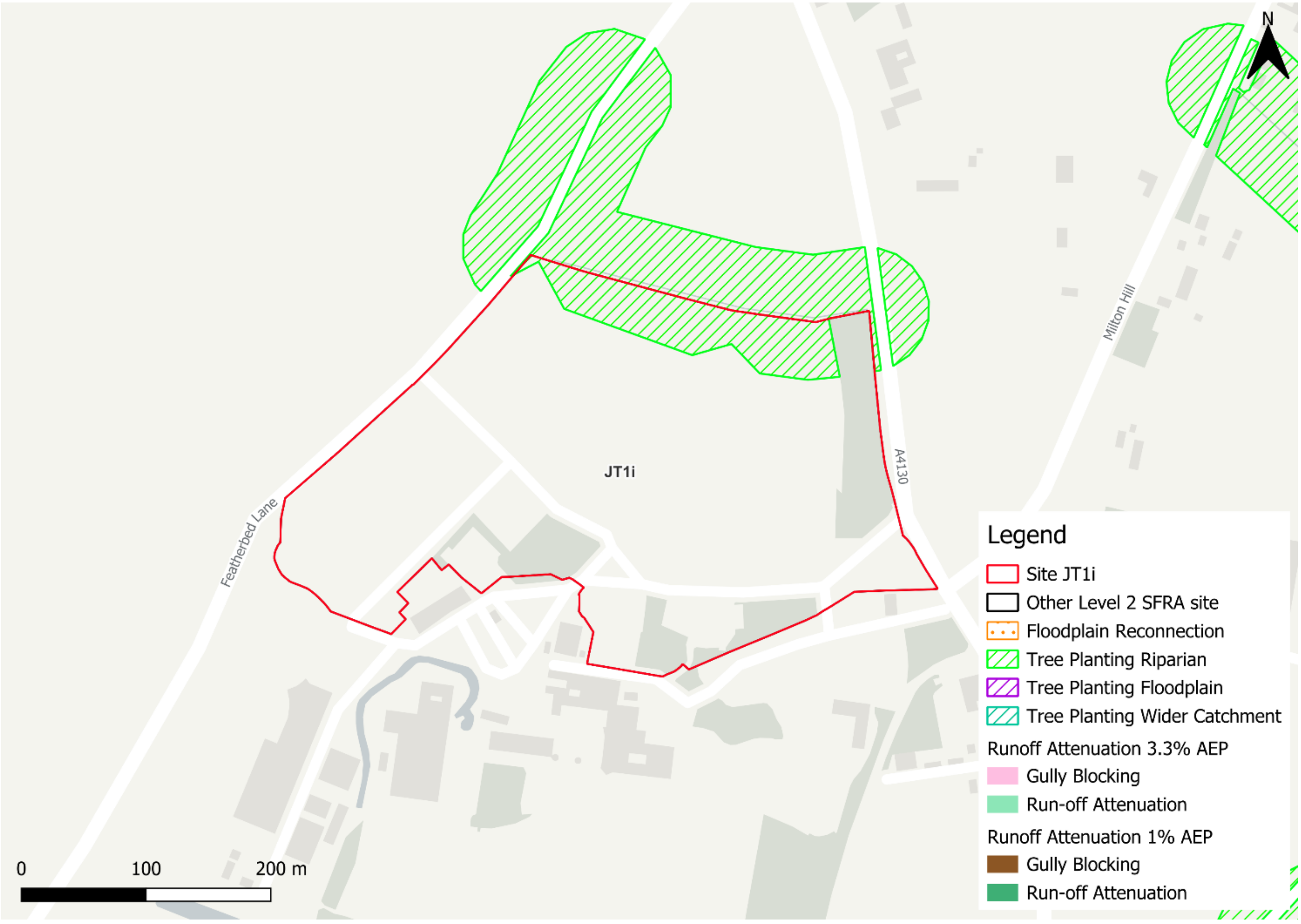

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.4 Residual risk

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

The site is not modelled to be at risk from reservoir flooding.

2.5 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.6 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Safe access and escape routes should be achievable via Featherbed Lane to the west of the site.

2.7 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 0.1% of the site is within the medium risk surface water flood zone. A further 2% is at low surface water risk, as shown in Table 3-1.

In the medium risk event, surface water risk is confined to a small area of shallow ponding within a topographic low spot in the centre of the site. Greatest flood depths in the medium risk event are between 0.15 and 0.3 m (Figure 3-1) with hazards categorised as low (Figure 3-2). Safe access and escape routes should be possible via Featherbed Lane to the west of the site in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
97.9	2	0.1	0

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

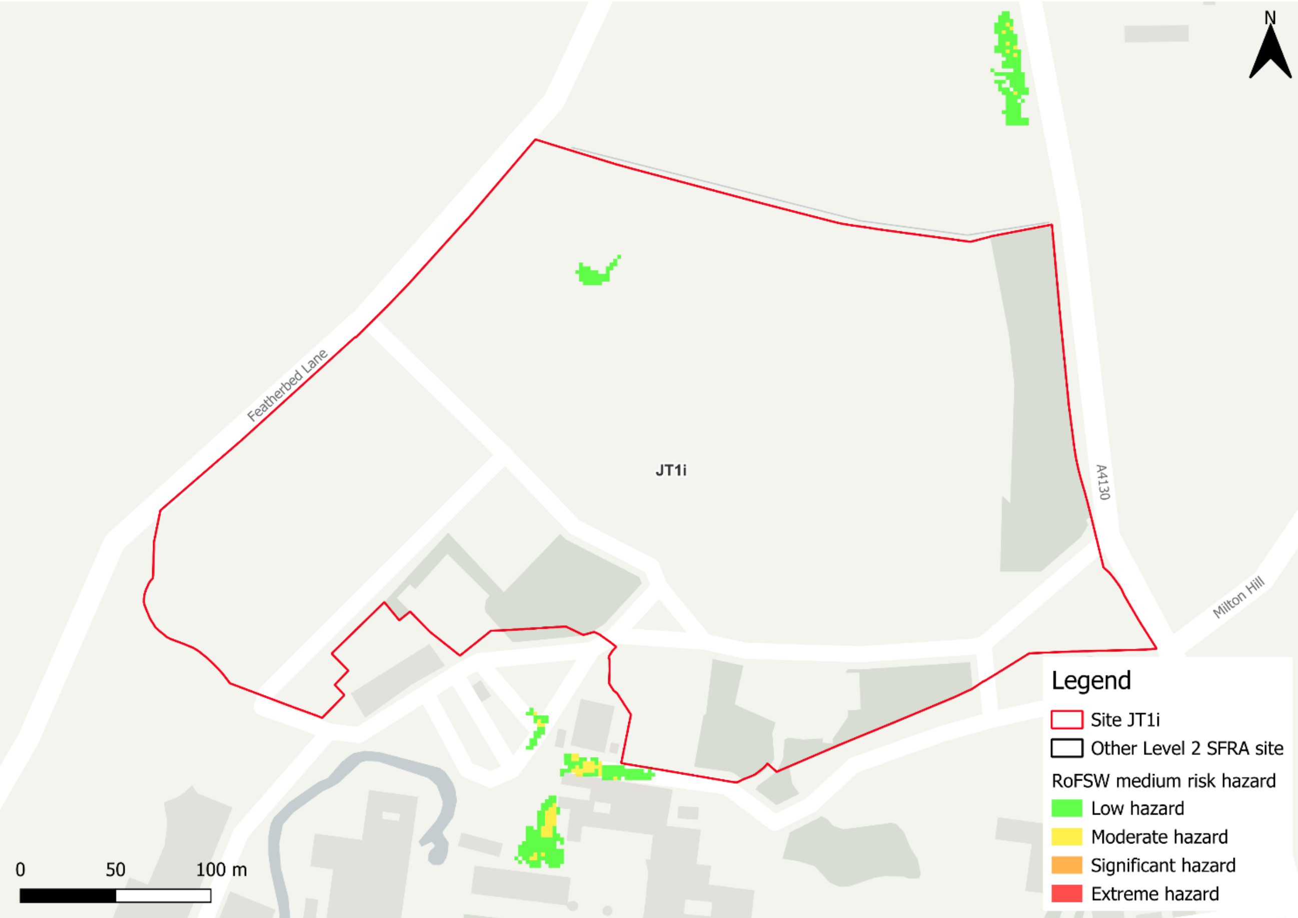

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled low risk event can be used as a precautionary proxy for the medium risk surface water event plus climate change.

Figure 3-3 shows the low risk surface water flood depths, as a proxy for the medium risk surface water event plus climate change. There are some additional areas of ponding across the site in comparison to the medium risk event, however depths remain low. Maximum flood depths are modelled to be between 0.15 and 0.3 m, with some areas of moderate hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

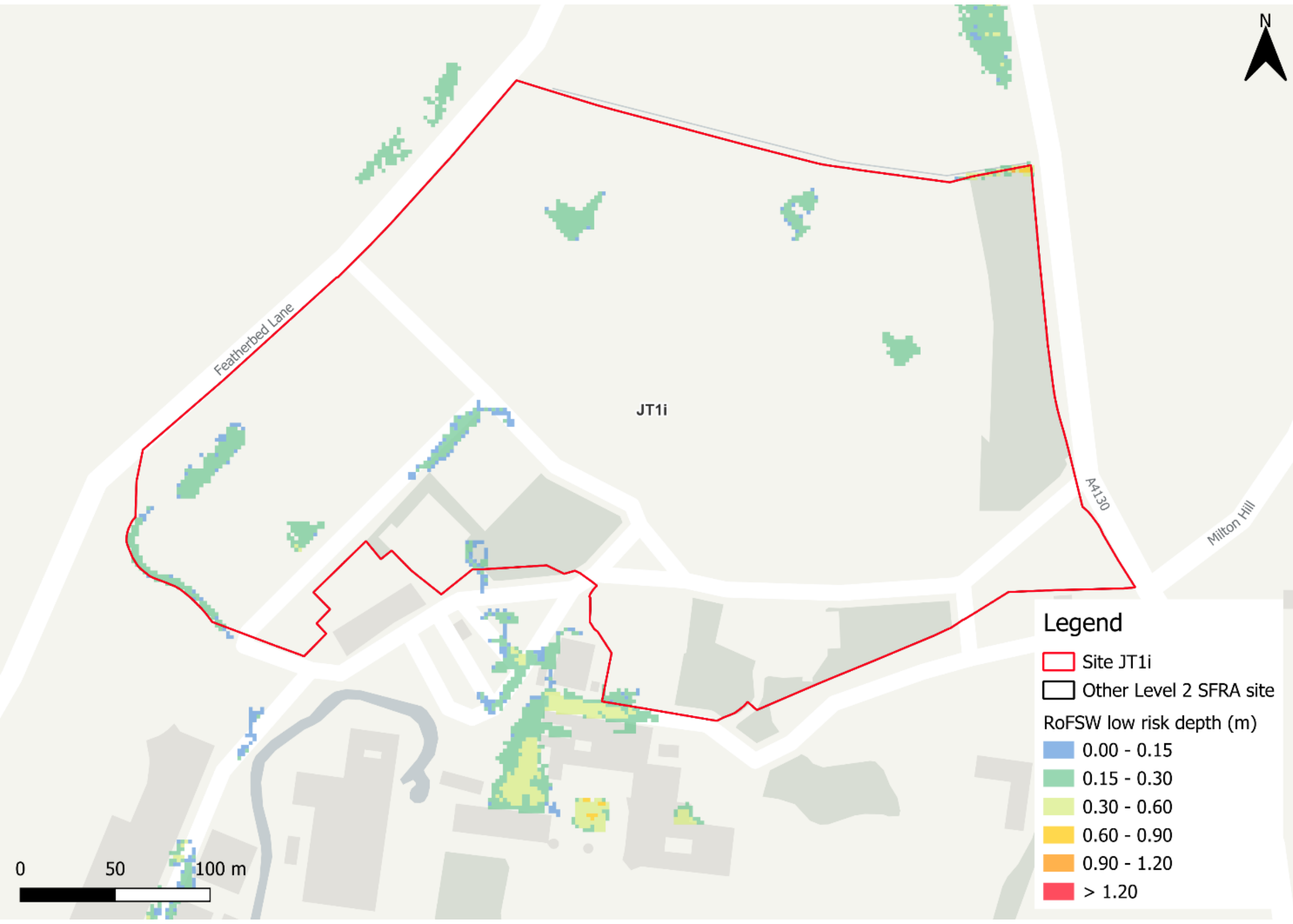

Figure 3-3: Low risk event surface water flood depths (as a proxy for the medium risk event plus climate change)

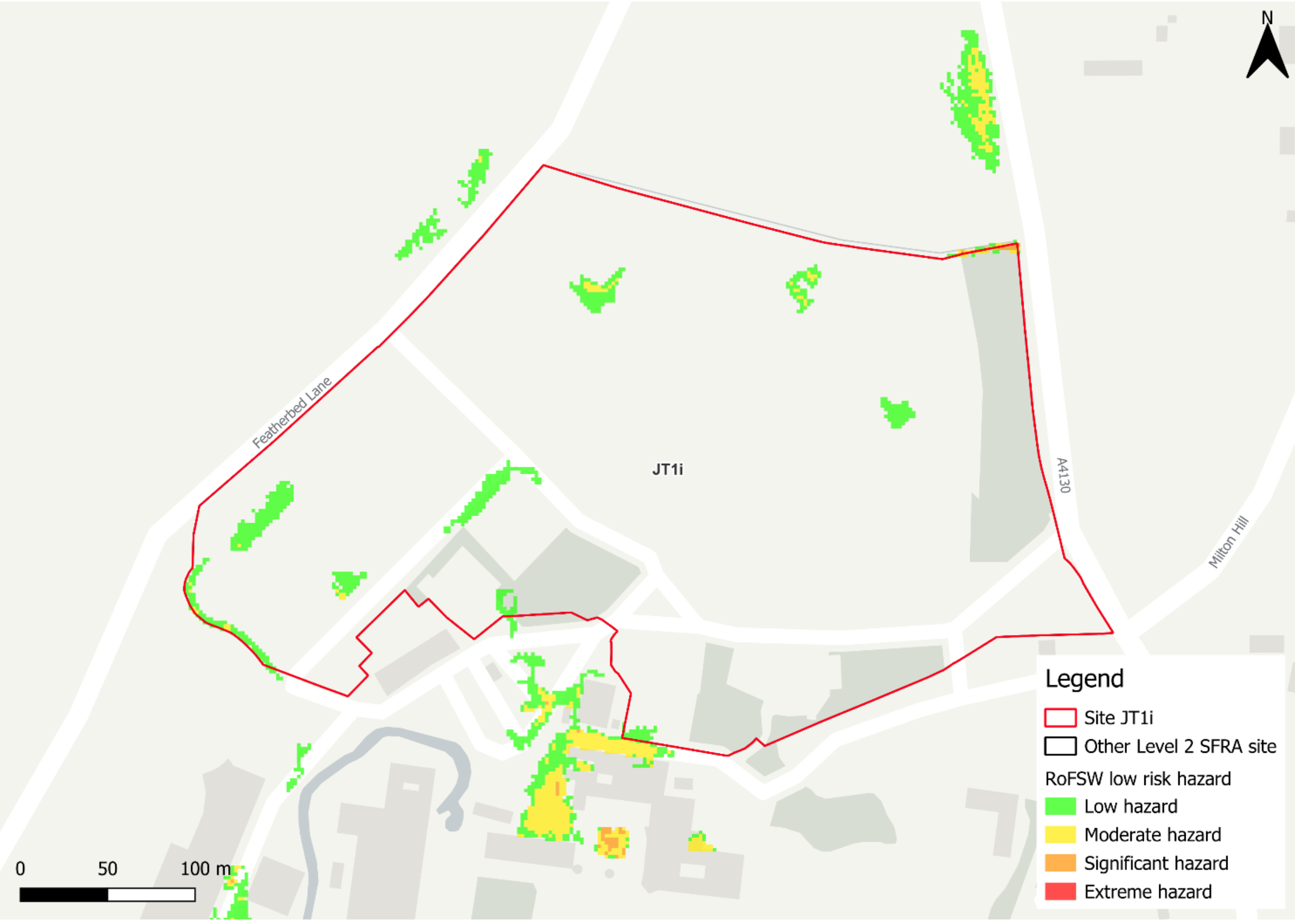

Figure 3-4: Low risk event surface water flood hazards (as a proxy for the medium risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with only 2% of the site being at low surface water flood risk. Surface water risk in the medium risk events is confined to a small area of shallow ponding within the centre of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the low risk surface water event has been used as a proxy for the medium risk event plus climate change. There are some additional areas of surface water ponding, however these remain shallow.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- The Groundwater Flood Map (Figure 4-1) indicates that ground conditions may be suitable for infiltration SuDS. This should be further explored through appropriate ground survey as part of the site-specific FRA and drainage strategy.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- Assessment of the current drainage system in place should be carried out to ascertain any current capacity issues and whether the current system could accommodate the proposed residential development or whether further capacity will be required.
- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site JT1i (Former Esso Research Centre) and the surrounding areas and Table 4-1 explains the risk classifications.

The entirety of the site is in an area where there is negligible groundwater risk. Groundwater conditions may therefore be suited to infiltration SuDS.

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- It should be appropriate for this site to be allocated, given the very low fluvial and surface water flood risk to the site. However, were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- A drainage strategy will be required for any new development. The use of infiltration SuDS should be investigated.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should produce a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

[3] Para 170 National Planning Policy Framework 2023

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South Oxfordshire and Vale of White Horse Level 2 Strategic Flood Risk Assessment

Site JT1k - South of Park Road, Faringdon

Final Report

September 2024

Prepared for:

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Reviewed by	Mike Williamson BSc MSc CGeog FRGS EADA Principal Analyst
Authorised by	Krista Keating BSc MSc CEnv CSci MCIWEM C.WEM Associate Director

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1.1 Site JT1k - South of Park Road, Faringdon

- Location: South of Park Road, Faringdon (Figure 1-1)
- Existing site use: Greenfield. North western area of the site currently developed for residential uses.
- Existing site use vulnerability: Water compatible
- Proposed site use: Mainly employment
- Proposed site use vulnerability: Less vulnerable
- Site area: 27.9 ha. Employment allocation for the JLP is 3 ha of the total site area.
- Proposed development impermeable area: 23.7 ha / 2.6 ha JLP employment allocation area (assumed 85% of site area)
- Watercourse: N/A
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for more detailed assessment through Level 2 SFRA (Strategic Recommendation B)
    - Assess present day modelled surface water depths, hazards
    - Climate change proxy assessment

Figure 1-1: Site location

1.2 Topography

The Environment Agency (EA) Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 1-2. The highest ground levels in the site are located within the south at approximately 130mAOD. The lowest ground levels are located within the north of the site at approximately 105mAOD.

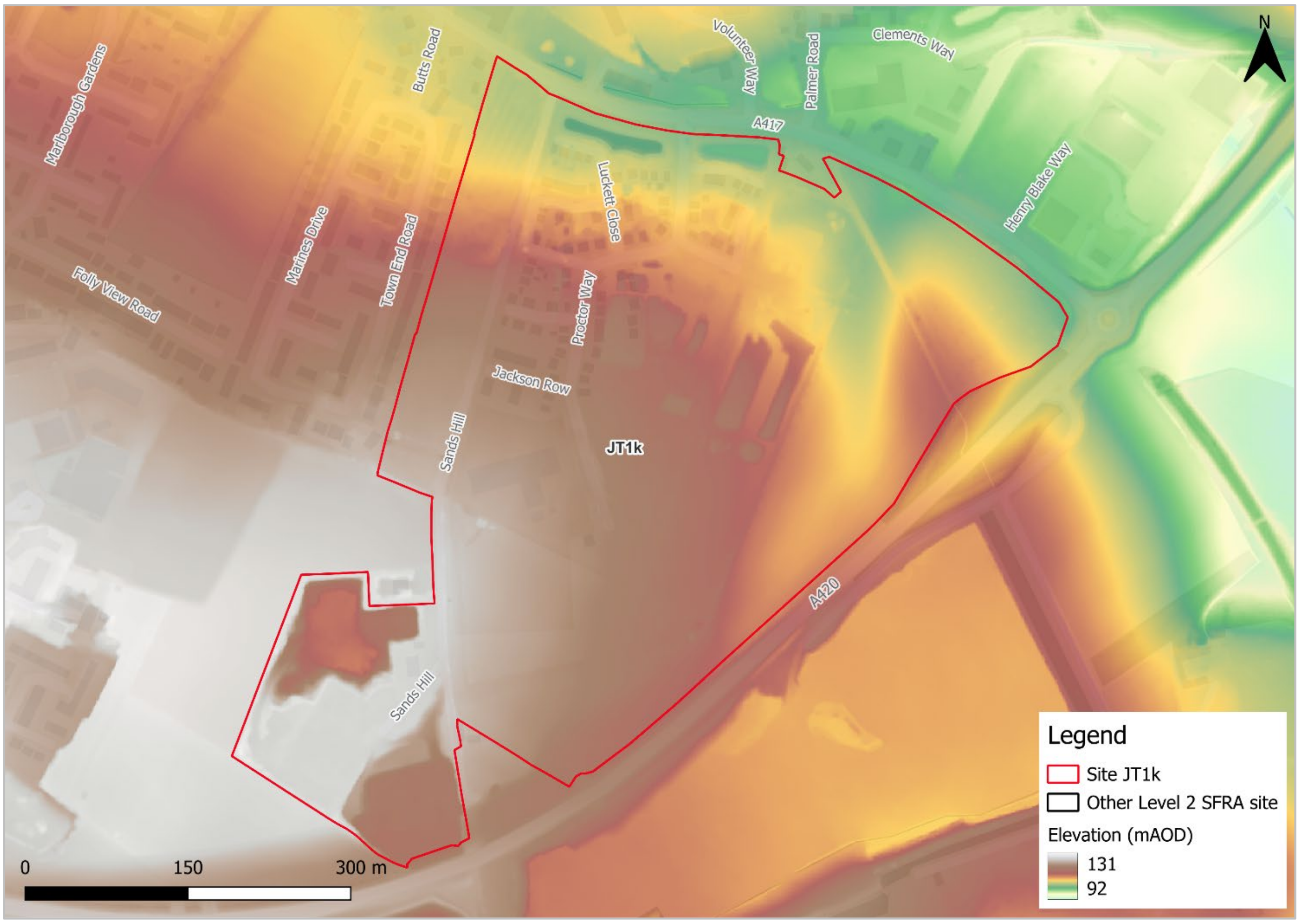

Figure 1-2: Topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the South Oxfordshire and Vale of White Horse District Councils Level 1 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is entirely within Flood Zone 1.

Table 2-1: Existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
100	0	0	0

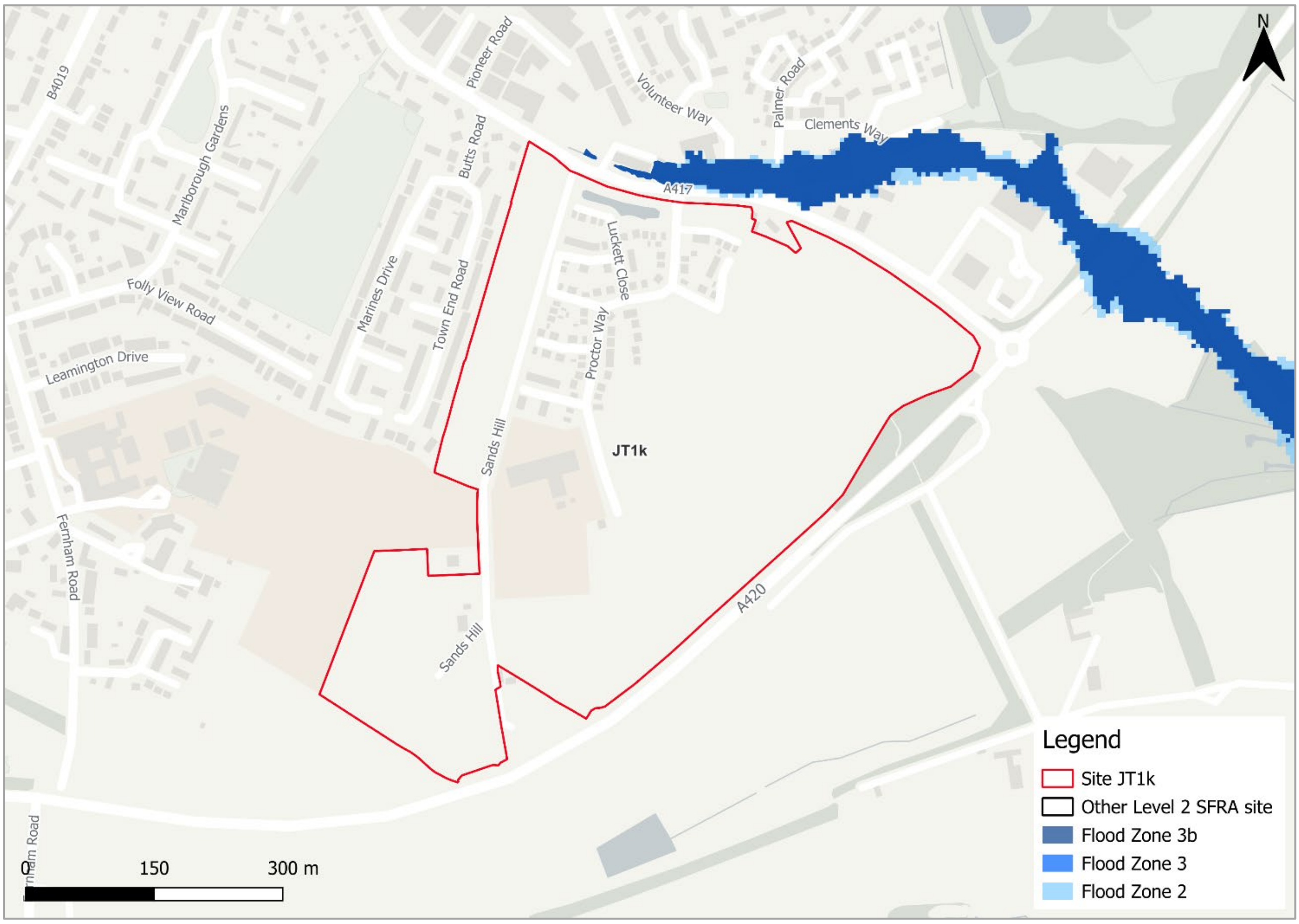

Figure 2-1: Existing risk from rivers to the site

2.2 Flood risk management

The site does not benefit from any formal engineered flood defences, according to the EA's spatial flood defences dataset.

2.2.1 Cumulative impacts

A cumulative impact assessment was completed through the South Oxfordshire and Vale of White Horse Level 1 SFRA (2024), which aimed to identify catchments sensitive to the cumulative impact of development. Site JT1k (South of Park Road, Faringdon) is located within two catchments, namely; Ock (to Cherbury Brook) and Thames (Leach to Evenlode). The majority of the site is within a low sensitivity catchment. Planning considerations that apply to all sites in relation to the cumulative impacts of development can be found in Appendix E of the Level 1 SFRA. Cumulative impacts of development should also be considered as part of a site-specific FRA.

2.2.2 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. Within the site, there is potential for tree planting to slow floodwaters, reduce flood peak height and reduce sediment delivery to the watercourse. There is also potential for runoff attenuation features to reduce the speed of flooding downstream. These areas are shown on Figure 2-2.

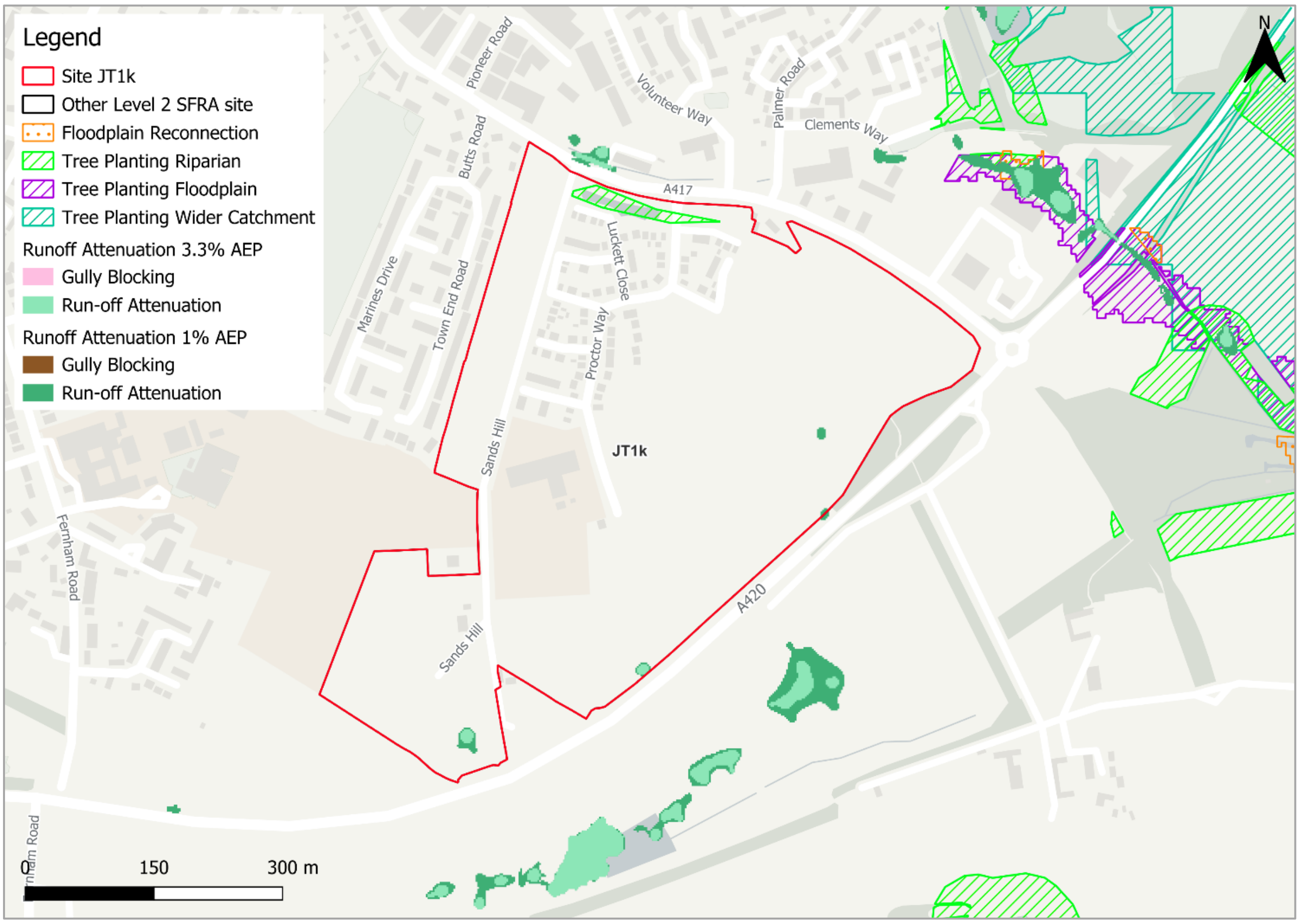

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.3 Residual risk

2.3.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is not modelled to be at risk of flooding from reservoirs.

2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) and Recorded Flood Outlines (RFO) datasets have been considered. There are no recorded historic flood incidents within the vicinity of the site.

2.5 Flood warning and access and escape routes

There are no Flood Warning Areas (FWA) or Flood Alert Areas (FAA) within the vicinity of the site.

Based on the FMfP, safe access and escape routes should be achievable via the A417 to the north of the site.

2.6 Observations, mitigation options and site suitability - fluvial

- The site is wholly within Flood Zone 1.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is predominantly very low. Approximately 0.3% of the site is within the high risk surface water flood zone. A further 0.2% is at medium surface water risk, and a further 1% is at low surface water risk, as shown in Table 3-1.

In the high and medium risk events, surface water risk is confined to the hardstanding road through the site, with some areas of additional ponding in topographic low spots in the south. In the low risk event, the extent of surface water flood risk remains low, with some additional areas of ponding in low spots within the east of the site.

Greatest flood depths in the high risk event are between 0.9 and 1.2 m (Figure 3-1) with some areas of significant hazard (Figure 3-2). Safe access and escape routes should be possible via the A417 in all events.

Table 3-1: Existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
98.5	1	0.2	0.3

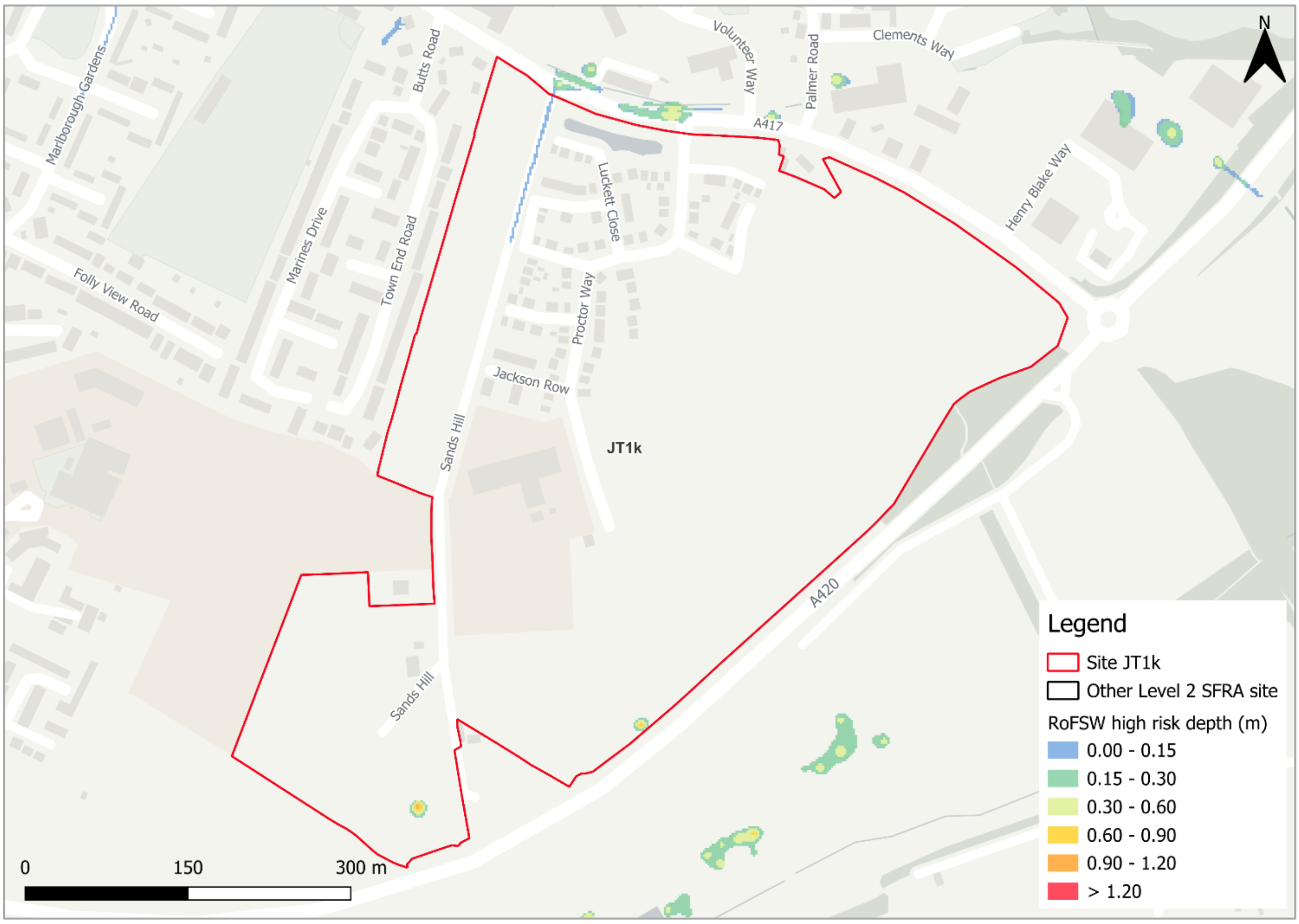

Figure 3-1: High risk event surface water flood depths (Risk of Flooding from Surface Water map)

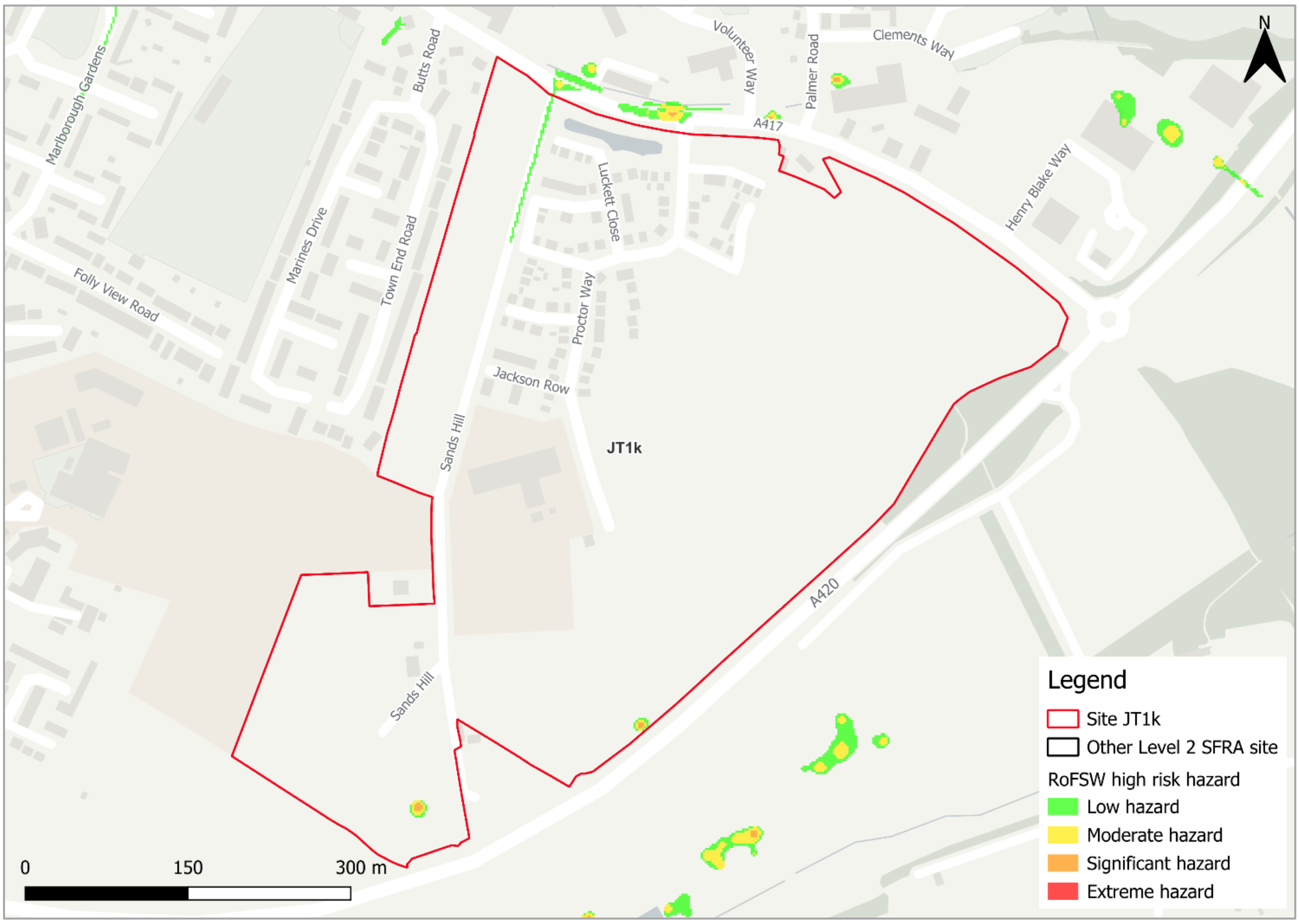

Figure 3-2: High risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has not been modelled for this SFRA. Therefore, in the absence of modelled climate change information, the modelled medium risk event can be used as a precautionary proxy for the high risk surface water event plus climate change.

Figure 3-3 shows the medium risk surface water flood depths, as a proxy for the high risk surface water event plus climate change. Risk is largely similar to the high risk event, with a slightly greater extent of flooding within topographic low spots. Maximum flood depths are modelled to be between 0.9 and 1.2 m, with some areas of significant hazard (Figure 3-4).

[1] Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

Figure 3-3: Medium risk event surface water flood depths (as a proxy for the high risk event plus climate change)

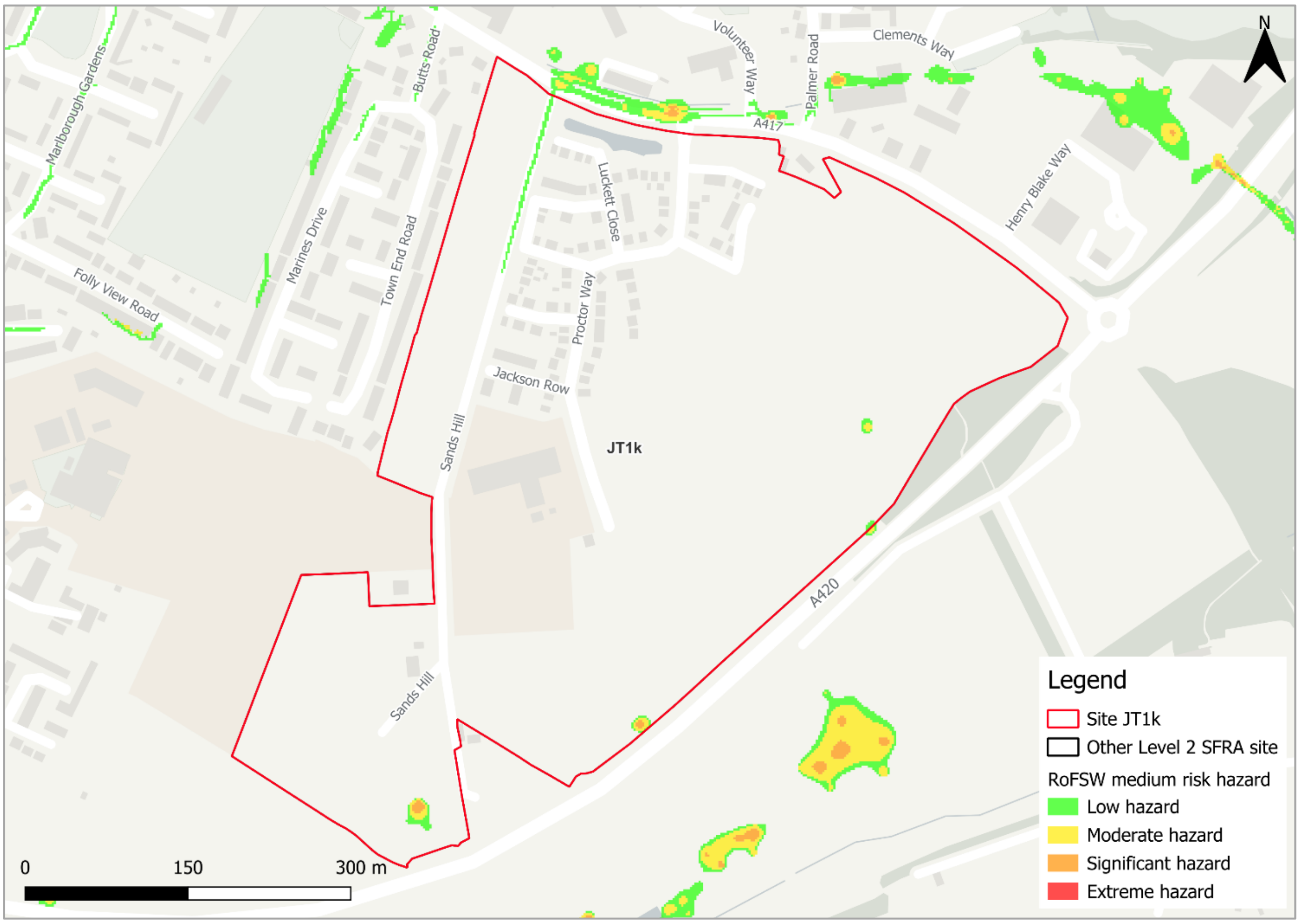

Figure 3-4: Medium risk event surface water flood hazards (as a proxy for the high risk event plus climate change)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with approximately 98.5% of the site being at very low risk. Surface water risk in the high and medium risk events is present along the hardstanding road and some areas of ponding in topographic low sports in the south of the site.
- Surface water risk in the low risk event is largely similar, with some areas of additional ponding within the east of the site.
- The effects of climate change on surface water have not been modelled for this SFRA, however the medium risk surface water event has been used as a proxy for the high risk event plus climate change. Risk is largely similar to the high risk event, with slightly a greater extent flooding within the topographic low spots.
- The impact of climate change on surface water should be considered further through a site-specific FRA and/or an update of this Level 2 SFRA.
- Were development plans to proceed, a full detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map for Site JT1k (South of Park Road, Faringdon) and the surrounding areas and Table 4-1 explains the risk classifications.

The majority of the site is in an area where there is a risk of groundwater flooding to both surface and subsurface assets. There are some areas through the site at negligible groundwater risk. Ground investigations will be required through the site-specific FRA to ascertain groundwater levels and conditions.

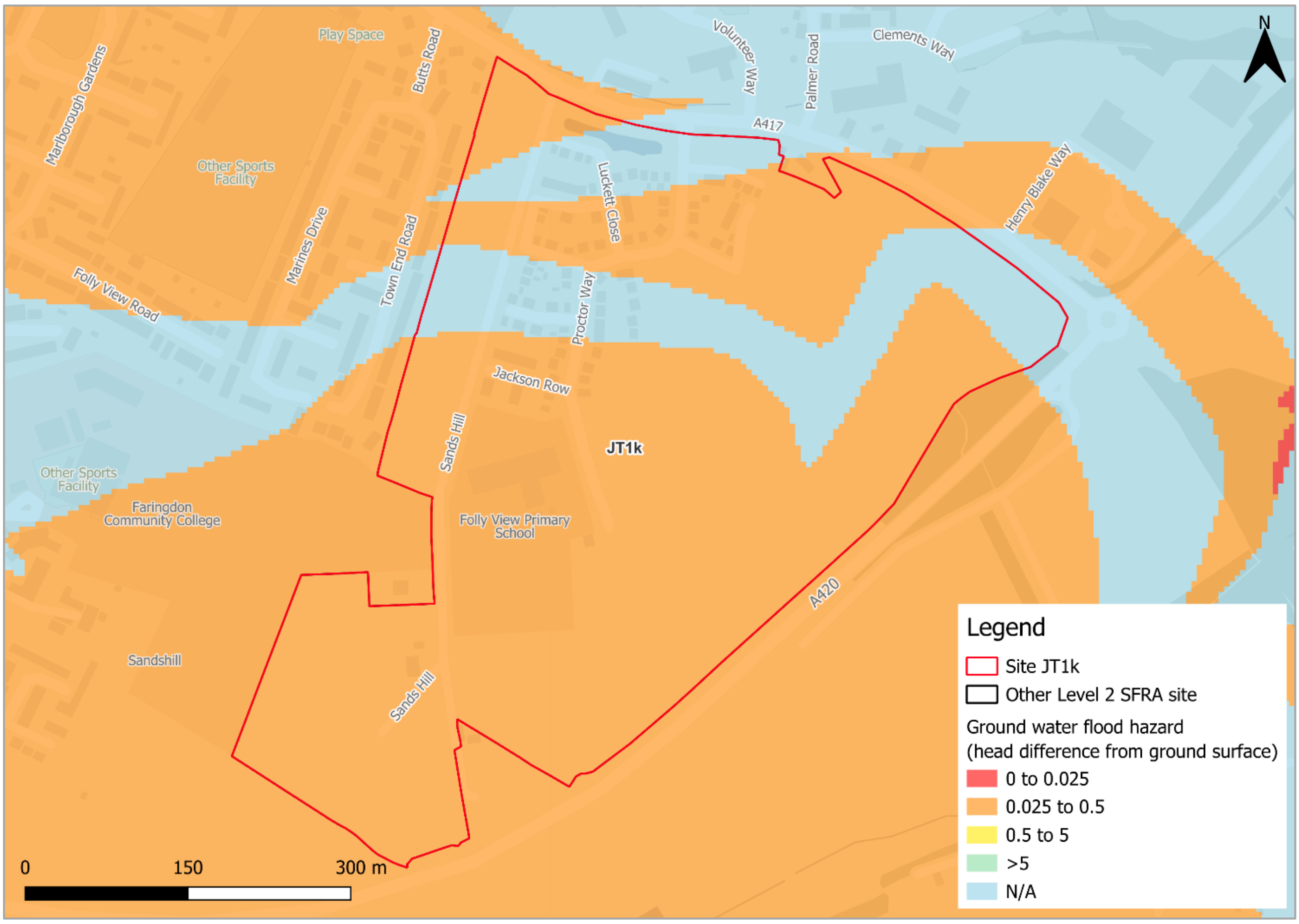

Figure 4-1: JBA 5m Groundwater Flood Map

[2] Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.
*Difference is defined as ground surface in mAOD minus modelled groundwater table in mAOD.	

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[3], it must be proven that the development can be safe for its lifetime, which is 75 years for non-residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

The site is not required to pass the exception test as it is proposed for less vulnerable uses.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2024) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from water compatible to less vulnerable, according to the NPPF.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- Updated climate change modelling should be used to update this Level 2 SFRA at the earliest opportunity to provide an up-to-date strategic assessment of surface water flood risk to this site and the surrounding areas. It would be acceptable to use updated modelling to suitably assess surface water risk through a site-specific FRA, as well as/instead of a Level 2 SFRA update.
- Based on current information, this site could be allocated given the very low fluvial and surface water flood risk. However, were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA on future flood risk from surface water is fully ascertained.
- Groundwater conditions must be investigated further.
- Opportunities for NFM features to reduce flood risk to the site and surrounding areas should be explored at the site-specific FRA stage.

5.3 Site-specific FRA requirements and further work

- Any site-specific FRA must carry out further modelling to understand the impacts of climate change on surface water flood risk to the site.
- Any site-specific FRA should fully investigate groundwater conditions and produce a detailed drainage strategy.
- Any site-specific FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; South Oxfordshire and Vale of White Horse District Councils Joint Local Plan and LLFA policies; and national and local SuDS policy and guidelines.

[3] Para 170 National Planning Policy Framework 2023

- Throughout the site-specific FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; TW; the highways authorities; and the emergency services.

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