Sheffield Level 2 Strategic Flood Risk Assessment Update - Site S03483

Final

May 2025

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Sheffield City Council

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Contract

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This report describes work commissioned by Sheffield City Council (SCC) by an instruction dated 23 January 2025. The Client's representative for the contract was Chris Hanson of SCC. Freya Nation of JBA Consulting carried out this work.

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Acknowledgements

We would like to thank the Environment Agency for their assistance with this work.

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the Sheffield City Council (SCC) Local Plan Site S03483. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'SCC Level 1 SFRA' (2022) and read the 'SCC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site S03483

- Location: Land between Storth Lane and School Lane, S35 0DT
- Existing site use: Open green space
- Existing site use vulnerability: Water compatible
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 3.9 Ha
- Proposed development impermeable area: 3.4 Ha
- Watercourse: Tinker Brook (ordinary watercourse)
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of potential risk from unmodelled watercourse
    - Assessment of all other sources of flood risk

Figure 1-1: Existing site location boundary

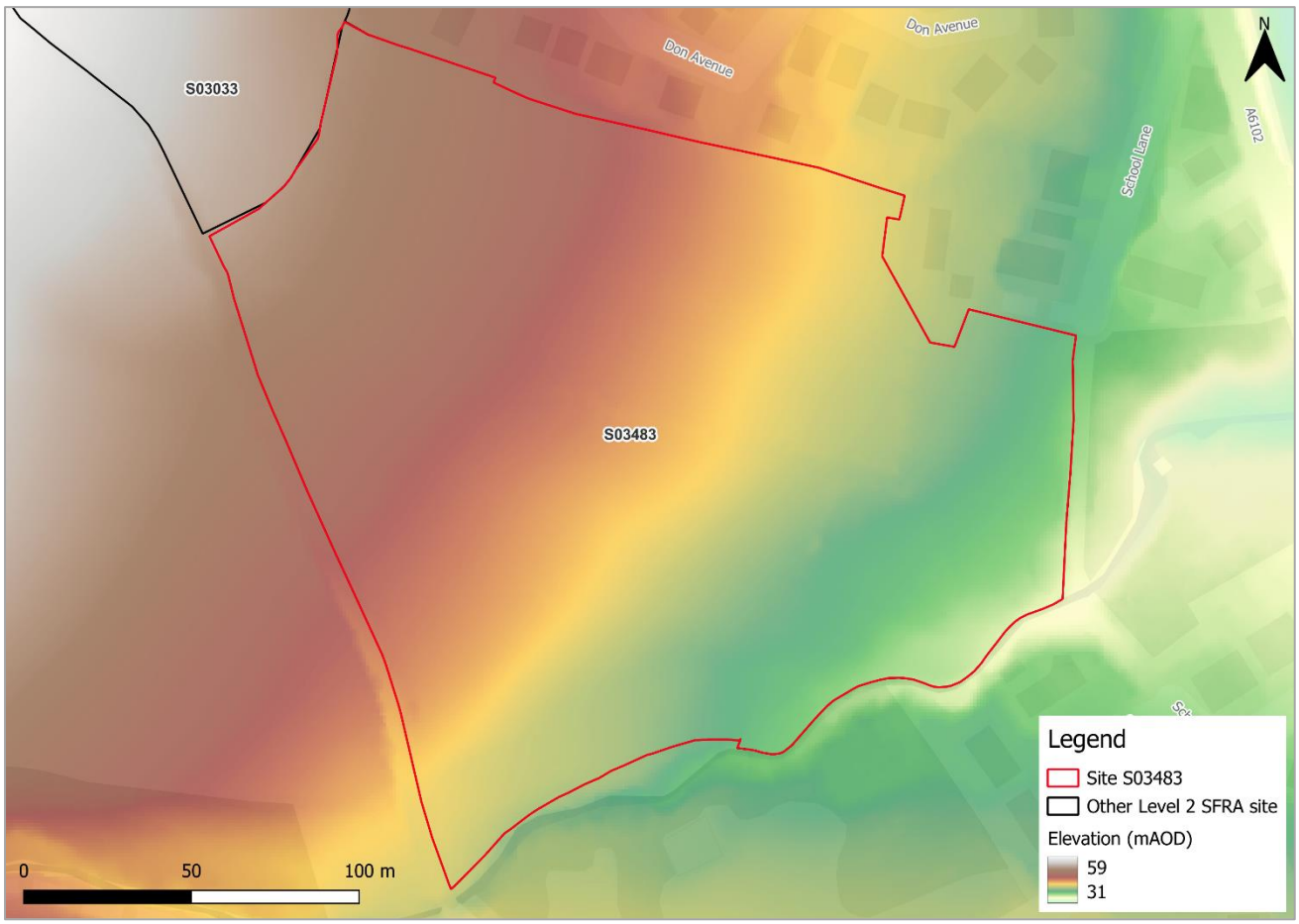

Figure 1-2: Topography

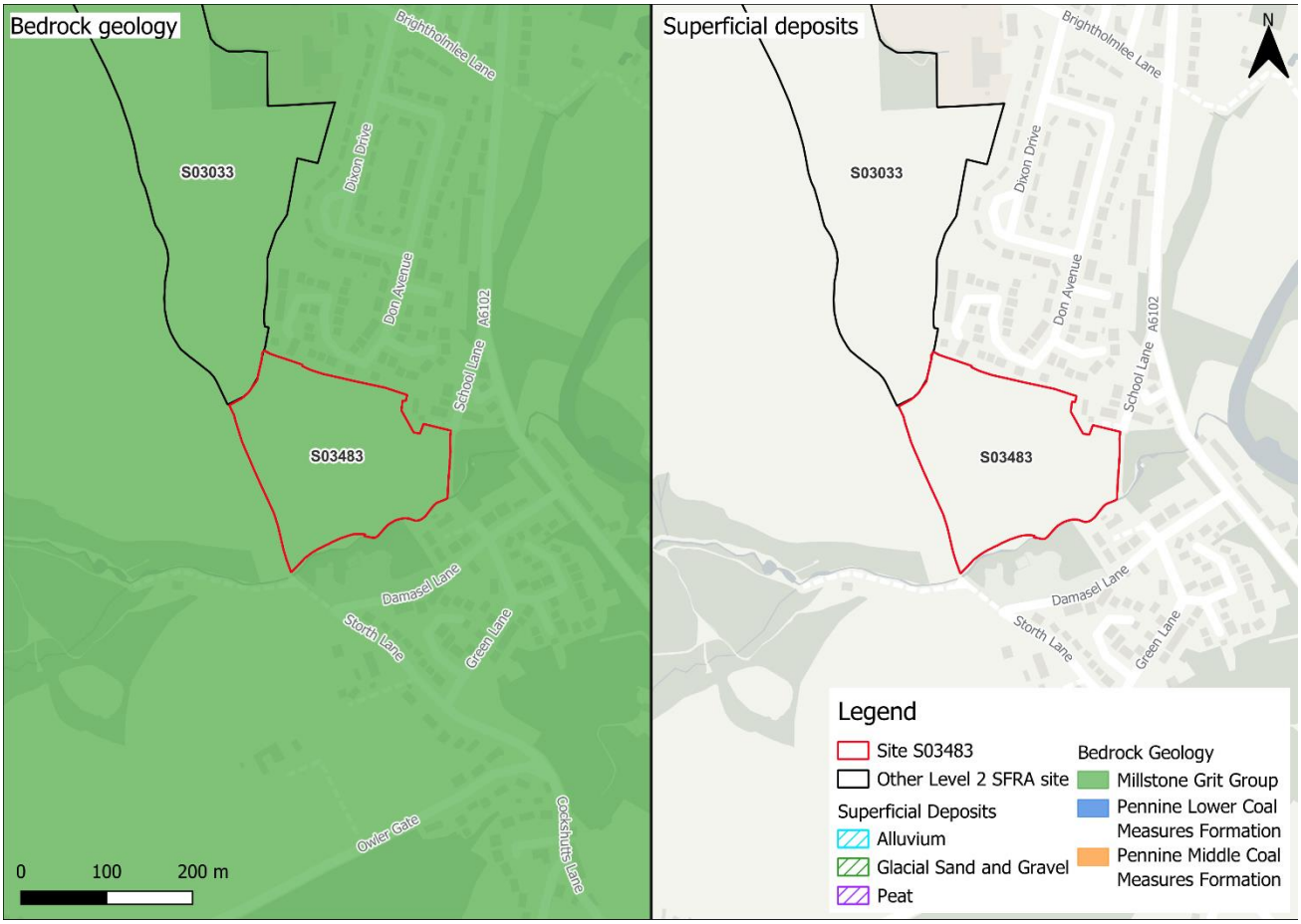

Figure 1-3: Soils and geology

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 (February 2025) and Flood Zone 3b (functional floodplain), as updated in the Level 2 SFRA finalised in 2024, the percentage areas of the site within each fluvial flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. This version of the Flood Map for Planning does not consider flood defence infrastructure (Section 2.2) or the impacts of climate change.

The site is predominantly located within Flood Zone 1 indicating it is largely at low risk of flooding from rivers. 2% of the site, along the southern site boundary, is within Flood Zone 3b, along the channel of the unmodelled Tinker Brook. Functional floodplain in this area is based on an 8 metre buffer either side of the watercourse line designed to direct development away from the watercourse. Section 2.1.2 discusses the potential risk to the site from Tinker Brook, using the third generation Risk of Flooding from Surface Water (RoFSW) dataset to inform this.

Table 2-1: Existing fluvial flood risk based on percentage area of site at risk

Flood Zone 1 (% area)	Flood Zone 2 (% area)	Flood Zone 3a (% area)	Flood Zone 3b (% area)
98	0	0	2

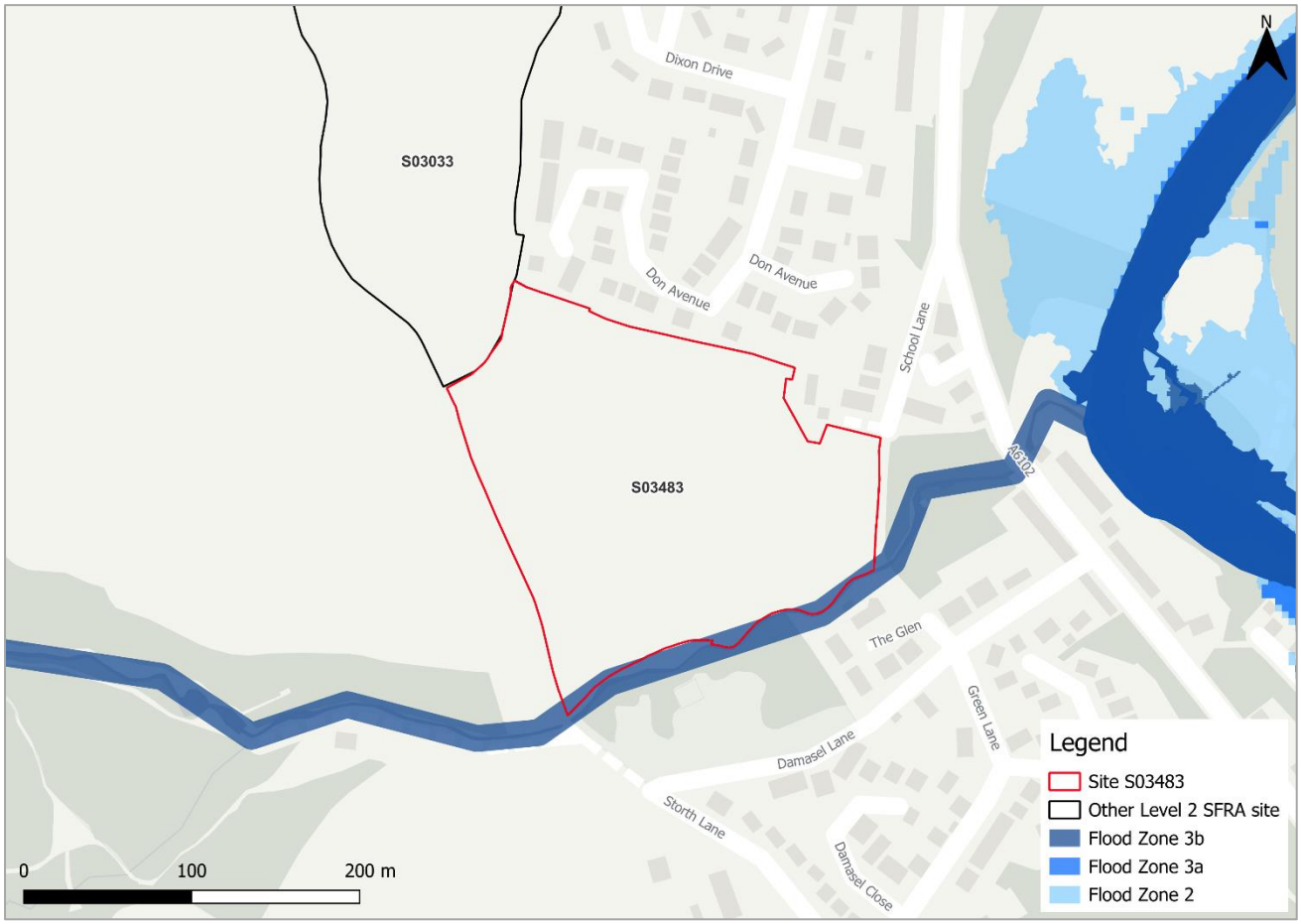

Figure 2-1: Existing risk from rivers to the site

2.1.2 Unmodelled watercourse risk

Tinker Brook forms the southern boundary of the site. There is no existing EA model for this watercourse, therefore the fluvial risk it poses to the site is unknown. Given the timescales for the local plan, new modelling for this watercourse to inform this SFRA will not be feasible. Therefore, the 0.1% AEP event of the third generation RoFSW dataset is used as a proxy to inform this risk, as shown in Figure 2-2. Risk is modelled to remain largely confined to the areas immediately adjacent to the channel, along the southern site boundary.

Any site-specific FRA should develop a model of Tinker Brook to fully understand the onsite fluvial risk. Development should be directed away from the risk area and not be within 8 metres of the channel bank. The risk area could be included within a blue green corridor for the site.

Figure 2-2: Low risk event surface water flood extent (Risk of Flooding from Surface Water map) as a proxy for onsite fluvial risk

2.2 Impacts from climate change

The impacts of climate change on flood risk from Tinker Brrok have not been modelled for this SFRA, as a model covering this watercourse is not available. 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. Any site-specific FRA should produce a detailed model of Tinker Brrok and include for the most up to date climate change allowances

2.3 Flood risk management

2.3.1 Flood defences

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

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) that may help to reduce flood risk to the site and surrounding areas. Upstream of, and within the site, along Tinker Brook mapping

shows potential for riparian woodland planting (Figure 2-3). Riparian woodland can slow down and hold back flood flows within watercourses, reducing flood risk downstream. It can also reduce sediment delivery and bankside erosion. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

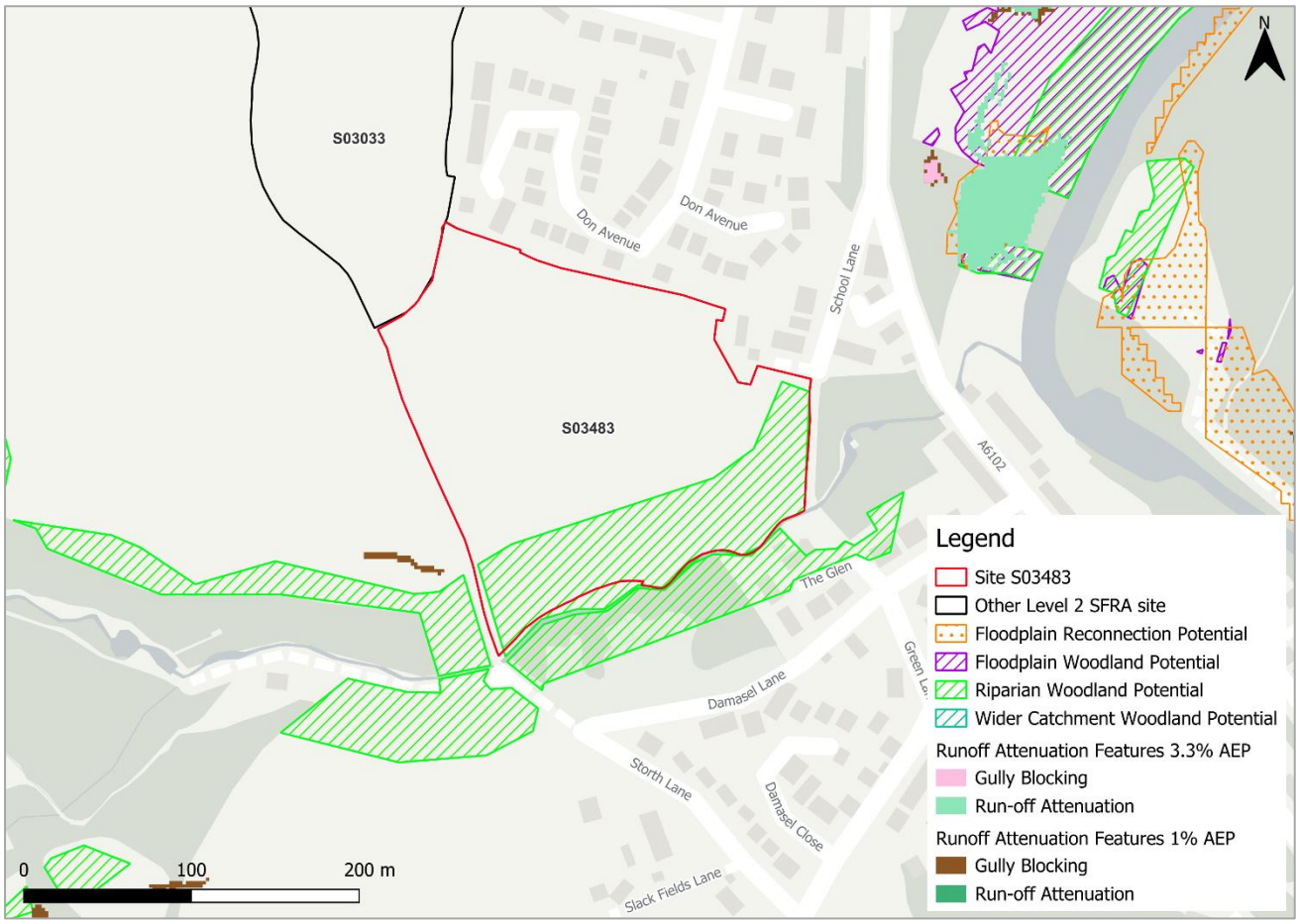

Figure 2-3: NFM potential mapping

2.4 Historic flood incidents

The EA's Historic Flood Map (HFM) has been considered. The site is not recorded to have experienced historic flooding.

2.5 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. The site is not located within a FAA.

Based on available information, safe access and escape routes should be achievable via Storth Lane to the west or School Lane to the east.

2.6 Observations, mitigation options and site suitability - fluvial

- 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 FRA must show that the development can be designed to be safe and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- The site is largely located within Flood Zone 1 and is therefore modelled to be at predominantly low risk of flooding from rivers. The southern site boundary is located within Flood Zone 3b, adjacent to the channel of Tinker Brook. There should be no development within the functional floodplain.
- Potential flood risk from Tinker Brook, should be ascertained through modelling, at the FRA stage. The channel and risk area should be included within a blue green corridor.
- No development should take place within 8m either side of the watercourse.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale third generation Risk of Flooding from Surface Water (RoFSW) map (November 2023), surface water risk to the site is predominantly very low. Approximately 1% of the site is at high risk of surface water flooding. A further 1% of the site is at medium risk and a further 3% is at low surface water risk, as shown in Table 3-1.

In all three events, surface water risk is largely confined the area adjacent to the channel of Tinker Brook, along the southern site boundary. In the low risk event, a flow path crosses the southwestern corner of the site to join the path along Tinker Brook.

Greatest surface water depths in the medium risk event are between 0.6 and 0.9 m (Figure 3-1) with some areas of extreme hazard (Figure 3-2), these areas are within the channel of Tinker Brook. During the extreme event, safe access and escape routes may remain achievable via School Lane to the east, travelling north.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the RoFSW map

Very low risk (% area)	Low risk (% area)	Medium risk (% area)	High risk (% area)
95	3	1	1

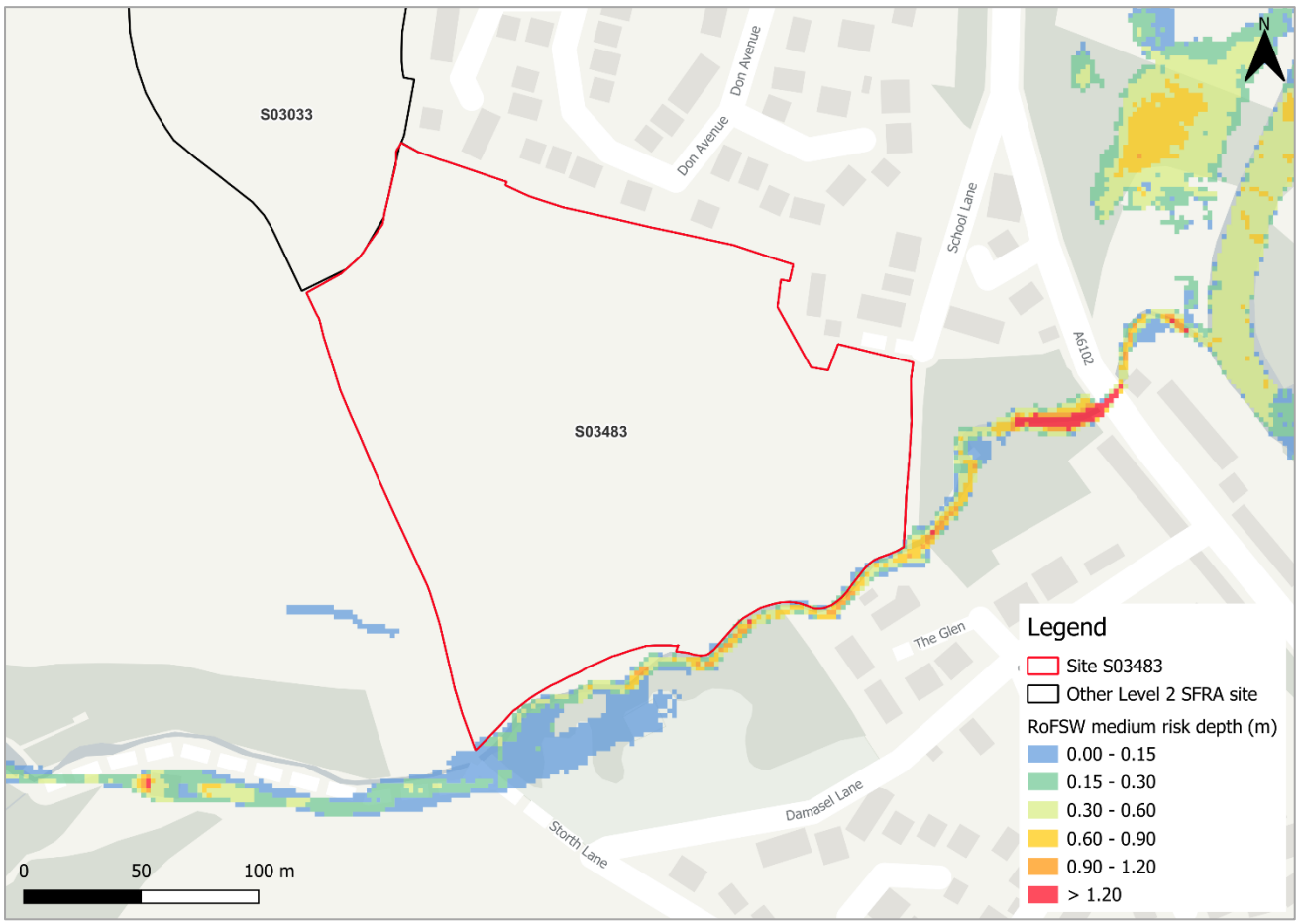

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

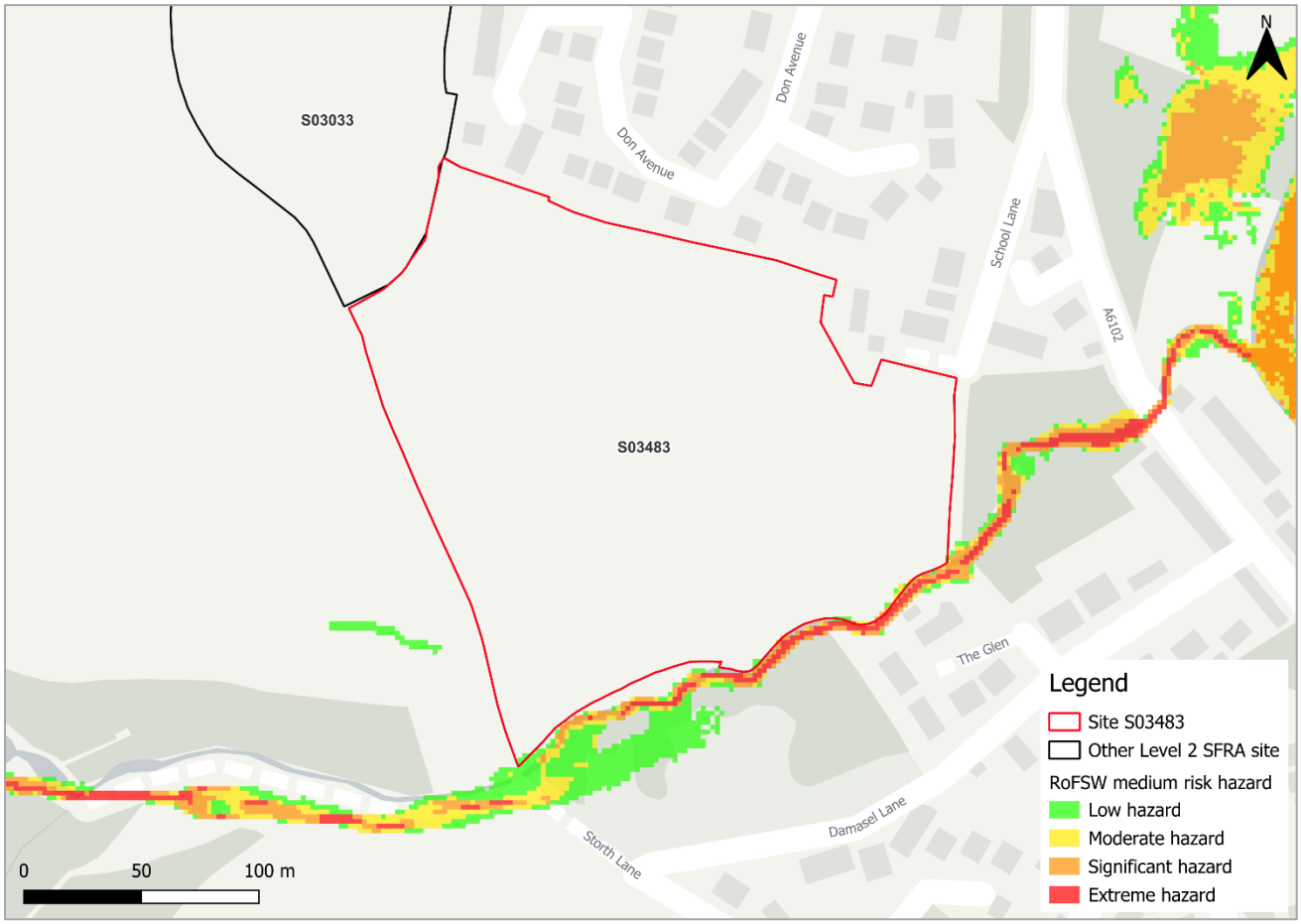

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: Modelled climate change allowances for rainfall for the Don and Rother management catchment

Return period	Central allowance 2070s (% increase)	Upper end allowance 2070s (% increase)
3.3% (high risk)	25%	35%
1% (medium risk)	25%	40%

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 shows the modelled surface water flood depths for the medium risk event plus 40% climate change. Risk is modelled to be greater than present day conditions, with the medium risk climate change event modelled to be similar to the present day low risk event. Maximum flood depths are modelled to increase to > 1.2 m, with further areas of extreme hazard (Figure 3-4). An additional shallow flow path is apparent from the west in the south of the site. Safe access and escape routes may remain achievable via School Lane to the east, travelling north

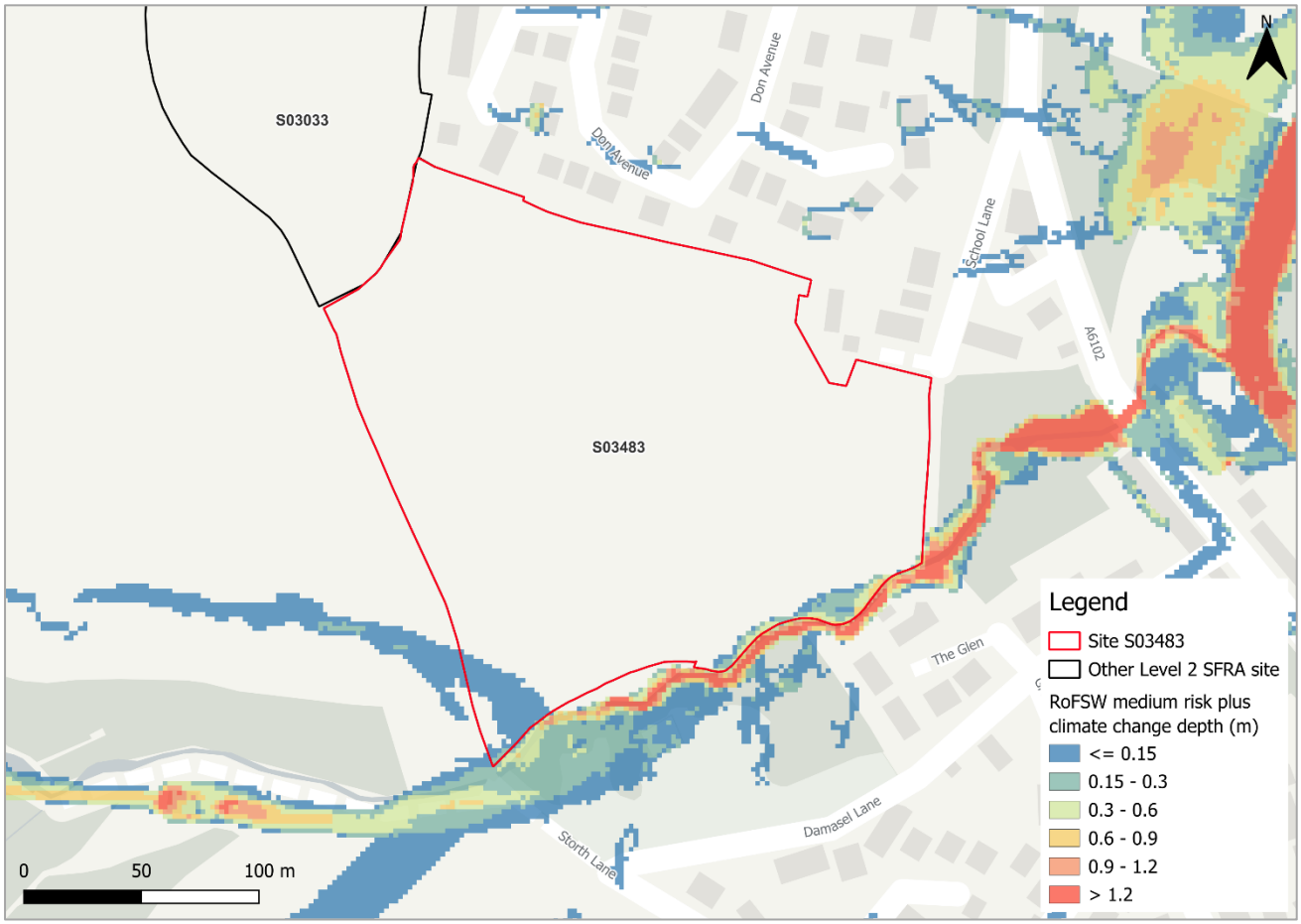

Figure 3-3: Medium risk event surface water flood depths plus 40% climate change (based on Risk of Flooding from Surface Water map)

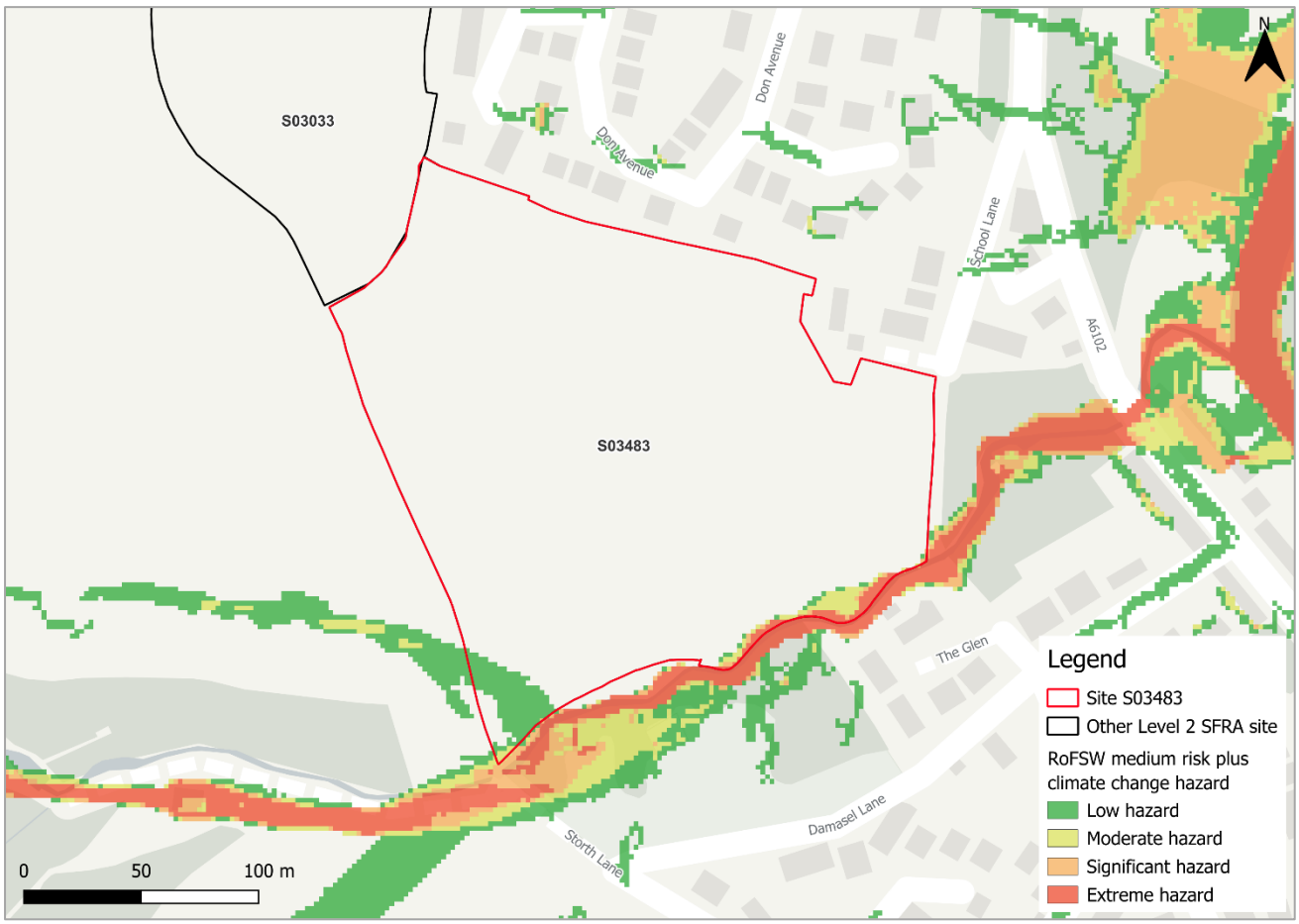

Figure 3-4: Medium risk event surface water flood hazards plus 40% climate change (based on Risk of Flooding from Surface Water map)

3.3 Risk of runoff from site post development

Runoff rates should not exceed current rates and if possible, betterment of existing rates should be aimed for. For the purposes of this assessment, the required volumes of attenuation have been calculated below based on the estimated impermeable area (assumed 85% of site area where this information was not available) and limiting greenfield runoff rate of Qbar (l/s).

Table 3-3: Surface water flood risk from proposed development

Design flood event (incl climate change)	Critical storm duration Hrs	Inflow volume m^3	Outflow volume m^3	Attenuation required m^3	Time to empty (assuming no infiltration) Hrs	Total storage required: Area (Ha) and % of site area
30yr Rainfall+25%	12	3211	926	2285	29.5	0.15 Ha 3.9%
30yr Rainfall+35%	12	3468	926	2542	32.9	0.17 Ha 4.3%
100yr Rainfall+25%	12*	5091	1698	3393 (1108 exceedance storage)	43.9	0.23 Ha 5.8%
100yr Rainfall+40%	12*	5869	1852	4017 (1475 exceedance storage)	51.9	0.27 Ha 6.8%
Surface water flood risk impacts from development site, mitigation & SuDS options	As part of this Level 2 SFRA we have included calculations to provide an estimated land take if a pond with an assumed depth of 1.5m was included as part of the development. Attenuation volumes are presented for the critical storm duration for the 3.33% AEP event with exceedance flows quantified up to the 1% event. To prevent development worsening flood risk elsewhere, surface water runoff must be managed on site.					
*critical storm duration limited to 12 hours						

Note: Proposed development limiting runoff rate: (l/sec). Qbar (FEH Statistical) – 30.62 (assume 5l/s minimum discharge), Q30 – 53.59, Q100 – 63.7.

3.4 Observations, mitigation options and site suitability - surface water

- Current and future risk are nominal and confined to the Tinker Brook floodplain. In the low risk event a second flow path, crosses the southwestern site corner.
- The flow paths onsite should be kept in place and remain unobstructed. They should be maintained and included within the landscaping design of the residential development. Tinker Brook should be included in a blue green corridor mitigating both fluvial and surface water risk.
- For the 1% AEP event plus 40% climate change, approximately 6.8% of the total area of the site would be required for flood storage based on a 1.5m deep pond to ensure runoff volumes do not exceed existing rates.
- The NaFRA2 release of the RoFSW should be considered at the FRA stage.
- Note that 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 Risk from groundwater

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[2]. Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications.

The northern third of the site is within an area where there is no risk of groundwater emergence. The central third of the site is within an area where flooding from groundwater is not likely. In the southern third of the site along the Tinker Brook floodplain, there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. Infiltration SuDS may be suitable across the north and centre of the site though not in the risk area in the south.

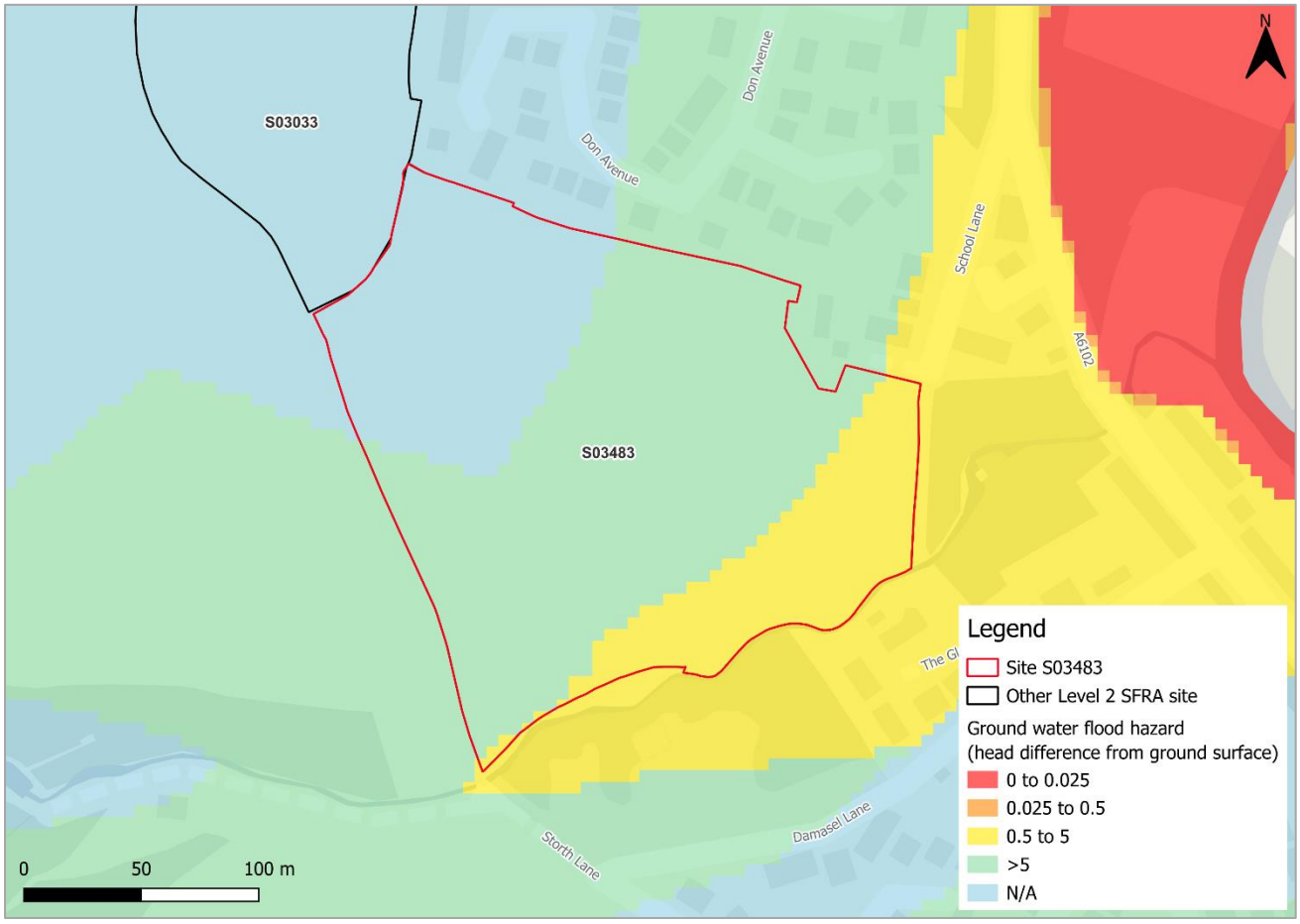

Figure 4-1: JBA 5m Groundwater Emergence Map

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

Table 4-1: Groundwater 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 Residual risk

5.1 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 5-1 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 nominal risk from one reservoir, namely Broomhead Reservoir, located in Sheffield authority area. Broomhead Reservoir is owned and operated by Yorkshire Water Services Ltd.

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 from an all-reservoirs panel engineer. The Council should consult the relevant reservoir undertaker to ascertain whether the proposed development could affect the reservoir's risk designation, it's design category or how it is operated. The Council, as category 1 responders, can access more detailed information about reservoir risk and reservoir owners using the Resilience Direct system.

Figure 5-1: Flood risk from reservoirs

5.2 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a breach of Broomhead Reservoir. However, flooding is only modelled to impact the site based on the 'wet day' flood extent, which represents a prediction of the credible worst-case scenario, therefore it's unlikely that any actual flood would be this large.
- However, as part of a FRA, developers should still consider[3]:
  - The potential loss of life and damage to buildings in the event of dam failure,
  - Whether emergency drawdown of the reservoir (reducing the water level) will add to flooding,
  - Consulting with relevant reservoir owners to assess if the design or maintenance of the reservoir would need improving, and whether development could affect the operation of the reservoir and impact on the reservoir category, and
  - Consulting with the local resilience forum for advice on emergency planning.

3 Reservoir flood maps: when and how to use them | Environment Agency | 2021

6 Overall site assessment

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

The site should be able to pass the exception test[4] if development avoids the area of the site within the functional floodplain / Flood Zone 3b. However, risk from Tinker Brook must be modelled to robustly inform on fluvial risk to the site and ultimately whether the exception test can be passed.

6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2022) and this Level 2 SFRA:

- Current and future risk from Tinker Brook must be fully modelled to ascertain the fluvial risk to the site. Assuming built development can avoid the modelled 1% AEP event plus climate change flood extent, it should be possible for the site to pass the exception test. No development should take place within 8 metres of the channel bank of Tinker Brook.
- Consultation should be had with Yorkshire Water concerning the potential reservoir risk.
- Groundwater conditions across the site must be investigated further through the site-specific FRA to ascertain groundwater levels and conditions.
- Any FRA must further consider safe access and escape routes to and from the site.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the SCC Local Plan and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; Yorkshire Water; the highways authorities; and the emergency services.

4 Para 178 National Planning Policy Framework 2024

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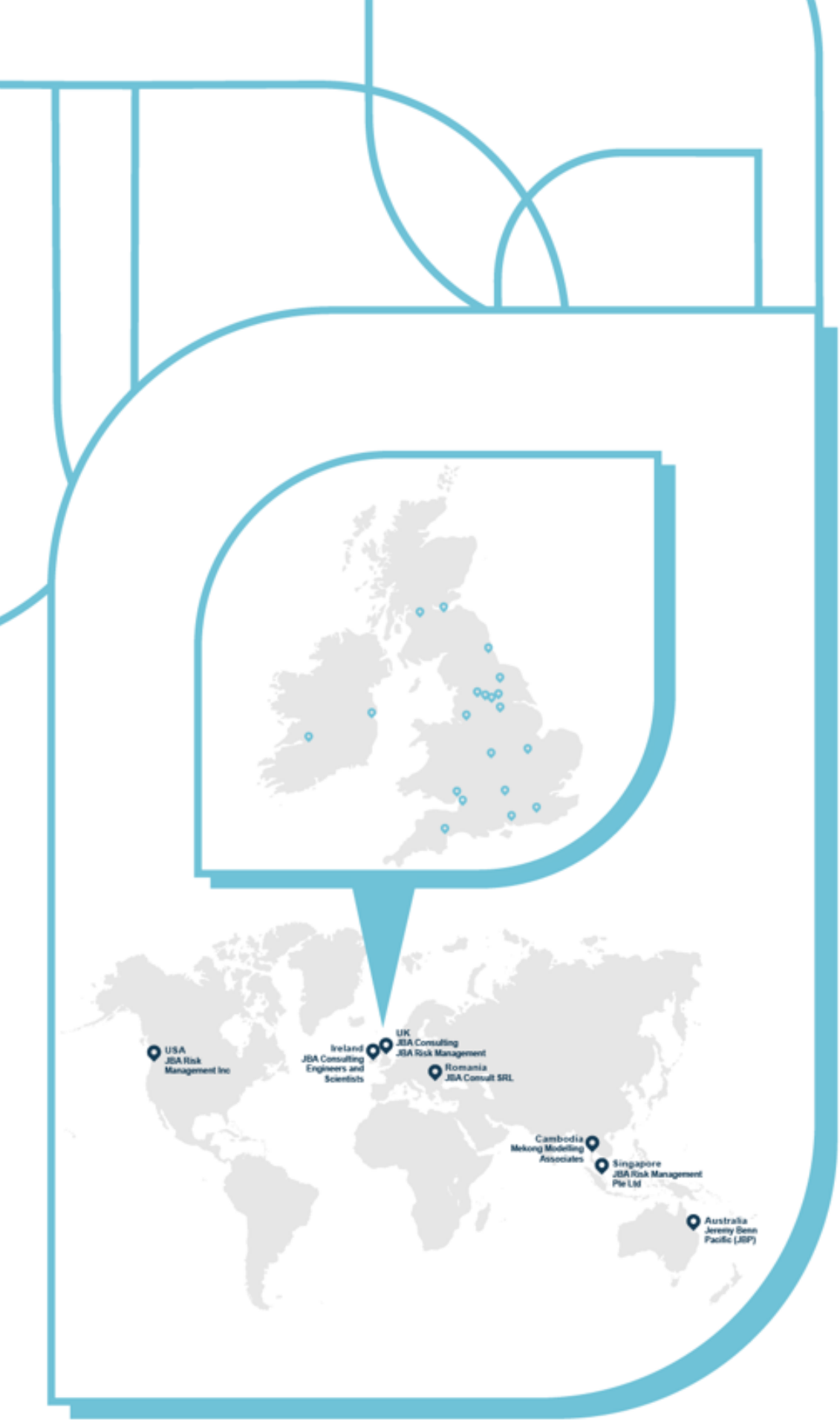

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