Sheffield Level 2 Strategic Flood Risk Assessment Update - Site S03004

Final

May 2025

Prepared for:

Sheffield City Council

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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. Laura Thompson 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 S03004. 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 S03004

- Location: Land to the west of Moor Valley, S20 5BB
- Existing site use: Largely agriculture, several commercial buildings present
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 13.9 hectares
- Proposed development impermeable area: 7.4 hectares
- Watercourse: Ochre Dike (ordinary watercourse)
- EA model: N/A
- Summary of requirements from scoping stage:
    - Assessment of the potential risk from the unmodelled watercourse
    - Assessment of surface water flood depths and hazards based on the EA's national Risk of Flooding from Surface Water dataset
    - Assessment of all other sources of flood risk

Figure 1-1: Existing site location boundary

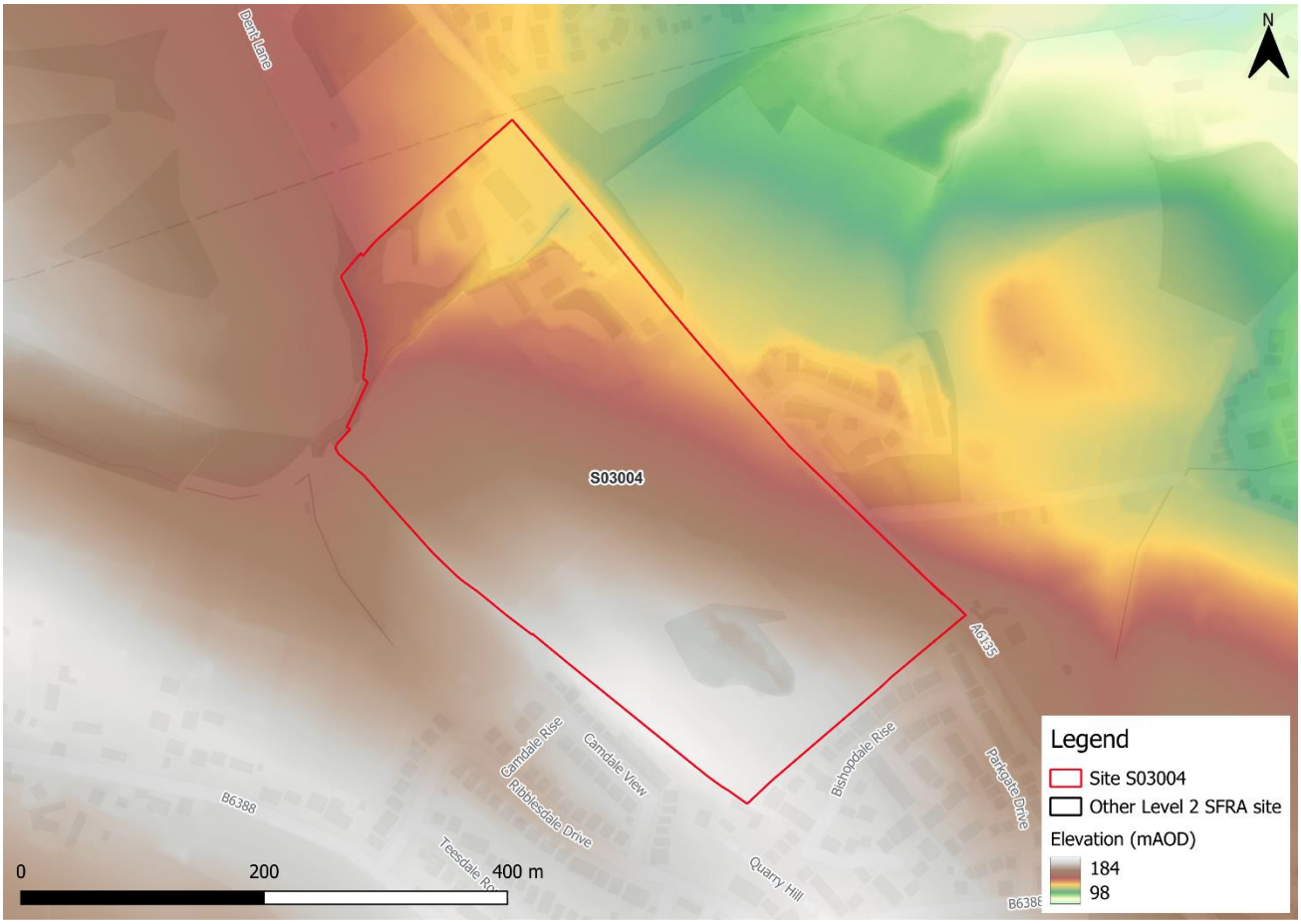

Figure 1-2: Topography

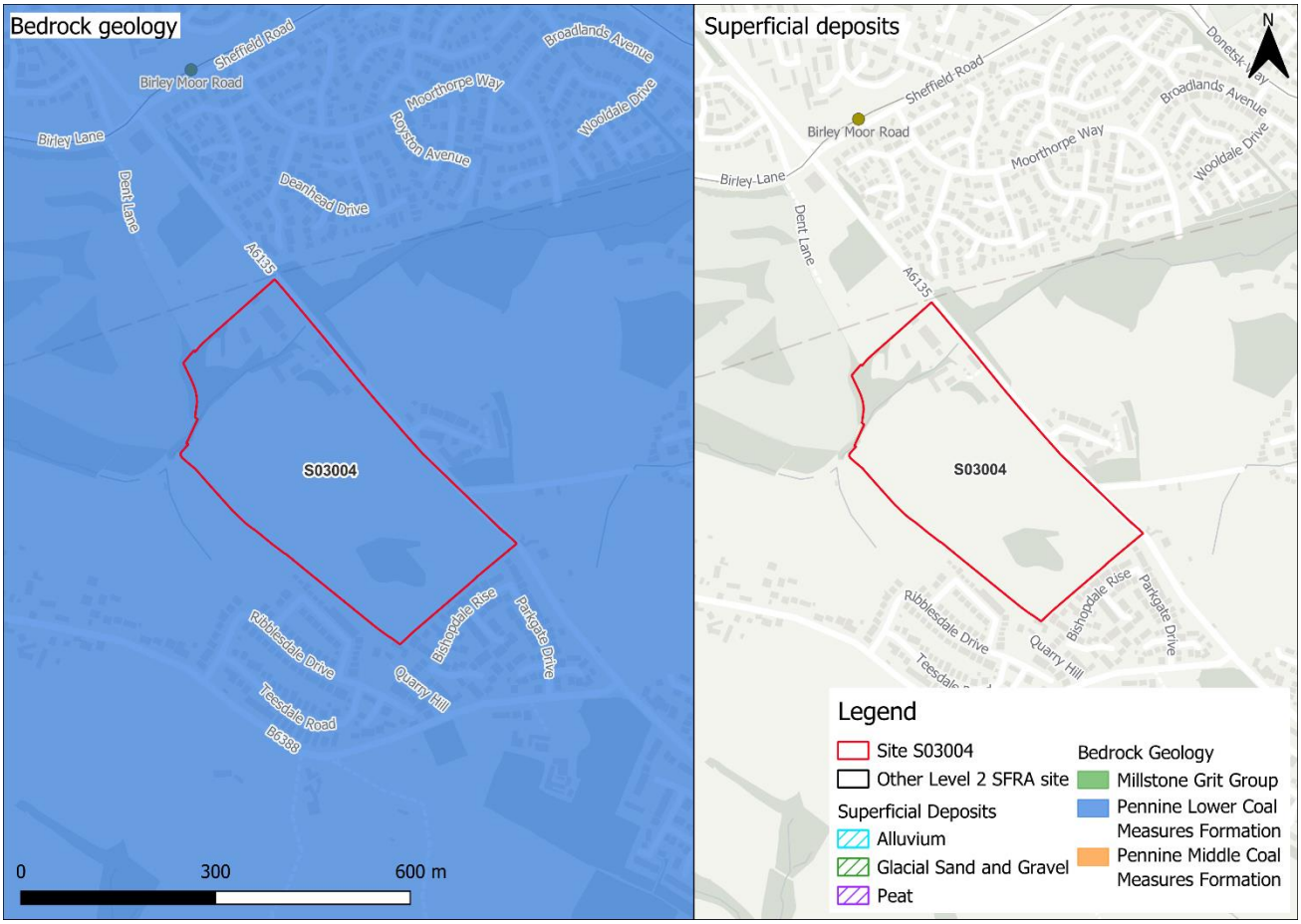

Figure 1-3: Soils and geology

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 2.3) or the impacts of climate change (Section 2.2).

The site is modelled to be within Flood Zone 1 indicating it is at low risk of flooding from rivers. OS mapping and topography data indicates that there is an unmodelled watercourse present within the north of the site, namely Ochre Dike. Section 2.1.2 discusses the potential risk to the site from this ordinary watercourse, using the third generation Risk of Flooding from Surface Water (RoFSW) dataset as a proxy 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)
100	0	0	0

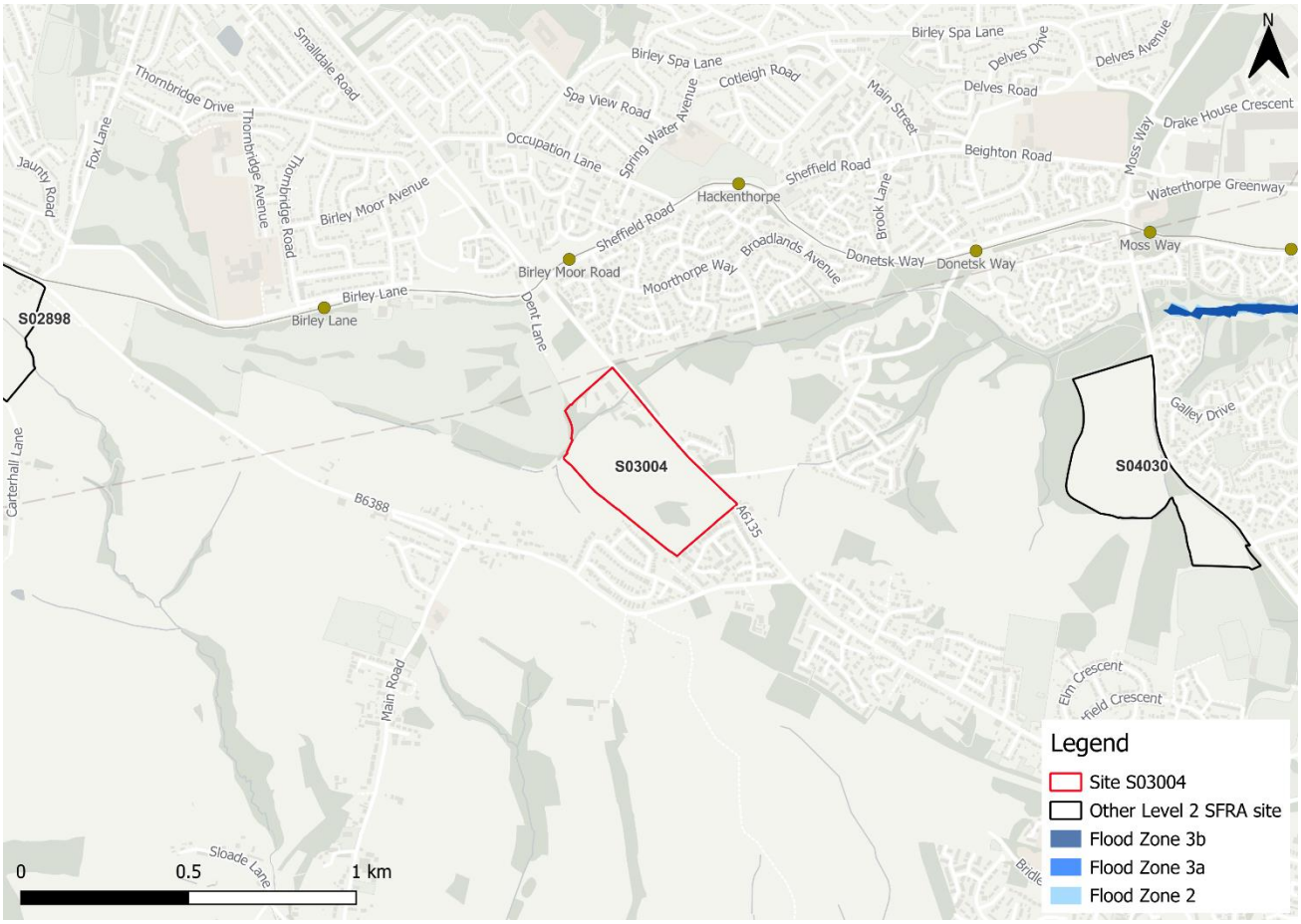

Figure 2-1: Existing risk from rivers to the site

2.1.2 Unmodelled watercourse risk

As documented in Section 2.1.1, Ochre Dike is present within the north of the site. There is no existing model for this watercourse, therefore risk 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. Any site-specific FRA should develop a model of Ochre Dike to fully understand the onsite fluvial risk. Site design should include the channel within a blue green corridor.

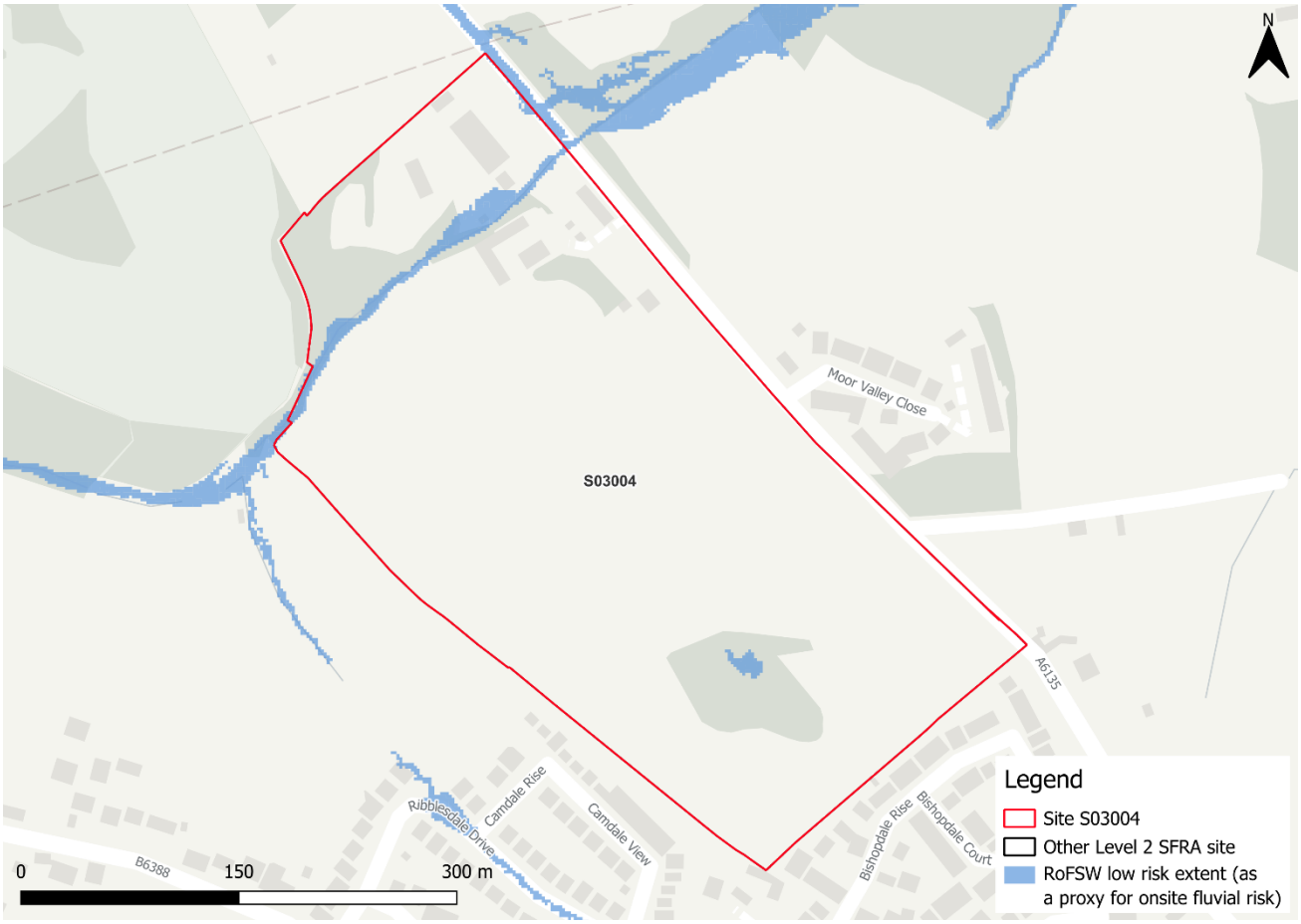

Figure 2-2: Low risk event surface water flood extent (Risk of Flooding from Surface Water map) as a proxy for onsite fluvial risk

2.2 Impacts from climate change

The impacts of climate change on flood risk from Ochre Dike have not been modelled for this SFRA, as a model covering the ordinary 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 Ochre Dike 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. Both upstream and within the site, there are opportunities for riparian woodland planting to attenuate flooding. Within the site, there is also potential for runoff attenuation features which indicate areas where enhanced storage may be achievable. These areas are shown in Figure 2-3. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

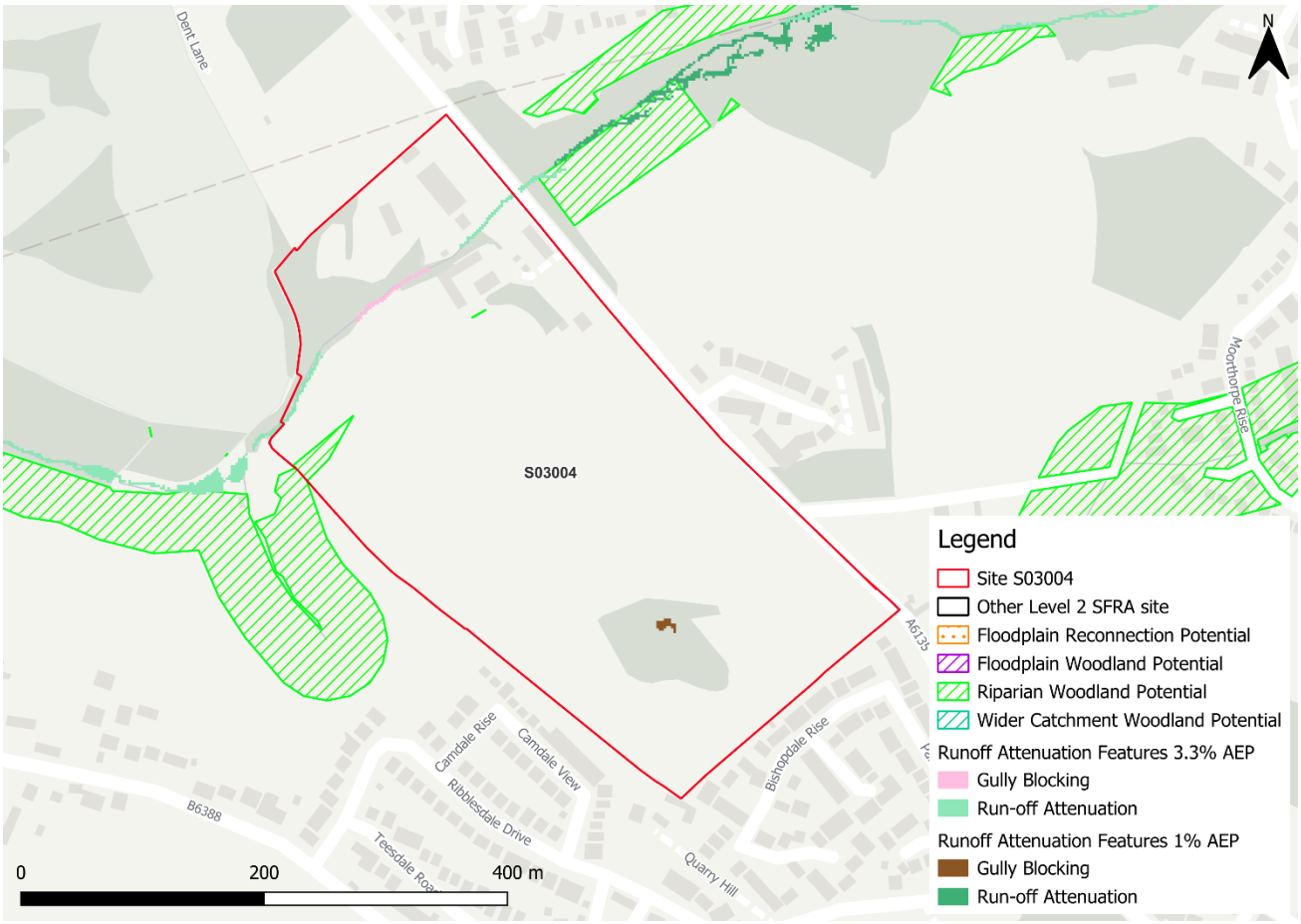

Figure 2-3: Natural Flood Management (NFM) potential mapping

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 events at the site.

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 would likely be achievable via the A6135 during a fluvial flood event.

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 located wholly within Flood Zone 1 indicating it is at low risk of flooding from rivers. However, there is potential fluvial risk from Ochre Dike.
- The extent of fluvial risk from the unmodelled watercourse is currently unknown. Using the 0.1% AEP surface water event as a proxy, risk is modelled to remain largely confined to the areas immediately surrounding the watercourse. Any site-specific FRA should develop a model of Ochre Dike to fully understand the onsite fluvial risk now and in the future.
- There should be no development within 8 metres of Ochre Dike. The watercourse should be included in site design as a blue green corridor.

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 (November 2023), surface water risk to the site is predominantly very low. Approximately 1% of the site is at high surface water risk. A further 1% of the site is at medium 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 the channel of Ochre Dike extending through the north of the site. There is an additional area of ponding in a topographic low spot within the south of the site in the medium risk event. In the low risk event, there is some modelled risk along the banks of Ochre Dike, however this is shallow. The area of ponding within the south of the site is modelled to increase in both extent and depth.

Greatest flood depths within the site in the medium risk event are between 0.9 and 1.2 m (Figure 3-1), however these depths are located within the channel onsite. Maximum depths outside of the channel are between 0.3 and 0.6 m, within the area of ponding in the south of the site. Modelled flood hazard outside of the channel on site is largely categorised as 'moderate', with a small area of 'significant' (Figure 3-2).

Safe access and escape routes are likely to be achievable via the A6135 in all events.

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)
96	2	1	1

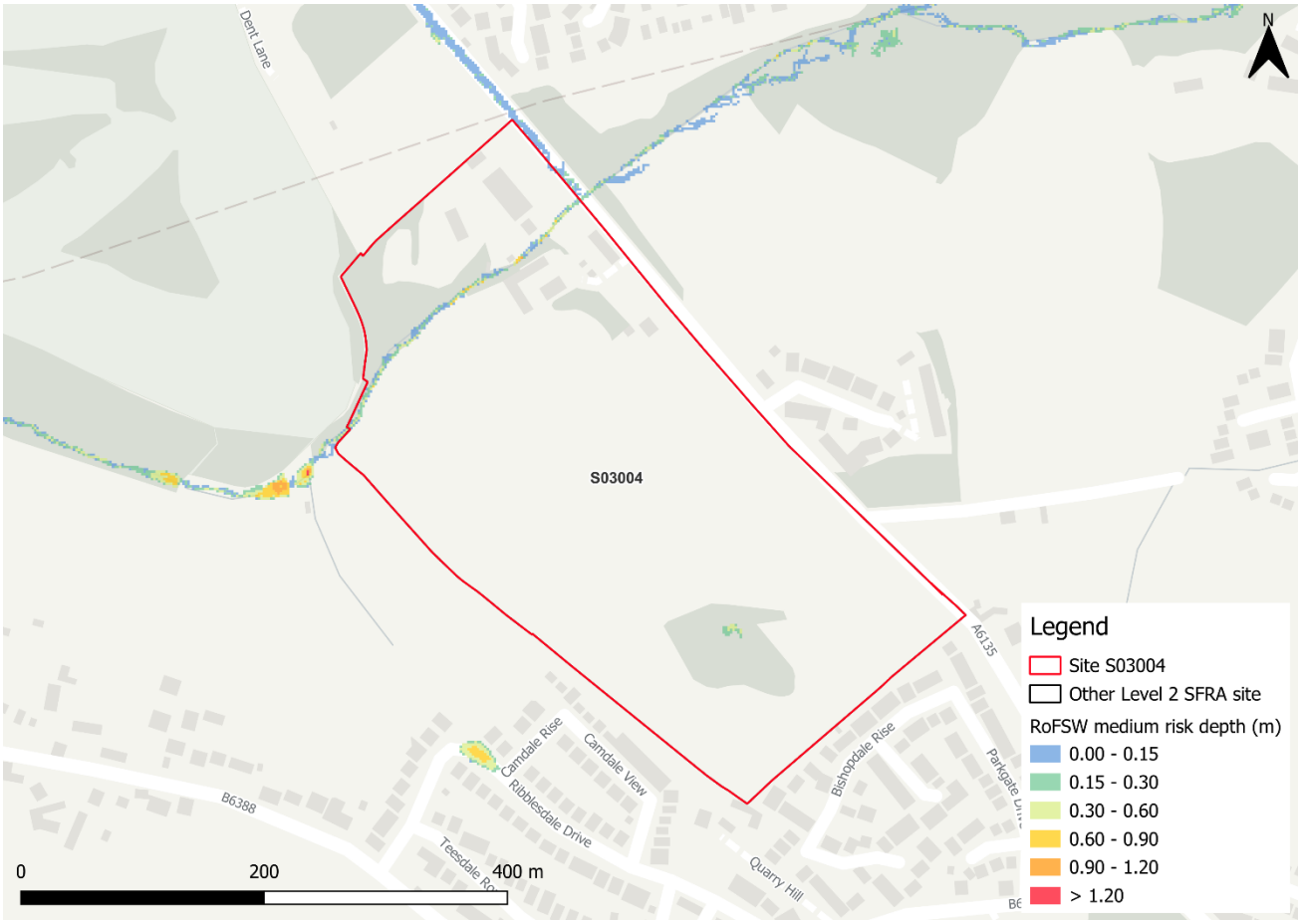

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

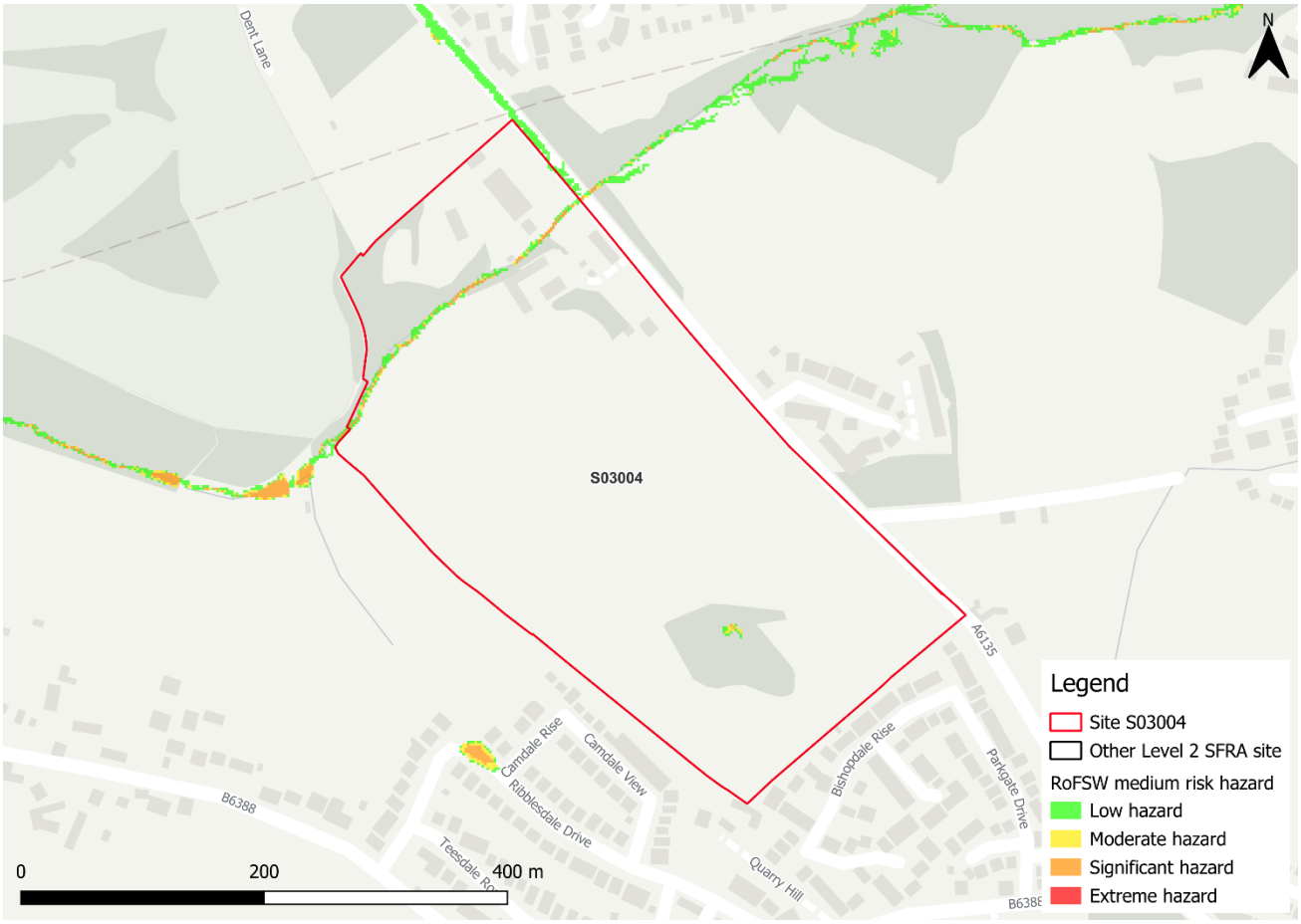

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

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 for present day conditions, with the medium risk climate change event showing a similar level of risk to the present day low risk event. Maximum flood depths outside of the channel onsite are modelled to increase to between 0.6 and 0.9 m, with some areas of hazard categorised as 'significant' (Figure 3-4). Safe access and escape routes should remain possible via the A6135.

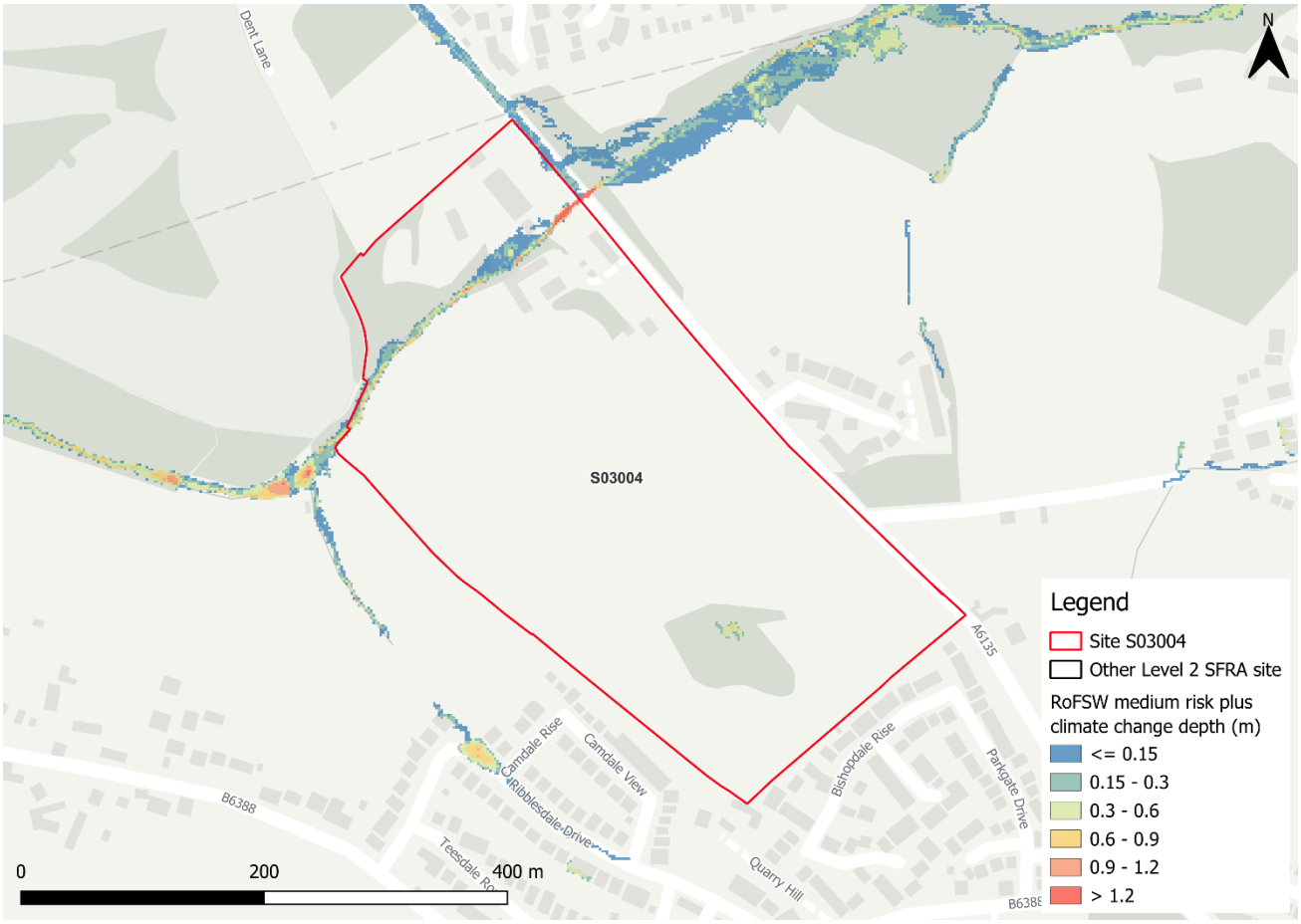

Figure 3-3: Medium risk event surface water flood depths plus 40% climate change (based on Risk of Flooding from Surface Water map)

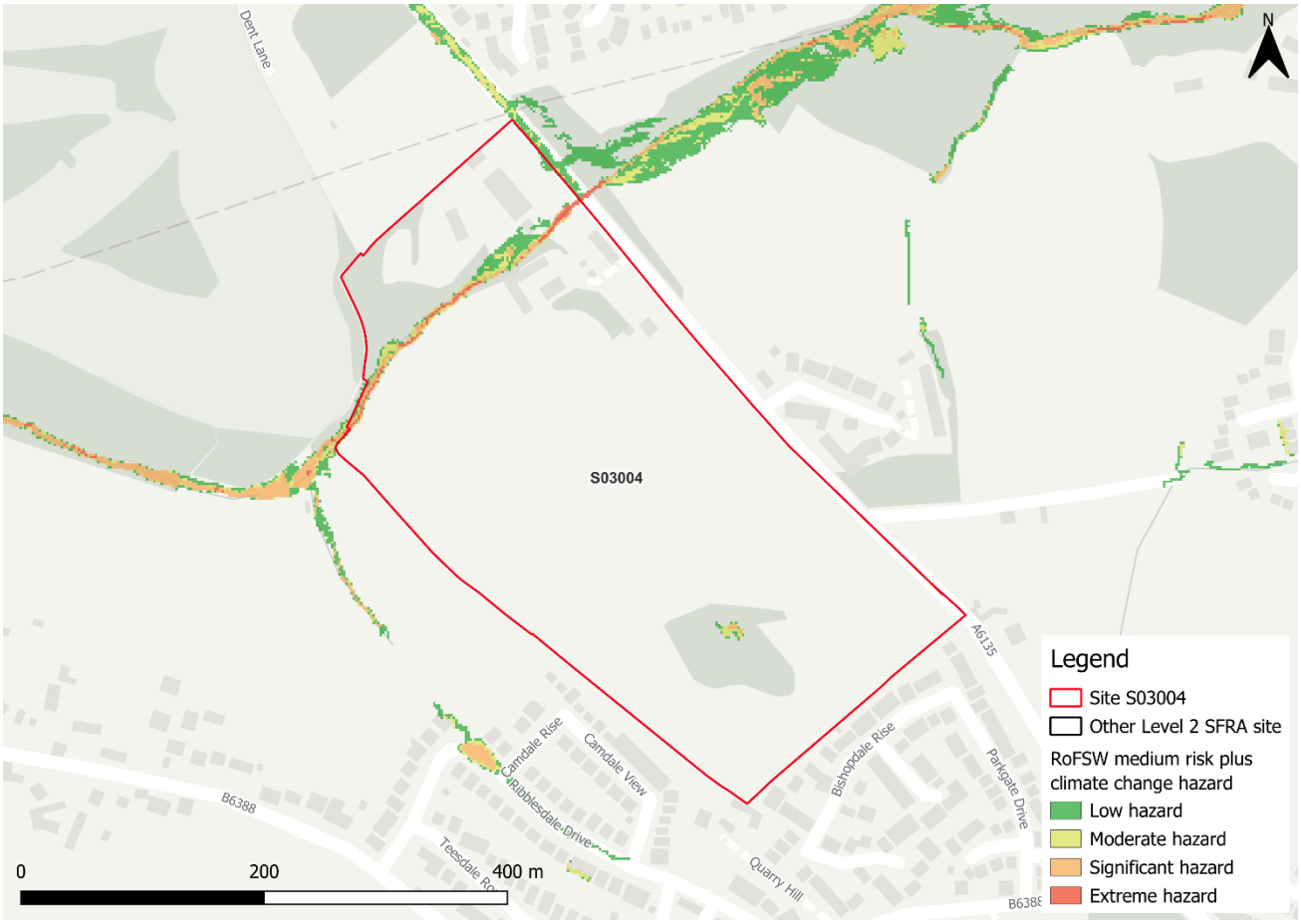

Figure 3-4: Medium risk event surface water flood hazards plus 40% climate change (based on Risk of Flooding from Surface Water map)

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*	8756	896	7860	210.0	0.52 Ha 3.8%
30yr Rainfall+35%	12*	9456	896	8560	228.7	0.57 Ha 4.1%
100yr Rainfall+25%	12*	21958	6270	15688 (7828 exceedance storage)	419.2	1.05 Ha 7.5%
100yr Rainfall+40%	12*	24593	6270	18323 (9763 exceedance storage)	489.6	1.22 Ha 8.8%
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) – 14.81, Q30 – 25.92, Q100 – 30.81.

3.4 Observations, mitigation options and site suitability - surface water

- Current risk is predominantly very low. Surface water risk in the medium risk event is largely confined to Ochre Brook. Safe access and escape routes would likely be achievable via the A6135 in all events.
- The channel should be kept in place and remain unobstructed. The channel should be maintained and included within the landscaping design of the residential development.
- Any topographic flow paths and depressions should be considered and included in site design and ideally left in place to flood naturally when required. Any regrading of land must include for like for like volumes to ensure risk is contained safely onsite for the lifetime of development.

- For the 1% AEP event plus 40% climate change, approximately 8.8% 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.
- A drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This may require surface water modelling based on layout plans and detailed design and consultation with the LLFA.
- The NaFRA2 version of the RoFSW should be considered at the FRA stage.
- Note, 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 risk of groundwater emergence varies within the site. Across the majority of the site, there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely. Within the north of the site, there is a risk of groundwater flooding to surface and subsurface assets. Ground survey, including percolation testing, may be required to fully ascertain groundwater conditions at the site.

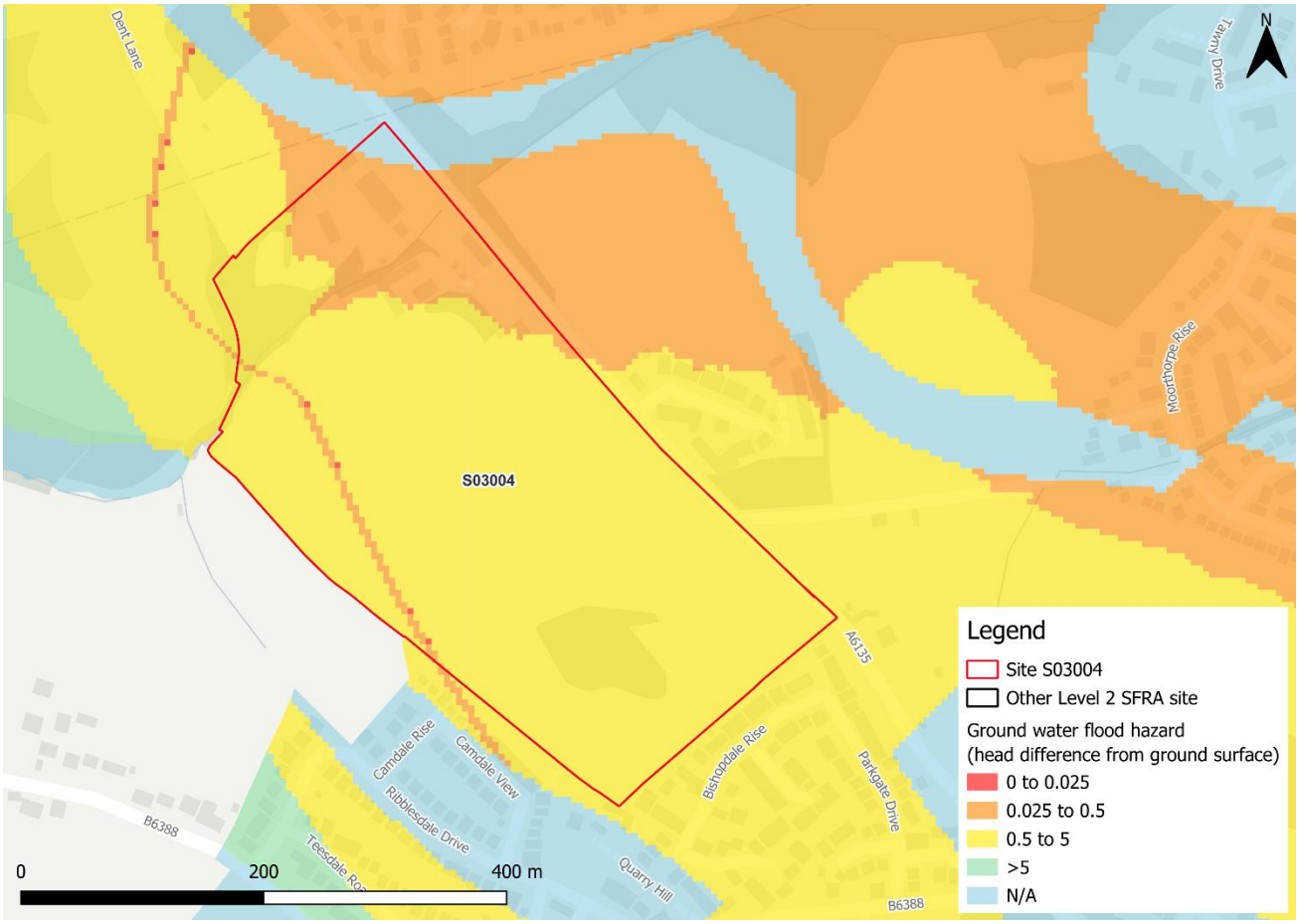

Figure 4-1: JBA 5m Groundwater Emergence Map

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 A6135 blockage

There is potential residual risk to the site from a blockage of the culvert beneath the A6135 along Ochre Dike to the northeast of the site. As there is no model available for this watercourse, the impact to the site of a blockage at this location has not been assessed.

5.2 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.

5.3 Observations, mitigation options and site suitability - residual risk

- There is potential residual risk from a blockage of the culvert beneath the A6135 along Ochre Dike. It is recommended that any site-specific FRA assesses the impact of a potential blockage to the site.

6 Overall site assessment

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

This site is not required to pass part b) of the exception test[3] as it is located within Flood Zone 1, however it must still be proven that the development can be safe for its lifetime, which is 100 years for residential development.

Were any future modelling of Ochre Dike to indicate that the site is at risk in the 1% AEP undefended event, the site may then be subject to the exception test, assuming the sequential test has been 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:

- It should be appropriate to develop this site for more vulnerable purposes given its location within Flood Zone 1. Ochre Dike present onsite should be kept in place and remain unobstructed and be included within a blue green corridor.
- There should be no development within 8 metres of the banks of Ochre Dike to allow for access to the watercourse for maintenance activities.
- Modelling of Ochre Dike should be carried out to inform on potential current and future flood risk to the site.
- There is potential residual risk to the site from a blockage of the culvert beneath the A6135. This risk should be considered as part of a site-specific FRA.
- Groundwater conditions at the site should be investigated further as part of a site-specific FRA. This may need to include for ground survey, including percolation testing to fully ascertain groundwater conditions at 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.

3 Para 178 National Planning Policy Framework 2024

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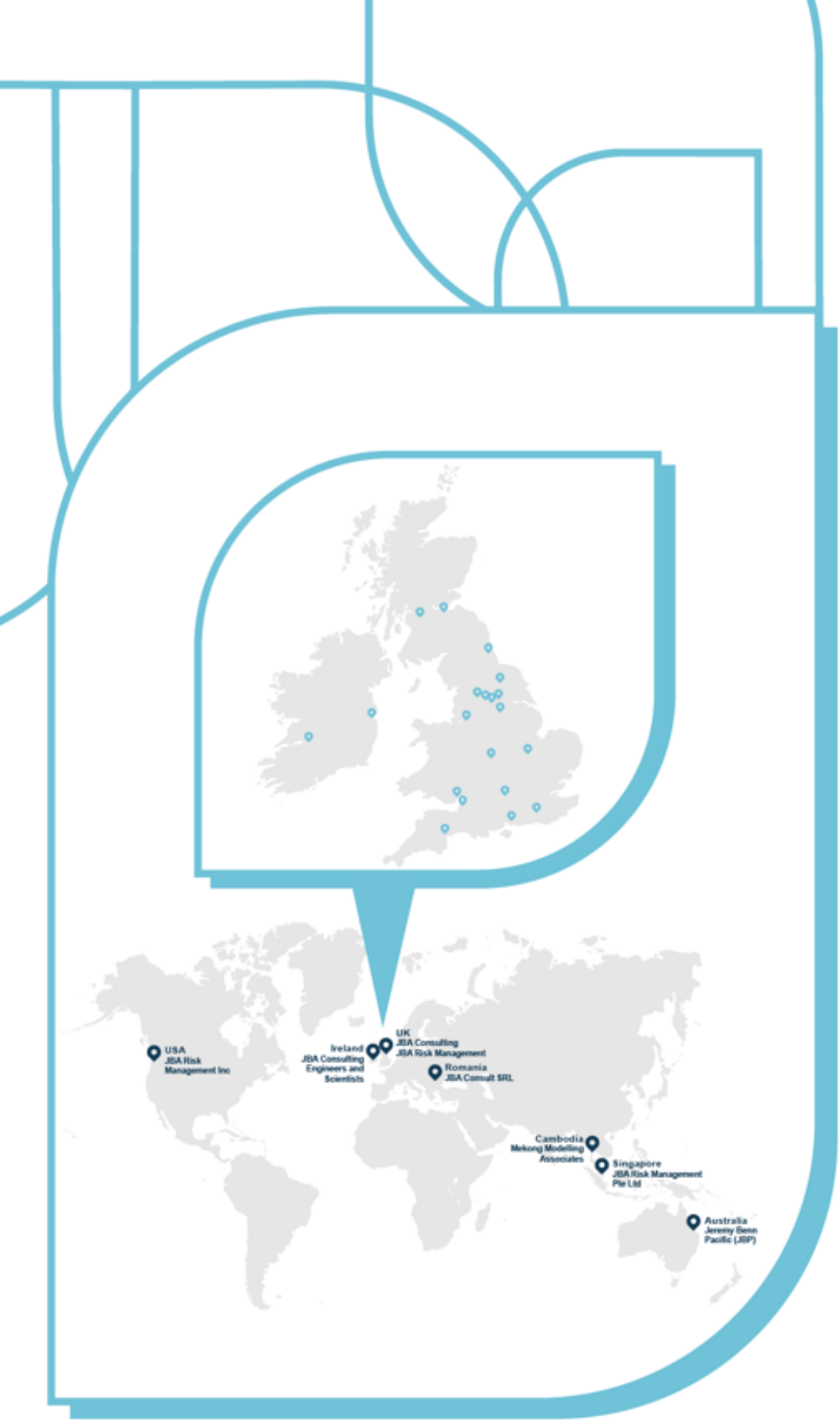

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