Sheffield Level 2 Strategic Flood Risk Assessment Update - Site S03076

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 S03076. 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 S03076

- Location: Land between Lodge Moor Road and Redmires Conduit, S10 4LZ
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 9.2 hectares
- Proposed development impermeable area: 7.8 hectares (assumed 85% of total site area)
- Watercourse: Redmires Conduit ordinary watercourse (unmodelled)
- Summary of requirements:
    - 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

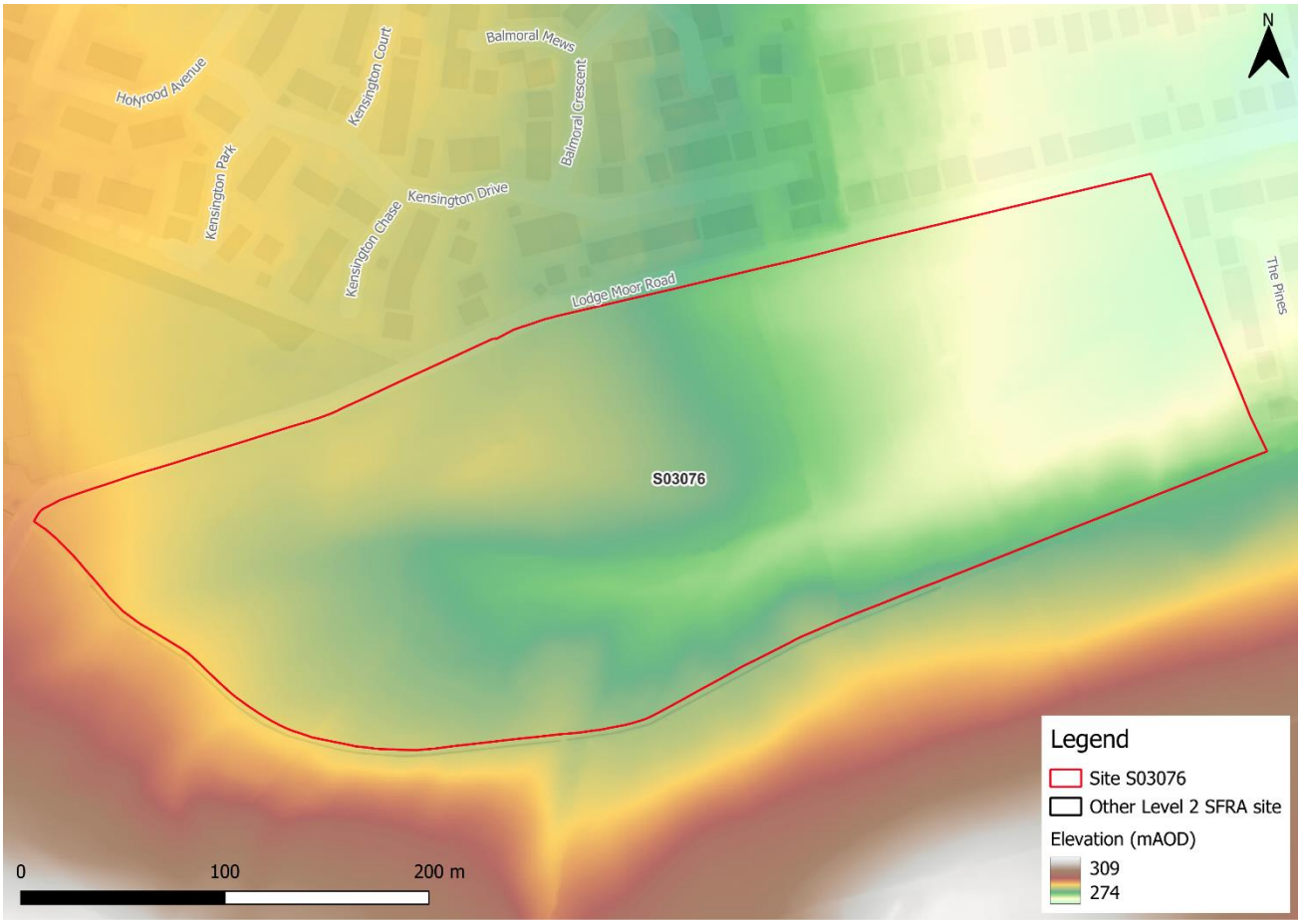

Figure 1-2: Topography

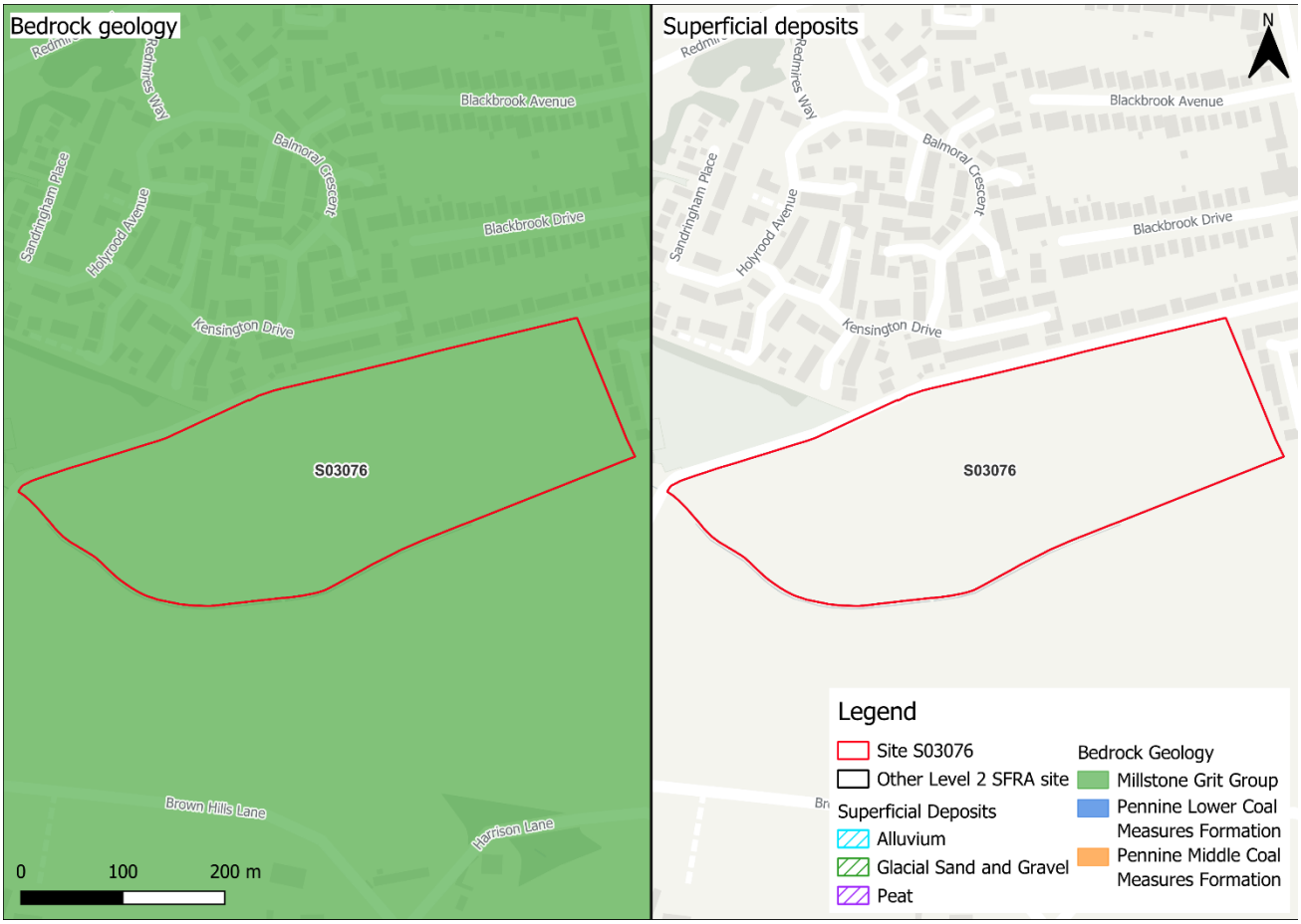

Figure 1-3: Soils and geology

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 2.1.2) or the impacts of climate change.

The site is modelled to be within Flood Zone 1 indicating it is at low risk of flooding from rivers. Redmires Conduit watercourse is situated along the southern boundary of the site. A flood model does not exist for this watercourse.

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

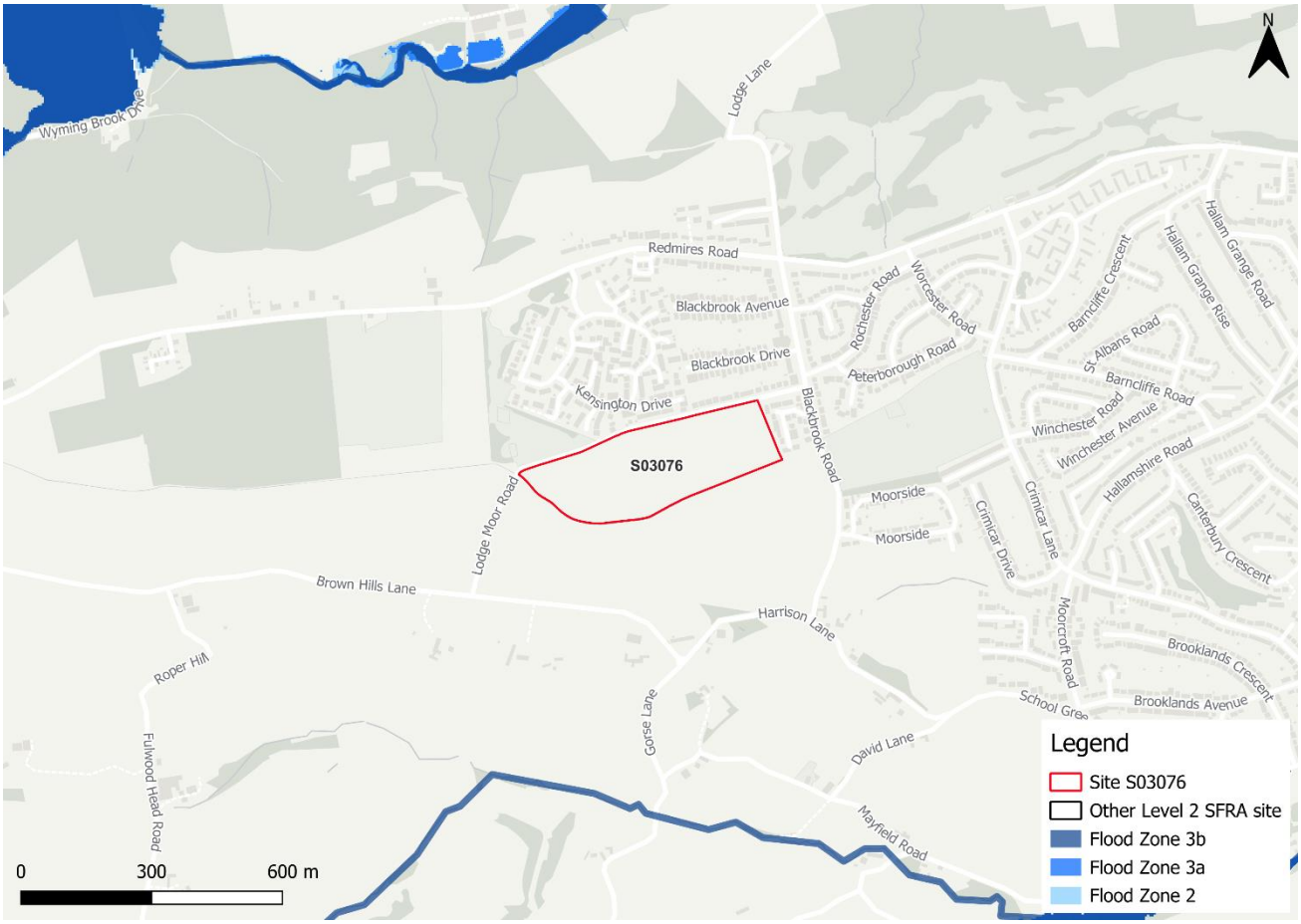

Figure 2-1: Existing risk from rivers to the site

2.1.2 Unmodelled ordinary watercourse risk

As documented within Section 2.1.1, an unmodelled watercourse is present on the southern boundary of the site, namely Redmires Conduit. There is no existing 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 is not feasible. There is also no representation of the watercourse within the 0.1% AEP event of the third generation RoFSW dataset. A site-specific FRA should model this ordinary watercourse to fully understand the onsite fluvial risk. This watercourse may act as a controlled drainage system for the Redmires Reservoirs upstream of the site. The owners of this reservoir system should be consulted at the FRA stage.

2.2 Flood risk management

2.2.1 Flood defences

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

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) that may help to reduce flood risk to the site and surrounding areas. Within the site, there are opportunities for runoff attenuation features indicating where it may be possible to temporarily store water and attenuate flooding during high flows. These areas are shown in Figure 2-2. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

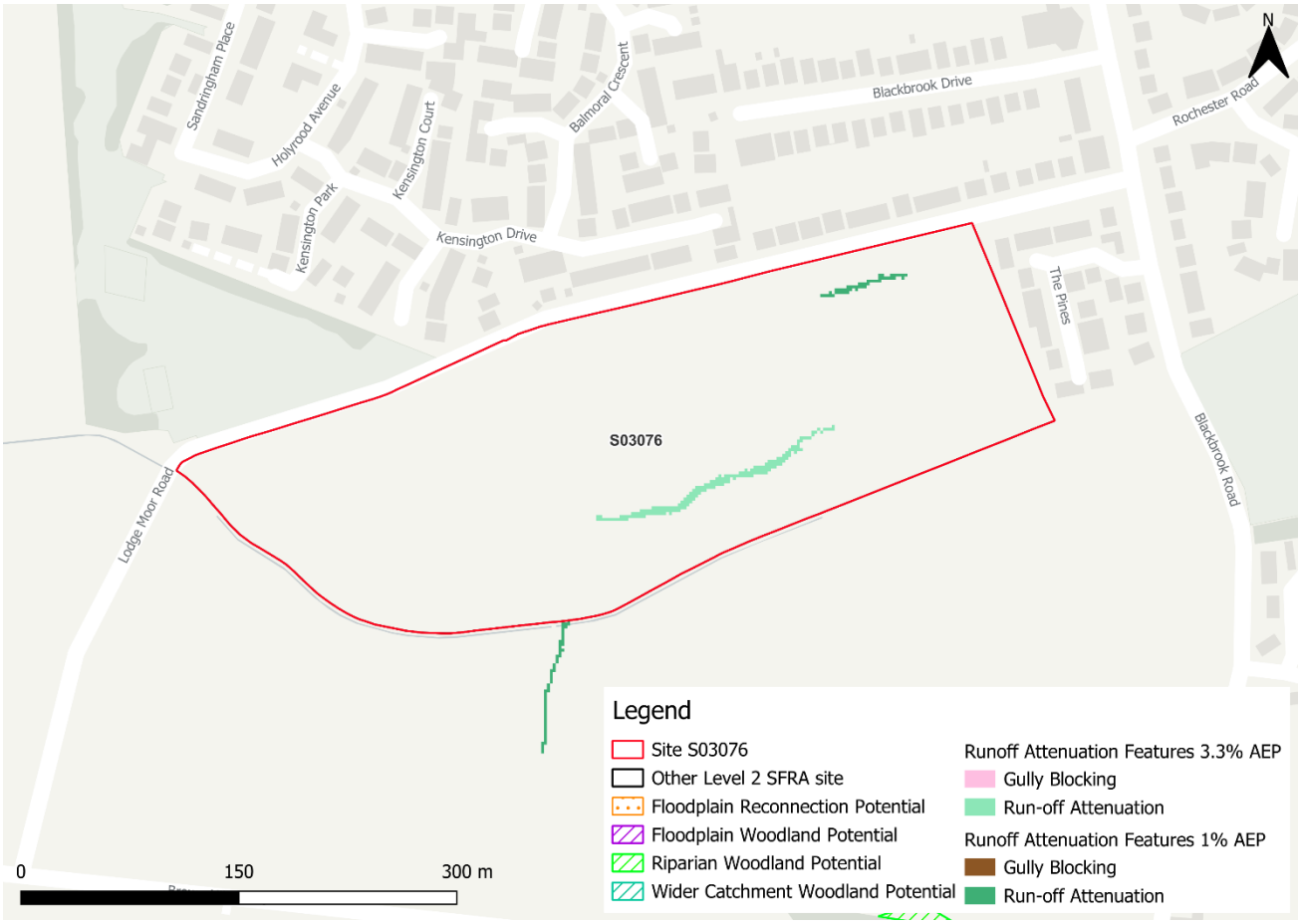

Figure 2-2: Natural Flood Management (NFM) potential mapping

2.3 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.

2.4 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 Lodge Moor Road to the north of the site during a fluvial flood event.

2.5 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, fluvial risk from Redmires Conduit located along the southern boundary of the site is currently unknown. Details on potential risk should be sought through initial consultation with the owners of the Redmires Reservoirs system.

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 3% of the site is at high surface water risk. A further 2% of the site is at medium risk and a further 10% is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is confined to a shallow flow path through the centre of the site, with an area of ponding along the eastern site boundary. The area of surface water risk is modelled to increase in extent in the medium risk event. In the low risk event, a shallow flow path develops through the north of the site, combined with an increase in depth and extent of the area of ponding within the east.

Greatest flood depths within the site in the medium risk event are between 0.6 and 0.9 m (Figure 3-1), with areas of hazard categorised as 'significant' (Figure 3-2). Safe access and escape routes should be possible via Lodge Moor Road to the north of the site.

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)
85%	10%	2%	3%

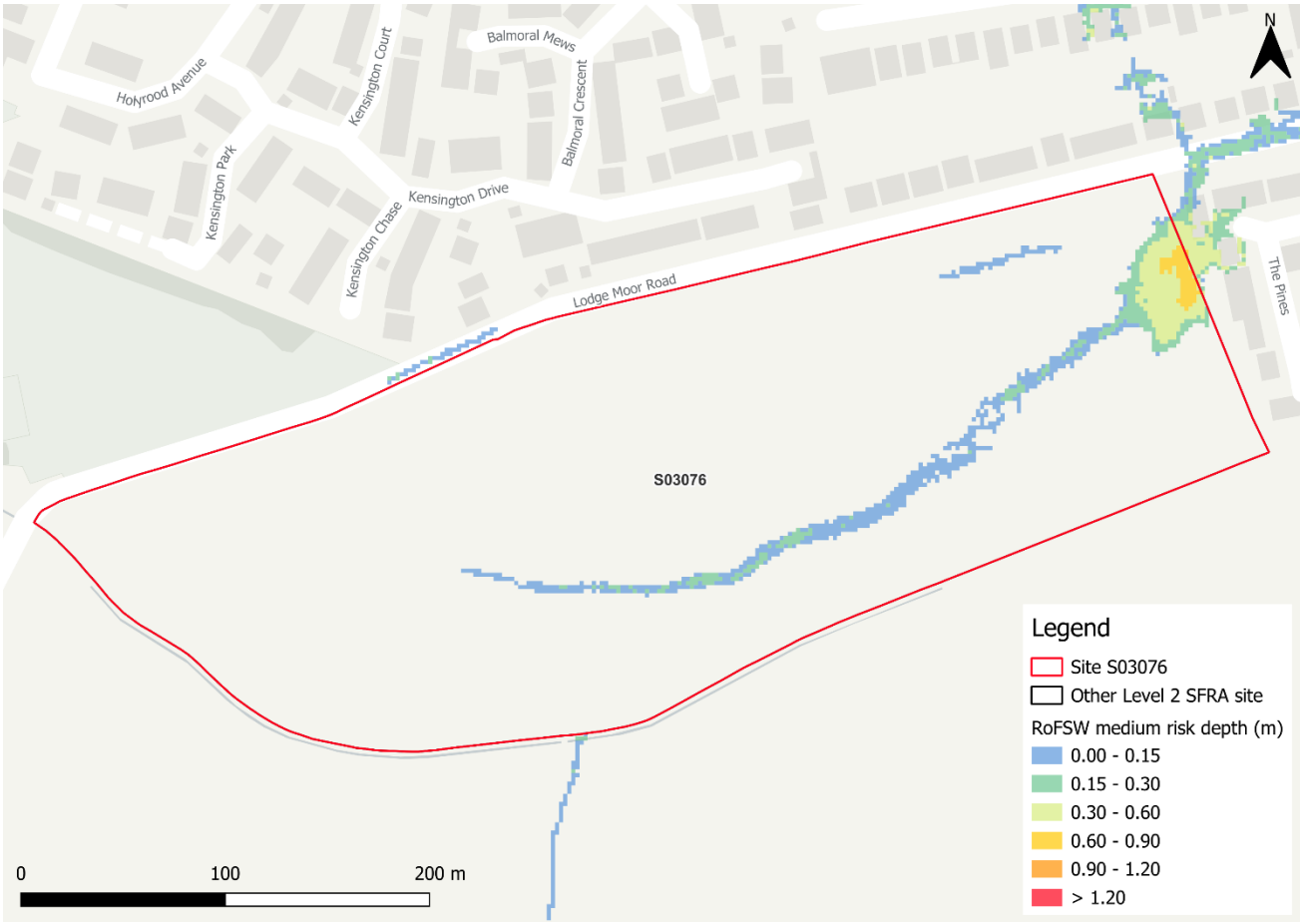

Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

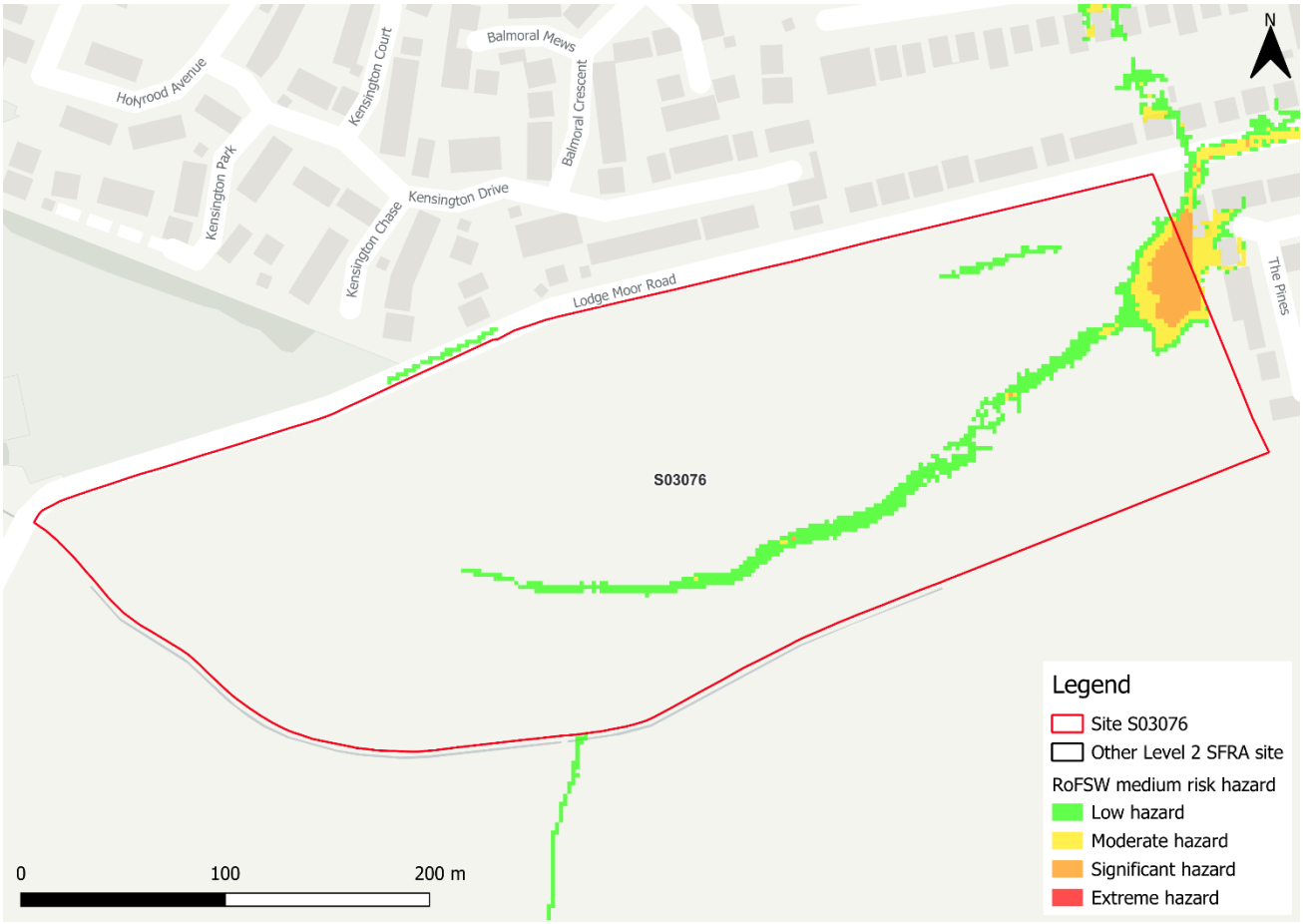

Figure 3-2: Medium risk event surface water flood hazard[1] (Risk of Flooding from Surface Water map)

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 significantly greater than for present day conditions, with the medium risk climate change event showing a greater level of risk than the present day low risk event. Maximum flood depths within the site are modelled to increase to between 0.9 and 1.2 m, with a large area of hazard categorised as 'significant' (Figure 3-4). Safe access and escape routes are likely to remain achievable via Lodge Moor Road to the north.

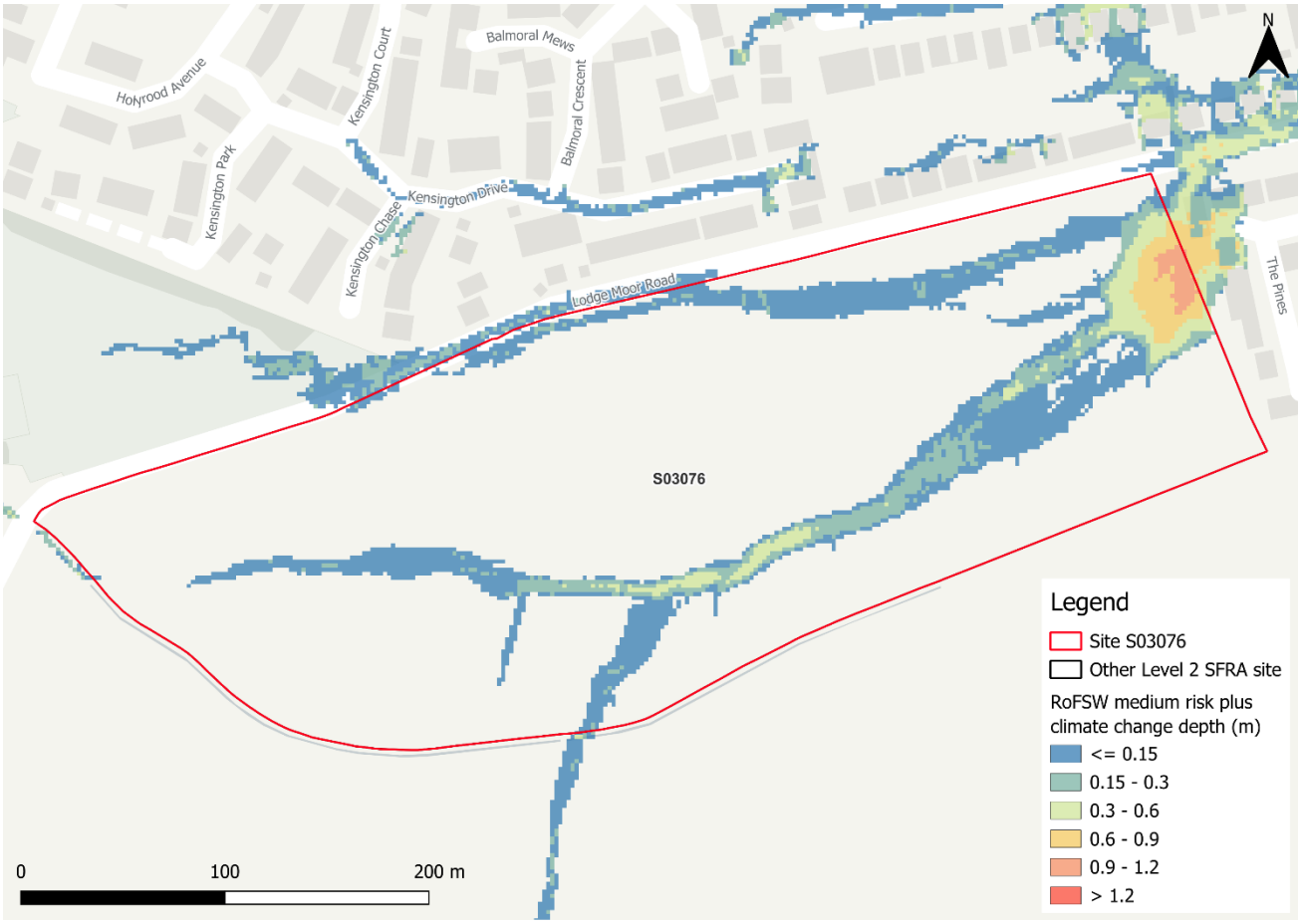

Figure 3-3: Medium risk event surface water flood depths plus 40% climate change (based on Risk of Flooding from Surface Water map)

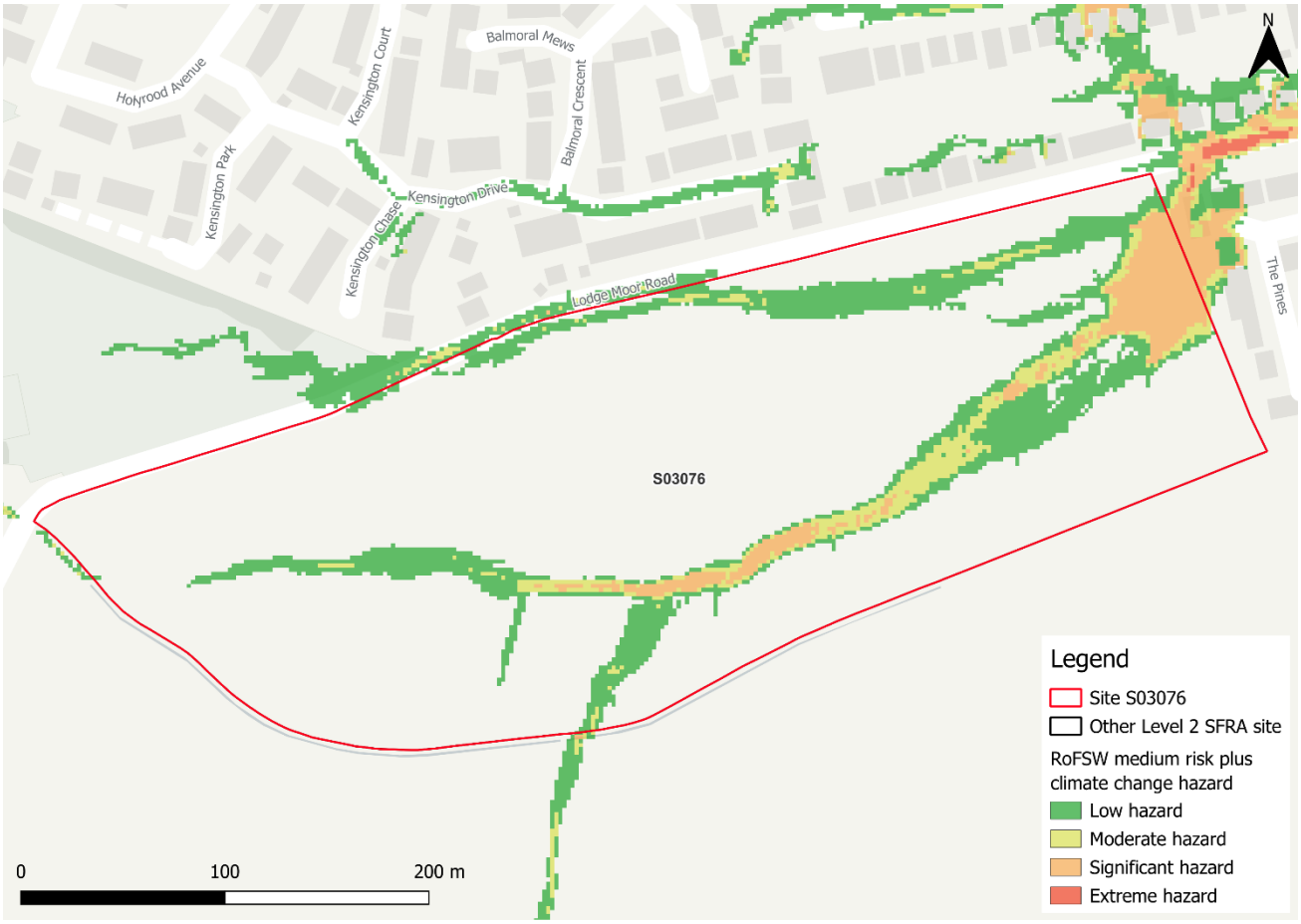

Figure 3-4: Medium risk event surface water flood hazards plus 40% climate change (based on Risk of Flooding from Surface Water map)

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%	8	5501	1683	3818	18.1	0.25 Ha 2.8%
30yr Rainfall+35%	9.25	6213	1946	4267	20.2	0.28 Ha 3.1%
100yr Rainfall+25%	12*	8111	2735	5375 (1557 exceedance storage)	25.5	0.36 Ha 3.9%
100yr Rainfall+40%	12*	9527	3156	6370 (2103 exceedance storage)	30.2	0.42 Ha 4.6%
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) – 83.5, Q30 – 155.4, Q100 – 184.7.

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 a shallow flow path through the centre of the site and an area of ponding along the eastern site boundary. Safe access and escape routes would likely be achievable via Lodge Moor Road in all events.
- When accounting for climate change, significant flow paths develop through the site flowing west to east and ponding at the eastern site boundary. These flow paths should be included in site design and layout and remain free of development.
- Any topographic flow paths and depressions should be 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 4.6% 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 detailed drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of changing from open space to new built development. This will likely require surface water modelling based on layout plans and detailed design and consultation with the LLFA.
- The NaFRA2 release 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 majority of the site is within an area where groundwater emergence is unlikely. The remaining area of the site is located in an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS across the site.

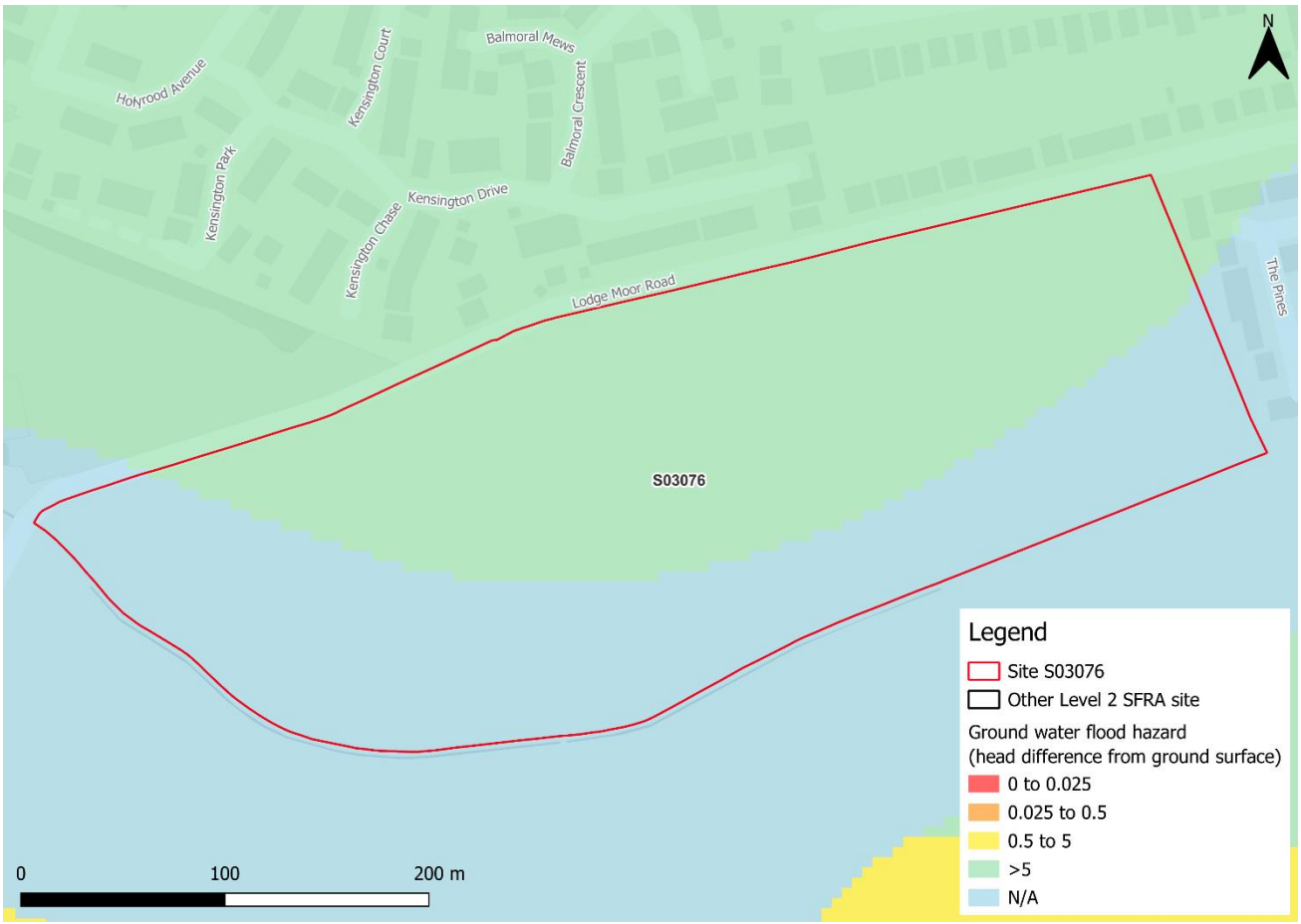

Figure 4-1: JBA 5m Groundwater Emergence Map

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 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. However, the Redmires Reservoirs system upstream of the site has not been modelled for the RFM (2021). The developer should consult with the reservoir owners at the FRA stage to ascertain any potential risk to the site or to the reservoir system as a result of new development downstream.

5.2 Observations, mitigation options and site suitability - residual risk

- The site is not likely to be at residual flood risk based on current information.

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 Redmires Conduit 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. However, fluvial risk to the site from Redmires Conduit along the southern boundary of the site is unknown. Any FRA should model this watercourse to fully understand the onsite fluvial risk both now and in the future.
- The owners of the Redmires Reservoir system should be consulted to help ascertain any risk to the site and any risk a new development may pose to the reservoir.
- There is risk from surface water through the site in the long term in the form of significant flow paths and a large area of ponding. A detailed drainage strategy will be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. Surface water should be retained onsite, which will require detailed surface water modelling based on layout plans and detailed design. There should be full consultation with the LLFA on required runoff rates, likely to be greenfield. The use of infiltration SuDS should be achievable and should be investigated early in the site design phase.
- 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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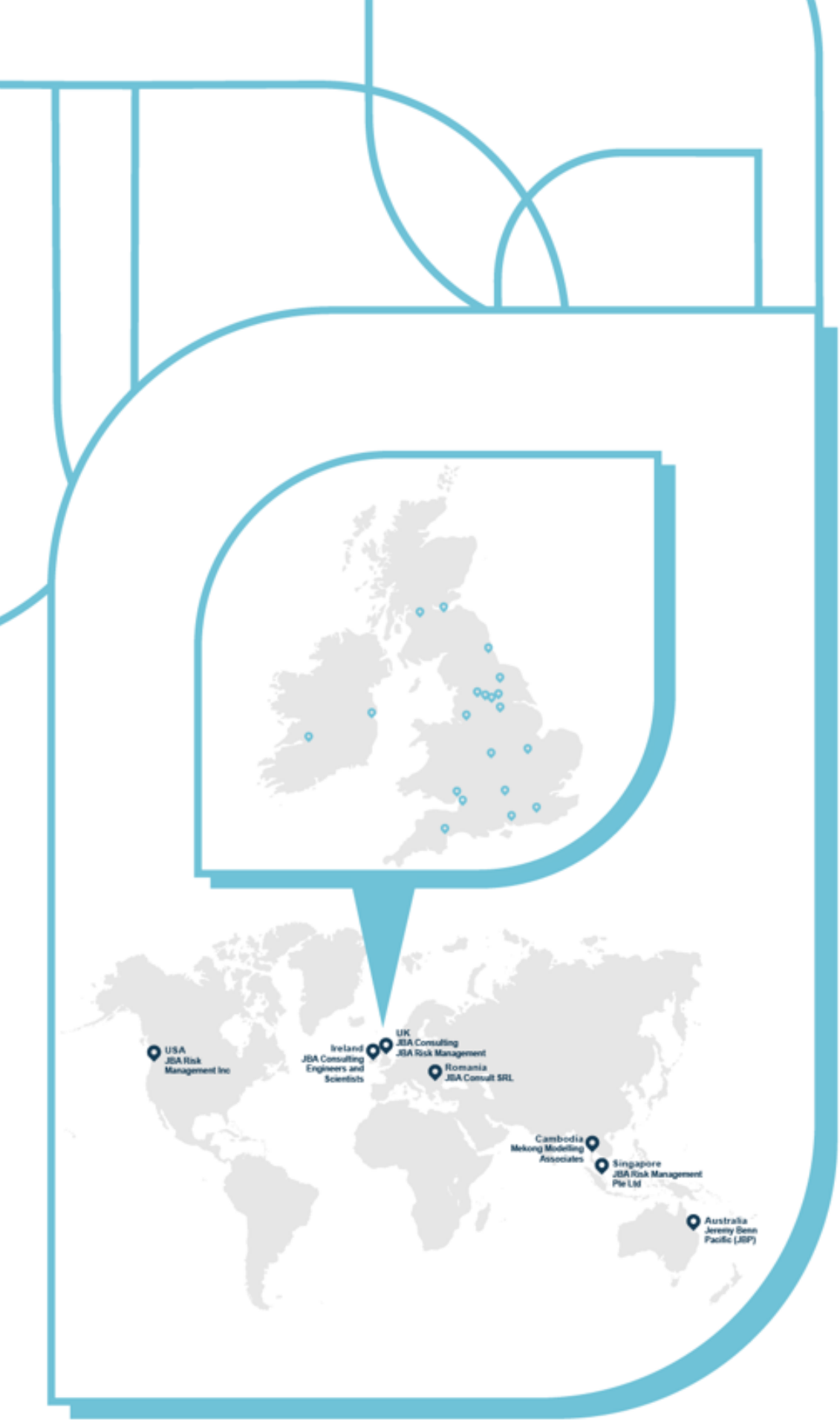

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