

Bradford Level 2 Strategic Flood Risk Assessment - Site H1254

Final Draft

July 2026

Prepared for:



City of
BRADFORD
METROPOLITAN DISTRICT COUNCIL

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Document Status

Issue date	17 July 2026
Issued to	Jonathan Dicken
BIM reference	NPA-JBA-XX-XX-RP-Z-0017
Revision	P03
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Contract

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This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Laura Thompson-Jones of JBA Consulting carried out this work.

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between 18 November 2024 and 17 July 2026 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

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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 City of Bradford Metropolitan District Council (CBMDC) Local Plan Site H1254. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

1.1 Site H1254

- Location: Briggella Mills and Little Horton Lane
- Existing site use: Commercial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Residential
- Proposed site use vulnerability: More vulnerable
- Site area: 1.8 hectares
- Proposed development impermeable area: 1.62 hectares
- Watercourse: Bowling Beck
- Environment Agency (EA) model: N/A
- Summary of requirements from scoping stage:
 - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
 - 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

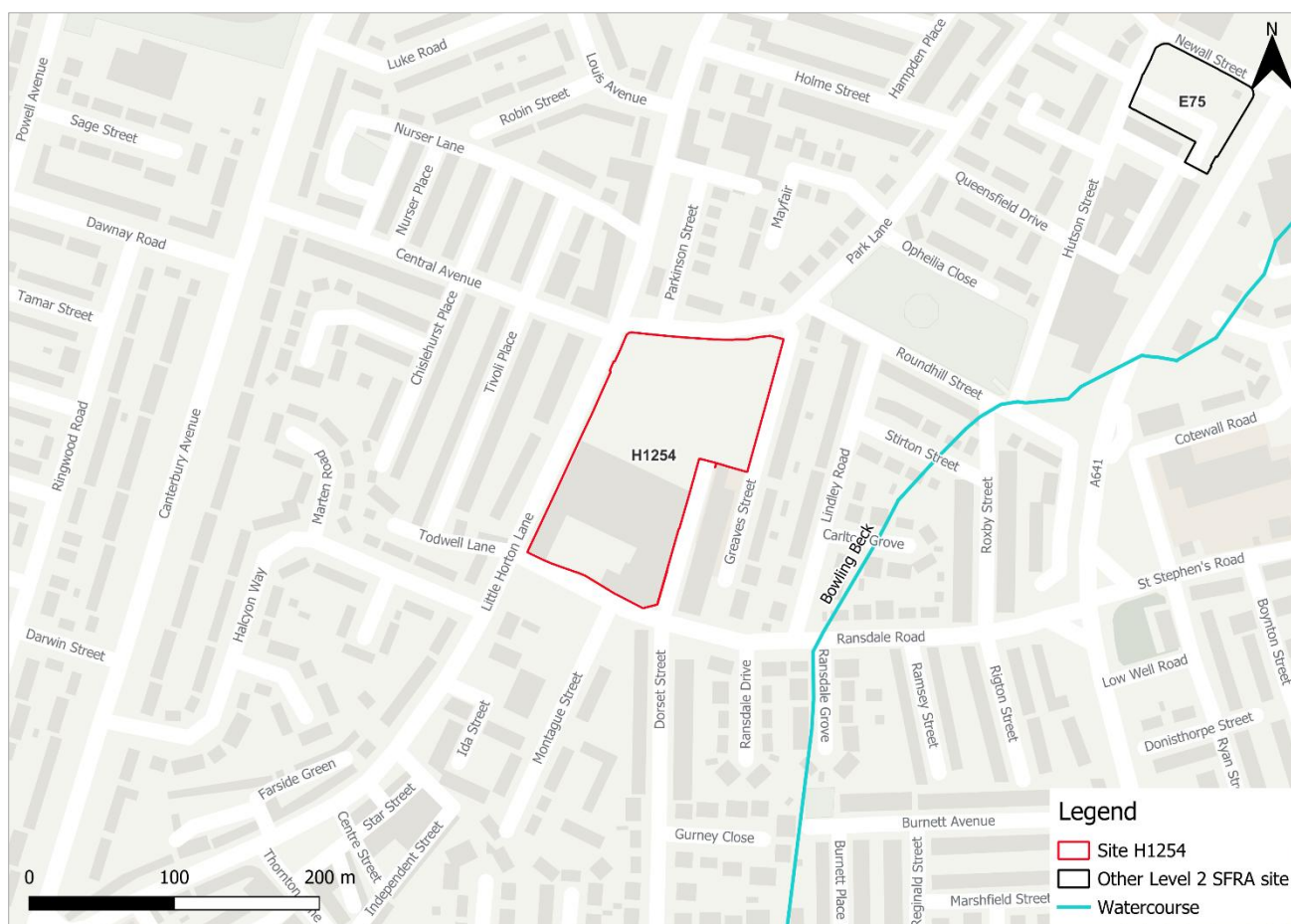


Figure 1-1: Existing site location boundary

The topography is generally consistent across the site (Figure 1-1). There are areas of higher elevation within the south of the site, sloping slightly towards the north.

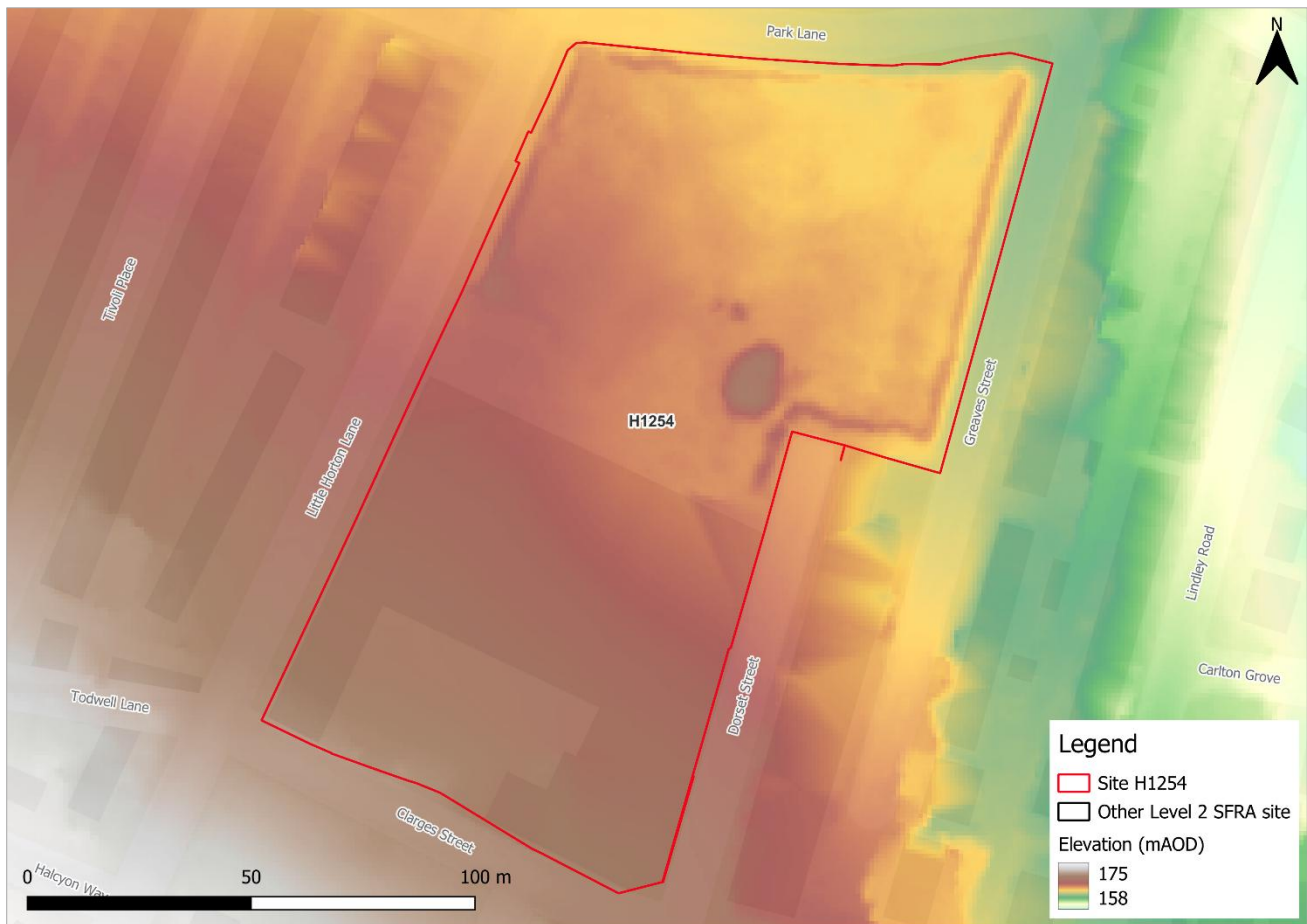


Figure 1-2: Topography

The underlying bedrock within the site is defined as 'Pennine Lower Coal Measures Formation', which comprises mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 1-3). This is overlain with superficial deposits of till. Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, however this can be highly variable. Sandstone has a higher permeability.



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 (January 2026) and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, 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).

The site is entirely located within Flood Zone 1 indicating it is at low risk of flooding from rivers. Bowling Beck, a tributary of Bradford Beck, is culverted to the east of the site. The exact location of culverted watercourses should be identified through site investigation, rather than through mapping, where information differs.

Historic land-use mapping held by the LLFA indicates a watercourse within the southeastern corner of the site. This should be confirmed, and the exact location ascertained, through site investigation. Potential flood risk from this watercourse may need to be ascertained at the FRA stage. No development should take place over the top of a culvert nor within 8m either side of the culverted section of 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 Bradford Beck 2026 model outputs - present day

The Bradford Beck 2026 model does not cover the reach of Bowling Beck present to the east of the site. Therefore, flood depth, hazard and velocity data cannot be considered as part of this Level 2 SFRA. Any site-specific FRA should produce a detailed model of the reach of Bowling Beck to the east of the site. The exact culvert location and capacity of the LLFA identified watercourse needs to be established through a survey. A model of this watercourse may also be required at the site-specific FRA stage depending on the outcomes of the culvert survey.

2.2 Impacts from climate change

The EA's SFRA guidance states that SFRA should assess the central allowance for less vulnerable, more vulnerable, highly vulnerable and water compatible development (Table 2-2). The impacts of climate change on flood risk from the Bradford Beck 2026 model have been modelled without flood defence infrastructure in place. As documented in Section 2.3.1, there are no formal engineered flood defences that would benefit the site.

Table 2-2: Climate change allowances for peak river flows for the Aire and Calder Management Catchment

Return period (AEP event)	Central allowance 2080s (% increase)	Higher central allowance 2080s (% increase)	Upper end allowance 2080s (% increase)
3.3% (functional floodplain)	23%	31%	51%
1%	23%	31%	51%

2.2.1 Bradford Beck 2026 model outputs - climate change

As documented in Section 2.1.2, the Bradford Beck 2026 model does not cover the site. Therefore, detailed climate change modelling is unavailable for consideration.

2.2.2 Flood Map for Planning - climate change

The EA's Flood Map for Planning plus Climate Change (2070-2125) dataset also does not cover the site (Figure 2-2). The impact 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 model produced for the LLFA identified watercourse, if required, and Bowling Beck must also consider the latest climate change allowances (Table 2-2).



Figure 2-2: EA Flood Zones plus Climate Change dataset

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) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

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 within the vicinity of the site.

2.5 LLFA flood incidents

The LLFA have records of two surface water incidents within the vicinity of the site. Developers should contact the LLFA for further information at the FRA stage, to assess potential flood risk to the site associated with these incidents.

2.6 Emergency planning

2.6.1 Flood warnings

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. This site is not located within a FAA.

2.6.2 Access and escape routes

Based on available information, safe access and escape routes could likely be achieved during a flood event via multiple points surrounding the site (Figure 2-3).

depending on the outcomes of the culvert survey. Any model produced would need to consider the latest climate change allowances.

- No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse, if identified to be present within the site following a survey. If a watercourse is identified, it may need to be modelled to quantify the risk.
- Assuming a culvert is located beneath the site, opportunities for opening up the culvert should be explored for inclusion in site design as a blue green corridor. This would remove any residual risk of flooding to the site as a result of culvert failure or blockage.
- Access and escape:
 - Based on available information, safe access and escape routes appear to be available via multiple routes surrounding the site.

3 Flood risk from surface water

3.1 Existing risk

At the time of writing, the EA's latest national Risk of Flooding from Surface Water (RoFSW) does not include depth and hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation RoFSW depth and hazard mapping in addition to the NaFRA2 extents, as agreed with the EA. Surface water depth and hazard should be confirmed at the site-specific FRA stage.

3.1.1 Risk of Flooding from Surface Water - NaFRA2 extents

Based on the EA's national scale RoFSW map (January 2026), surface water risk to the site is predominantly very low, as shown in Table 3-1. Surface water risk is confined to areas of ponding in topographic low spots across the site (Figure 3-1). Within the south of the site, surface water risk is clearly constrained by the existing development within the site. Safe access and escape routes would likely be achievable via Park Lane 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)
86	5	4	5

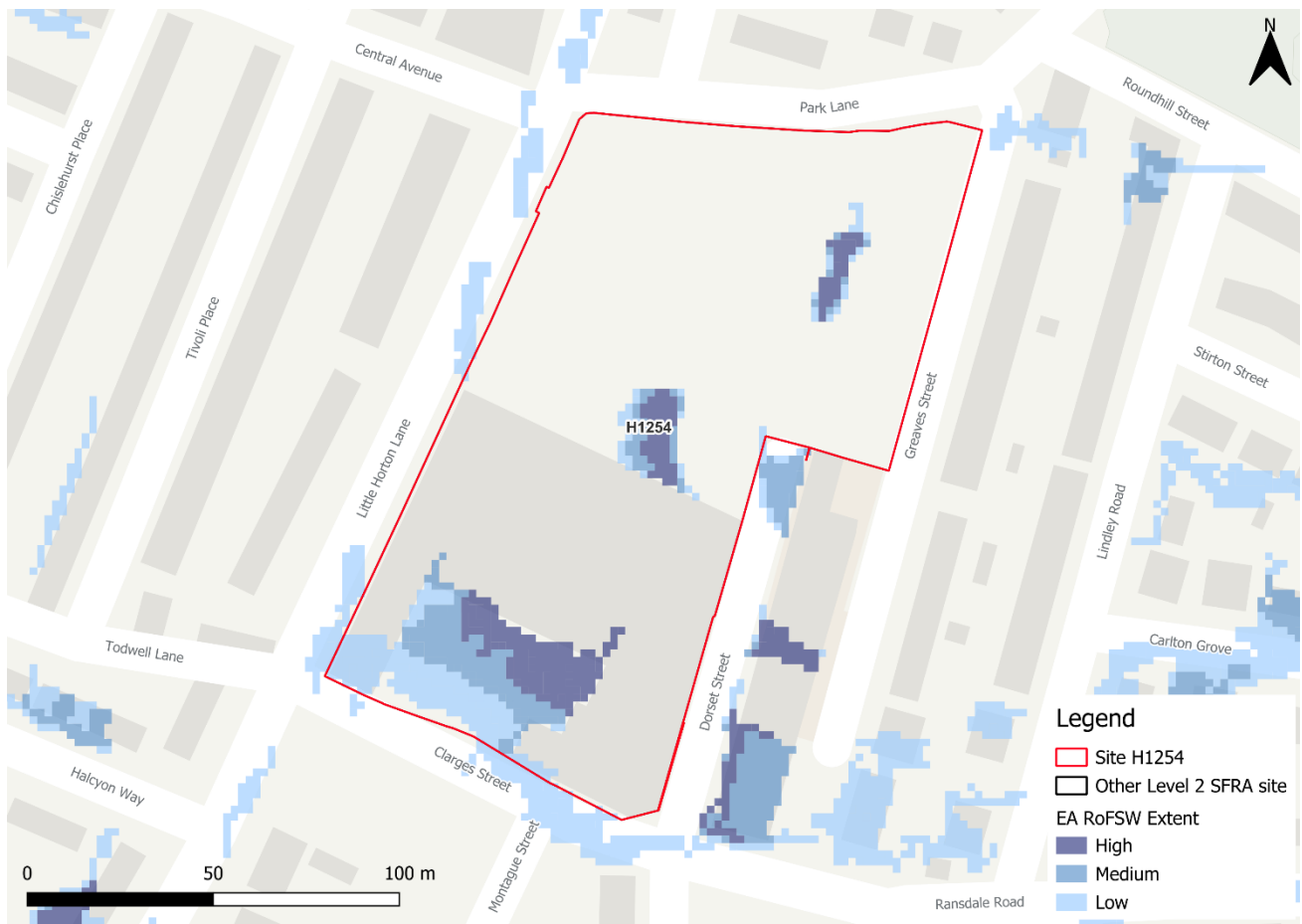


Figure 3-1: Surface water flood extents (NaFRA2 - Risk of Flooding from Surface Water map)

3.1.2 Risk of Flooding from Surface Water - third generation depths and hazard

Based on the EA's national scale third generation RoFSW map, the greatest flood depths within the site in the medium risk event are > 1.2 m (Figure 3-2), with areas of hazard categorised as 'significant' (Figure 3-3).

There are clear differences between the NaFRA2 RoFSW map and the third-generation depth and hazard mapping. The NaFRA2 RoFSW map does not map flooding less than 0.075m (7.5cm) in depth. Therefore, where the map may show no flooding, there may be shallow flooding up to a depth of 0.075m. In contrast, the third generation RoFSW does not map flooding with a hazard rating of less than 0.575. This could explain the differences observed between the NaFRA2 and third generation RoFSW. Assessment of surface water should be carried out at the site-specific FRA stage to establish current and future surface water flood risk conditions.



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



Figure 3-3: Medium risk event surface water flood hazard¹ (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

At the time of writing, the available national surface water climate change mapping is unsuitable for consideration in development planning. This Level 2 SFRA considers the low risk surface water event as a conservative proxy for the medium risk event plus climate change, as agreed with the EA. The impact of climate change on surface water flood risk should be considered at the site-specific FRA stage.

Using the low risk event as a proxy, the medium risk surface water event is likely to increase slightly in extent within the site when accounting for climate change (Figure 3-4). The third generation map indicates maximum flood depths are likely to remain at > 1.2 m (Figure 3-5), with a small area of hazard categorised as 'extreme' (Figure 3-6). Safe access and escape routes would likely remain achievable via Park Lane to the north 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 3-4: Low risk event surface water flood extent, as a proxy for the medium risk event plus climate change (NaFRA2 - Risk of Flooding from Surface Water map)

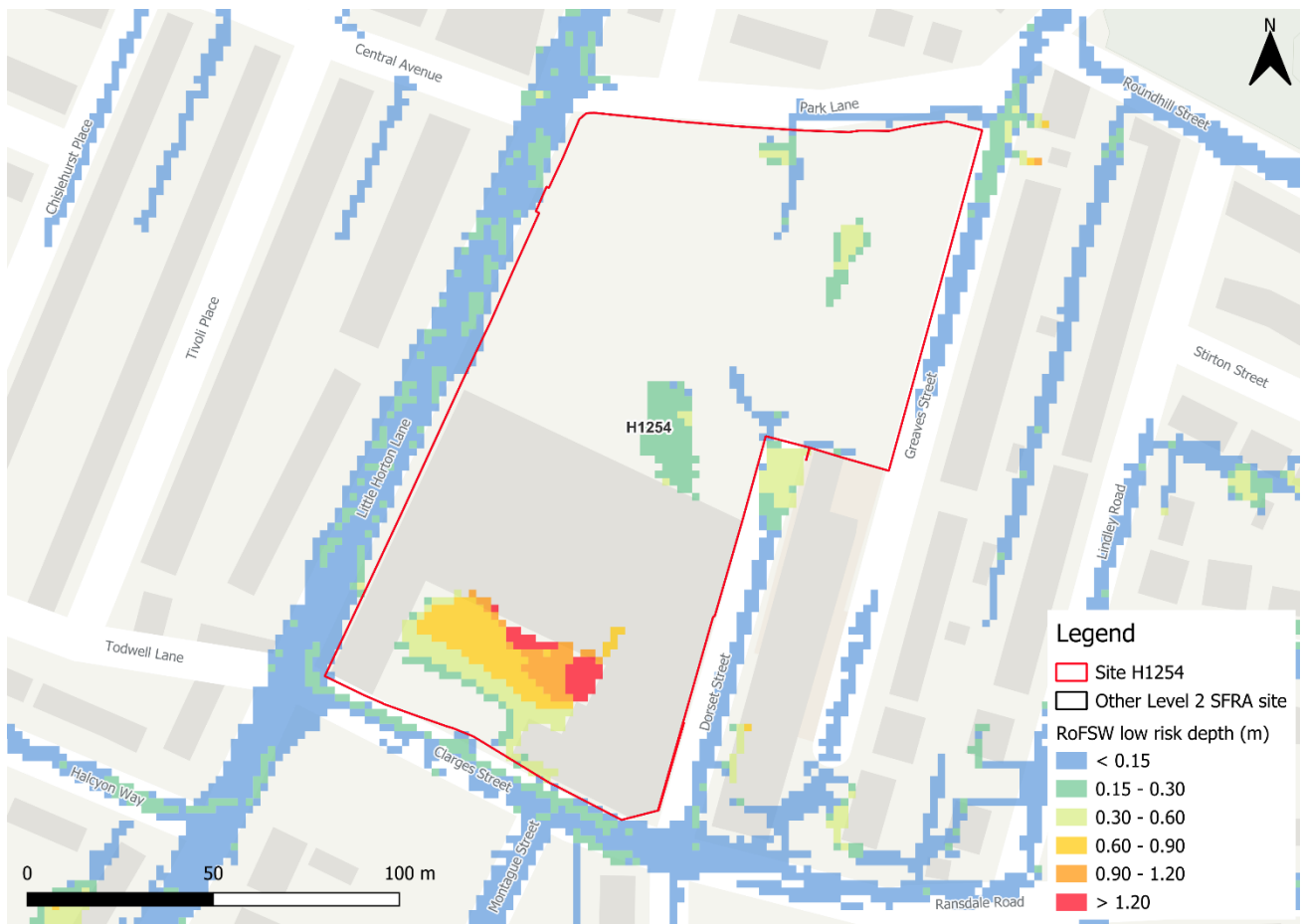


Figure 3-5: Low risk event surface water flood depths, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)



Figure 3-6: Low risk event surface water flood hazard, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is predominantly very low, with 86% of the site being at very low surface water flood risk. Surface water risk in the medium risk event is confined to areas of ponding in topographic low spots across the site.
- Surface water risk is significant in the south of the site, where it is currently shown to be constrained by the existing development present. It is assumed that the proposed development will be a conversion of the existing development present onsite. Any change in site layout where current buildings are to be demolished will require detailed surface water modelling.
- 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. Surface water risk to the site is likely to increase slightly when considering climate change.
- Topographic 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 like for like volumes to ensure risk is contained safely onsite for the lifetime of development.

- The drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield rates will likely apply, though the developer should consult local LLFA guidance and the National SuDS guidance.
- 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. A Water Cycle Study would help to inform this.
- Safe access and escape routes should remain achievable via Park Lane to the north of the site.
- 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 Guide². 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 there is no risk of groundwater emergence. Groundwater conditions in these areas may therefore be suited to infiltration SuDS, however this should be considered further through the drainage strategy given the likely low permeability of the underlying bedrock (Figure 1-3).

Within the east of the site, there is the possibility of groundwater emerging at the surface locally. Ground investigations will be required within the east of the site through the site-specific FRA to ascertain groundwater levels and conditions.

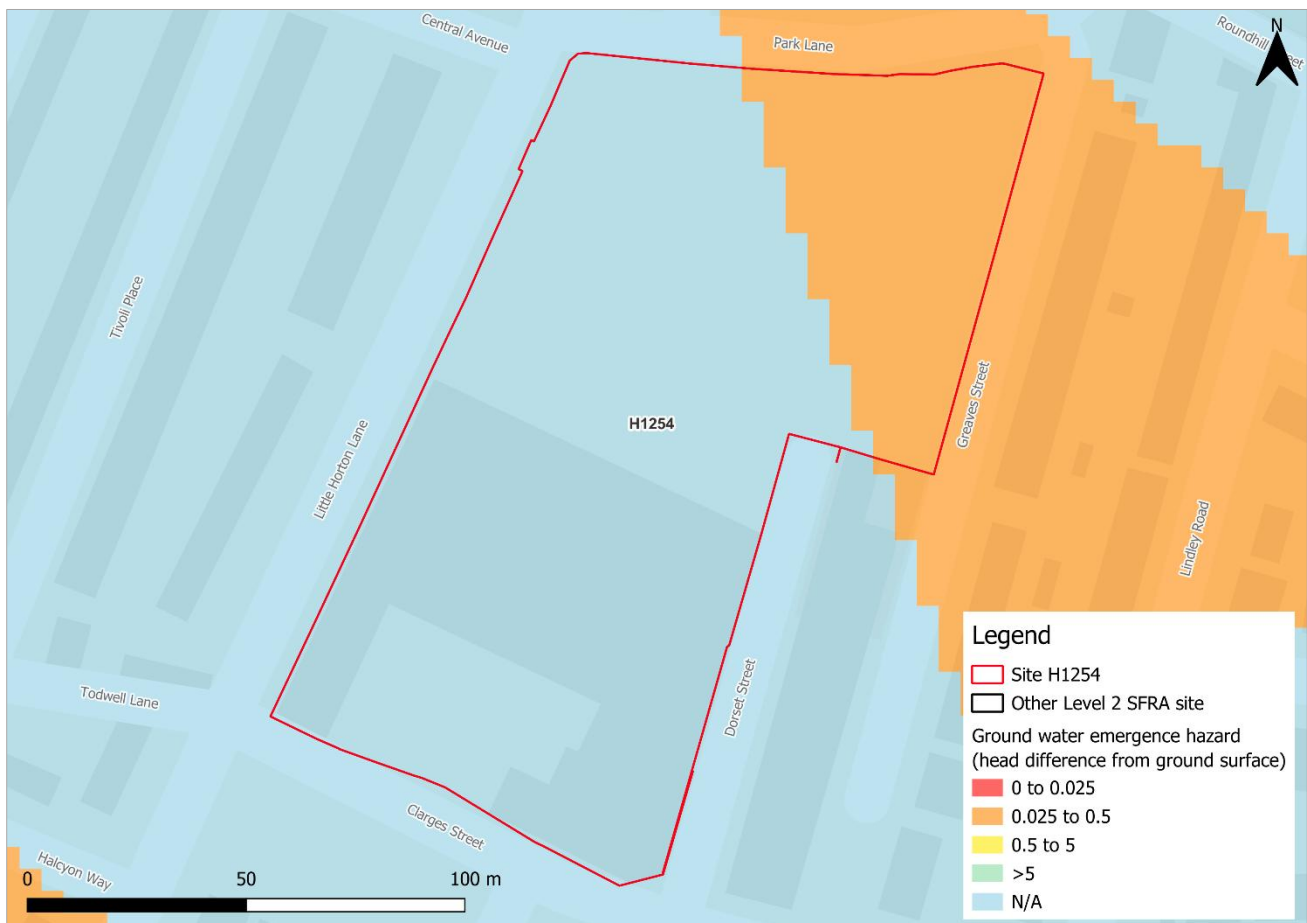


Figure 4-1: JBA 5m Groundwater Emergence Map

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 Potential culvert

Historic land-use mapping held by the LLFA, indicates that there may be a watercourse culverted beneath the southeastern corner of the site. If a watercourse is present, there will be a residual risk of flooding to the site were there to be a culvert failure or blockage. A model for this watercourse is not available. Therefore, residual risk could not be assessed for this Level 2 SFRA.

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

- Historic mapping indicates there may be a watercourse culverted beneath the site. If present, the culvert represents potential residual risk of flooding to the site through culvert failure or blockage. This may need to be further investigated and modelled at the FRA stage.

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 test³ as it is not located within Flood Zone 3a, however it must still be proven that the development can be safe for its lifetime, which is generally considered to be 100 years for residential development.

6.2 Recommendations summary

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- It should be appropriate to develop this site for more vulnerable purposes given its location within Flood Zone 1.
- Detailed flood modelling of Bowling Beck may be required at the site-specific FRA to confirm risk to the site from this watercourse. The exact culvert location and capacity of the LLFA identified watercourse needs to be established through a survey. A model of this watercourse may also be required at the site-specific FRA stage depending on the outcomes of the culvert survey.
- Historic mapping indicates there may be a watercourse culverted beneath the site. If present, the culvert represents potential residual risk of flooding to the site through culvert failure or blockage. This may need to be further investigated and modelled at the FRA stage. Modelling should include for residual risk and options for culvert removal.
- Assuming the culvert is located beneath the site, opportunities for opening up the culvert should be explored for inclusion in site design as a blue green corridor. This would remove any residual risk of flooding to the site as a result of culvert failure or blockage.
- Surface water risk is constrained by the existing development in the south of the site. It is assumed that the proposed development will be a conversion of the existing development present onsite. Any change in site layout where current buildings are to be demolished will require detailed surface water modelling.
- Surface water should be retained onsite. This may require surface water modelling based on layout plans and design and consultation with the LLFA on required runoff rates, likely to be brownfield or betterment. The use of infiltration SuDS should be investigated for suitability across the site.

6.3 Site-specific FRA requirements and further work

At the planning application stage, the following should be considered:

- Full detailed flood modelling of Bowling Beck to assess up to date risk to the site, including for the impacts of climate change.

³ Para 178 National Planning Policy Framework 2024

- A culvert survey of the LLFA identified watercourse assumed to be located beneath the site to establish culvert path and capacity.
- Further modelling to understand the impacts of climate change on surface water flood risk to the site, through a drainage strategy.
- A condition and capacity assessment of the culvert beneath the site, identified through historic mapping.
- Groundwater conditions in the east of the site must be investigated further through the site-specific FRA to ascertain groundwater levels and conditions.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC 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.

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Final Draft

May 2025

Prepared for:



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Document Status

Issue date	16 May 2025
Issued to	Jonathan Dicken
BIM reference	NPA-JBA-XX-XX-RP-Z-0018
Revision	P03
Prepared by	Freya Nation BSc Analyst
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Acknowledgements

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for the City of Bradford Metropolitan District Council (CBMDC) Local Plan Site H1258. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site H1258

- Location: Thornton Road, Leaventhorpe
- Existing site use: Agricultural
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Residential
- Proposed site use vulnerability: More vulnerable
- Site area: 1.6 hectares
- Proposed development impermeable area: 1.5 hectares
- Environment Agency (EA) river model: N/A
- Watercourse: Pitty Beck
- Summary of requirements from scoping stage:
 - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
 - Subject to the exception test as more vulnerable development proposed in Flood Zone 3a
 - Assessment of modelled fluvial flood depths, velocities and hazards
 - 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
 - Modelling of residual risk from Pitty Beck culvert



Figure 1-1: Existing site location boundary

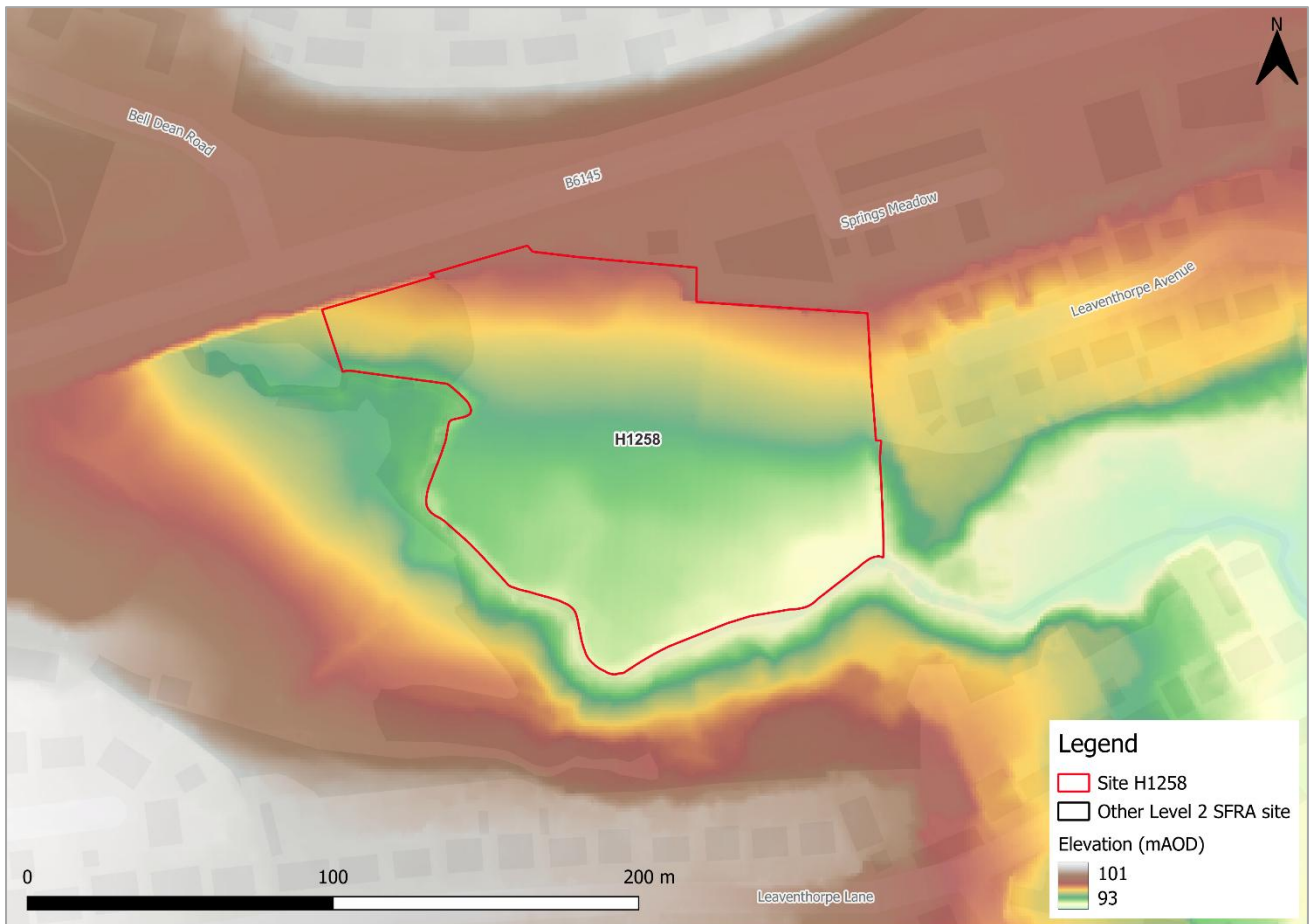


Figure 1-2: Topography



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 and Flood Zone 3b (functional floodplain), as updated in the Level 2 SFRA, 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 majority of the site is modelled to be within Flood Zone 1. 21% of the site, namely along the course of Pitty Beck (within the south and west) is within Flood Zone 3b, indicating it is at high risk of flooding from rivers. Additionally, further parts of the south of the site are within Flood Zone 2, indicating they are at medium risk of flooding from rivers, however this is only 5% of the site. Pitty Beck is an ordinary watercourse (not a statutory main river).

The functional floodplain in this area is based on Flood Zone 3a of the Flood Map for Planning. An EA model for Pitty Beck has not been made available for this Level 2 SFRA. Therefore, 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 Pitty Beck, 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 based on percentage area of site at risk

Flood Zone 1 (% area)	Flood Zone 2 (% area)	Flood Zone 3a (% area)	Flood Zone 3b (% area)
74	5	0	21

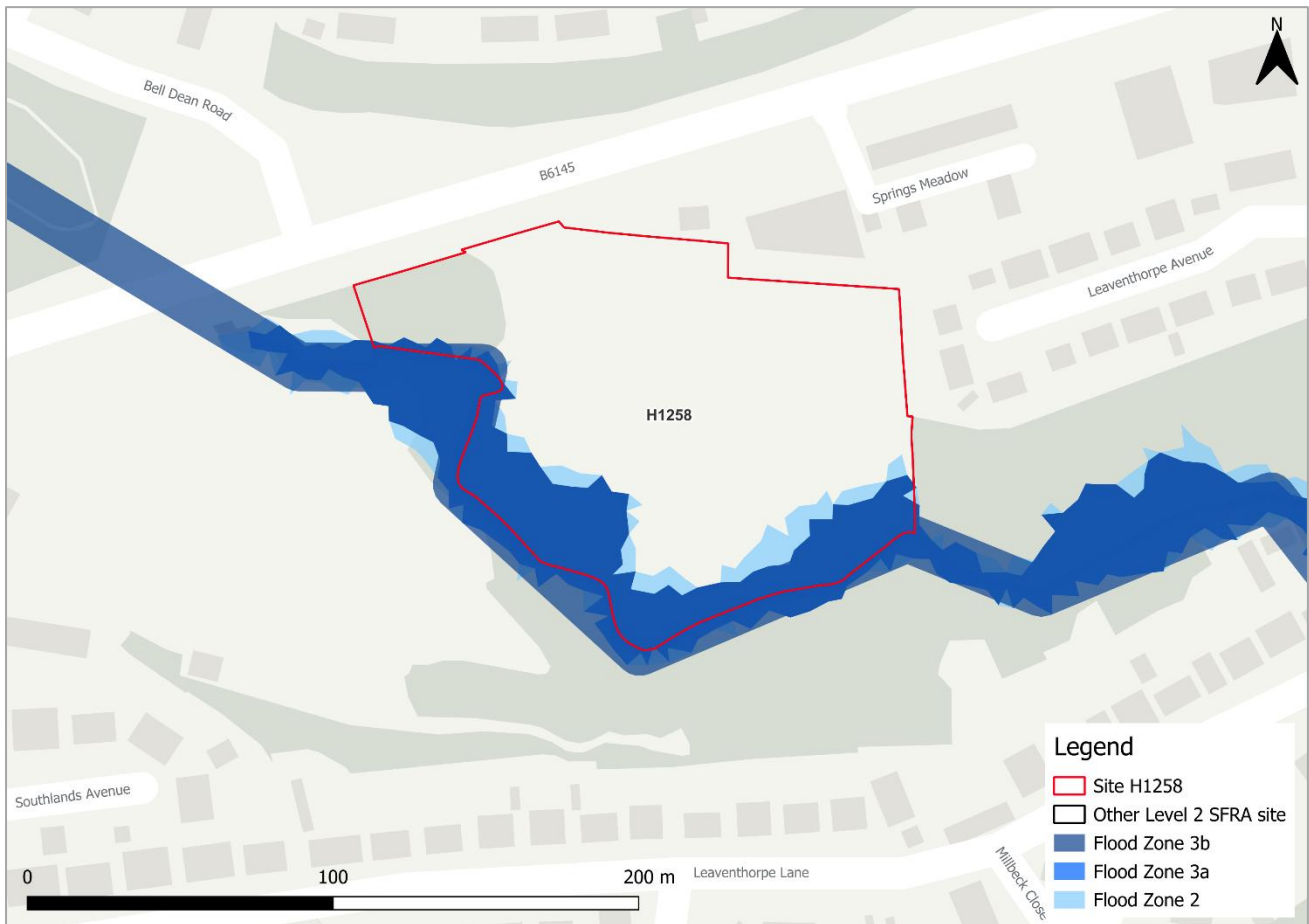


Figure 2-1: Existing risk from rivers to the site

2.2 Impacts from climate change

The impact of climate change on flood risk from Pitty Beck has not been modelled for this SFRA, as a model covering this watercourse 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 may increase in extent in comparison to present day (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 Pitty Beck, 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

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) to reduce flood risk to the site and surrounding areas. Within the site there is potential for floodplain reconnection, which can decrease the magnitude of the flood peak and reduce downstream flood depths especially for high frequency, low return period floods. 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.

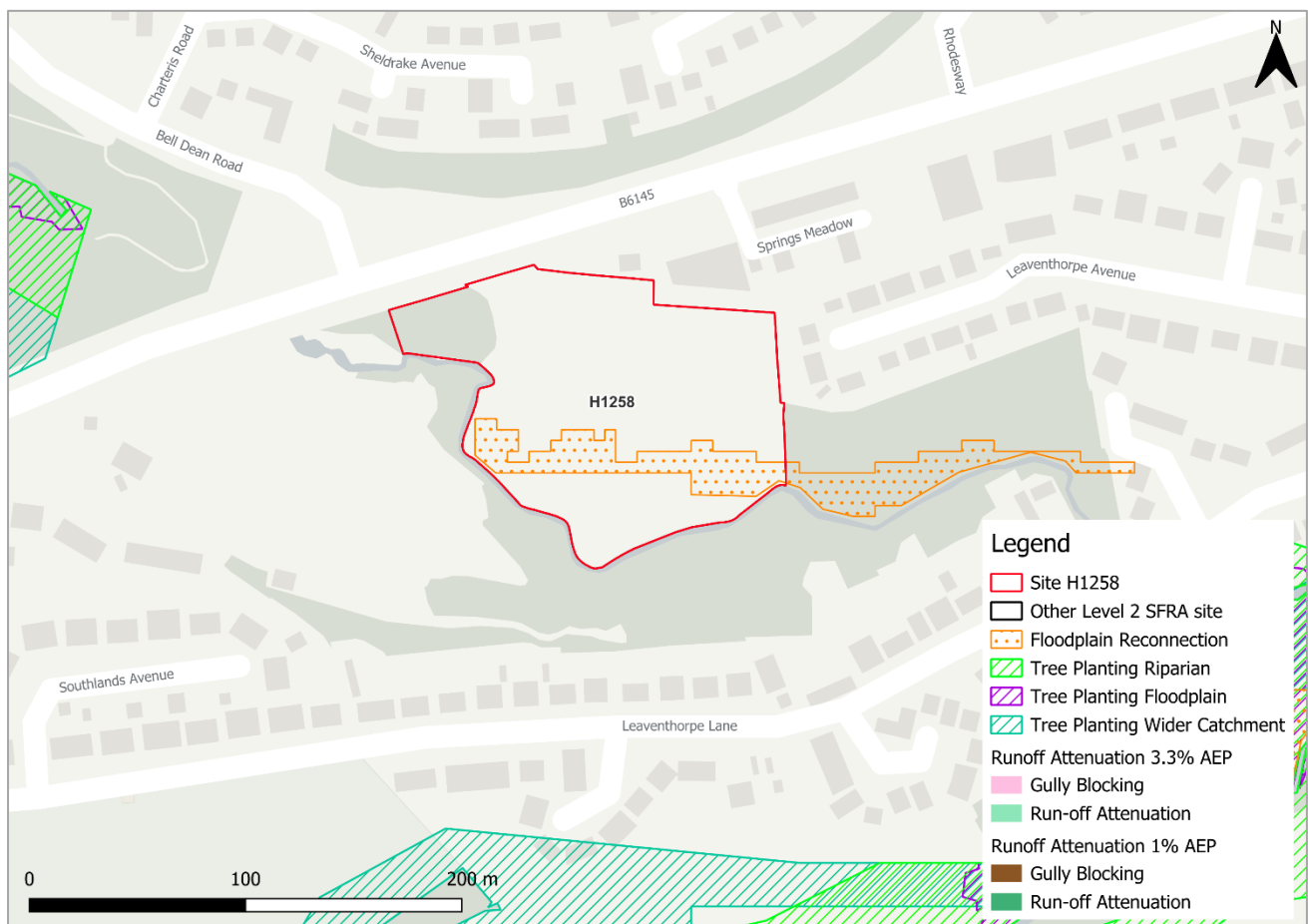


Figure 2-2: Natural Flood Management (NFM) potential mapping

2.4 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 LLFA flood incidents

The LLFA have record of one flood incident south of the site, which occurred in 2007. Developers should contact the LLFA for further information at the FRA stage, to assess potential flood risk to the site associated with this incident.

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. This site is partially located within a FAA, namely 123WAF961 - Middle River Aire Catchment, as shown in Figure 2-3.

Based on available information, safe access and escape routes could likely be achieved during a flood event via the B6145 to the north of the site.



Figure 2-3: EA Flood Warning Areas and Flood Alert Areas

2.7 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).
- However, the site is modelled to be within the functional floodplain and Flood Zone 3a along the southern boundary of the site, adjacent to Pitty Beck. Development is not permitted within the functional floodplain and development should avoid Flood Zone 3a. If feasible, this area would be used as a green / blue corridor which can provide multifunctional benefits providing ecological, social and amenity value.
- For any works on or near the ordinary watercourse (Pitty Beck), which have the potential to obstruct flow, the developer must apply for Ordinary Watercourse Consent from the LLFA.
- Given the site is more vulnerable and within Flood Zone 3a the site must be subject to and must pass the exception test.
- 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 may increase in extent in comparison to the present day Flood Zone 3b and 3a, impacting the southern half of the site.
- Given there is no available model for Pitty Beck, 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 Pitty Beck, 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.
- EA flood alerts should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs.
- Safe access and escape routes could likely be achieved during a flood event via the B6145 to the north of the site, based on available 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 is largely very low. However, 22% of the site is within the low risk surface water zone, 6% in the medium risk and 7% in the high risk, as shown in Table 3-1.

In the high risk event, surface water flooding is confined to the southern site boundary, within and adjacent to the flow path along Pitty Beck and Bell Dean Road. In the medium risk event, this water encroaches further into the southern half of the site and in the low risk event, water encroaches further and enters the northwestern corner of the site. Much of the surface water flood risk is within the functional floodplain.

Greatest flood depths within the site during the medium risk event are >1.2 m (Figure 3-1) with areas of hazard classified as extreme (Figure 3-2). Safe access and escape routes may not be achievable in all events via the B6145 due to the flow paths on the road during the extreme event which have a hazard classification of significant.

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)
65	22	6	7

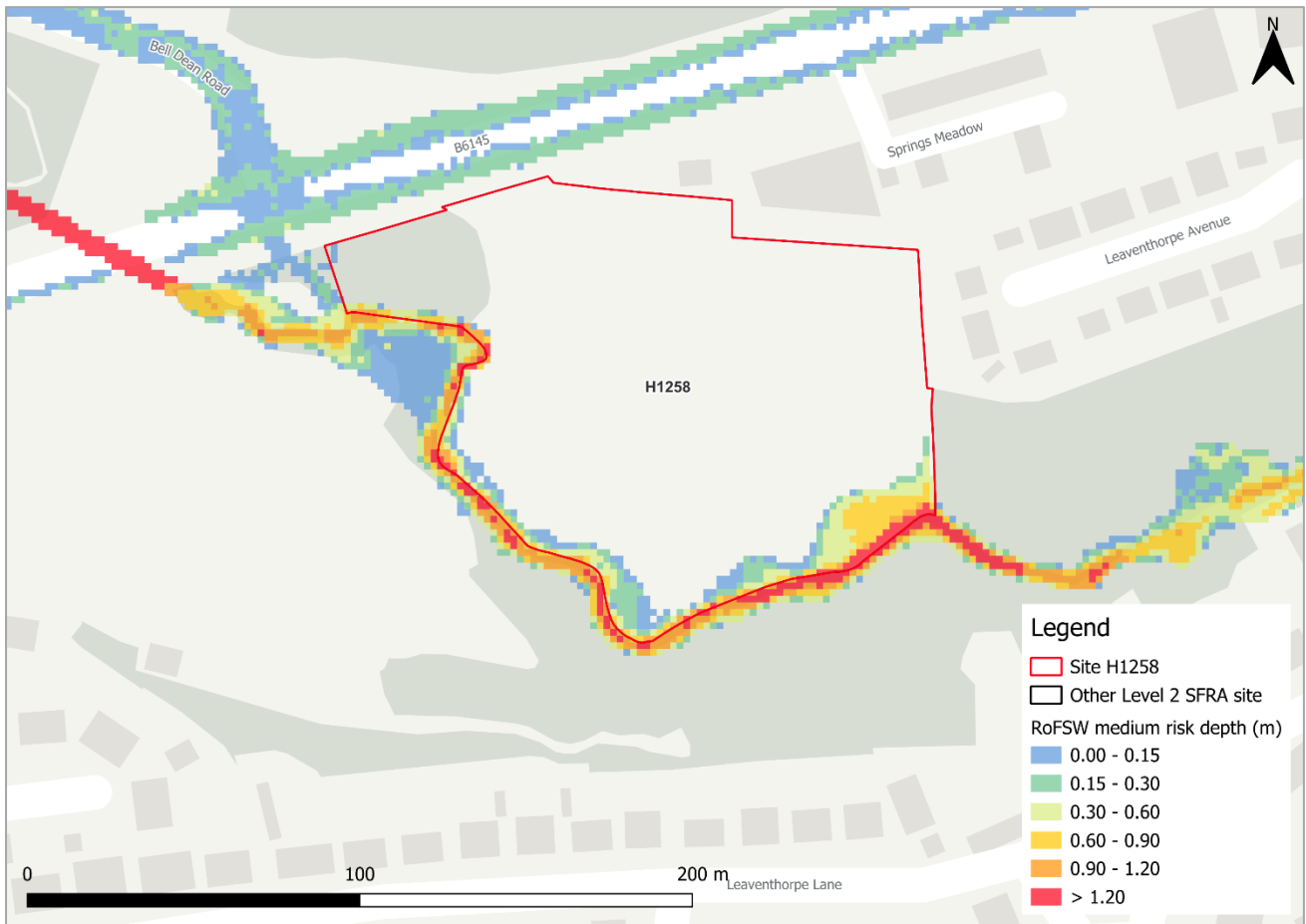


Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

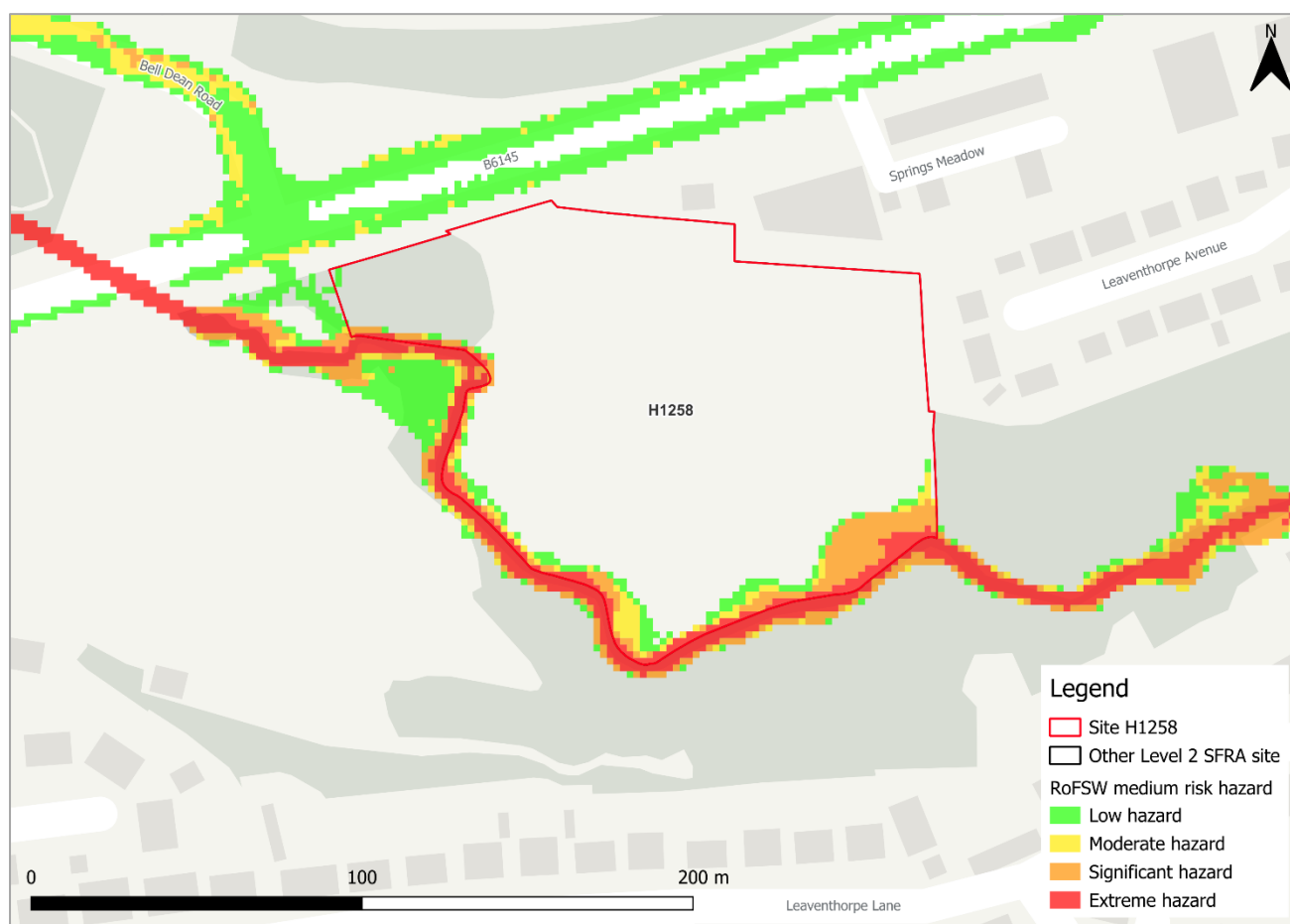


Figure 3-2: Medium risk event surface water flood hazard¹ (Risk of Flooding from Surface Water map)

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 Aire and Calder management catchment

Return period	Central allowance 2070s (% increase)	Upper end allowance 2070s (% increase)
3.3% (high risk)	25%	40%
1% (medium risk)	30%	45%

Figure 3-3 shows the modelled surface water flood depths for the medium risk event +45% climate change. Risk is modelled to be greater than for present day conditions, with the

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

medium risk climate change event showing a similar level of risk to the low risk present day event. Maximum depths remain > 1.2 m, particularly along the southern site boundary, with areas of hazard categorised as extreme (Figure 3-4). Safe access and escape routes may not be achievable via the B6145 during the climate change event due to the flow paths on the road which have a hazard classification of significant.

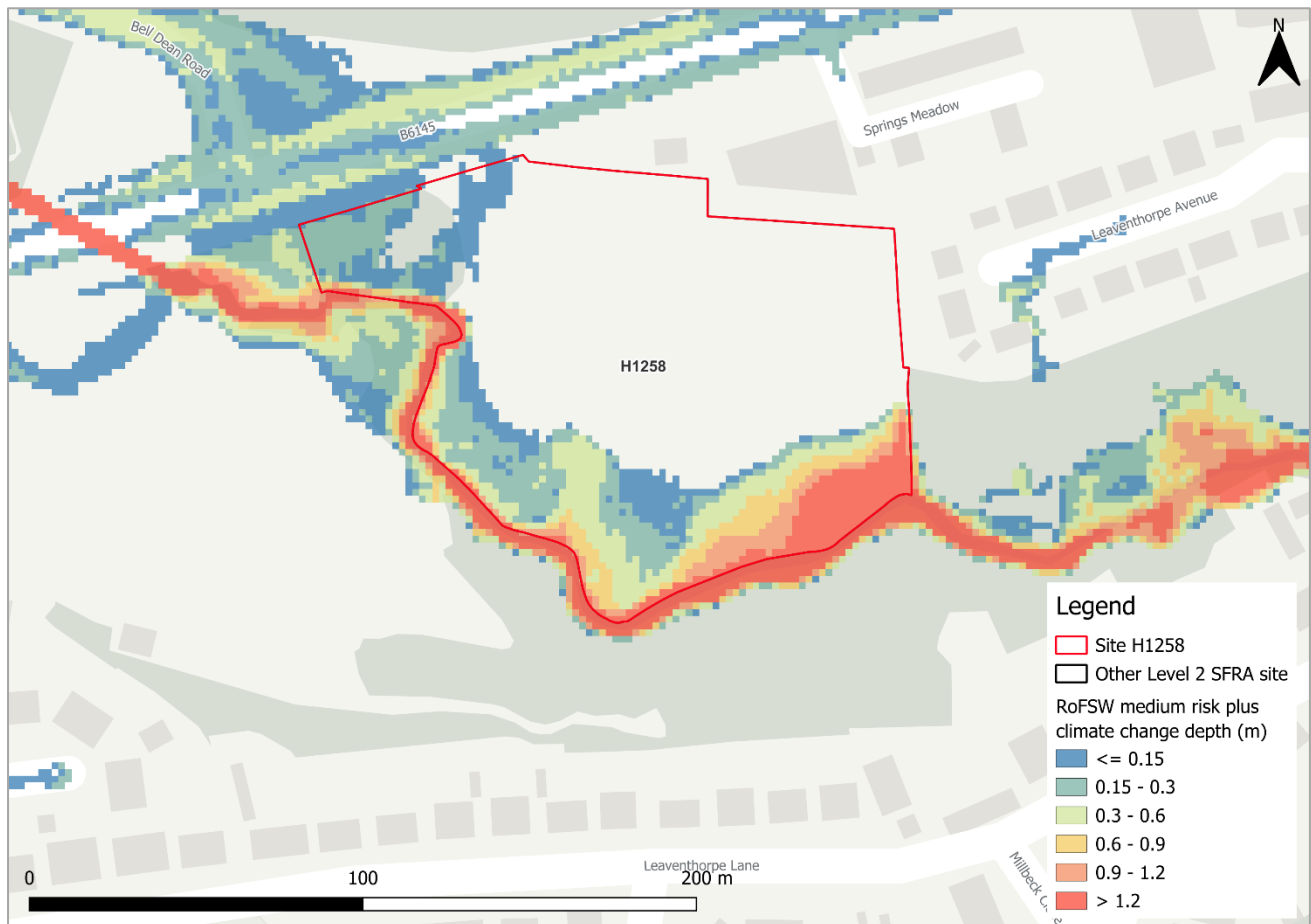


Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)

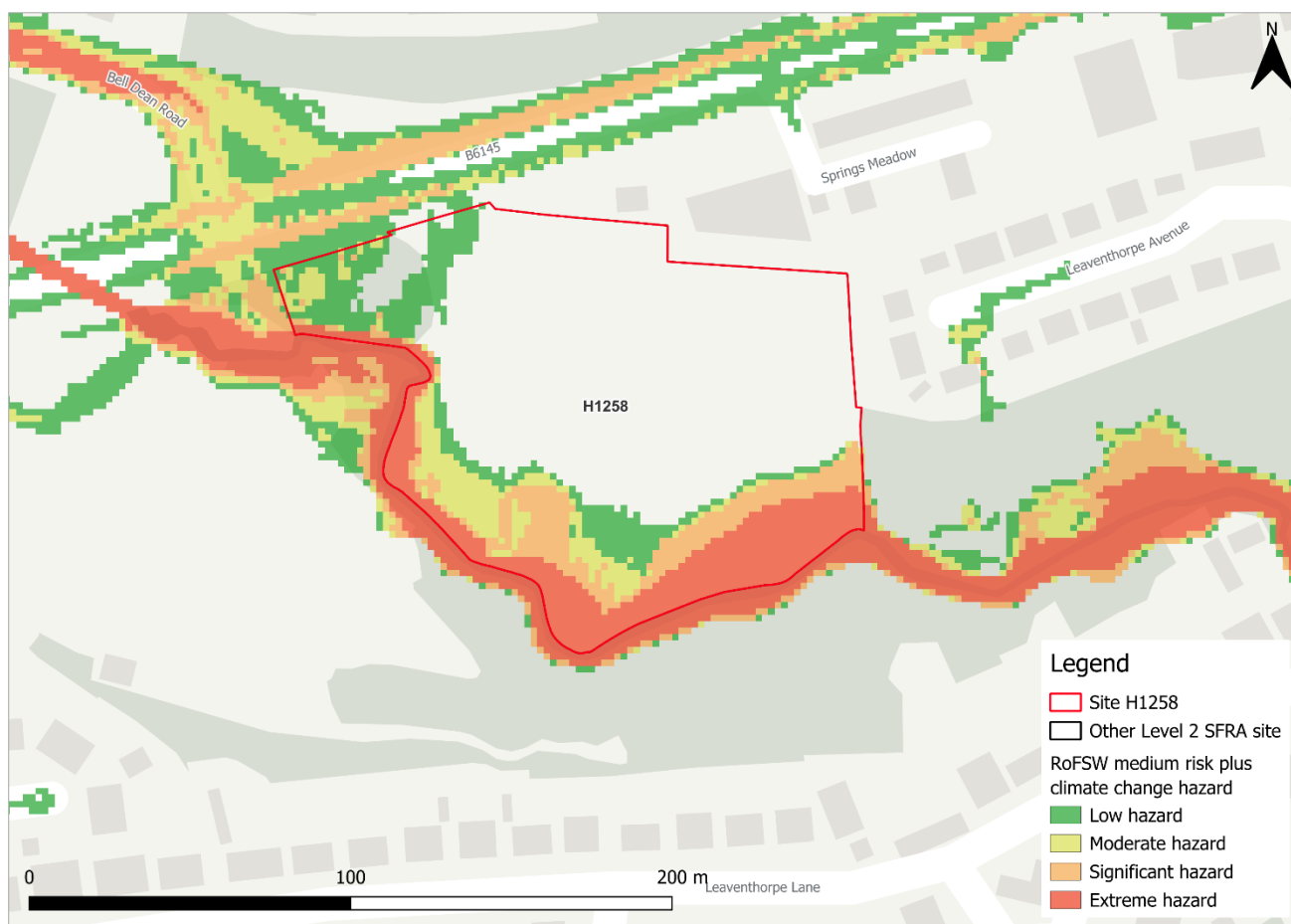


Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk to the site is largely very low, with approximately 65% of the site being at very low risk. However, there is significant risk to the southern half of the site during all events. Surface water risk in the high risk event is confined to the southern boundary of the site within the functional floodplain. In the medium risk event flooding expands to more of the southern half of the site and in the low risk event flooding additionally impacts part of the northwest of the site. Safe access and escape routes may not be achievable via the B6145 in the extreme event due to the significant hazard rating of the flow paths on this road.
- The modelled medium risk surface water climate change outputs indicate a similar risk to the present day low risk event. Safe access and escape routes may not be achievable via the B6145 in the extreme event due to the significant hazard rating of the flow paths on this road.
- Development should avoid the risk areas along the watercourse. A multifunctional blue green corridor should be put in place to provide flood alleviation, ecological and social benefits.
- Topographic flow routes 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 like for like volumes to ensure risk is contained safely onsite for the lifetime of development.

- A full drainage strategy would be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. Runoff volumes should be restricted to greenfield rates and betterment should be achieved where possible. This will require surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- The use of appropriate SuDS should be investigated. The groundwater table is likely to be high across the site judging from the Groundwater Emergence Map in Figure 4-1, therefore infiltration SuDS are unlikely to be suitable. Investigation into suitable SuDS will require appropriate ground and infiltration survey, and surface water modelling based on layout plans and detailed design and full consultation with the LLFA.
- 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 Guide². 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 in an area where 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. Groundwater conditions are therefore unlikely to be suited to infiltration SuDS. A drainage strategy must include for ground and infiltration surveys and further investigation into groundwater levels are recommended.

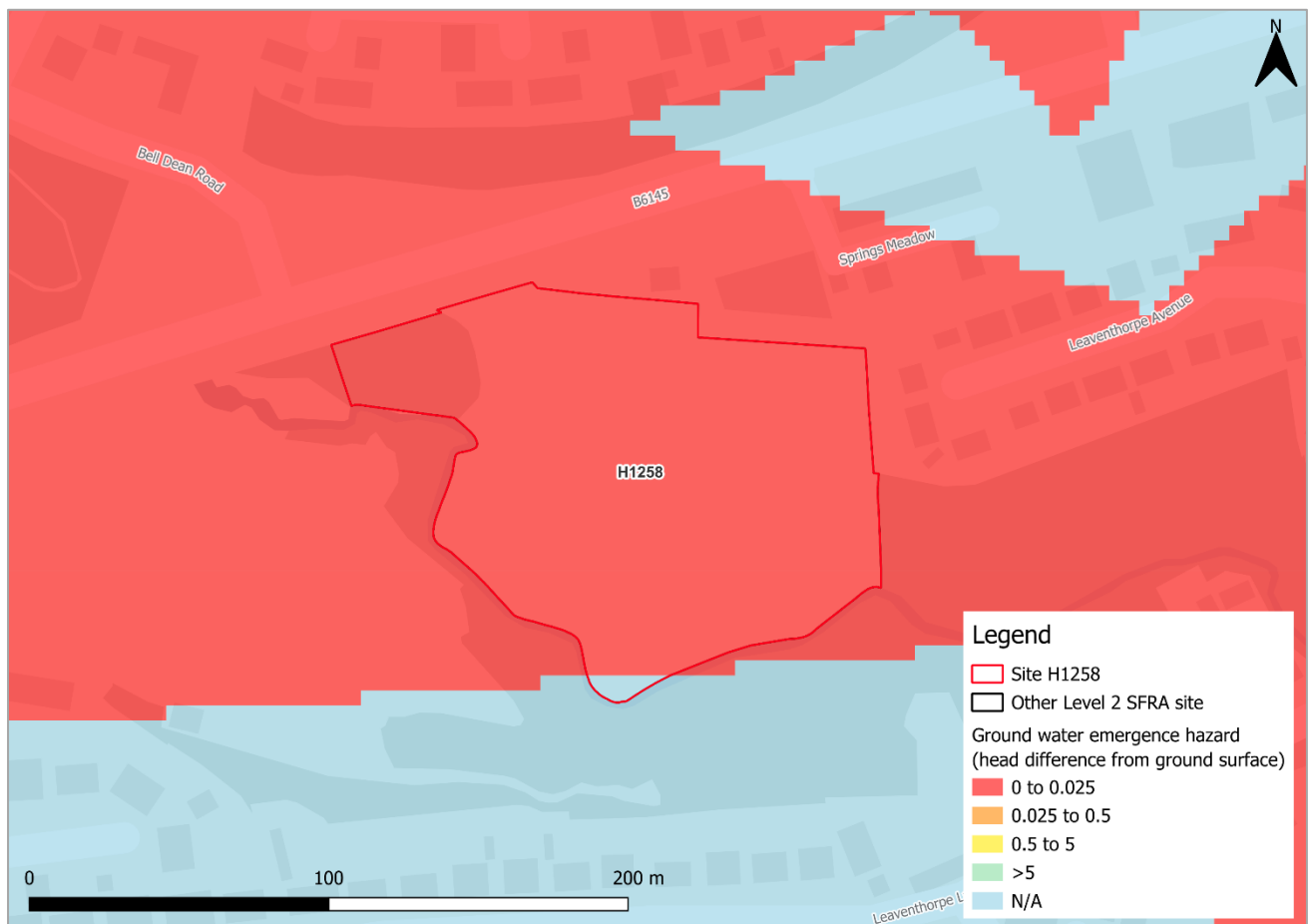


Figure 4-1: JBA 5m Groundwater Emergence Map

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

Although a site may be afforded some protection from defences and / or drainage infrastructure, there is always a residual risk of flooding from asset failure i.e. breaching / overtopping of flood defences, blockages of culverts or bridge openings.

Residual risk at this site comes from possible blockage of the culvert beneath the B6145, as shown in Figure 5-1. As there is no available model of Pitty Beck, potential residual risk of culvert blockage cannot be modelled for this Level 2 SFRA. Residual risk from this culvert must be ascertained as part of the planning application FRA.



Figure 5-1: Potential blockage location

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 shown to be at risk of reservoir flooding.

5.2 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded, blocked or it cannot discharge due to a high water level in the receiving watercourse.

Yorkshire Water records indicate that there have been historical flood incidents in the area over the last two years. Developers should contact Yorkshire Water directly to check specific details at the FRA stage.

5.3 Observations, mitigation options and site suitability - residual risk

- There may be residual risk to the site from a blockage of the Pitty Beck culvert beneath the B6145. However, risk cannot be quantified at this stage due to a model for Pitty Beck not being available.
- The owner of this culvert is currently unknown. Once established, the owner should be able to advise on funding and maintenance arrangements for this asset into the future. Consultation with the LLFA will also be required given this is an ordinary watercourse
- Areas adjacent to culverts and bridges are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked. Emergency plans must be in place for such areas and safe access and egress routes must be in place for the lifetime of development. Resistance and resilience measures may also need to be put in place to manage residual flood risk when avoidance measures have been exhausted.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.

6 Overall site assessment

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

This site is required to pass part b) of the exception test³ due to its location in Flood Zone 3a. The site should be able to pass the exception test if development avoids the area of the site within the functional floodplain / Flood Zone 3b.

6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- Updated present day and climate change modelling of Pitty Beck 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.
- This site could be allocated if development is directed to areas of low flood risk and avoids the southern half of the site at modelled fluvial and surface water risk. The LPA must make it clear that the areas of the site at risk cannot be developed until the required information detailed in this SFRA on existing and future flood risk from Pitty Beck is fully ascertained. This is because, at this stage, it cannot be proven that the site can remain safe for its lifetime. Were additional, more detailed modelled information on flood risk become available through an update to the SFRA or through a site-specific FRA, that show the risk area to be lower than currently shown, more of the site could then be developed. Conversely, were the risk to be greater, any development must account for this.
- Any FRA should produce a detailed drainage strategy which should include ground investigation into potentially significant groundwater levels.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC 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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Bradford Level 2 Strategic Flood Risk Assessment - Site H1272

Final Draft

July 2026

Prepared for:



City of
BRADFORD
METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

Document Status

Issue date	17 July 2026
Issued to	Jonathan Dicken
BIM reference	NPA-JBA-XX-XX-RP-Z-0019
Revision	P02
Prepared by	Georgina Williams BSc Msc Analyst
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Contract

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This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Georgina Williams 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 City of Bradford Metropolitan District Council (CBMDC) Local Plan Site H1272. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

1.1 Site H1272

- Location: All Saints Road
- Existing site use: Brownfield
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 1.2 hectares
- Proposed development impermeable area: 1.04 hectares
- Watercourse: West Brook
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
 - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
 - Subject to the exception test as more vulnerable development proposed in Flood Zone 3a
 - 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

The topography of the site is varied, with areas of higher elevation along the southern boundary of the site, sloping down towards the north and east of the site (Figure 1-2).

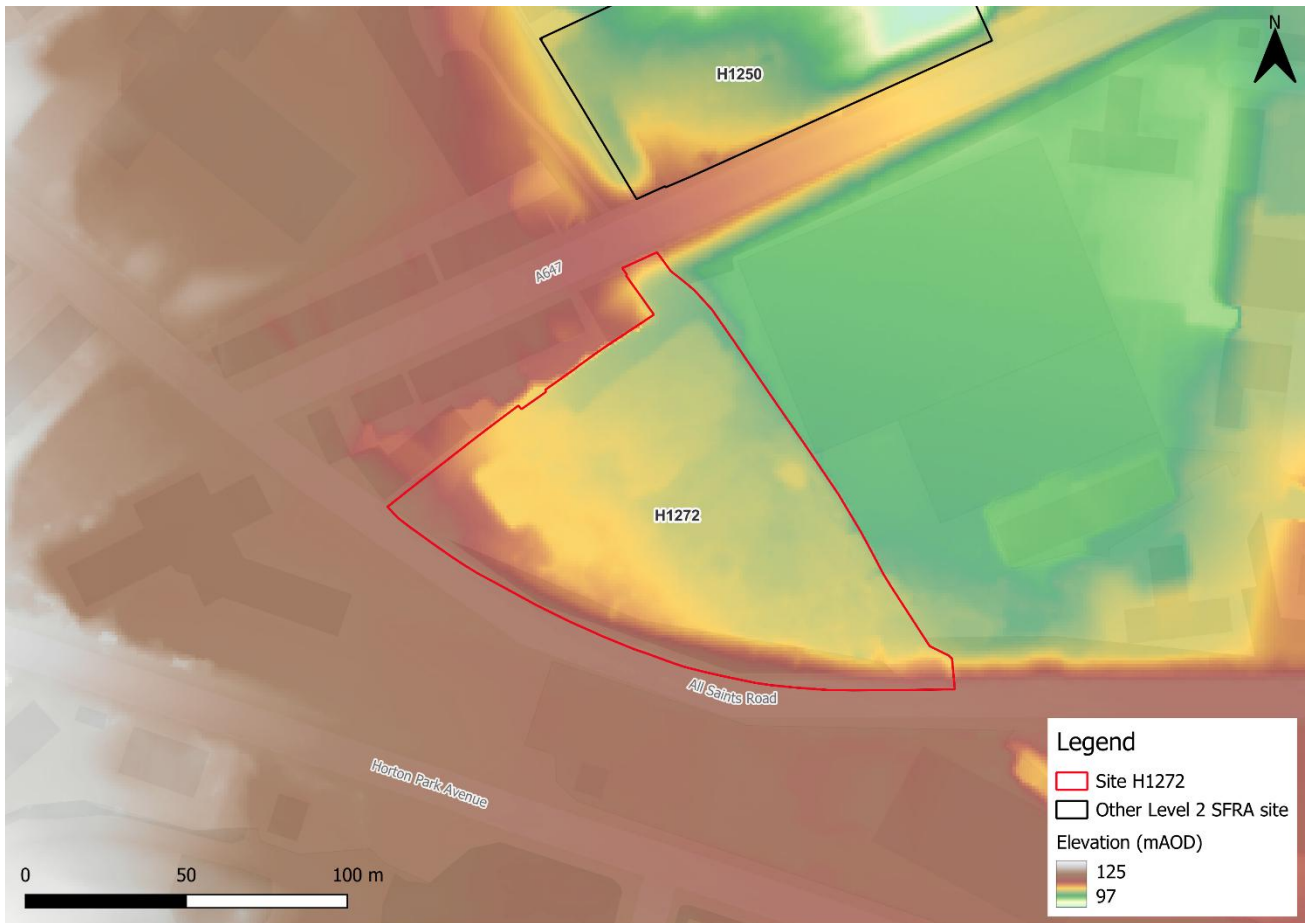


Figure 1-2: Topography

The underlying bedrock within the site is defined as 'Pennine Lower Coal Measures Formation', which comprises mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 1-3). This is overlain with superficial deposits of till. Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, however this can be highly variable. Sandstone has a higher permeability.



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 (January 2026) and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, 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).

Fluvial flood risk to the site comes from West Brook which is culverted beneath the site. Functional floodplain is present through the centre of the site. This is based on Flood Zone 3 of the Flood Map for Planning and an 8m buffered polygon of the West Brook culverted channel indicating the presence of the watercourse beneath the site. There should be no development within the functional floodplain.

The mapped watercourse location may not represent the actual location of the culverted channel. Noting that, functional floodplain policy applies to the path of the culvert beneath the site and not the mapping functional floodplain, where these differ. The path of the culverted channel should be confirmed through a survey as part of the site-specific FRA.

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)
47	1	0	52

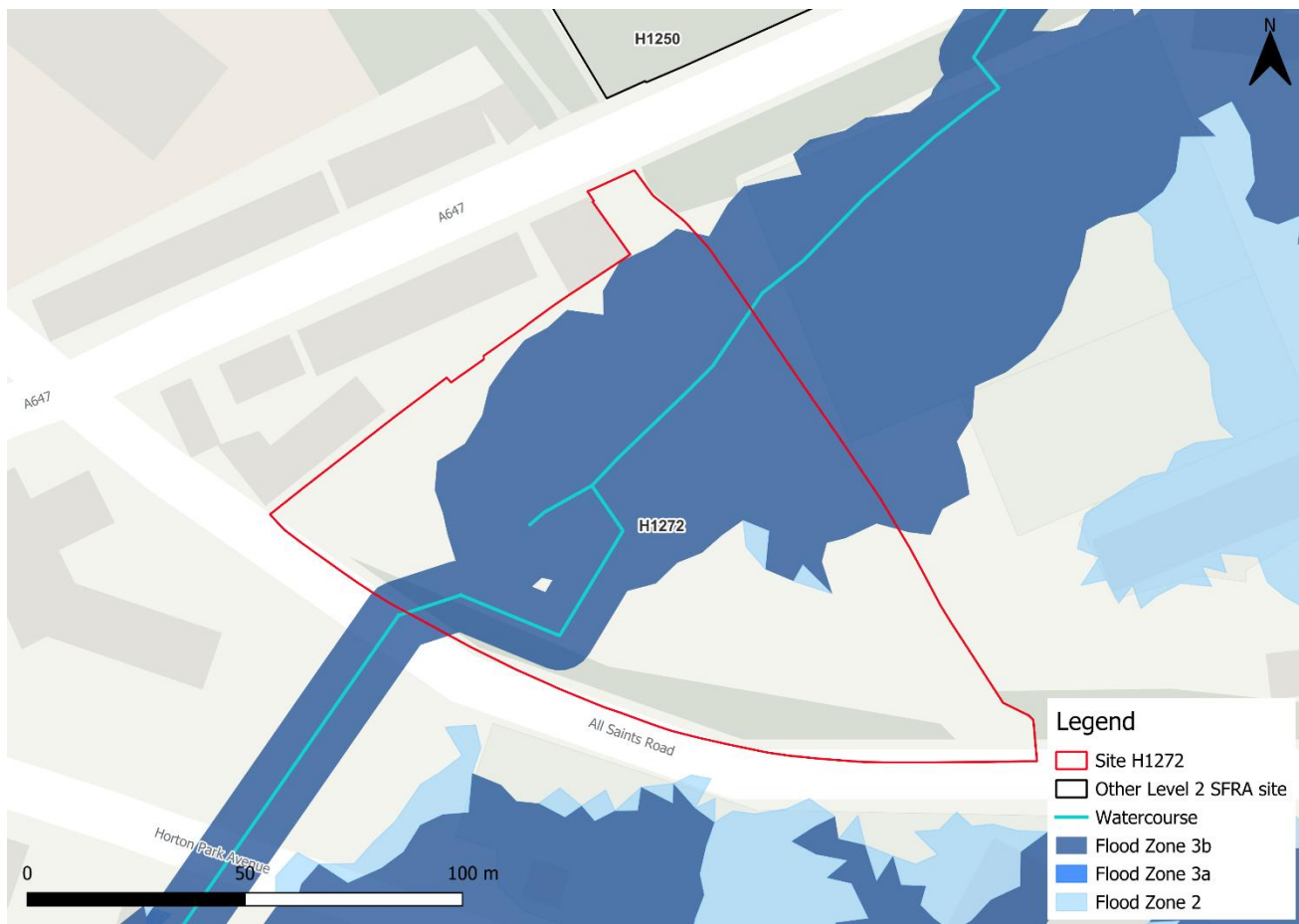


Figure 2-1: Existing risk from rivers to the site

2.1.2 Bradford Beck 2026 model outputs - present day

The Bradford Beck 2026 model does not cover the reach of the watercourse present beneath the site. Therefore, flood depth, hazard and velocity data cannot be considered as part of this Level 2 SFRA. Any site-specific FRA should produce a detailed model of the reach of West Brook within the vicinity of the site.

2.2 Impacts from climate change

The EA's SFRA guidance states that SFRA's should assess the central allowance for less vulnerable, more vulnerable, highly vulnerable and water compatible development.

Table 2-2: Climate change allowances for peak river flows for the Aire and Calder Management Catchment

Return period (AEP event)	Central allowance 2080s (% increase)	Higher central allowance 2080s (% increase)	Upper end allowance 2080s (% increase)
3.3% (functional floodplain)	23%	31%	51%
1%	23%	31%	51%

2.2.1 Bradford Beck 2026 model outputs - climate change

As documented in Section 2.1.2, the Bradford Beck 2026 model does not cover the site. Therefore, detailed climate change modelling is unavailable for consideration.

2.2.2 Flood Map for Planning - Climate Change

The EA's Flood Map for Planning plus Climate Change (2070-2125) dataset also does not cover the site (Figure 2-2). The impact 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 the reach of West Brook within the vicinity of the site, including for the most up to date climate change allowances (Table 2-2).

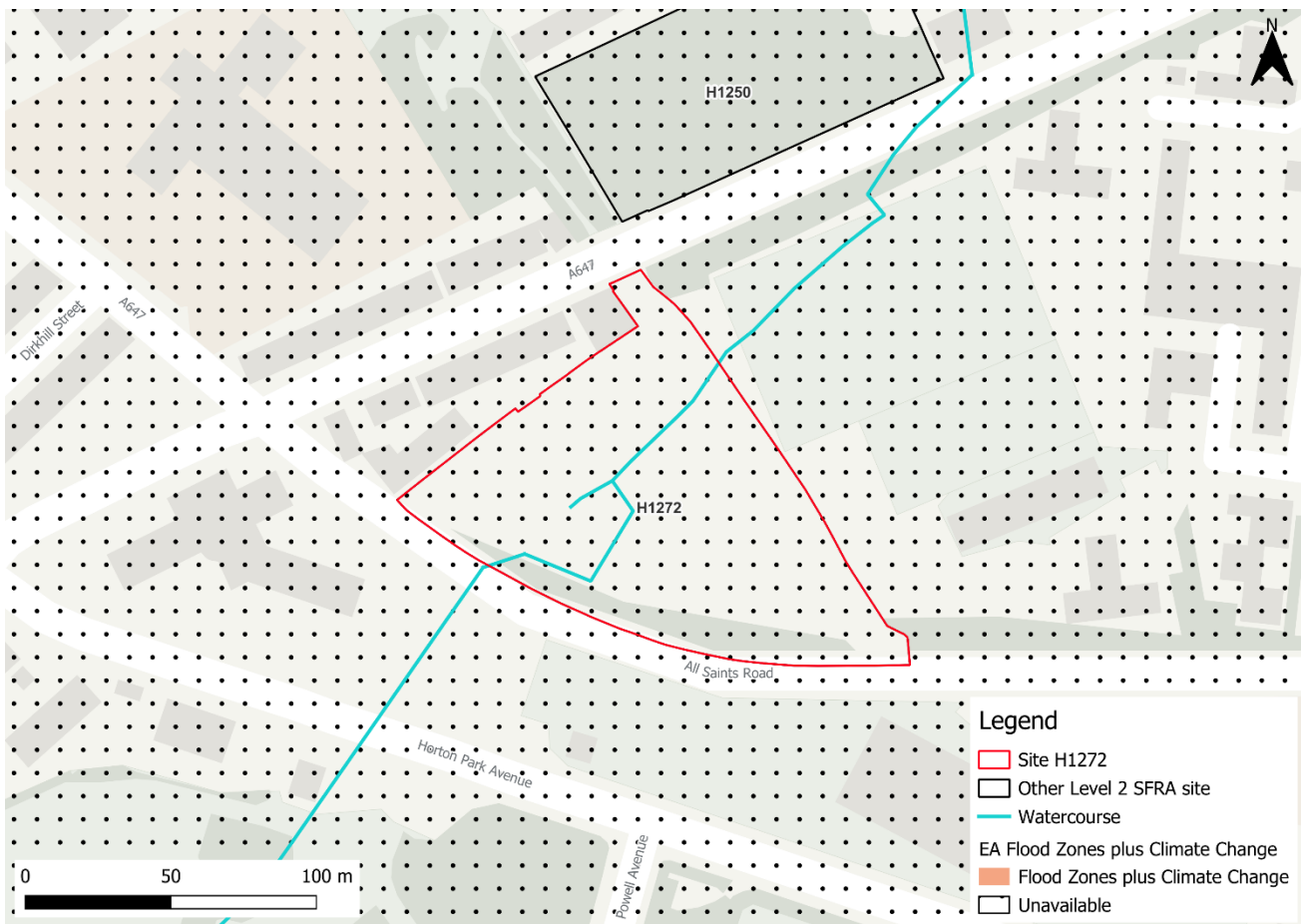


Figure 2-2: EA Flood Zones plus Climate Change dataset

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) to reduce flood risk to the site and surrounding areas. There are no opportunity areas within the site, however, upstream of the site there is potential for wider catchment and floodplain woodland planting (Figure 2-3). This area indicates where scrub and tree planting may be most effective to increase infiltration and hydrological losses. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

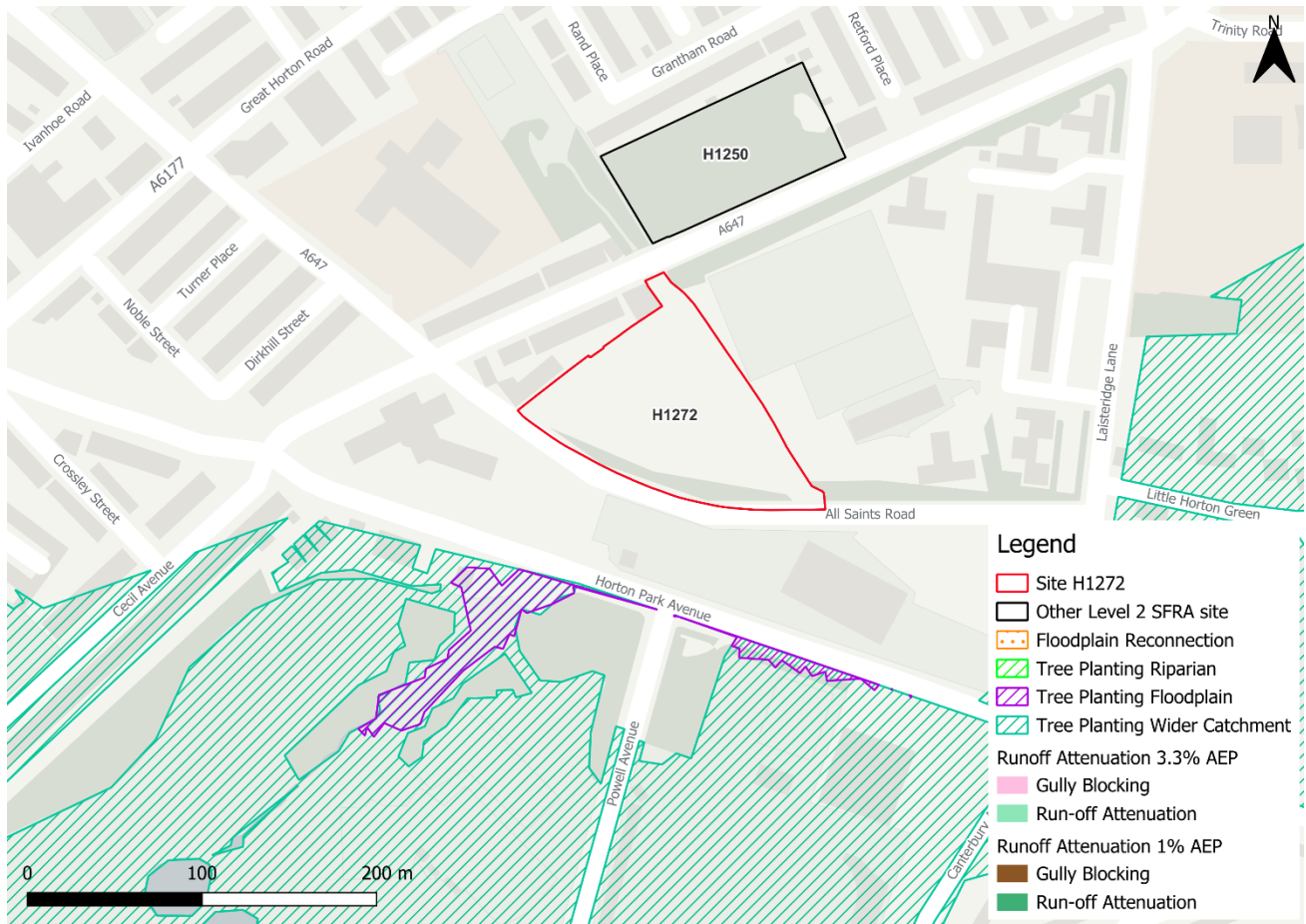


Figure 2-3: Natural Flood Management (NFM) potential mapping

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 within the vicinity of the site.

2.5 LLFA flood incidents

The LLFA have records of one flood incident occurring on All Saints Road to the south of the site, which occurred in 2006. Horton Park Avenue to the south of the site is also known to flood regularly, with a recorded incident occurring in 2015. Developers should contact the LLFA for further information at the FRA stage, to assess potential flood risk to the site associated with these incidents.

2.6 Emergency planning

2.6.1 Flood warnings

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 large area in the north of the site is located within a FAA, namely 123WAF961 - Middle River Aire catchment.



Figure 2-4: EA Flood Warning Areas and Flood Alert Areas

2.6.2 Access and escape routes

Based on available information on fluvial flood risk, safe access and escape routes would likely be achievable via All Saints Road to the south of the site during a fluvial flood event (Figure 2-5).

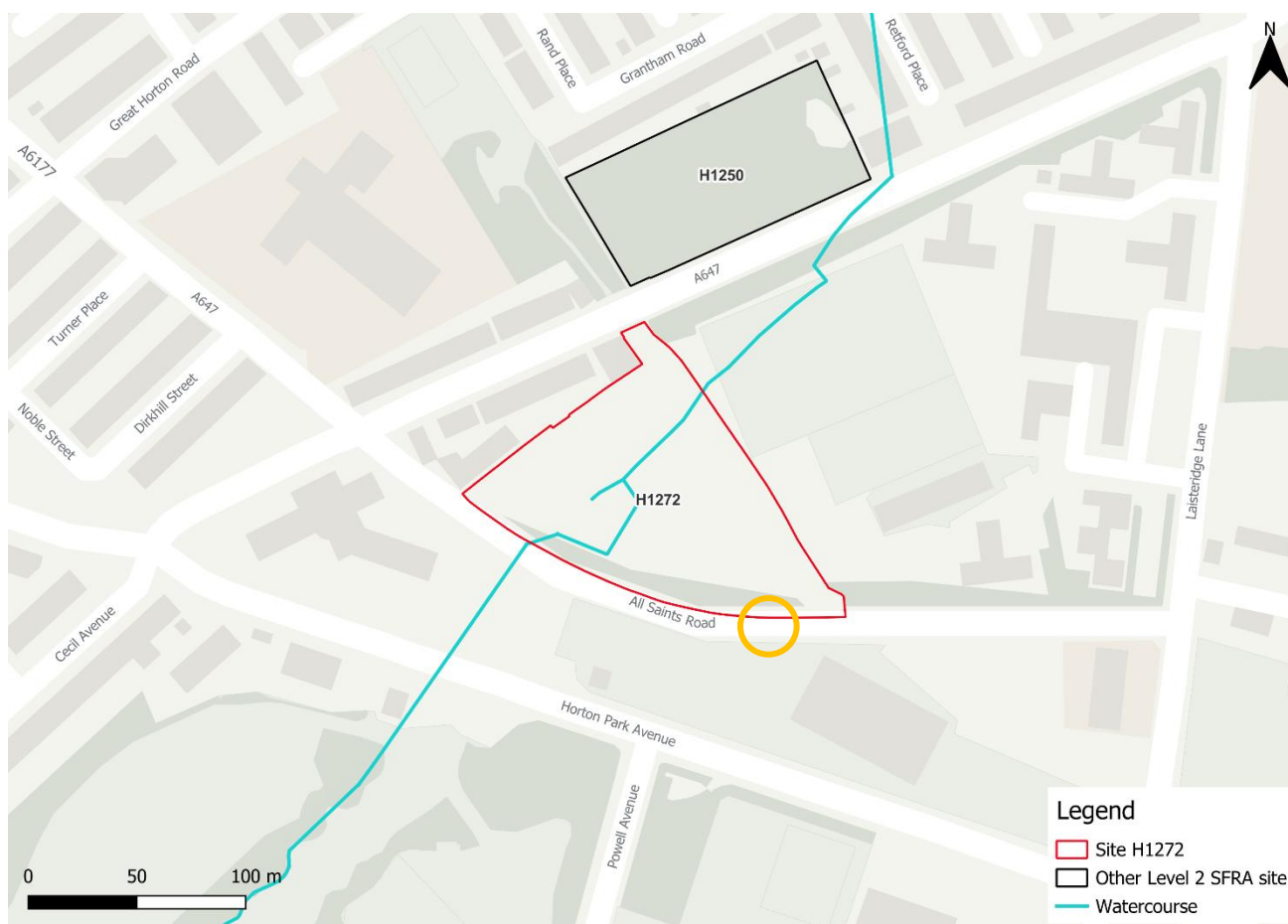


Figure 2-5: Potential access and escape routes

2.7 Observations, mitigation options, site suitability and sequential approach to development management - fluvial

- Observations:
 - 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 LPA must consider whether the change of use is acceptable and whether the development can be designed to be safe, including for adequate emergency planning provision, accounting for the information provided in this Level 2 SFRA (para 014 FRCC-PPG).
 - The site is shown to be within the functional floodplain through the centre of the site, based on Flood Zone 3 of the Flood Map for Planning and an 8m buffer of the culverted West Brook watercourse beneath the site. There should be no development within the functional floodplain.
 - Consideration should be given as to whether deculverting and daylighting this section of culvert is feasible, supported by detailed modelling. The watercourse should be considered within site design and form a blue green corridor through the site.

- If West Brook will remain culverted beneath the site, there should be no development above the culvert. The location and course of the culvert should be confirmed through a survey.
- There are no detailed model outputs available to confirm onsite flood depths, hazard and velocities, as the Bradford Beck model does not cover the reach of watercourse beneath the site. Any site-specific FRA should produce a detailed model of the reach of West Brook to confirm modelled flood extents and depths within the site.
- If works are proposed on or near West Brook, a separate permission may be required. The type of permission needed from the Lead Local Flood Authority will depend on the activity and location proposed.
- Based on available information, ideally this site would be converted to open space offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.
- Mitigation:
 - EA flood alerts should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs.
- Access and escape:
 - Based on available information, safe access and escape routes would likely be achievable via All Saints Road to the south of the site.

3 Flood risk from surface water

3.1 Existing risk

At the time of writing, the EA's latest national Risk of Flooding from Surface Water (RoFSW) does not include depth and hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation RoFSW depth and hazard mapping in addition to the NaFRA2 extents, as agreed with the EA. Surface water depth and hazard should be confirmed at the site-specific FRA stage.

3.1.1 Risk of Flooding from Surface Water - NaFRA2 extents

Based on the EA's national scale RoFSW map (January 2026), surface water risk to the site is predominantly very low, as shown in Table 3-1.

Surface water risk in the low risk event is confined to the boundaries of the site, with a flow path adjacent to the western boundary (Figure 3-1).

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)
87	13	0	0

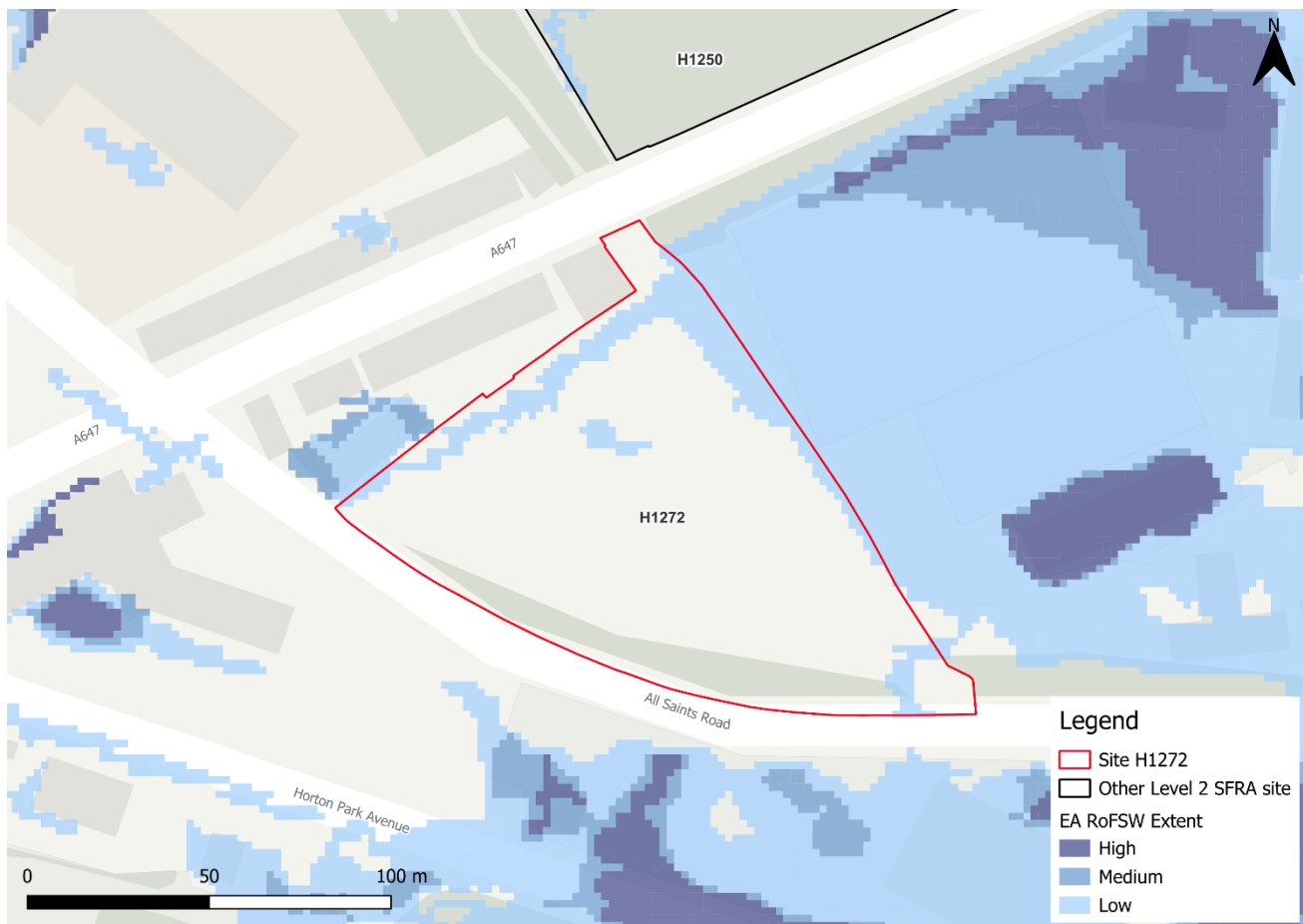


Figure 3-1: Surface water flood extents (NaFRA2 - Risk of Flooding from Surface Water map)

3.1.2 Risk of Flooding from Surface Water - third generation depths and hazards

Based on the EA's national scale third generation RoFSW map, the greatest flood depths within the site in the low risk event are between 0.3 and 0.6 m (Figure 3-2), with hazard largely categorised as either 'low' or 'moderate' (Figure 3-3). There is a very small area where flood hazard is categorised as 'significant', within the north of the site.

Safe access and escape routes would likely be achievable via All Saints Road to the south of the site, given the low surface water flood depths and hazards along this route.

There are some differences between the NaFRA2 RoFSW map and the third-generation depth and hazard mapping. The NaFRA2 RoFSW map does not map flooding less than 0.075m (7.5cm) in depth. Therefore, where the map may show no flooding, there may be shallow flooding up to a depth of 0.075m. In contrast, the third generation RoFSW does not map flooding with a hazard rating of less than 0.575. This could explain the differences observed between the NaFRA2 and third generation RoFSW. Assessment of surface water flood risk should be carried out at the site-specific FRA stage to establish current and future surface water flood risk conditions.

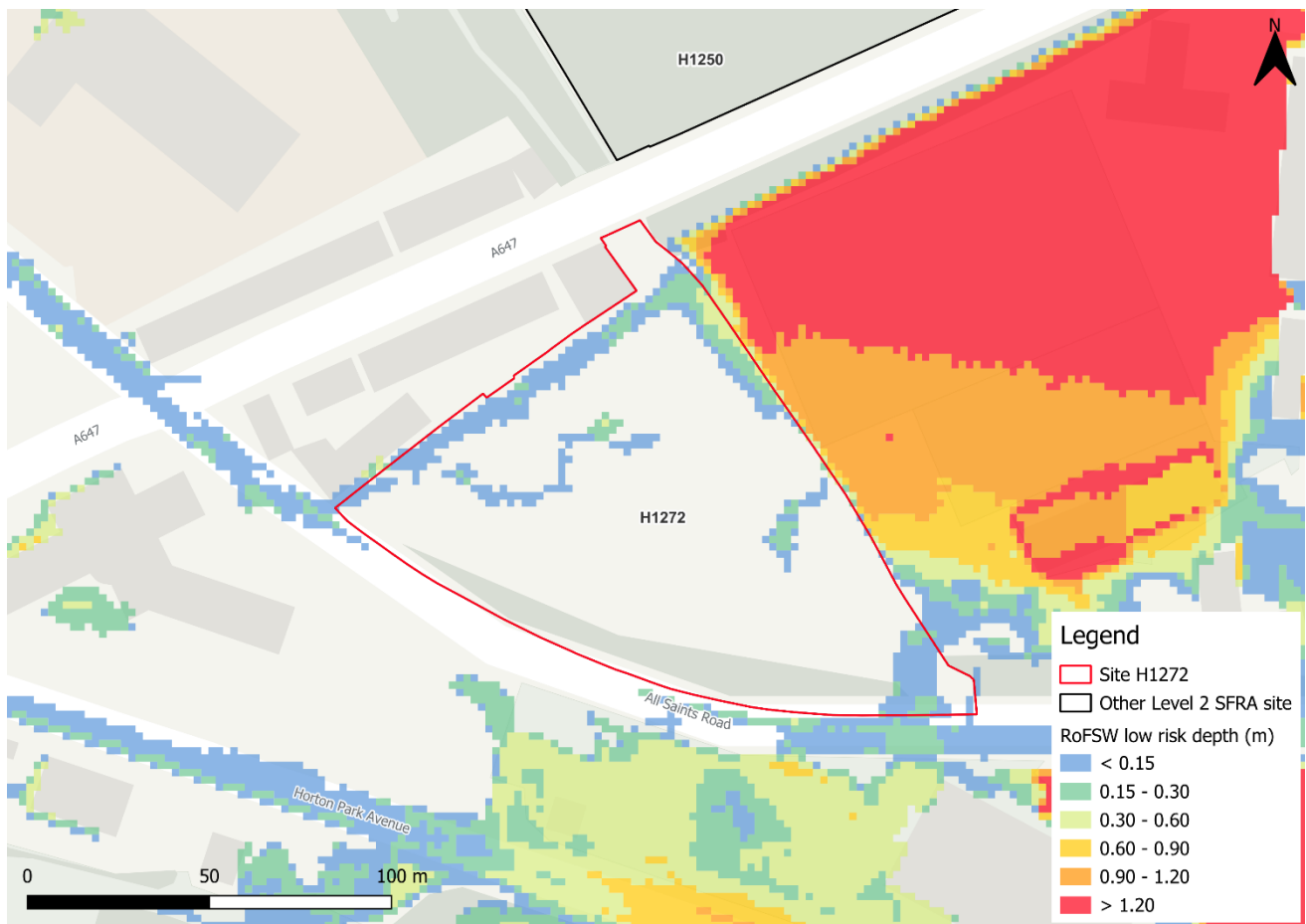


Figure 3-2: Low risk event surface water flood depths (Risk of Flooding from Surface Water map)

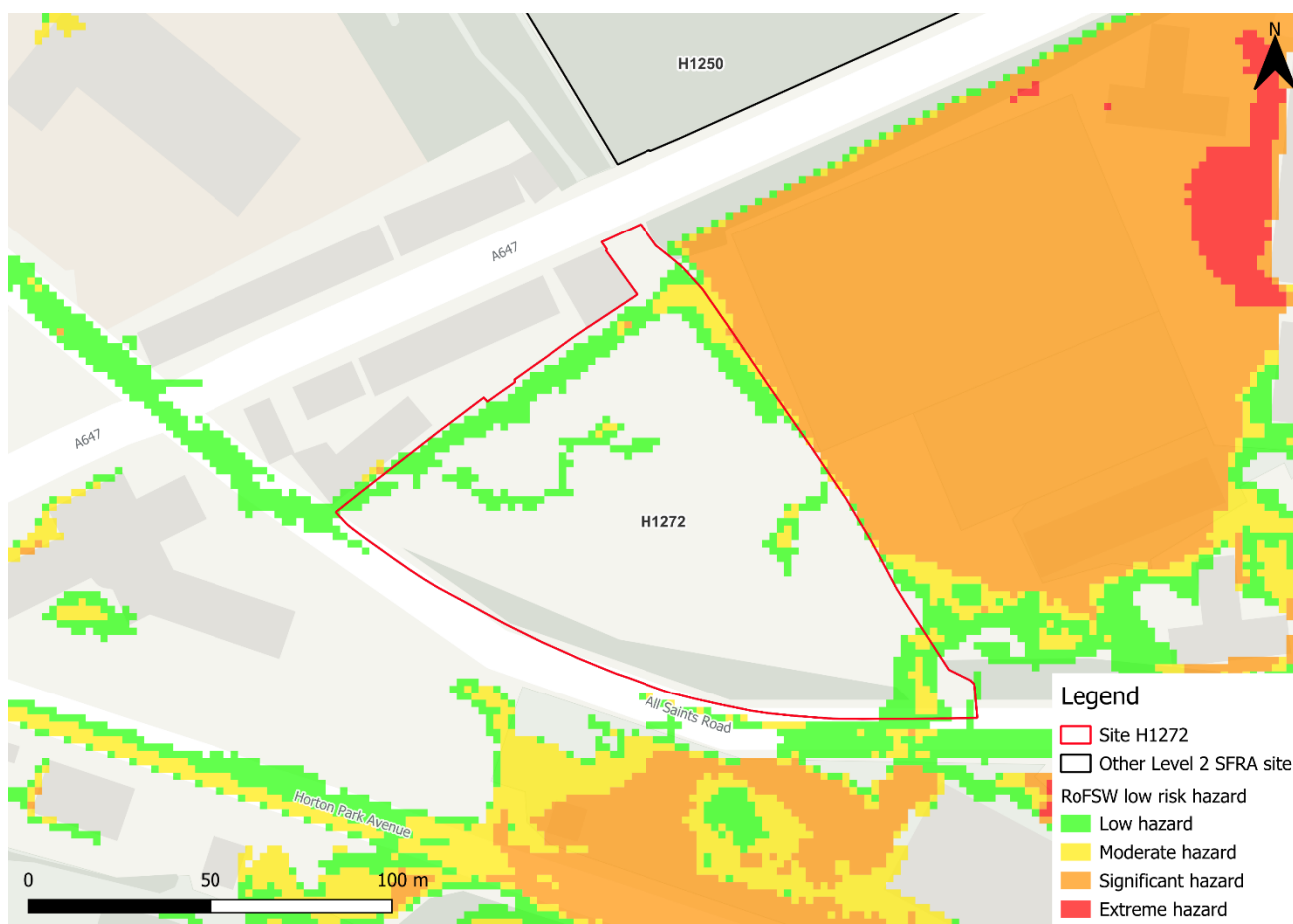


Figure 3-3: Low risk event surface water flood hazard¹ (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

At the time of writing, the available national surface water climate change mapping is unsuitable for consideration in development planning. This Level 2 SFRA considers the low risk surface water event as a conservative proxy for the medium risk event plus climate change, as agreed with the EA. The impact of climate change on surface water flood risk should be considered at the site-specific FRA stage.

Using the low risk event as a proxy, the medium risk surface water event is likely to impact the site when accounting for climate change (Figure 3-4). These areas are confined to the boundaries of the site, as discussed in Section 3.1.

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

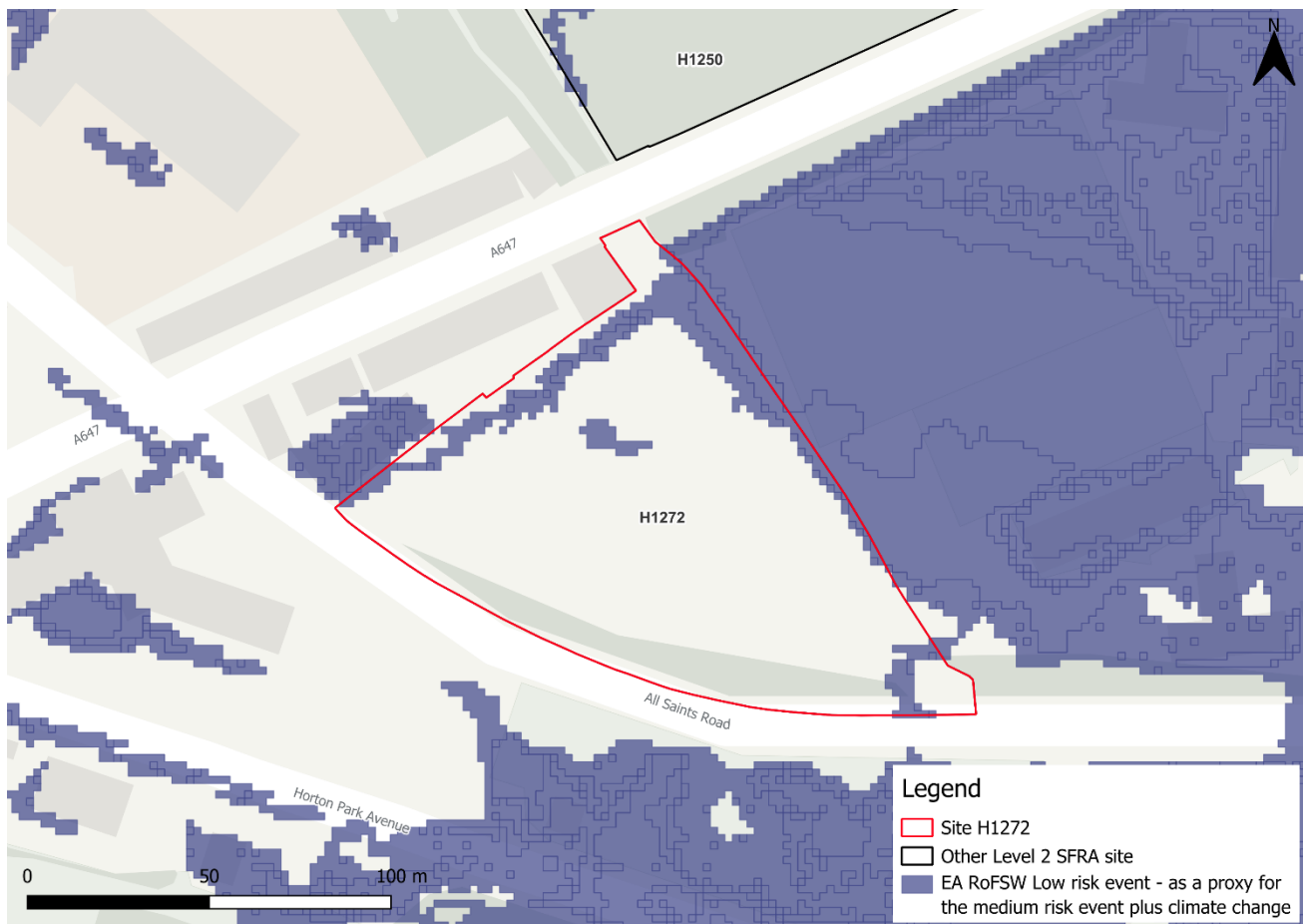


Figure 3-4: Low risk event surface water flood extent, as a proxy for the medium risk event plus climate change (NaFRA2 - Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- Current and future risk to the site is predominantly very low, with approximately 87% of the site being at very low risk. Surface water risk in the present day low risk event is primarily confined to shallow flow paths along the boundaries of the site.
- Topographic flow paths should be considered and included in site design and ideally left in place to flood naturally when required. Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development.
- Safe access and escape routes should be possible via All Saints Road to the south of the site during all events.
- The drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield rates will likely apply, though the developer should consult local LLFA guidance and the National SuDS guidance.
- 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 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 Guide². Figure 4-1 shows the map covering this site and the surrounding areas and Table 4-1 explains the risk classifications.

The entire site is located within an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS, however this should be considered further through the drainage strategy given the likely low permeability of the underlying bedrock (Figure 1-3).

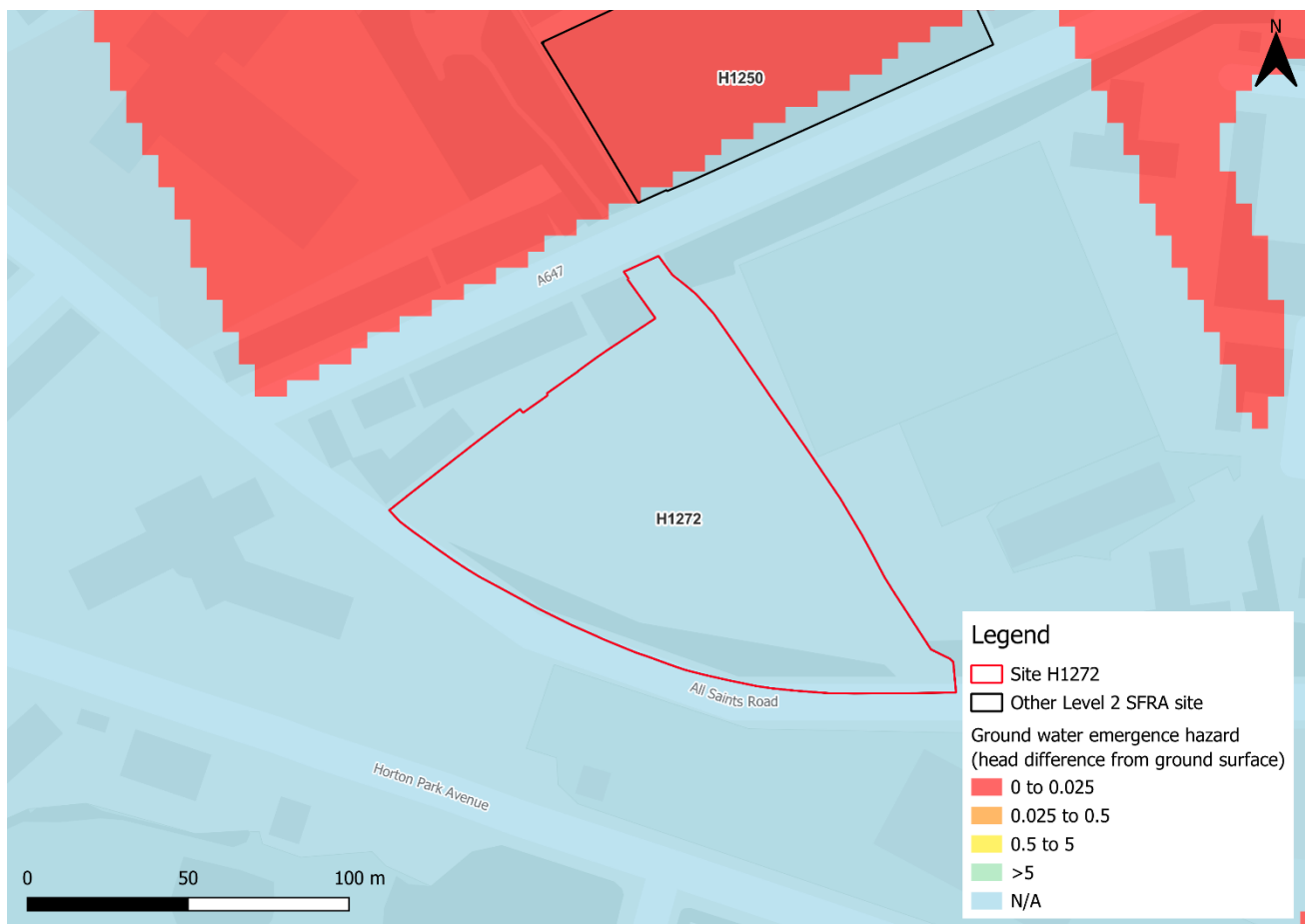


Figure 4-1: JBA 5m Groundwater Emergence Map

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

Although a site may be afforded some protection from defences and / or drainage infrastructure, there is always a residual risk of flooding from asset failure i.e. defence breaches, or blockages of culverts or drainage assets. Residual risk at this site may come from a blockage or structural failure of the culverted channel beneath the site.

5.1 Potential blockage

A blockage or structural failure of the culvert beneath the site may cause water in the channel to overtop and cause flooding to the site, depending on the severity of the blockage and the magnitude of the flood event. The inlet of the culvert is marked on Figure 5-1.

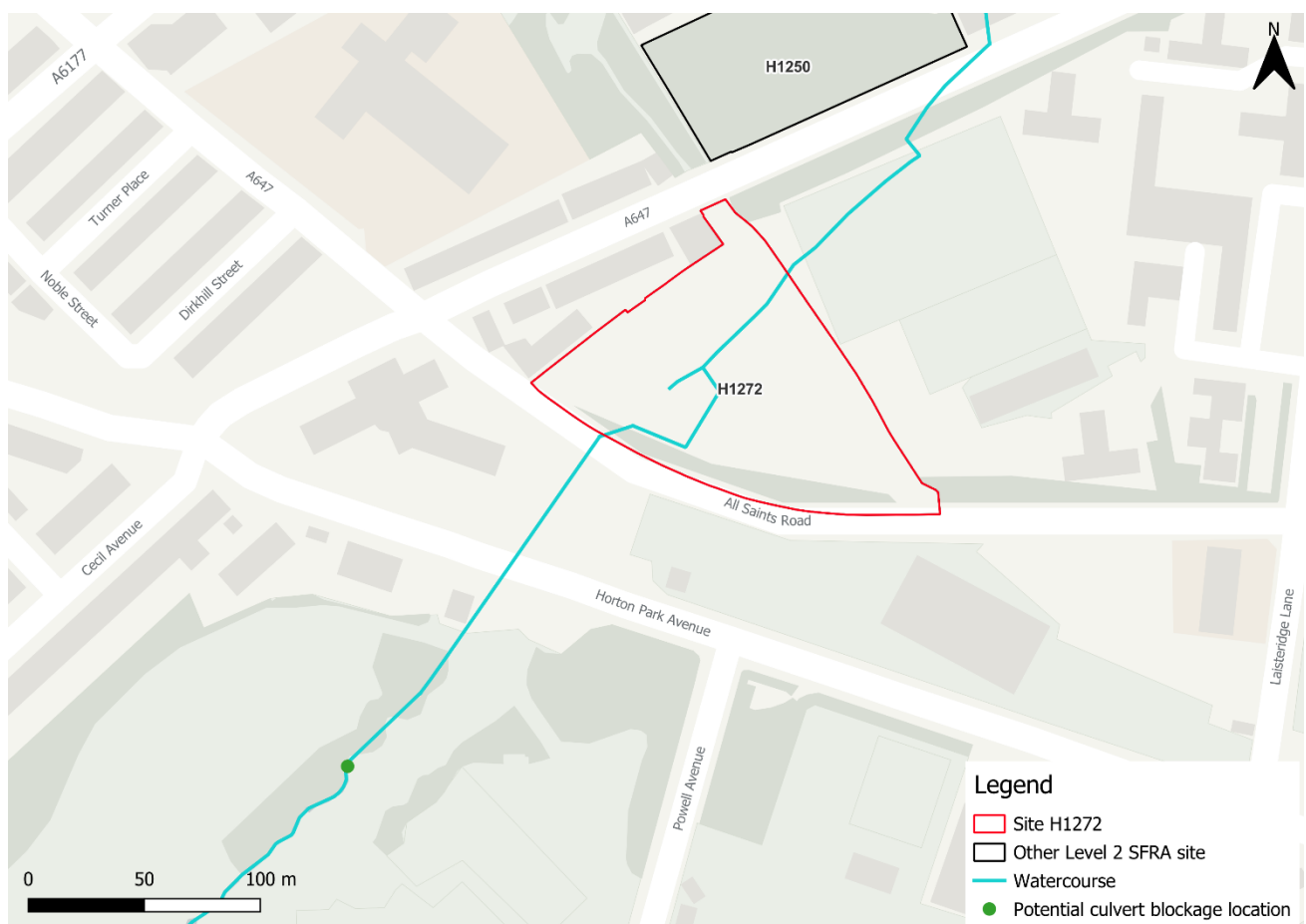


Figure 5-1: Potential blockage location

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

- The site is at potential residual risk from a blockage or structural failure of the West Brook culvert beneath the site. The site-specific FRA could consider modelling a blockage scenario to understand whether there would be any additional risk to the site as a result of a blockage.
- Areas adjacent to culverts and bridges are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked. Emergency plans must be in place for such areas and safe access and escape routes must be in place for the lifetime of development. Resistance and resilience measures may also need to be put in place to manage residual flood risk when avoidance measures have been exhausted.
- The LPA should use the information on residual risk in this Level 2 SFRA to state in the local plan strategic policies a preferred mitigation strategy for ensuring development will be safe throughout its lifetime in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications (para 042, FRCC-PPG).

6 Overall site assessment

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

This site is required to pass part b) of the exception test³, given it is proposed for more vulnerable uses and is located within Flood Zone 3a. It must be proven that the development can be safe for its lifetime, which is generally considered to be 100 years for residential development.

Based on the information presented in this Level 2 SFRA, the exception test cannot be passed, and the site should not be allocated for residential uses. The test should also be reapplied if more recent information about existing or potential flood risk becomes available at application stage which shows less risk to the site, ideally through the development of a detailed model of West Brook.

6.2 Recommendations summary

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- A large area of the site is located within the functional floodplain. Development is not permitted within the functional floodplain.
- There should be no development above the West Brook culvert which runs beneath the site, if it is to remain culverted. The location and path of this culvert should be confirmed through a survey as part of the site-specific FRA.
- It is recommended that this site is converted to open space offering multifunctional benefits alongside flood risk mitigation including BNG contributions, and social and amenity benefits, given the significant fluvial risk to the site.
- There may be opportunities to deculvert and daylight the West Brook culvert beneath the site which could impact flood risk on the site. Any site-specific FRA should produce a detailed model of the reach of West Brook to confirm modelled flood extents and depths within the site.
- The latest Bradford Beck model does not include the site within the model domain. The existing flood zones within the site boundary are based on older modelling in comparison to the rest of the Bradford Beck watercourse.
- Modelled flood depths, velocities and hazards have therefore not been considered as part of this Level 2 SFRA. Updated present day and climate change modelling of West 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.
- 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 178 National Planning Policy Framework 2024

6.3 Site-specific FRA requirements and further work

At the planning application stage, the following should be considered:

- Full detailed flood modelling of West Brook to assess up to date risk to the site, including for deculverting and culvert blockage scenarios.
- Further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- A condition and capacity assessment of the culvert beneath the site.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA guidance; the CBMDC 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.

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Bradford Level 2 Strategic Flood Risk Assessment - Site H1274

Final Draft

July 2026

Prepared for:



City of
BRADFORD
METROPOLITAN DISTRICT COUNCIL

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Document Status

Issue date	17 July 2026
Issued to	Jonathan Dicken
BIM reference	NPA-JBA-XX-XX-RP-Z-0020
Revision	P02
Prepared by	Dominic Richardson BSc Analyst
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Contract

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This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Dominic Richardson 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 City of Bradford Metropolitan District Council (CBMDC) Local Plan Site H1274. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

1.1 Site H1274

- Location: Cousen Road
- Existing site use: Brownfield
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 0.45 hectares
- Proposed development impermeable area: 0.41 hectares
- Watercourse: West Brook
- Environment Agency (EA) river model: N/A
- Summary of requirements from scoping stage:
 - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
 - 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

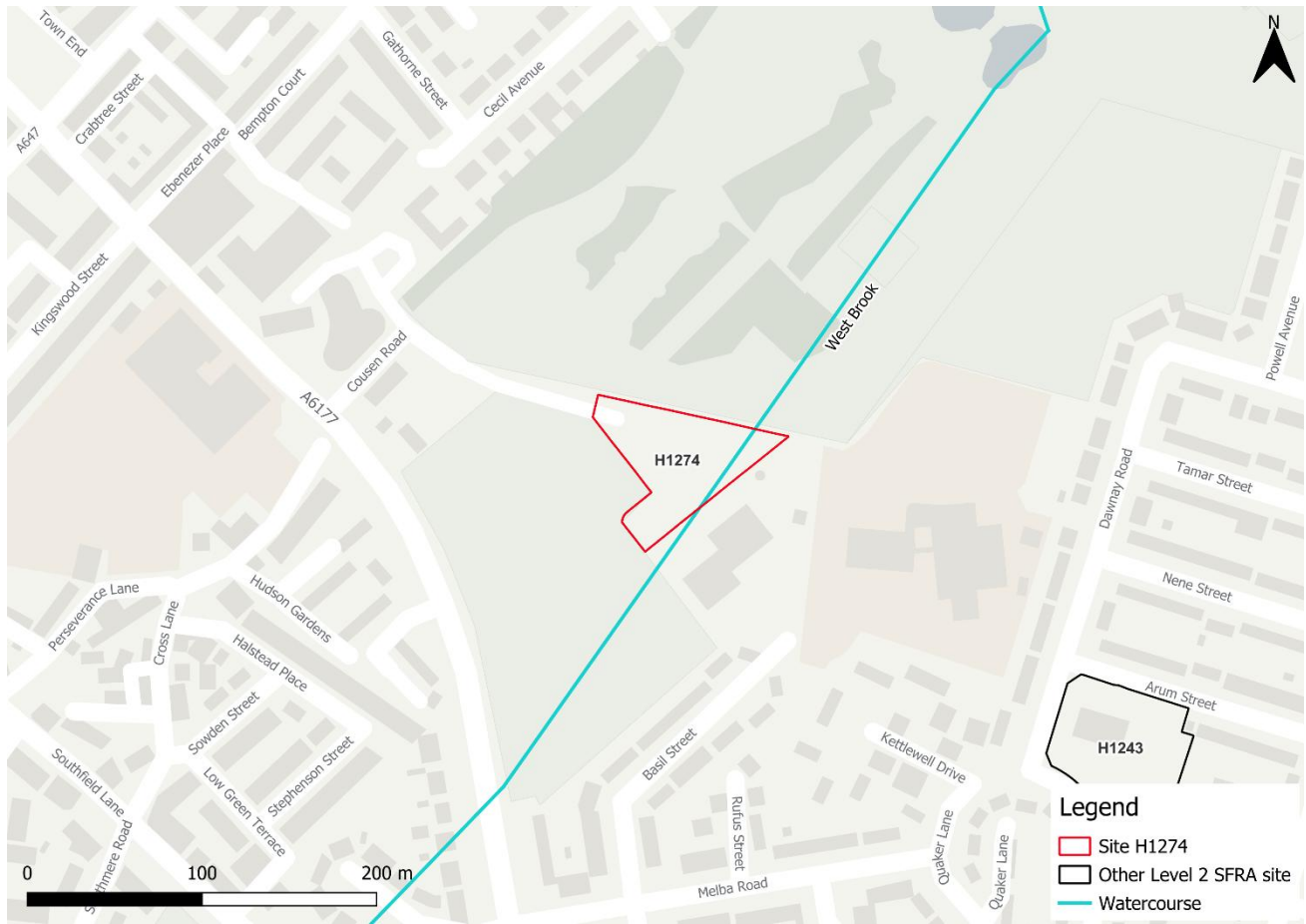


Figure 1-1: Existing site location boundary

The topography and elevation are generally consistent throughout the site (Figure 1-2). The site is situated in an area of higher elevation in comparison to the surrounding areas.

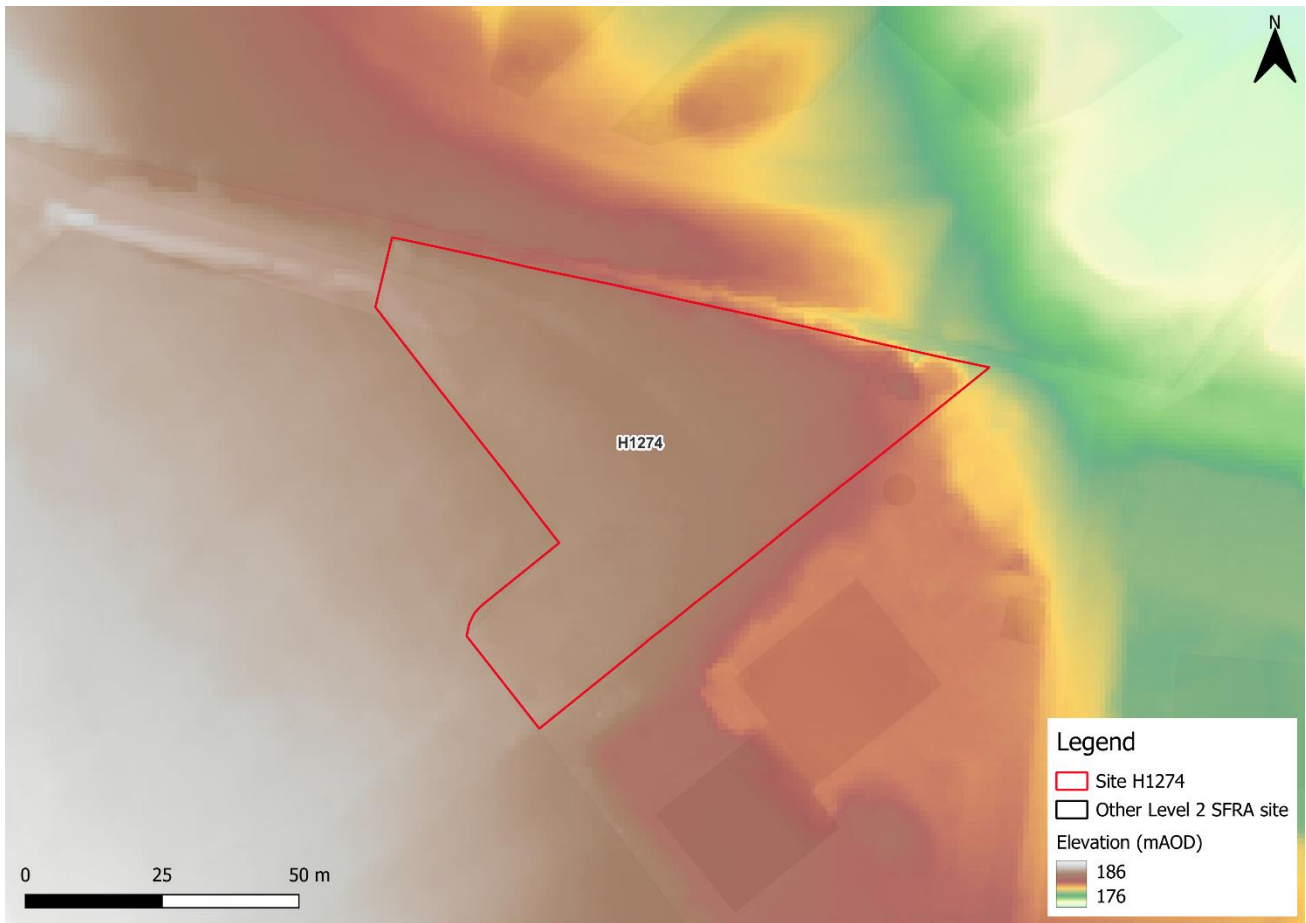


Figure 1-2: Topography

The underlying bedrock within the site is defined as 'Pennine Lower Coal Measures Formation', which comprises mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 1-3). This is overlain with superficial deposits of till. Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, however this can be highly variable. Sandstone has a higher permeability.



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 (January 2026) and Flood Zone 3b (functional floodplain), as updated in this Level 2 SFRA, 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).

The site is located within the functional floodplain through the south and east of the site, representing the channel of West Brook which is assumed to be culverted beneath the site. However, this is based on an 8m buffered polygon of the West Brook culverted channel to indicate the presence of the watercourse. The mapped watercourse location may not represent the actual location of the culverted channel. Noting that, functional floodplain policy applies to the path of the culvert beneath the site and not the mapping functional floodplain, where these differ. The path of the culverted channel should be confirmed through a survey as part of the site-specific FRA. The remaining area of the site is within Flood Zone 1 and therefore at low risk of fluvial flooding.

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)
81	0	0	19



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

2.1.2 Bradford Beck 2026 model outputs - present day

The Bradford Beck 2026 model does not cover the reach of the watercourse present beneath the site. Therefore, flood depth, hazard and velocity data cannot be considered as part of this Level 2 SFRA. Any site-specific FRA should produce a detailed model of the reach of West Brook within the vicinity of the site.

2.2 Impacts from climate change

The EA's SFRA guidance states that SFRAs should assess the central allowance for less vulnerable, more vulnerable, highly vulnerable and water compatible development.

Table 2-2: Climate change allowances for peak river flows for the Aire and Calder Management Catchment

Return period (AEP event)	Central allowance 2080s (% increase)	Higher central allowance 2080s (% increase)	Upper end allowance 2080s (% increase)
3.3% (functional floodplain)	23%	31%	51%
1%	23%	31%	51%

2.2.1 Bradford Beck 2026 model outputs - climate change

As documented in Section 2.1.2, the Bradford Beck 2026 model does not cover the site. Therefore, detailed climate change modelling is unavailable for consideration.

2.2.2 Flood Map for Planning - Climate Change

The EA's Flood Map for Planning plus Climate Change (2070-2125) dataset also does not cover the site (Figure 2-2). The impact 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 the reach of West Brook within the vicinity of the site, including for the most up to date climate change allowances (Table 2-2).



Figure 2-2: EA Flood Zones plus Climate Change dataset

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) to reduce flood risk to the site and surrounding areas. Within and upstream of the site, there are opportunities for tree planting in the wider catchment. Tree planting can intercept, slow, store and filter water, reducing runoff downstream. 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.

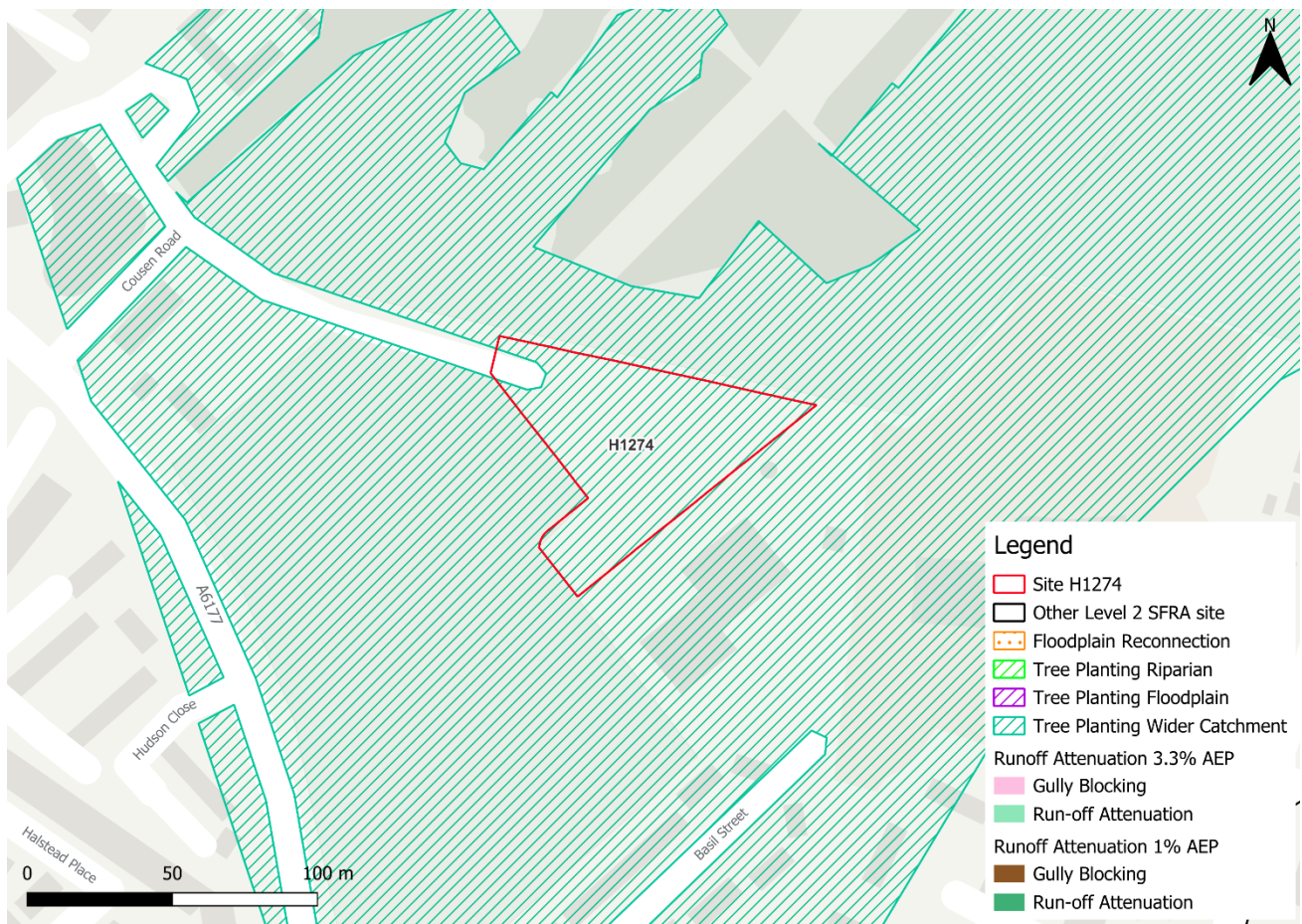


Figure 2-3: Natural Flood Management (NFM) potential mapping

2.4 Historic flood incidents

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

2.5 Emergency planning

2.5.1 Flood warnings

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. This site is also not located within a FAA.

2.5.2 Access and escape routes

Based on available information, safe access and escape routes could likely be achieved during a flood event via the unnamed access road to the west of the site (Figure 2-4).

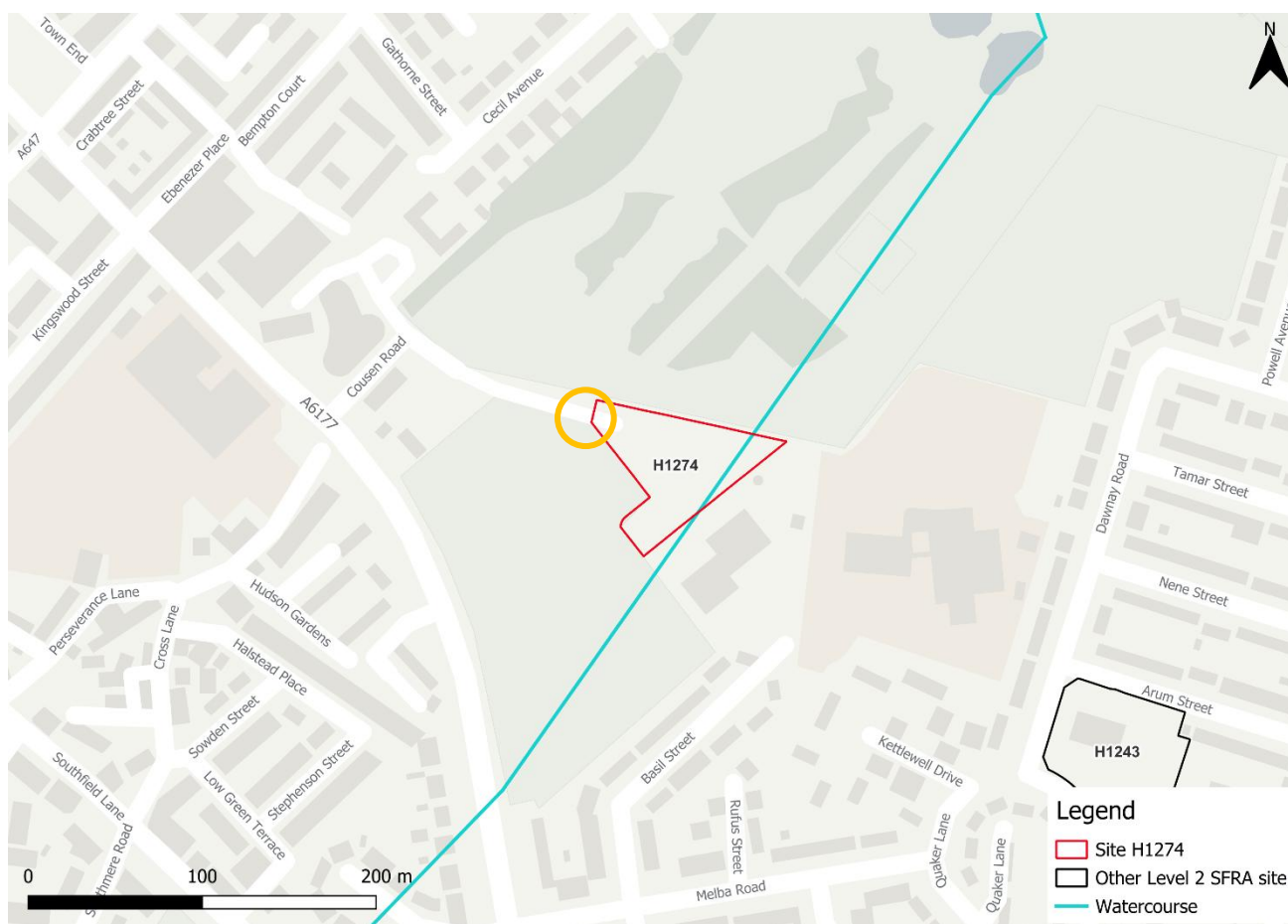


Figure 2-4: Potential access and escape routes

2.6 Observations, mitigation options, site suitability and sequential approach to development management - fluvial

- Observations:
 - 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 LPA must consider whether the change of use is acceptable and whether the development can be designed to be safe, including for adequate emergency planning provision, accounting for the information provided in this Level 2 SFRA (para 014 FRCC-PPG).
 - The site is shown to be within the functional floodplain through the south and east of the site, representing the presence of the culverted West Brook watercourse beneath the site. The location and course of the culvert should be confirmed through a survey. Consideration should be given as to whether deculverting and daylighting this section of culvert is feasible, supported by detailed modelling. The watercourse should be considered within site design and form a blue green corridor through the site.
 - If West Brook will remain culverted beneath the site, there should be no development above the culvert.

- If works are proposed on or near West Brook, a separate permission may be required. The type of permission needed from the Lead Local Flood Authority will depend on the activity and location proposed.
- There may be opportunities to deculvert and daylight the West Brook culvert beneath the site which could impact flood risk on the site. Any site-specific FRA should produce a detailed model of the reach of West Brook to confirm modelled flood extents, depths and hazards within the site for both present day and accounting for the impacts of climate change.
- Access and escape:
 - Based on available information, safe access and escape routes would likely be achievable by the unnamed access road to the west of the site.

3 Flood risk from surface water

3.1 Existing risk

At the time of writing, the EA's latest national Risk of Flooding from Surface Water (RoFSW) does not include depth and hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation RoFSW depth and hazard mapping in addition to the NaFRA2 extents, as agreed with the EA. Surface water depth and hazard should be confirmed at the site-specific FRA stage.

3.1.1 Risk of Flooding from Surface Water - NaFRA2 extents

Based on the EA's national scale RoFSW map (January 2026), surface water risk to the site is predominantly very low, as shown in Table 3-1.

Surface water risk is confined to a very small area in the northwestern corner of the site in the low risk event (Figure 3-1). Safe access and escape routes would likely be achievable via the unnamed access road to the west 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)
99	1	0	0

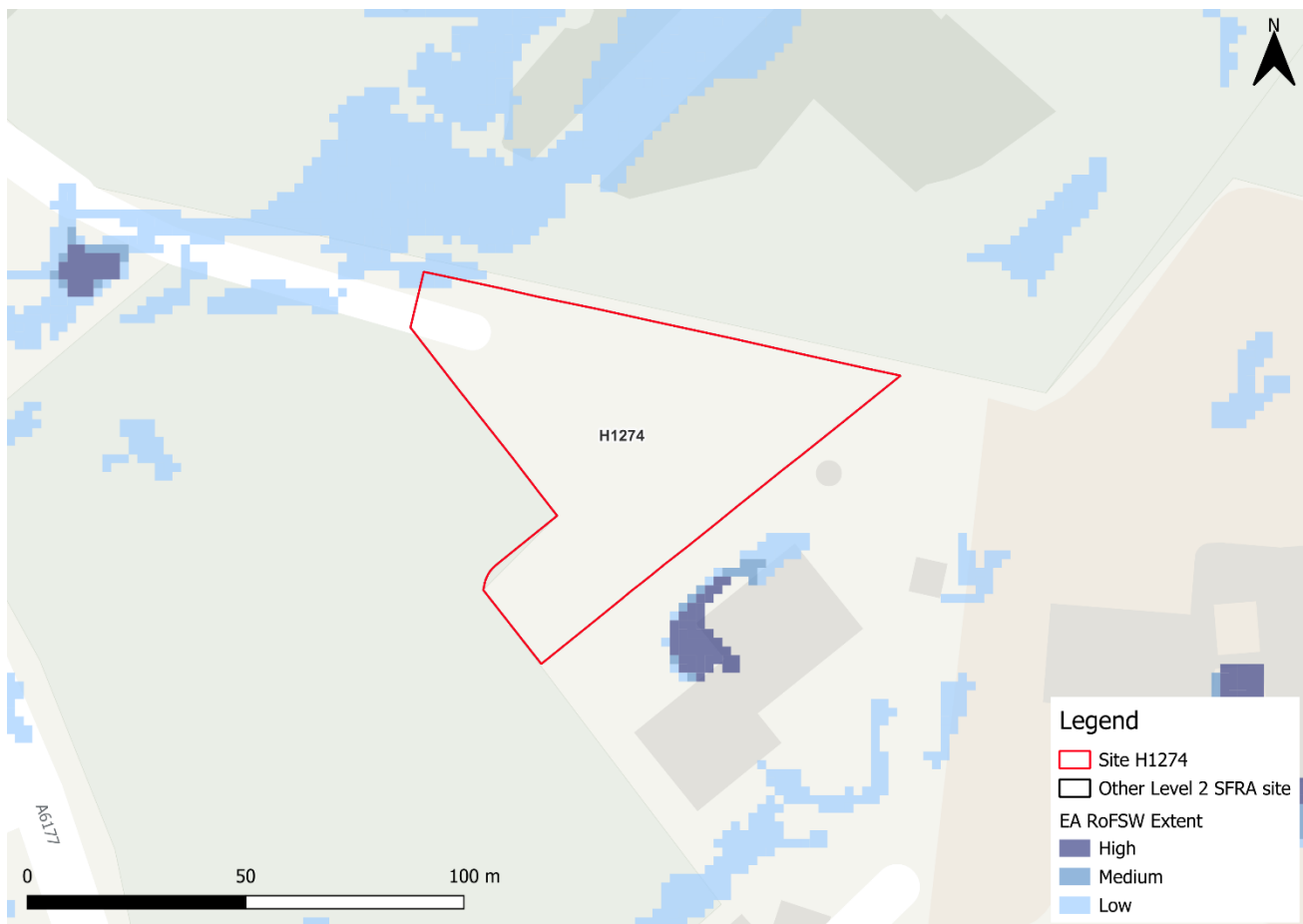


Figure 3-1: Surface water flood extents (NaFRA2 - Risk of Flooding from Surface Water map)

3.1.2 Risk of Flooding from Surface Water - third generation depths and hazards

Based on the EA's third generation RoFSW map, the greatest flood depths within the site in the medium risk event are between 0.6 and 0.9 m (Figure 3-2), with hazard categorised as 'significant' (Figure 3-3). Safe access and escape routes should be achievable via the unnamed access road given the low surface water depths and hazards along this route.

However, there are some differences between the NaFRA2 RoFSW map and the third-generation depth and hazard mapping, given the site is not shown to be at surface water risk in the medium risk event in the NaFRA2 RoFSW mapping. The NaFRA2 RoFSW map does not map flooding less than 0.075m (7.5cm) in depth. Therefore, where the map may show no flooding, there may be shallow flooding up to a depth of 0.075m. In contrast, the third generation RoFSW does not map flooding with a hazard rating of less than 0.575. This could explain the differences observed between the NaFRA2 and third generation RoFSW. Assessment of surface water should be carried out at the site-specific FRA stage to establish current and future surface water flood risk conditions.

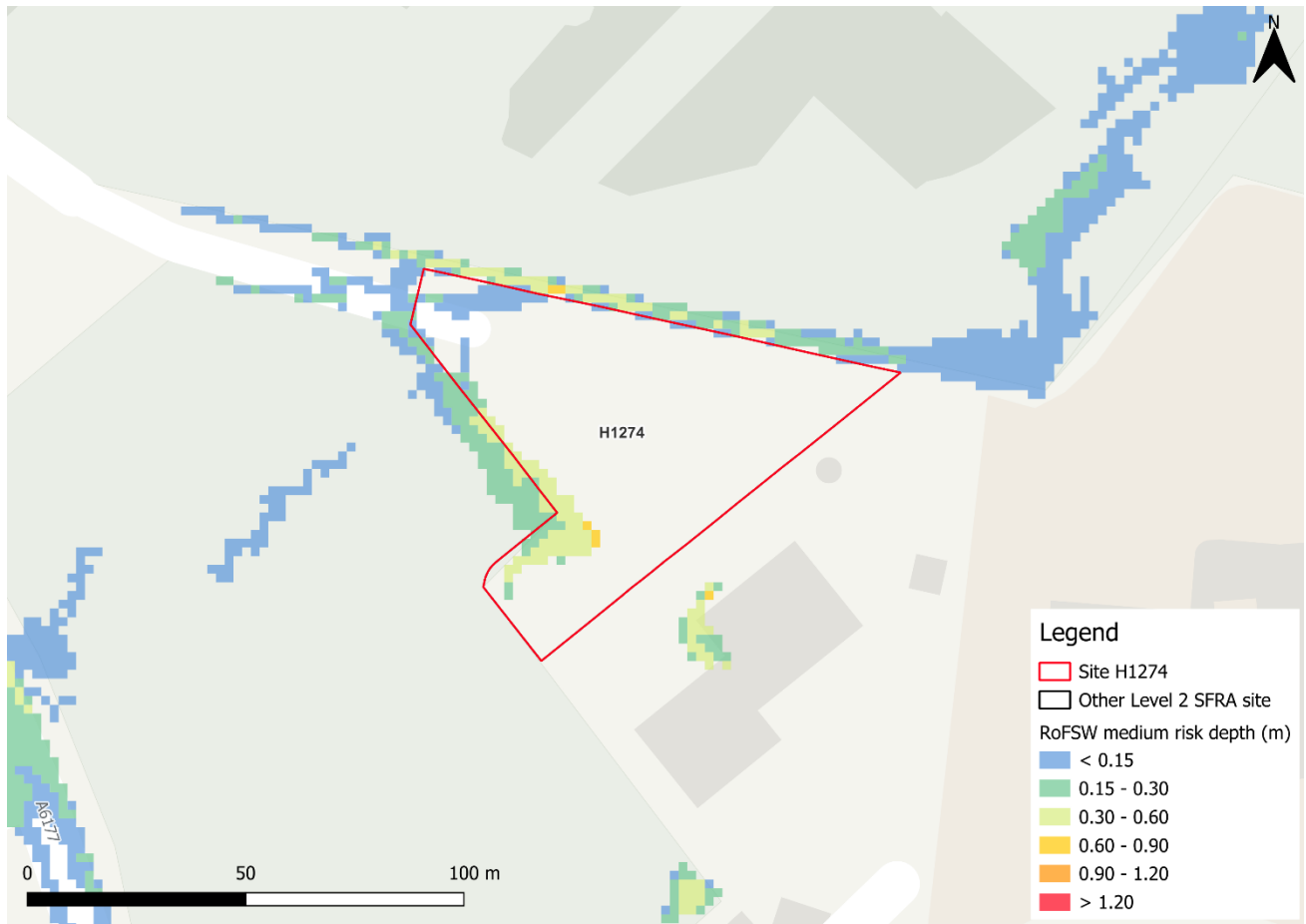


Figure 3-2: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)

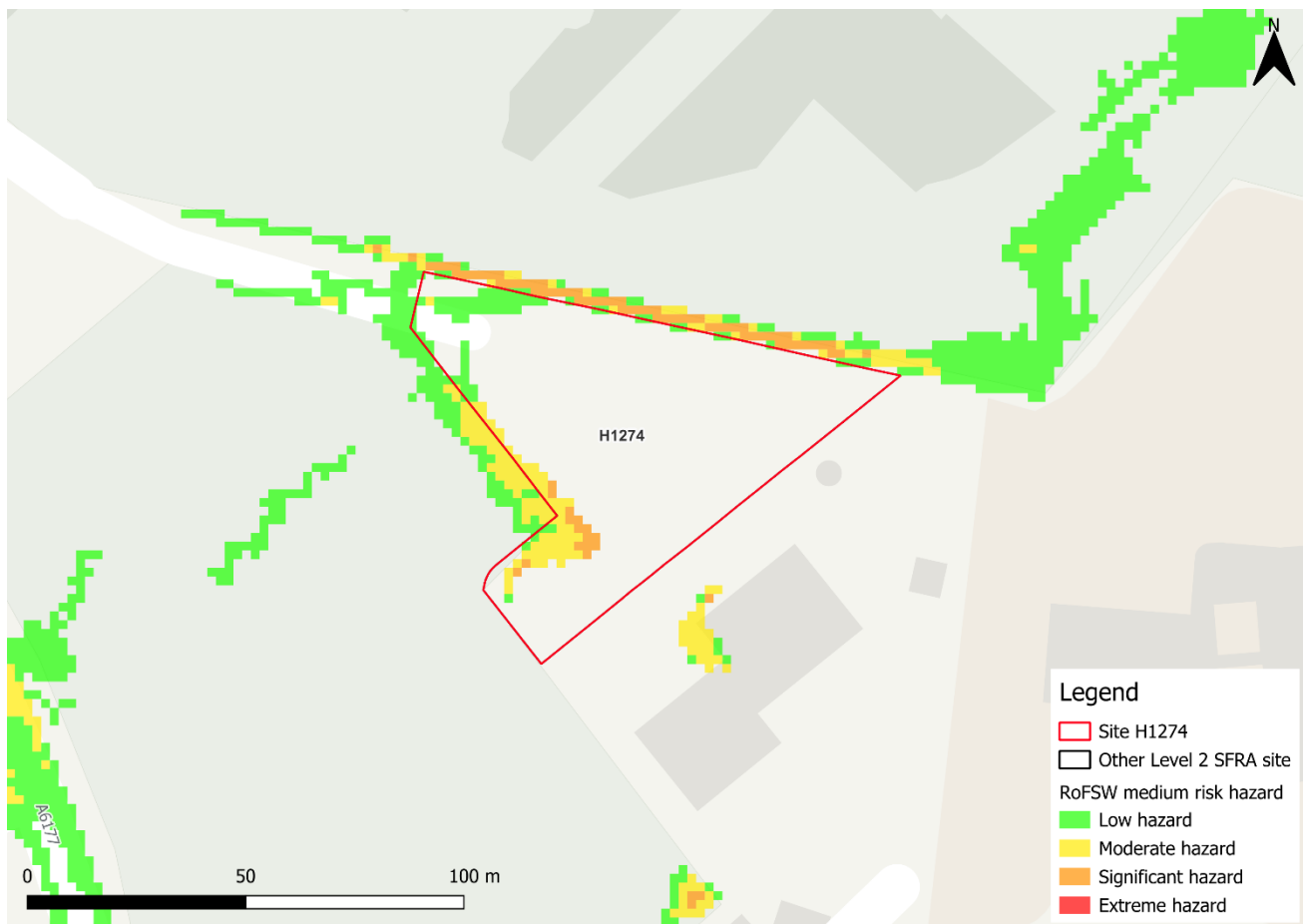


Figure 3-3: Medium risk event surface water flood hazard¹ (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

At the time of writing, the available national surface water climate change mapping is unsuitable for consideration in development planning. This Level 2 SFRA considers the low risk surface water event as a conservative proxy for the medium risk event plus climate change, as agreed with the EA. The impact of climate change on surface water flood risk should be considered at the site-specific FRA stage.

Using the low risk event as a proxy, the medium risk surface water event is likely to increase in extent within the site, however risk will remain very low (Figure 3-4). Greatest flood depths are shown to remain at between 0.6 and 0.9m (Figure 3-5), with areas of hazard categorised as 'significant' (Figure 3-6). Safe access and escape routes should remain achievable via the unnamed access road to the west 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

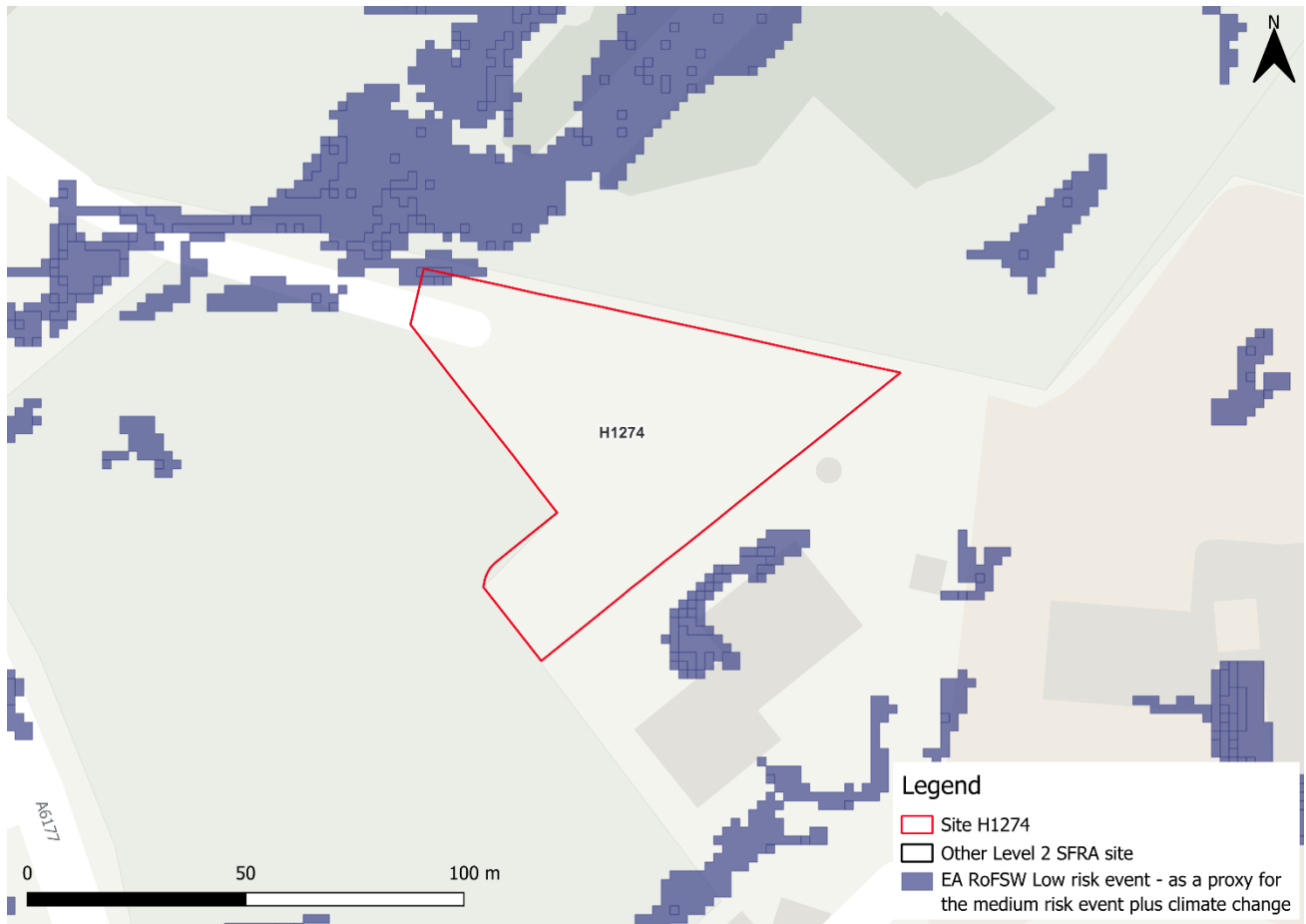


Figure 3-4: Low risk event surface water flood extent, as a proxy for the medium risk event plus climate change (NaFRA2 - Risk of Flooding from Surface Water map)

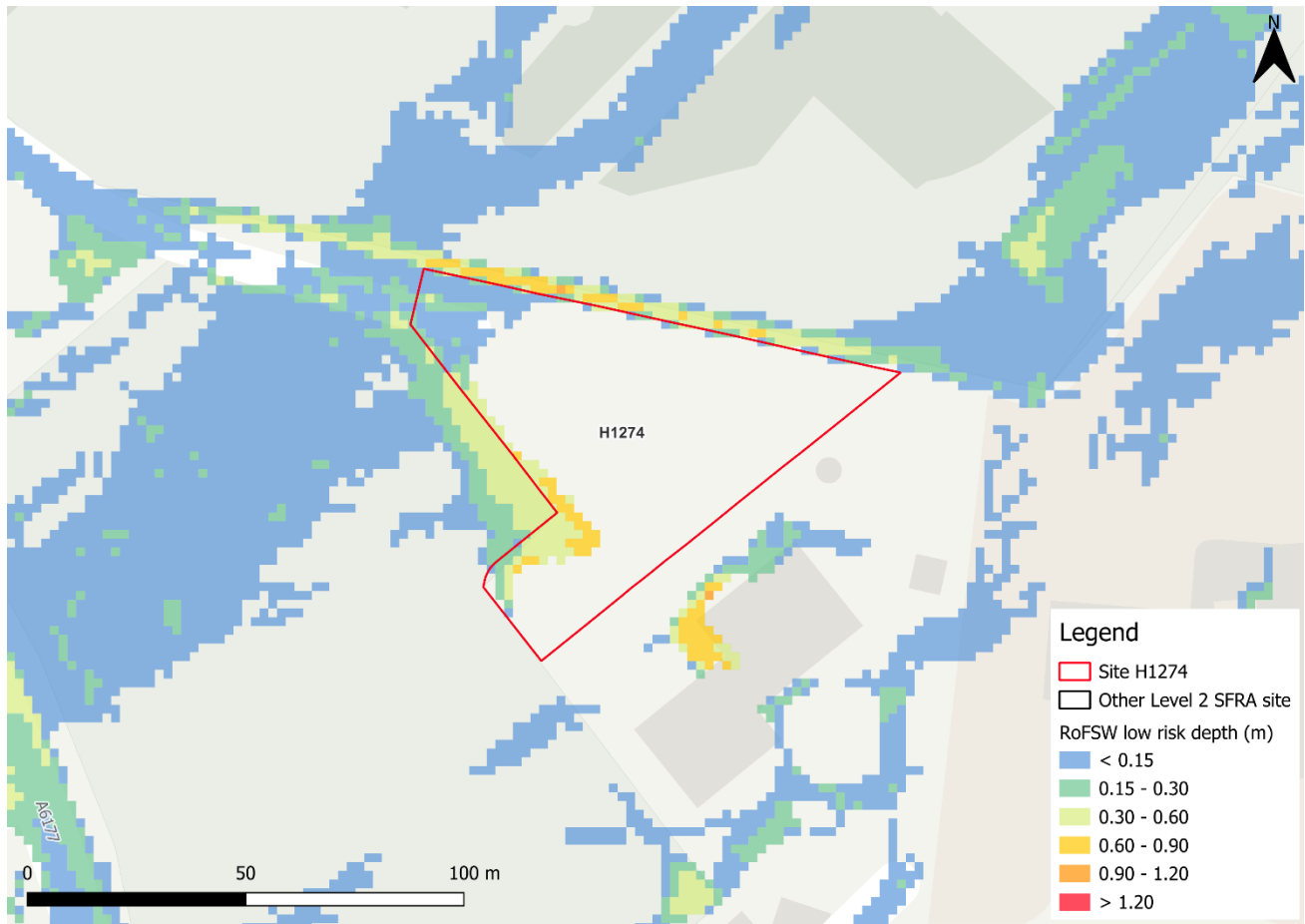


Figure 3-5: Low risk event surface water flood depths, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

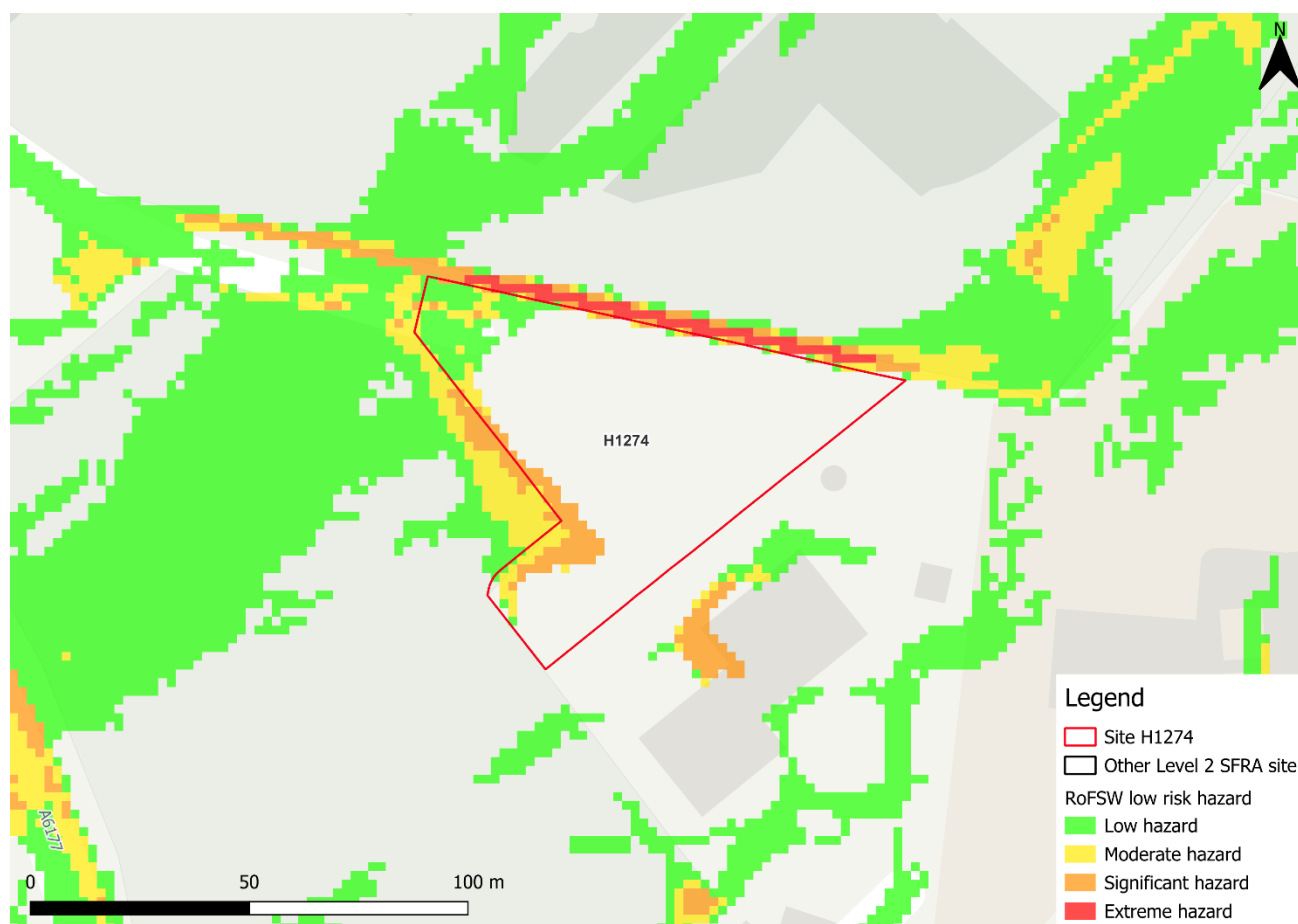


Figure 3-6: Low risk event surface water flood hazard, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- Current and future risk to the site is predominantly very low, with approximately 99% of the site being at very low risk. Surface water risk in the present day low risk event is confined to a very small area within the northwest 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. Surface water flood risk in this event is confined to areas of ponding within topographic low spots across the site.
- Topographic flow routes 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.
- Safe access and escape routes along the unnamed access road may be achievable, however this would need to be confirmed through a site-specific FRA and drainage strategy given the flood depths and hazards along this route in the low risk event, as shown in the third generation RoFSW mapping.
- The drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield rates will likely

apply, though the developer should consult local LLFA guidance and the National SuDS guidance.

- 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 Guide². 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 in an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS in these areas, however this should be considered further through the drainage strategy given the likely low permeability of the underlying bedrock (Figure 1-3).

The northern boundary of the site and northeast corner of the site is located within an area at risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally in these areas, and it may not be suitable to locate SuDS in these areas. A drainage strategy must include for ground and infiltration surveys and further investigation into groundwater levels is recommended.

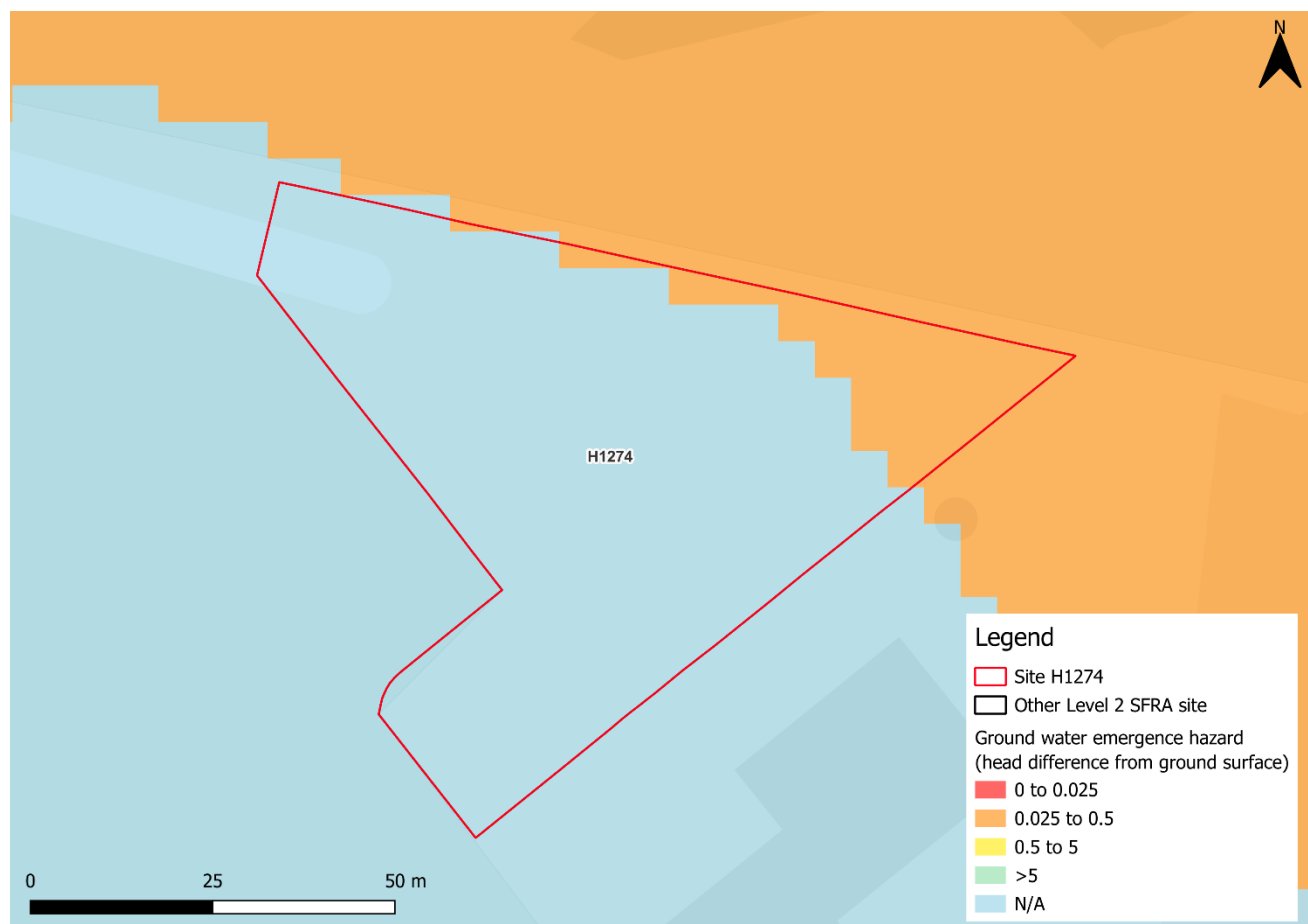


Figure 4-1: JBA 5m Groundwater Emergence Map

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

Although a site may be afforded some protection from defences and / or drainage infrastructure, there is always a residual risk of flooding from asset failure i.e. defence breaches, or blockages of culverts or drainage assets. Residual risk at this site may come from a structural failure of the culverted channel beneath the site.

5.1 Potential structural failure

A structural failure of the culvert beneath the site may cause flooding to the site, depending on the severity of the failure and the magnitude of the flood event.

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 of flooding from reservoirs.

5.3 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a structural failure of the West Brook culvert beneath the site.
- Areas adjacent to culverts and bridges are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked. Emergency plans must be in place for such areas and safe access and escape routes must be in place for the lifetime of development. Resistance and resilience measures may also need to be put in place to manage residual flood risk when avoidance measures have been exhausted.
- The LPA should use the information on residual risk in this Level 2 SFRA to state in the local plan strategic policies a preferred mitigation strategy for ensuring development will be safe throughout its lifetime in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications (para 042, FRCC-PPG).

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 test³ as it is not located within Flood Zone 3a, however it must still be proven that the development can be safe for its lifetime, which is generally assumed to be 100 years for residential development.

6.2 Recommendations summary

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- Detailed modelling is required to understand any fluvial risk to the site from West Brook, including for the impact of blockage and climate change.
- There may be opportunities to deculvert and daylight the West Brook culvert beneath the site which could impact flood risk on the site. Any site-specific FRA should produce a detailed model of the reach of West Brook to confirm modelled flood extents, depths and hazards within the site.
- There should be no development above the West Brook culvert which may run beneath the site, if it is to remain culverted. The location and path of this culvert should be confirmed through a survey as part of the site-specific FRA.

6.3 FRA requirements and further work

- Full detailed flood modelling of West Brook to assess up to date risk to the site, including for deculverting and culvert blockage scenarios.
- Further modelling to understand the impacts of climate change on fluvial and surface water flood risk to the site.
- A condition and capacity assessment of the culvert beneath the site.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA guidance; the CBMDC 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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Bradford Level 2 Strategic Flood Risk Assessment - Site H1277

Final Draft

May 2025

Prepared for:



City of
BRADFORD
METROPOLITAN DISTRICT COUNCIL

www.jbaconsulting.com

Document Status

Issue date	16 May 2025
Issued to	Jonathan Dicken
BIM reference	NPA-JBA-XX-XX-RP-Z-0021
Revision	P03
Prepared by	Laura Thompson BSc Analyst
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Contract

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This report describes work commissioned by City of Bradford Metropolitan District Council (CBMDC) by an instruction dated 19 July 2024. The Client's representative for the contract was Jonathan Dicken of CBMDC. Laura Thompson of JBA Consulting carried out this work.

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Acknowledgements

We would like to thank the Environment Agency and Yorkshire Water 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 City of Bradford Metropolitan District Council (CBMDC) Local Plan Site H1277. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'CBMDC Level 1 SFRA' (2023) and read the 'CBMDC Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site H1277

- Location: Blamires Street
- Existing site use: Industrial
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Residential
- Proposed site use vulnerability: More vulnerable
- Site area: 0.3 hectares
- Proposed development impermeable area: 0.29 hectares
- Environment Agency (EA) model: N/A
- Watercourse: N/A
- Summary of requirements from scoping stage:
 - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
 - 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
 - Modelling of latest EA climate change allowances for peak rainfall intensities



Figure 1-1: Existing site location boundary

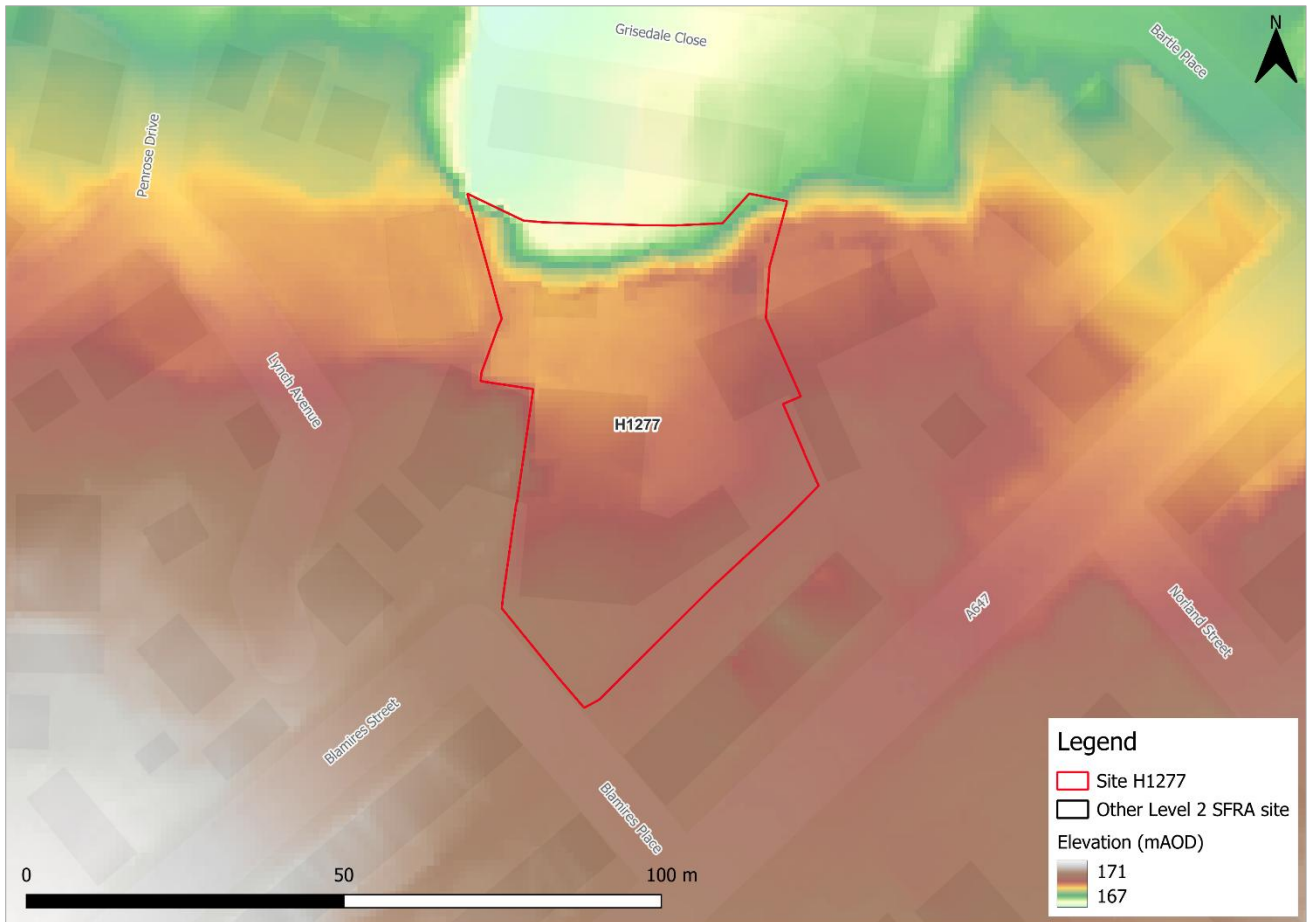


Figure 1-2: Topography



Figure 1-3: Soils and geology

2.2 Historic land-use mapping

Historic land-use mapping held by the LLFA indicates a watercourse within the southern corner of the site. This should be confirmed, and the exact location ascertained, through site investigation. Potential flood risk from this watercourse may need to be ascertained at the FRA stage. No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse.

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) to reduce flood risk to the site and surrounding areas. There are no applicable areas that could benefit the site.

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 within the vicinity of 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. This site is also not located within a FAA.

Based on available information, safe access and escape routes could likely be achieved during a flood event via Blamires Place to the south of the site.

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 wholly located within Flood Zone 1 and is therefore modelled to be at low risk of flooding from rivers.
- Potential flood risk from the watercourse shown in historic land-use mapping to enter the site may need to be ascertained at the FRA stage. No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse.
- If a watercourse is identified, it may need to be modelled to quantify the risk from any culverts.
- Assuming a culvert is located beneath the site, opportunities for opening up the culvert should be explored for inclusion in site design as a blue green corridor. This would remove any residual risk of flooding to the site as a result of culvert failure or blockage.

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 6% of the site is within the high risk surface water flood zone. A further 15% of the site is at medium surface water risk and a further 13% of the site is at low surface water risk, as shown in Table 3-1.

In the high risk event, surface water risk is confined to two short flow paths within the north and south of the site. In the medium risk event, a shallow flow path emerges through the centre of the site and along the south eastern boundary. This flow path increases in both extent and depth in the low risk event. Surface water is constrained by the existing development within the site.

Greatest surface water flood depths in the medium 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 Blamires Street to the south west 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)
66	13	15	6

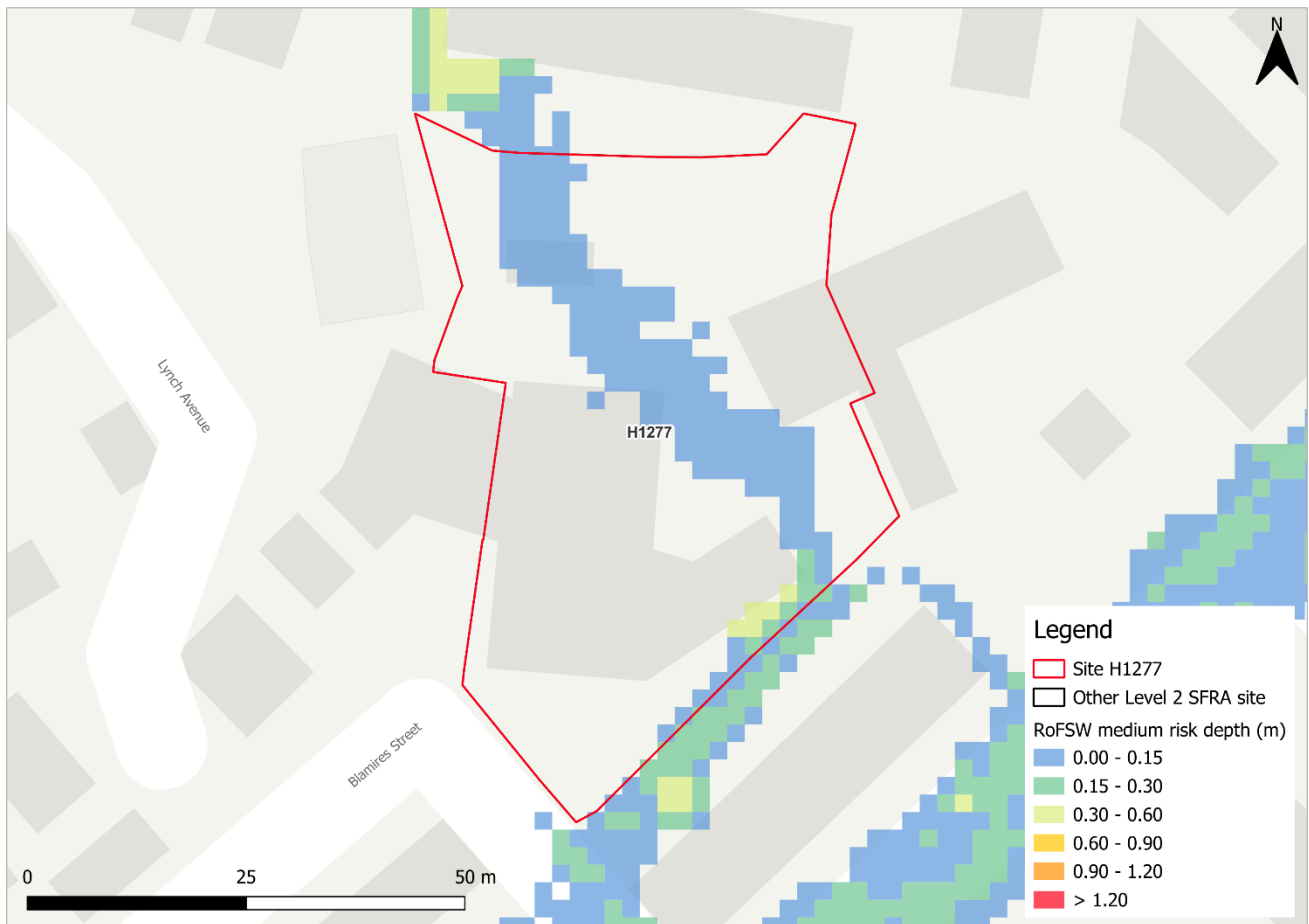


Figure 3-1: Medium risk event surface water flood depths (Risk of Flooding from Surface Water map)



Figure 3-2: Medium risk event surface water flood hazard¹ (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 Aire and Calder management catchment

Return period	Central allowance 2070s (% increase)	Upper end allowance 2070s (% increase)
3.3% (high risk)	25%	40%
1% (medium risk)	30%	45%

Figure 3-3 shows the medium risk surface water flood depths plus 45% climate change. Risk is modelled to be significantly greater than present day conditions, with the medium

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

risk climate change event being slightly greater in extent compared to the present-day low risk event. Maximum flood depths are modelled to be between 0.6 and 0.9 m, with some areas of significant hazard (Figure 3-4). Safe access and escape routes should remain possible via Blamires Street.

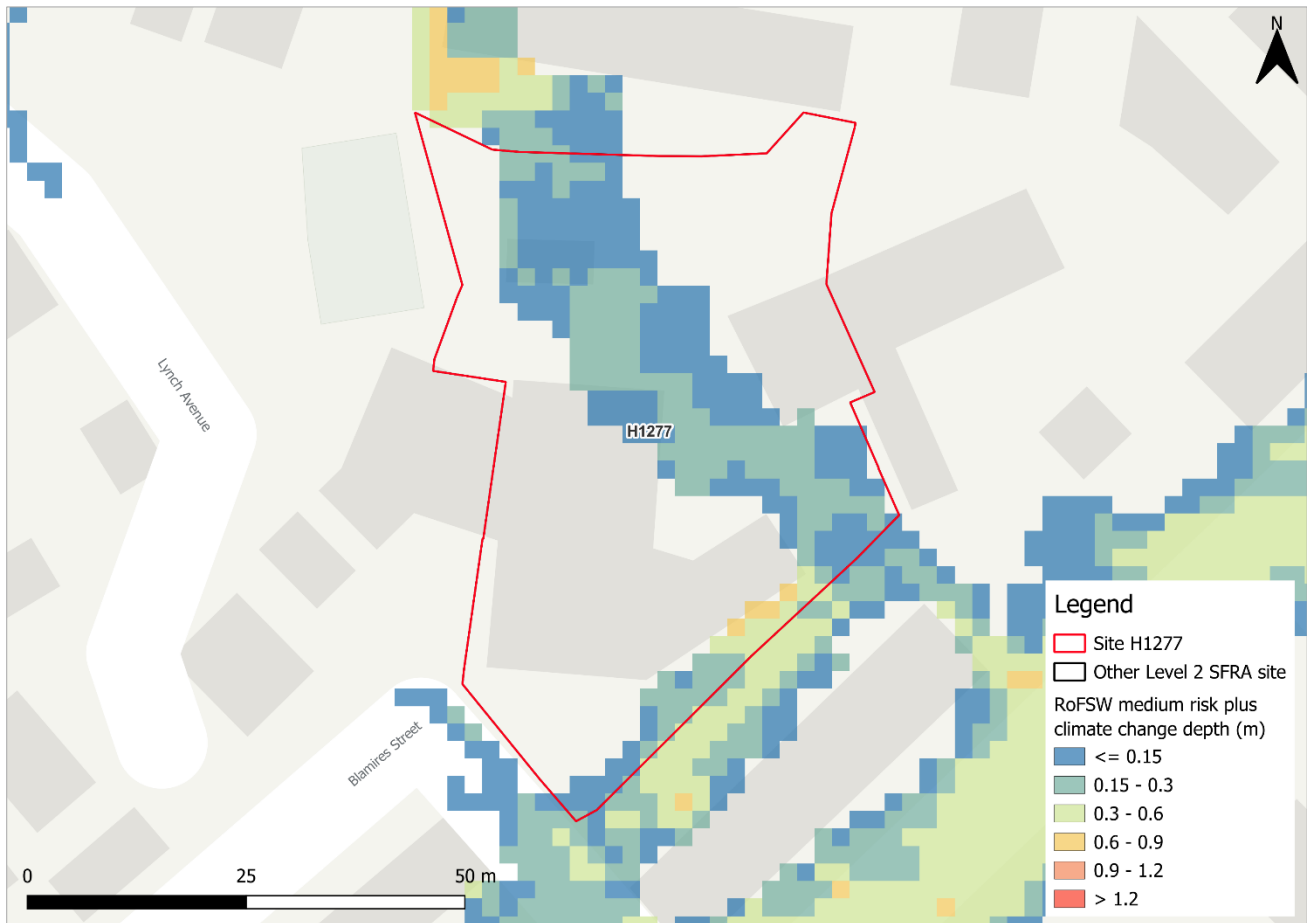


Figure 3-3: Medium risk event surface water flood depths plus 45% climate change (based on Risk of Flooding from Surface Water map)

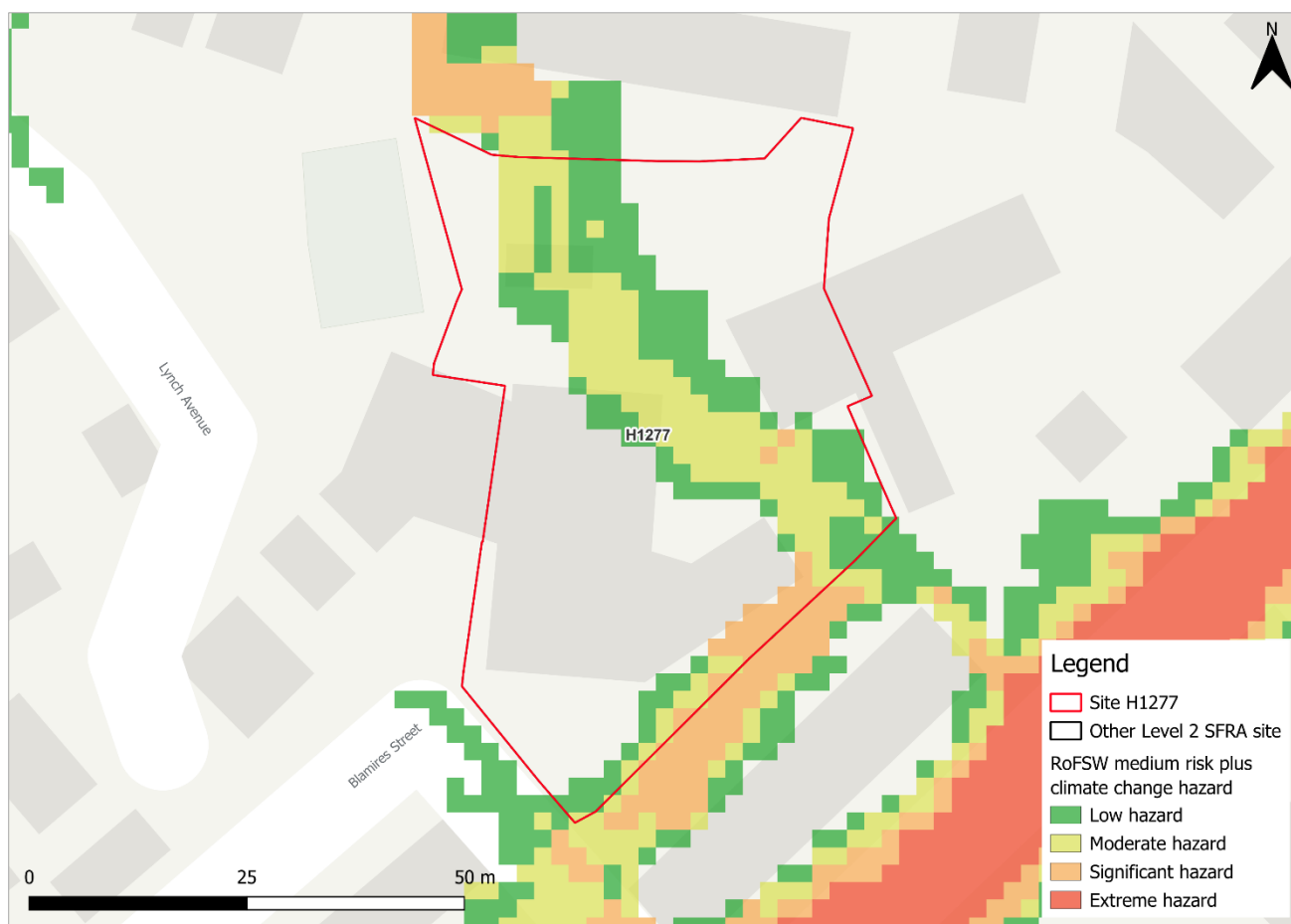


Figure 3-4: Medium risk event surface water flood hazards plus 45% climate change (based on Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- Current risk in the medium risk surface water event is confined to a shallow flow path through the centre of the site and along the south eastern boundary. Surface water risk is constrained by the existing development within the site. Any change in site layout where current buildings are to be demolished and changes to road layouts will require detailed surface water modelling.
- Any regrading of land must include like for like volumes to ensure risk is contained safely onsite for the lifetime of development. A full 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. If possible, the flow route through the centre of the site should be maintained or suitably mitigated onsite.
- The drainage strategy should consider the surrounding roads and access routes in terms of drainage capacities, network conditions and maintenance.
- 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.

- 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 Guide². Figure 4-1 shows the map covering this site and the surrounding areas and. Table 4-1 explains the risk classifications.

The entirety of the site is within an area where there is no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS.



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 Potential culvert

Historic land-use mapping held by the LLFA, indicates that there may be a watercourse culverted beneath the southern corner of the site. If a watercourse is present, there will be a residual risk of flooding to the site were there to be a culvert failure or blockage. A model for this watercourse is not available. Therefore, residual risk could not be modelled for this Level 2 SFRA.

5.2 Flood risk from canals

The site is not likely to be at risk from a canal breach.

5.3 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.

5.4 Flood risk from sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes overloaded, blocked or it cannot discharge due to a high water level in the receiving watercourse.

Yorkshire Water records indicate that there have been historical flood incidents in the area over the last two years. Developers should contact Yorkshire Water directly to check specific details at the FRA stage.

5.5 Observations, mitigation options and site suitability - residual risk

- There is no modelled residual risk to the site.
- Historic mapping indicates there may be a watercourse culverted beneath the site. If present, the culvert represents potential residual risk of flooding to the site through culvert failure or blockage. This may need to be further investigated and modelled at the FRA stage.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.

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 test³ 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.

6.2 Recommendations, FRA requirements, and further work

Based on the evidence presented in the Level 1 SFRA (2023) and this Level 2 SFRA:

- It should be possible to allocate this site given its location within Flood Zone 1. However, there is a distinct surface water flow path through the centre of the site. 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.
- Historic mapping indicates there may be a watercourse culverted beneath the site. If present, the culvert represents potential residual risk of flooding to the site through culvert failure or blockage. This may need to be further investigated and modelled at the FRA stage. Modelling should include for residual risk and options for culvert removal.
- No development should take place over the top of a culvert nor within 8m either side of the culverted section of watercourse.
- Assuming the culvert is located beneath the site, opportunities for opening up the culvert should be explored for inclusion in site design as a blue green corridor. This would remove any residual risk of flooding to the site as a result of culvert failure or blockage.
- Surface water should be retained onsite which may reduce units. This will require detailed surface water modelling based on layout plans and detailed design and full consultation with the LLFA on required runoff rates, likely to be brownfield or betterment. The use of infiltration SuDS should be investigated.
- Given the historic sewer flooding in the area, developers should contact Yorkshire Water directly to check specific details at the FRA stage.
- Any FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the CBMDC 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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