



**EVB03.5**

# **Bolton Level 2 Strategic Flood Risk Assessment Site Site Summaries 380-410**

**Site 380**

## **Final Report**

Prepared for  
Bolton Council

Date  
September 2026

## Document Status

|               |                                                              |
|---------------|--------------------------------------------------------------|
| Issue date    | 15 September 2026                                            |
| BIM reference | RLW-JBA-XX-XX-RP-EN-0022                                     |
| Revision      | P03                                                          |
| Prepared by   | Tim Lyndon-Belt<br>Analyst                                   |
| Reviewed by   | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Project Director  |

---

## Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

---

## Accessibility

JBA aims to align with [governmental guidelines on accessible documents](#) and [WCAG 2.2 AA](#) standards, so that most people can read this document without having to employ special adaptation measures. This document is also optimised for use with assistive technology, such as screen reading software.

# Contract

|                     |                                                                 |
|---------------------|-----------------------------------------------------------------|
| JBA Project Manager | Laura Thompson-Jones                                            |
| Address             | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code    | 2025s1871                                                       |

This report describes work commissioned by Bolton Council by an instruction dated 18 June 2026. The Client's representative for the contract was Sara Dilmamode of Bolton Council. Tim Lyndon-Belt of JBA Consulting carried out this work.

## Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Bolton Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Bolton Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

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

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 June 2026 and 15 September 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.

---

## Acknowledgements

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

---

## Copyright

© Jeremy Benn Associates Limited 2026

---

# Contents

|          |                                                                                                                   |           |
|----------|-------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Background</b>                                                                                                 | <b>1</b>  |
| 1.1      | Site 380                                                                                                          | 1         |
| <b>2</b> | <b>Flood risk from rivers</b>                                                                                     | <b>4</b>  |
| 2.1      | Existing risk                                                                                                     | 4         |
| 2.2      | Impacts from climate change                                                                                       | 5         |
| 2.3      | Historic flood incidents                                                                                          | 5         |
| 2.4      | Flood risk management                                                                                             | 5         |
| 2.5      | Emergency planning                                                                                                | 6         |
| 2.6      | Observations, mitigation options, site suitability, sequential approach to development management - fluvial       | 7         |
| <b>3</b> | <b>Flood risk from surface water</b>                                                                              | <b>8</b>  |
| 3.1      | Existing risk                                                                                                     | 8         |
| 3.2      | Impacts from climate change                                                                                       | 10        |
| 3.3      | Sewer flood risk                                                                                                  | 13        |
| 3.4      | Observations, mitigation options, site suitability, sequential approach to development management - surface water | 13        |
| <b>4</b> | <b>Groundwater, geology and SuDS suitability</b>                                                                  | <b>15</b> |
| <b>5</b> | <b>Residual risk</b>                                                                                              | <b>18</b> |
| 5.1      | Flood risk from reservoirs                                                                                        | 18        |
| <b>6</b> | <b>Overall site assessment</b>                                                                                    | <b>19</b> |
| 6.1      | Can part b) of the exception test be passed?                                                                      | 19        |
| 6.2      | Recommendations and site-specific FRA requirements                                                                | 19        |
| <b>7</b> | <b>Licencing</b>                                                                                                  | <b>20</b> |

## List of Figures

|                                                                                                                                                                                            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1-1: Existing site location boundary                                                                                                                                                | 2  |
| Figure 1-2: Topography                                                                                                                                                                     | 3  |
| Figure 2-1: Existing risk                                                                                                                                                                  | 4  |
| Figure 2-2: Natural Flood Management (NFM) potential mapping                                                                                                                               | 6  |
| Figure 2-3: Potential access and escape routes                                                                                                                                             | 7  |
| Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day                                                                                                    | 8  |
| Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event                                                                            | 9  |
| Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard                                                                 | 10 |
| Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)                                                                               | 11 |
| Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)                                                       | 12 |
| Figure 3-6: Low risk event surface water flood hazard <sup>1</sup> , as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map) | 13 |
| Figure 4-1: JBA 5m Groundwater Emergence Map                                                                                                                                               | 15 |
| Figure 4-2: BGS Geology - Bedrock and superficial deposits                                                                                                                                 | 17 |

## List of Tables

|                                                                                                                                                                        |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 2-1: Existing flood risk based on percentage area of site at risk                                                                                                | 4  |
| Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map | 8  |
| Table 3-2: Peak rainfall intensity allowances for the Irwell management catchment                                                                                      | 11 |
| Table 4-1: Groundwater Hazard Classification                                                                                                                           | 16 |

# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Local Plan Site 380. The content of this report assumes the reader has already consulted the 'Bolton Level 1 SFRA' (2026) and read the 'Bolton Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site 380

- Location: Anchor Lane
- Existing site use: Open greenspace, recreational space
- Existing site use vulnerability: Water compatible
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area (ha): 32.1 (the site boundary appears arbitrarily drawn, therefore area likely to be smaller)
- Watercourse: Ordinary watercourses (unmodelled)
- Environment Agency (EA) model: N/A
- Summary of requirements from Level 2 SFRA scoping stage:
  - Assessment of surface water flood extent, depths and hazards
  - Assessment of all other sources of flood risk
  - Assessment of flood risk management measures and natural flood management

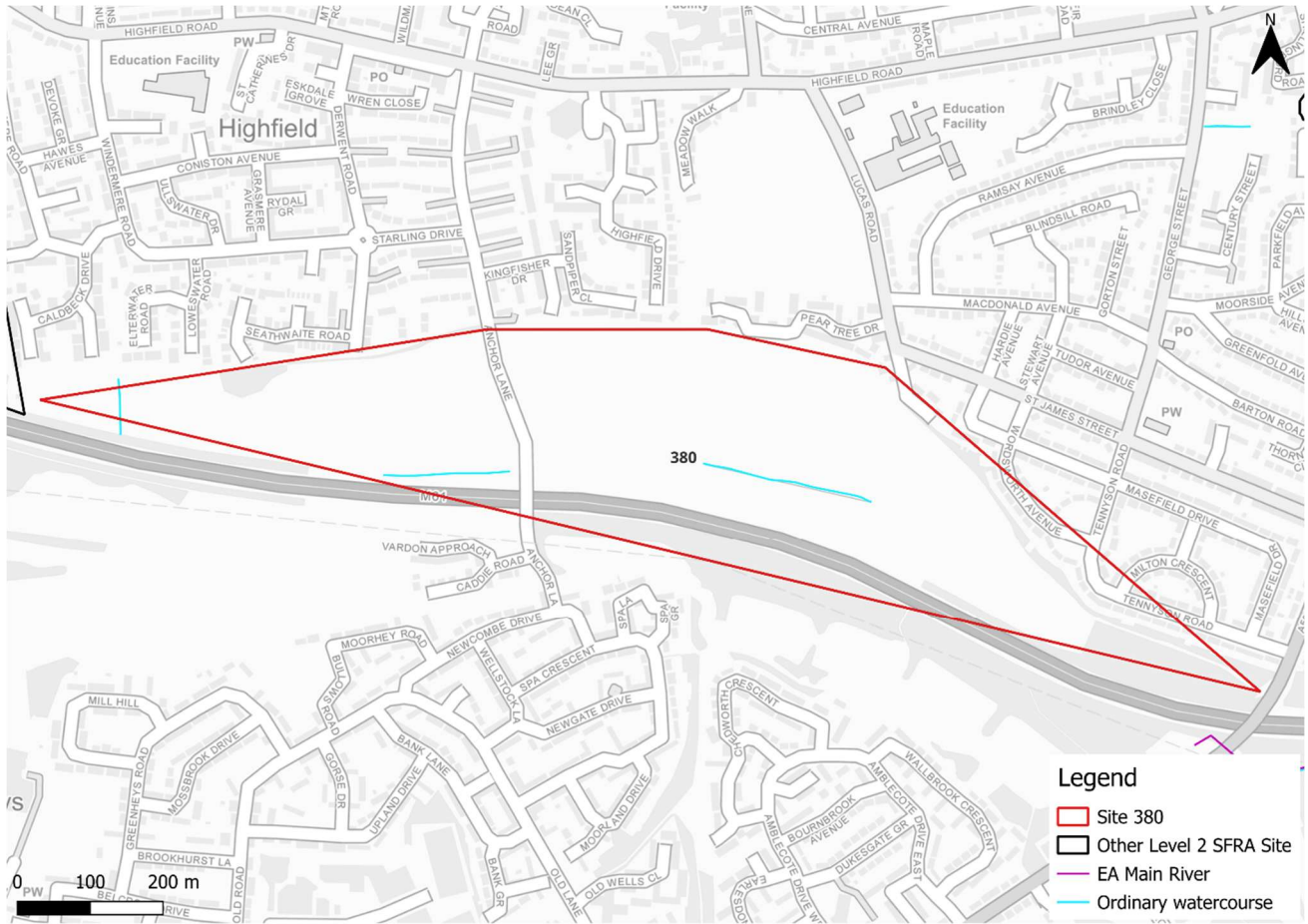


Figure 1-1: Existing site location boundary

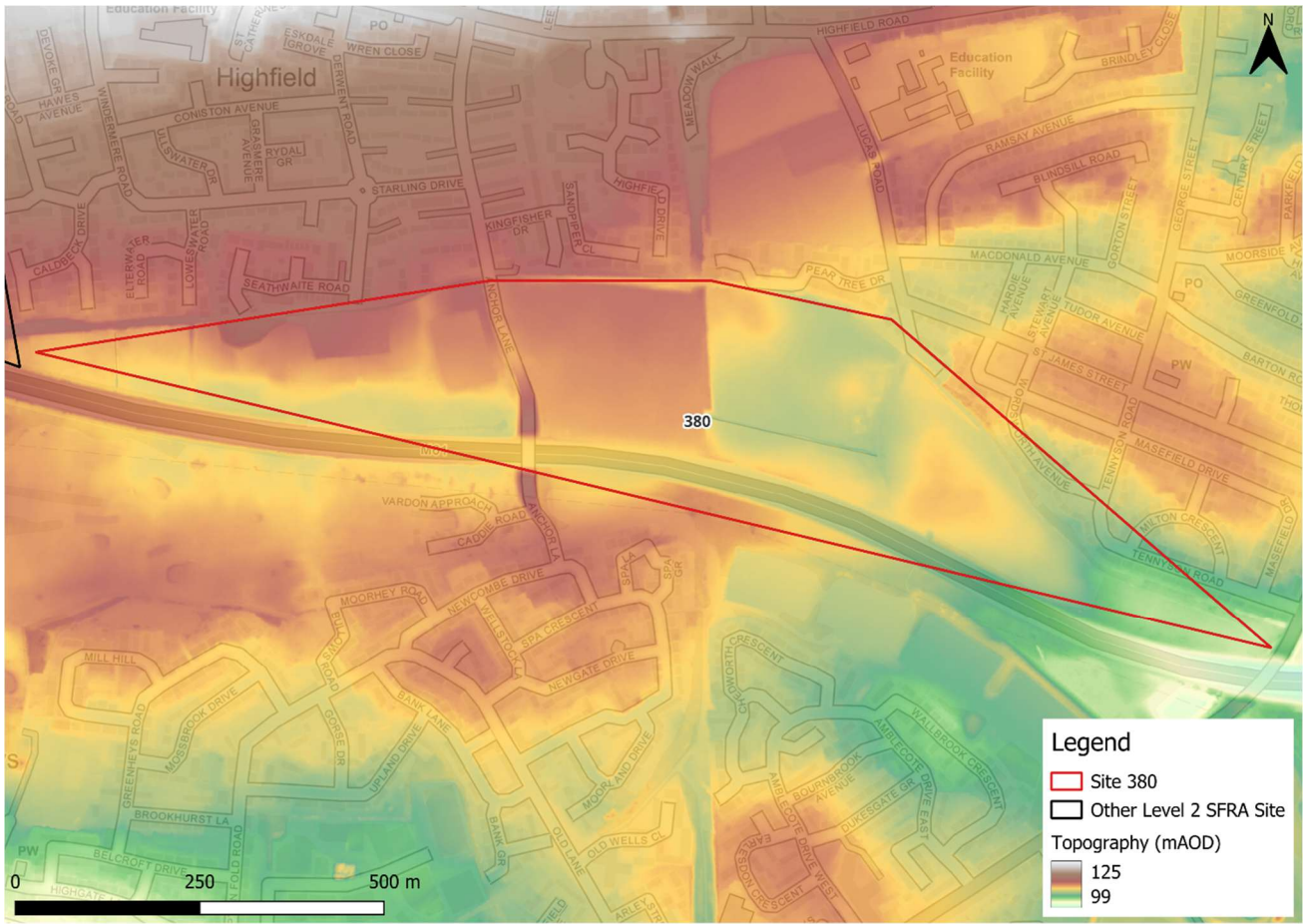


Figure 1-2: Topography

## 2 Flood risk from rivers

### 2.1 Existing risk

#### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (June 2026) and Flood Zone 3b (functional floodplain), as updated through the Bolton Level 1 SFRA, the percentage areas of each site within the flood zones 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 2.4).

The entire site is located within Flood Zone 1 and therefore at low risk of flooding from rivers. There are three ordinary watercourses onsite which are likely to be field drainage ditches.

Table 2-1: Existing 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                      |

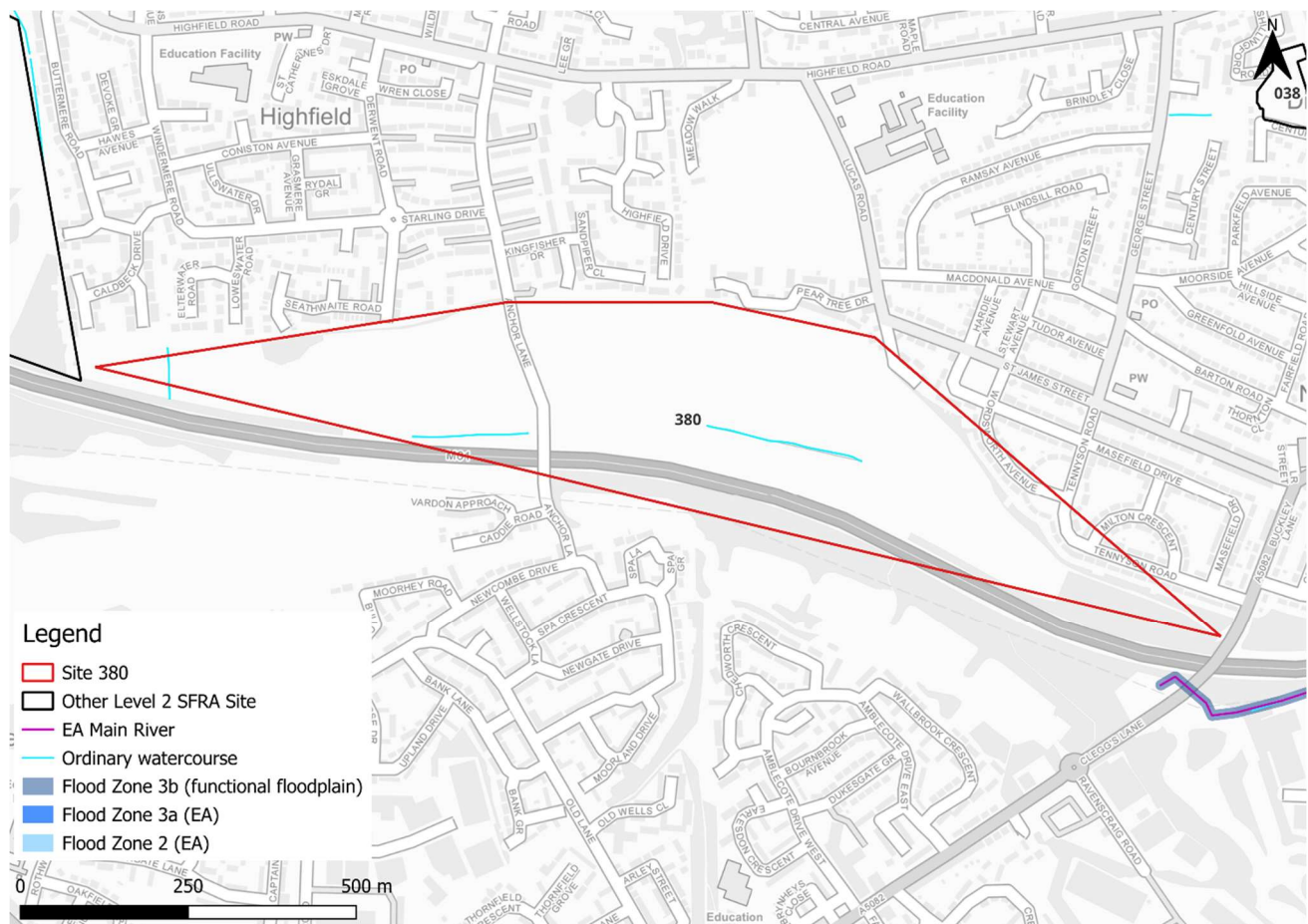


Figure 2-1: Existing risk

## **2.2 Impacts from climate change**

### **2.2.1 Flood Map for Planning - climate change**

The site is not likely to be at fluvial risk when considering climate change, based on the EA's Flood Map for Planning - Flood Zones plus Climate Change dataset.

### **2.3 Historic flood incidents**

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

The LLFA provided its historic floods register. There have been no recorded flooding incidents within the Farnworth South Ward within which the site is located.

## **2.4 Flood risk management**

### **2.4.1 Flood defences**

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

### **2.4.2 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 sites and surrounding areas. The entire site has wider catchment woodland potential with areas of riparian woodland potential in the centre and to the west of the site. These areas are shown on Figure 2-2. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

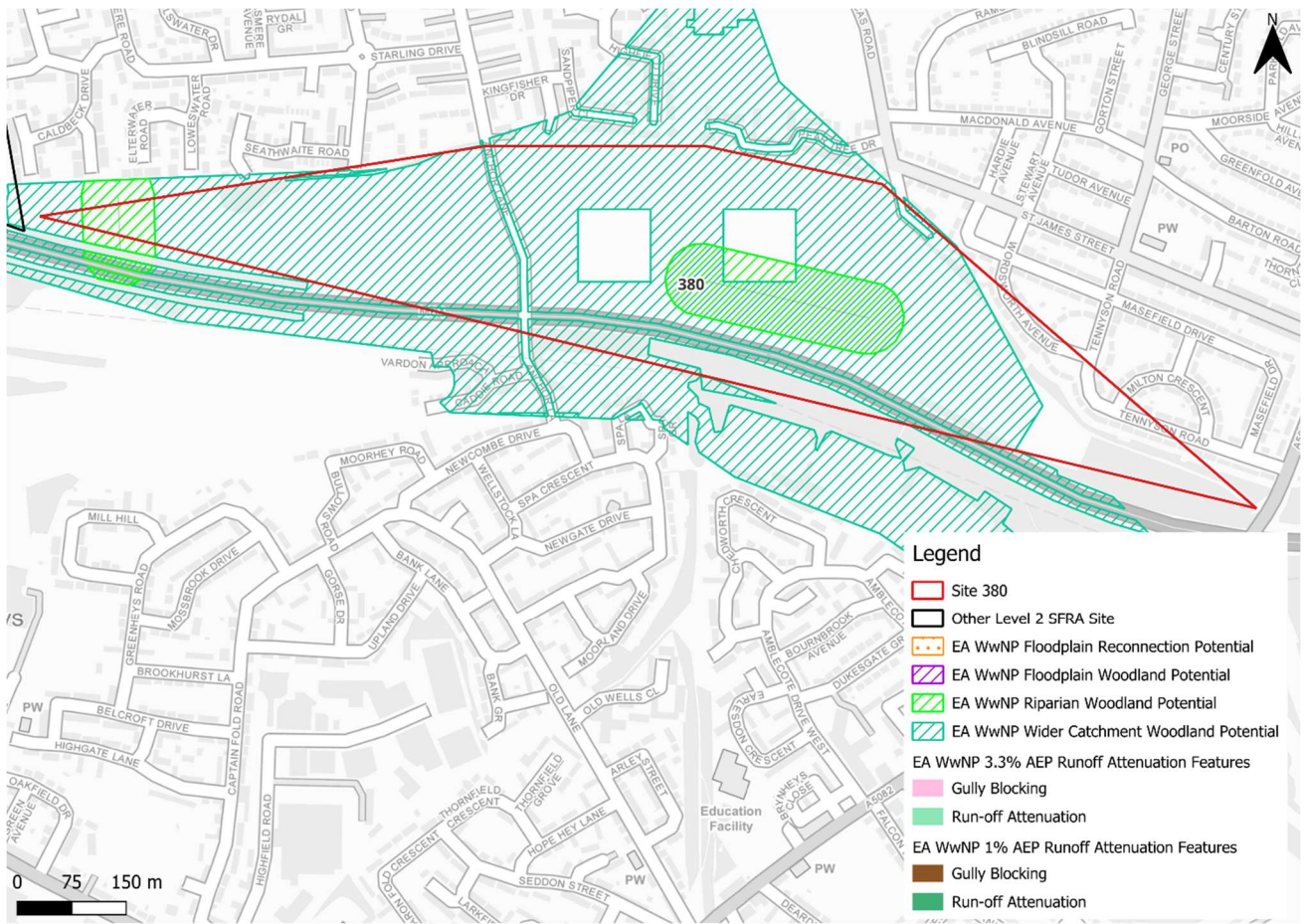


Figure 2-2: Natural Flood Management (NFM) potential mapping

## 2.5 Emergency planning

### 2.5.1 Flood warning

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 on fluvial flooding, safe access and escape routes are along Anchor Lane, running along the middle of the site, Wordsworth Avenue, and Tennyson Road (Figure 2-3).

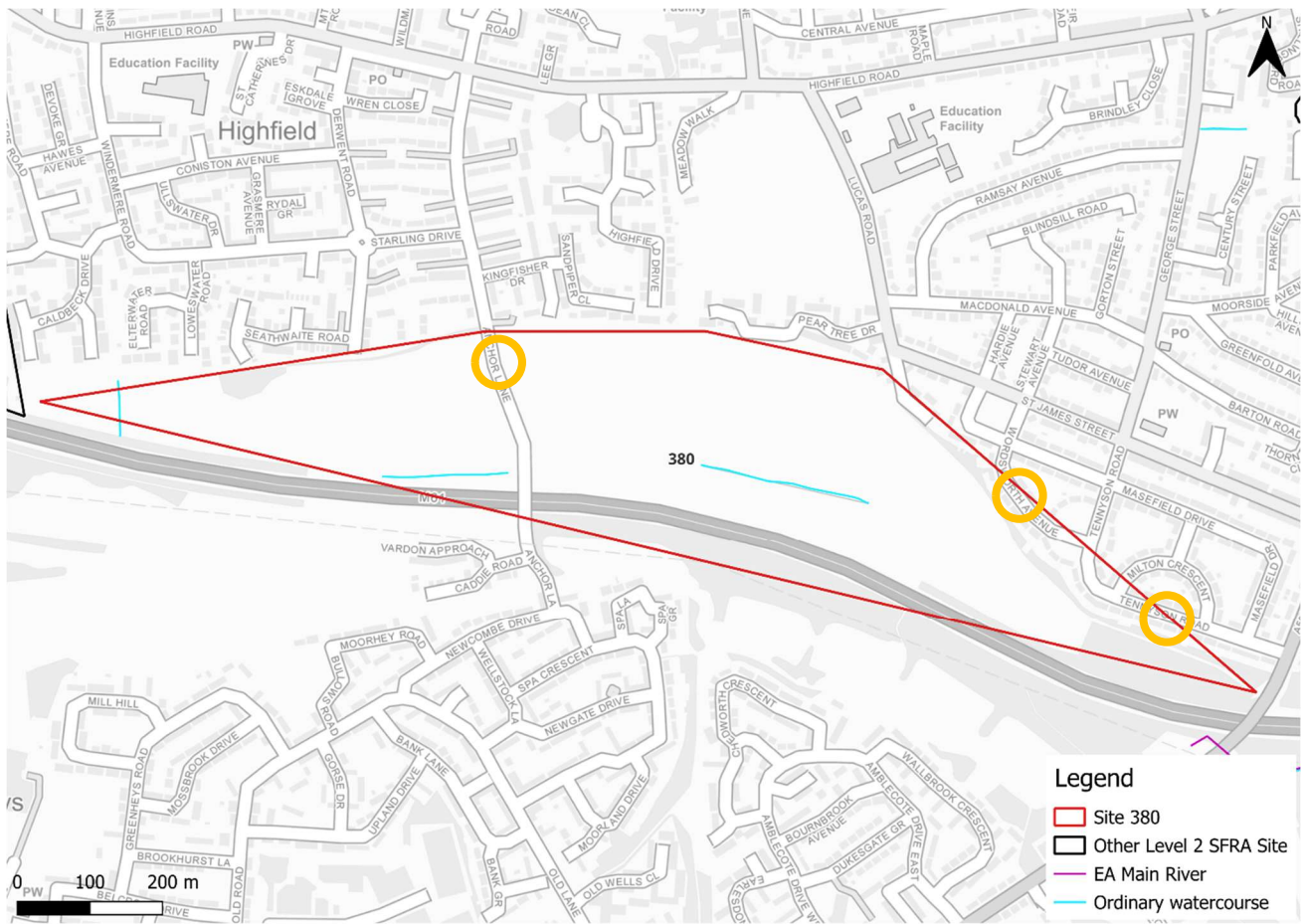


Figure 2-3: Potential access and escape routes

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

- Observations:
  - The site is wholly located within Flood Zone 1 and therefore at low risk from rivers.
  - The site is not shown to be at additional risk from climate change.
  - There are three ordinary watercourses onsite though they appear to be small drainage ditches.
- Access and escape:
  - Safe access and escape routes are along Anchor Lane, running along the middle of the site, Wordsworth Avenue, and Tennyson Road.

## 3 Flood risk from surface water

### 3.1 Existing risk

#### 3.1.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Present Day

Based on the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Extents Present Day map (June 2026), the majority of the site is outside of the 0.1% AEP surface water flood extent (Table 3-1). Based on the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Depths Present Day map, flood depths are mainly lower than 0.9m (Figure 3-2). These depths are at isolated locations and most of the site is not impacted. Safe access and escape routes would likely be achievable via Tennyson Road in all events.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map

| Less than 0.1% AEP event (% area) | 0.1% AEP event (% area) | 1% AEP event (% area) | 3.3% AEP event (% area) |
|-----------------------------------|-------------------------|-----------------------|-------------------------|
| 78                                | 9                       | 4                     | 9                       |

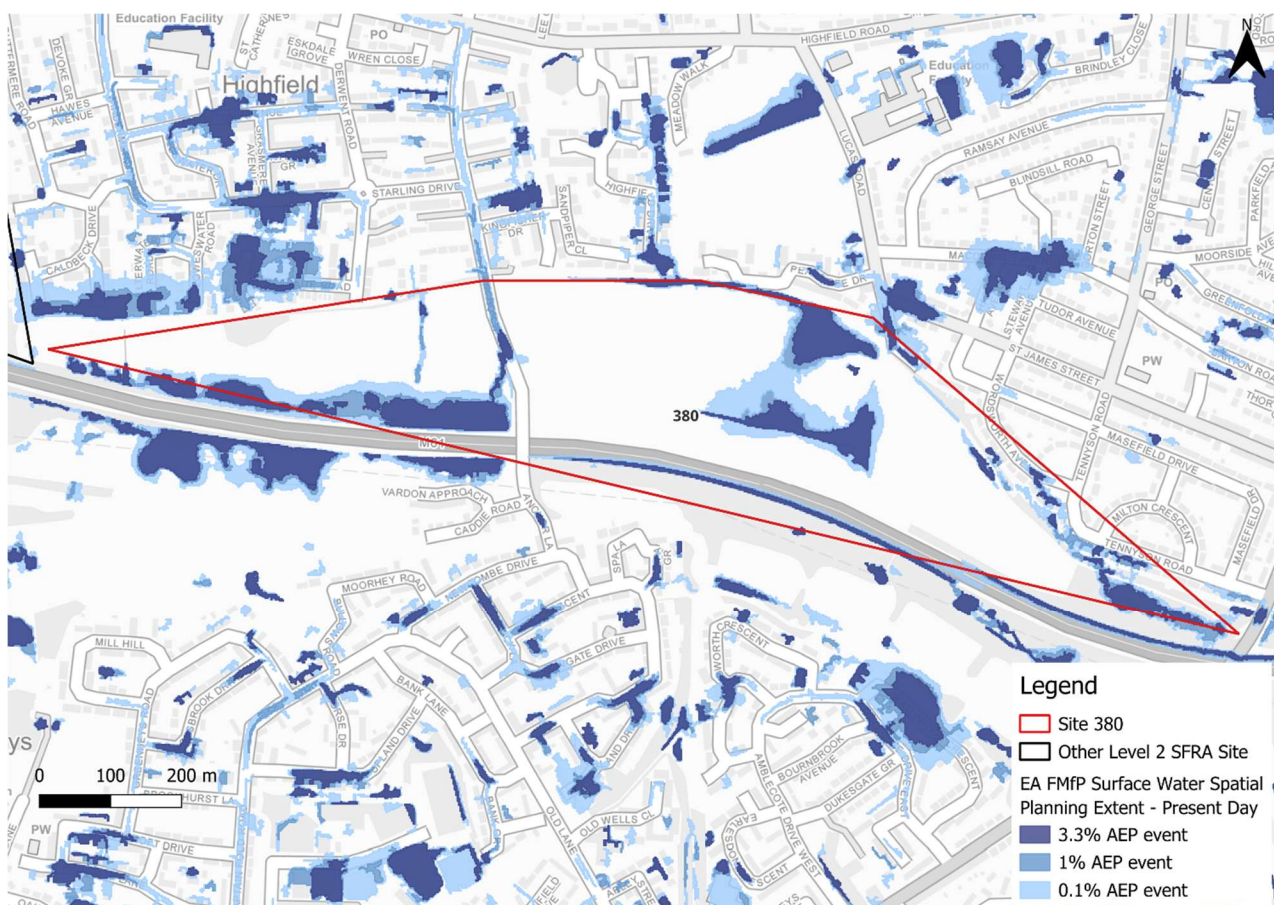


Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day

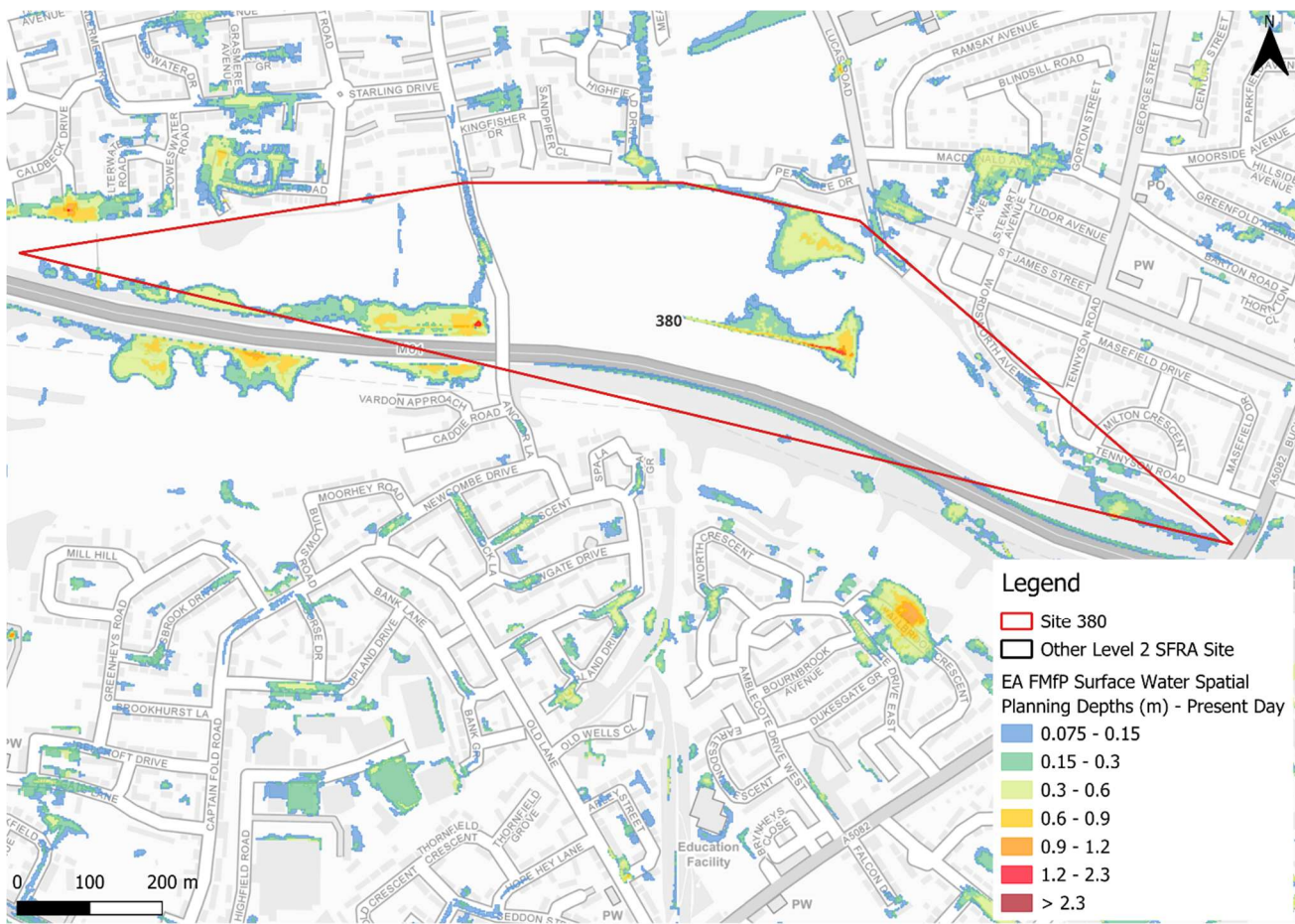


Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event

### 3.1.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning data does not include hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation Risk of Flooding from Surface Water (RoFSW) hazard mapping in addition to the Flood Map for Planning - Surface Water Spatial Planning extents and depths, as the best available information. Updated surface water hazard information would need to be confirmed at the site-specific FRA stage.

Based on the EA's national scale third generation RoFSW map, the greatest flood hazard within the site in the 1% AEP surface water event is categorised as 'significant' in some isolated areas (Figure 3-3). There are some differences between the Flood Map for Planning - Surface Water Spatial Planning Depths Present Day map and the third generation RoFSW hazard mapping. The Flood Map for Planning - Surface Water Spatial Planning Depths Present Day data 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 Flood Map for Planning and third generation RoFSW maps.

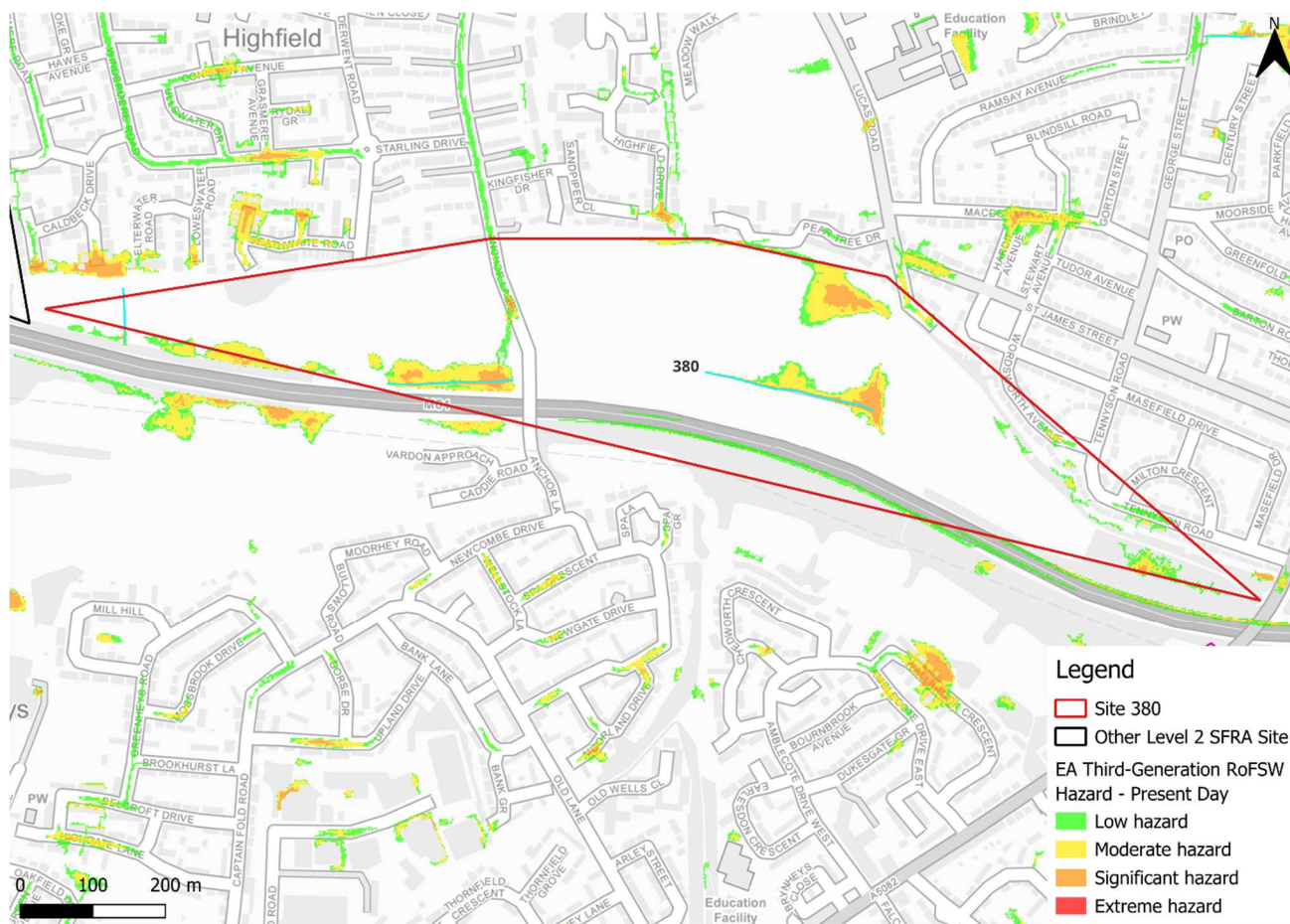


Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard<sup>1</sup>

## 3.2 Impacts from climate change

### 3.2.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths

The EA's [climate change allowance guidance](#) states that SFRA's should assess the upper end peak rainfall allowance for the 2070s epoch. This dataset is now included in the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Climate Change dataset (May 2026). The peak rainfall intensity allowances for the Irwell management catchment are shown in Table 3-2. The allowance for the 0.1% AEP event is not stated in the EA guidance.

<sup>1</sup> 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

Table 3-2: Peak rainfall intensity allowances for the Irwell management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---------------|--------------------------------------|----------------------------------------|
| 3.3% AEP      | 30                                   | 40                                     |
| 1% AEP        | 30                                   | 45                                     |

Figure 3-4 shows the surface water flood extents for the 2070s upper end climate change scenario. The greatest flood depths onsite in the 1% AEP event are shown to increase to between 1.2 and 2.3 m (Figure 3-5), into the large ponded area in the west of the site, along the M64. Safe access and escape routes would likely be achievable via Tennyson Road.

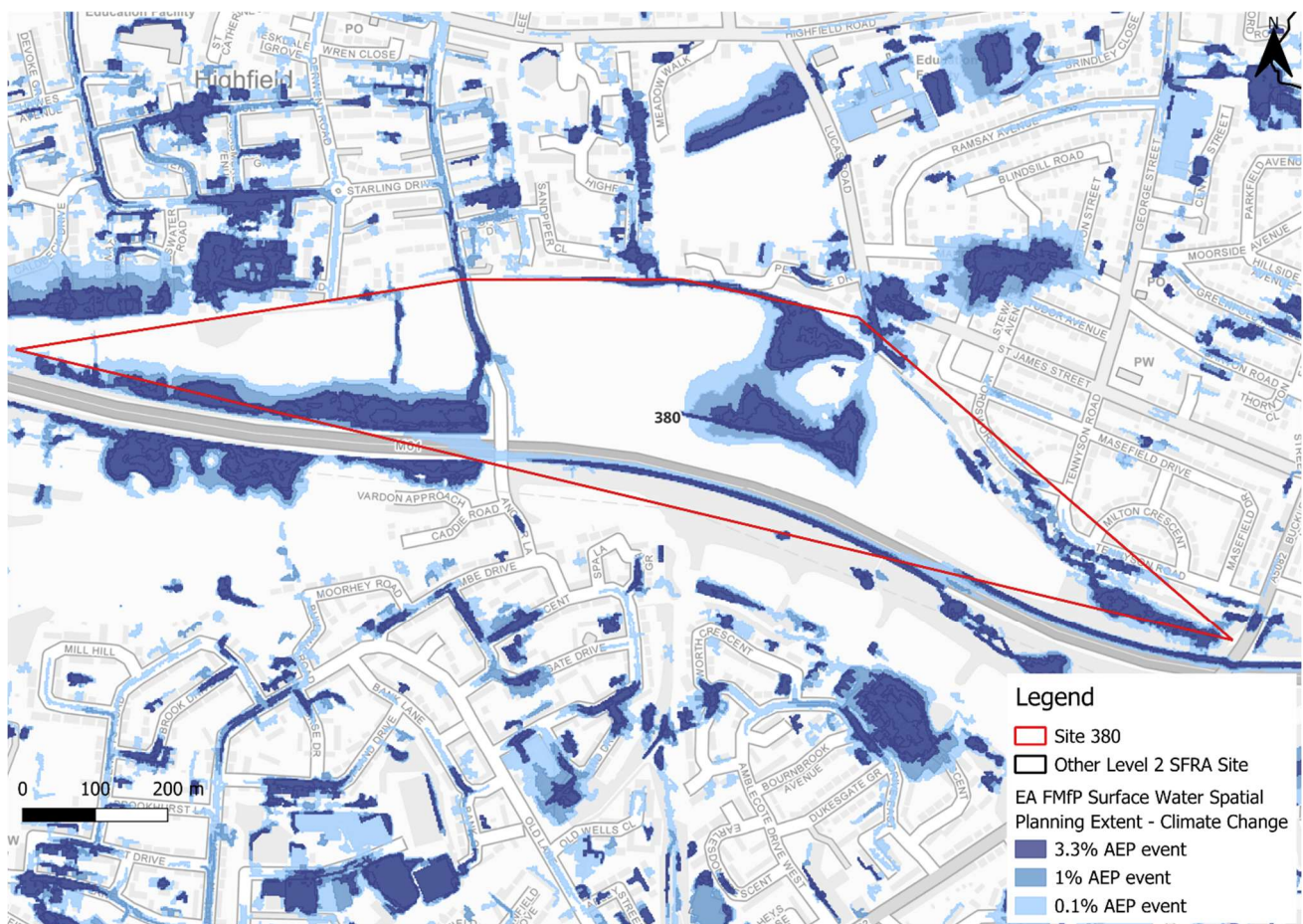


Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)

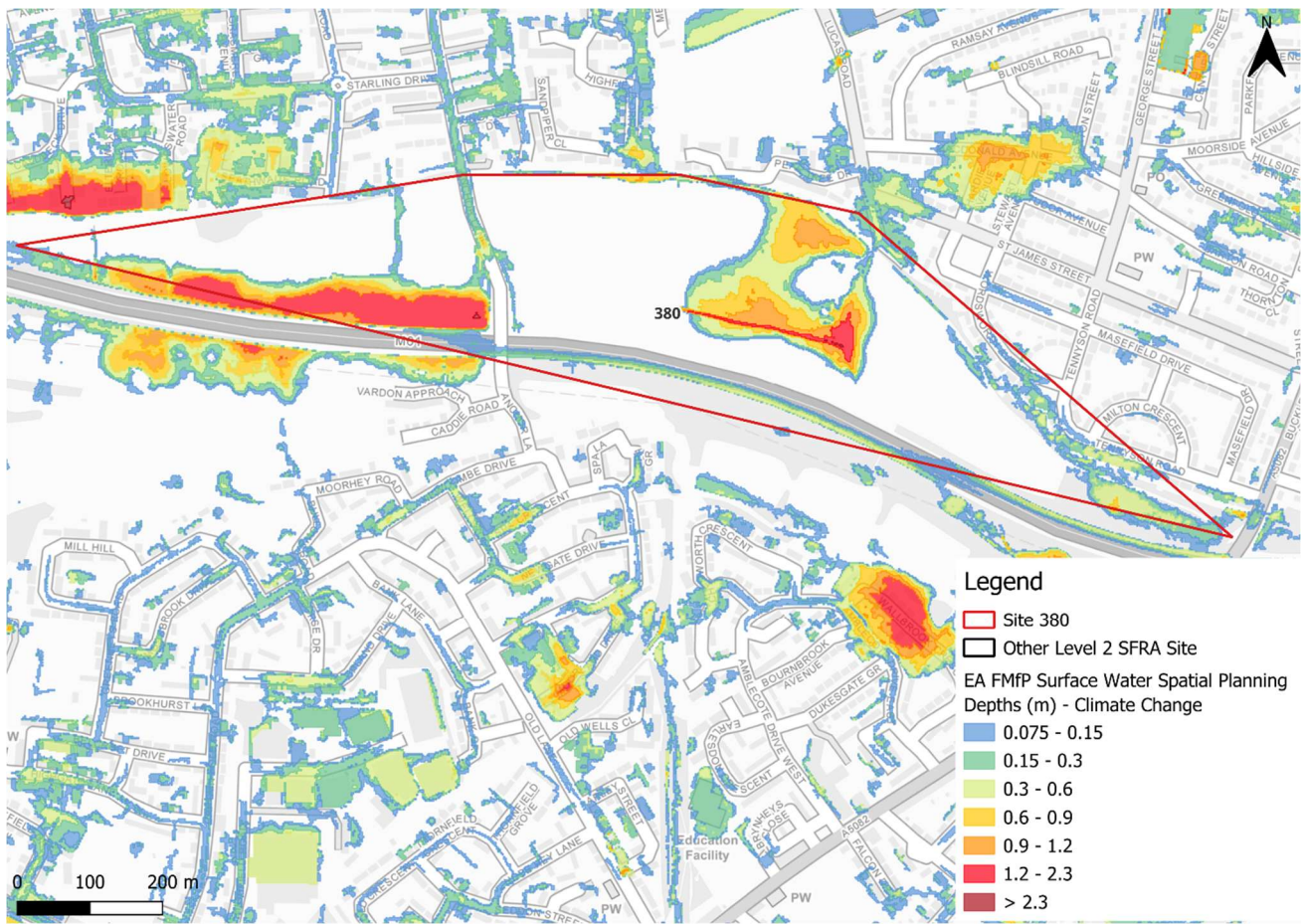


Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)

### 3.2.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning Climate Change data does not include hazard information suitable for planning purposes. This Level 2 SFRA therefore considers the RoFSW low risk surface water event as a conservative proxy for the RoFSW medium risk event plus climate change, as the best available information to assess surface water flood hazards. The impact of climate change on surface water flood hazards should be considered at the site-specific FRA stage.

Using the RoFSW low risk event as a proxy, future surface water flood hazard in the RoFSW medium risk event is categorised as significant. Large areas of the site in the West and centre are rated as significant.

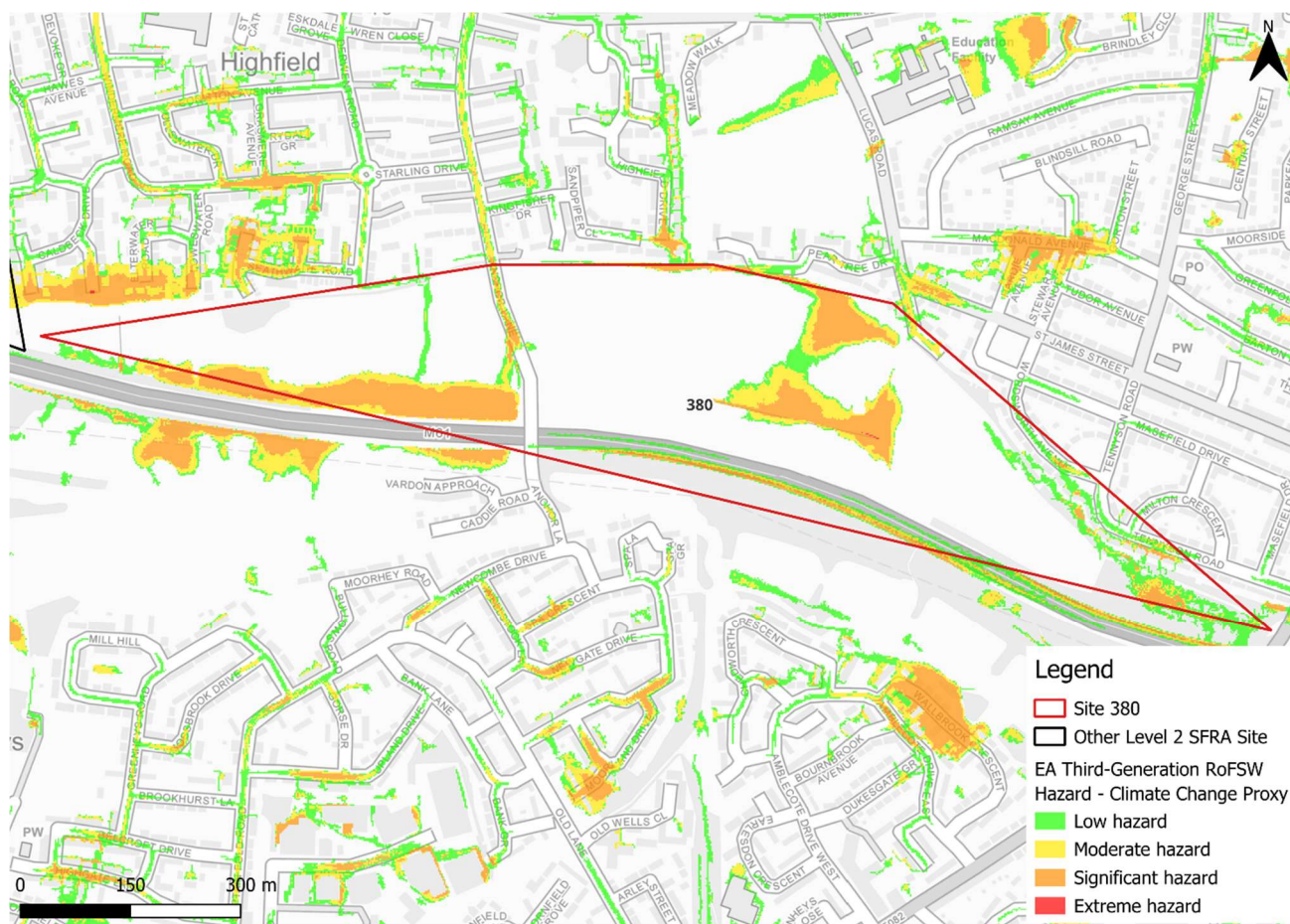


Figure 3-6: Low risk event surface water flood hazard<sup>1</sup>, as a proxy for the medium risk event plus climate change (Third generation - Risk of Flooding from Surface Water map)

### 3.3 Sewer flood risk

United Utilities provided their historic risk registers which were aggregated by ward. There are no recorded sewer flooding incidents within the immediate vicinity of the site. There have been no recorded flooding incidents within the Farnworth South Ward within which the site is located.

### 3.4 Observations, mitigation options, site suitability, sequential approach to development management - surface water

- Current risk to the site is predominantly very low, with 78% of the site being outside of the 0.1% AEP surface water flood extent. Present day surface water risk in all events is largely confined to two significant areas of ponding within the site. It is recommended that these areas are included within site design.
- Risk to the site is shown to increase in extent across the site when considering the impact of climate change.
- A drainage strategy will be required to ensure there is no increase in surface water flood risk elsewhere as a result of new development. Greenfield runoff rates should apply. The developer should consult the LLFA and follow local and

National SuDS guidance. All topographic low spots and surface water flow paths through the site should be considered within site design, left free of development and allowed to flood naturally when required.

- Safe access and escape routes would likely be achievable via Tennyson Road.

## 4 Groundwater, geology and SuDS suitability

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. Figure 4-1 shows the map covering the sites and the surrounding areas. Table 4-1 explains the risk classifications.

The entire site is within an area where there is no risk of groundwater emergence. Infiltration SuDS may therefore be suitable within these areas.

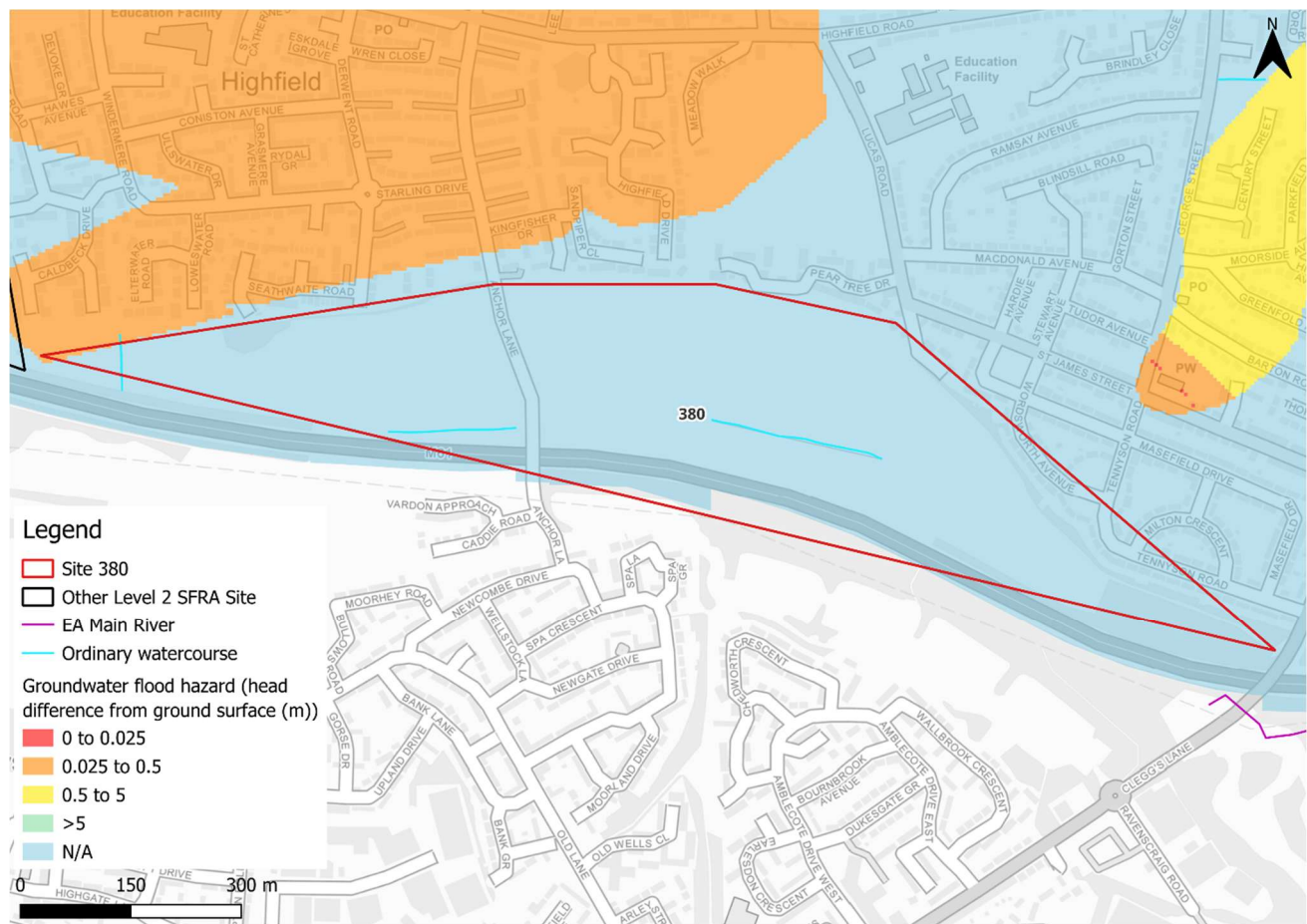


Figure 4-1: JBA 5m Groundwater Emergence Map

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.<br>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. |                                                                                                                                                                                                                                                                                                                                                             |

The underlying bedrock within the site is a combination of mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 4-2). Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, whereas sandstone has a higher permeability. Therefore, it is likely that the bedrock beneath the site will contribute to lower levels of infiltration and lower water tables. This is partially reflected in the groundwater emergence mapping showing no risk of groundwater emergence within the north of the site (Figure 4-1).

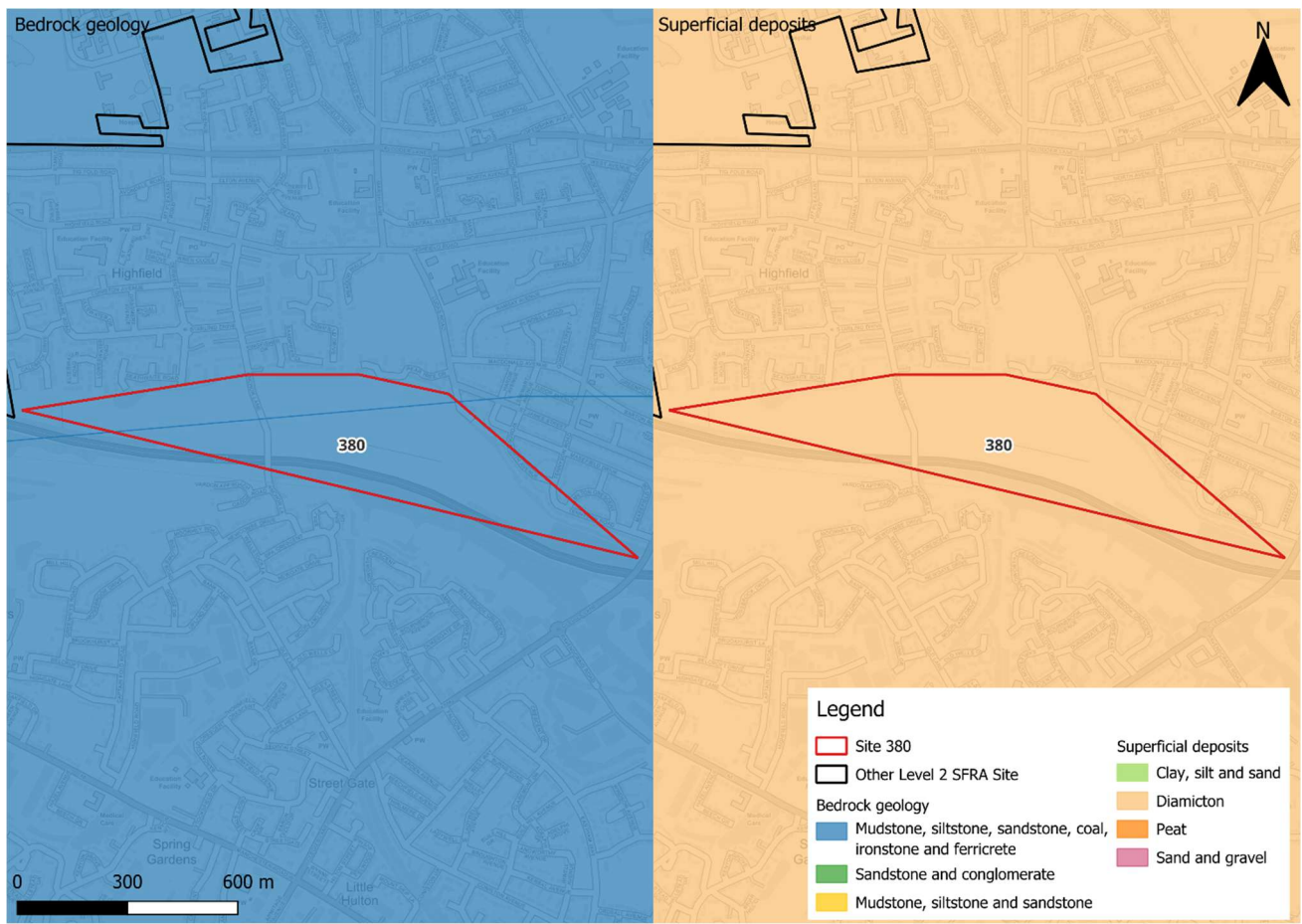


Figure 4-2: BGS Geology - Bedrock and superficial deposits

## 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.

There does not appear to be any residual risk to the site from asset blockage or defence breach.

### 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. The RFM shows that there is no modelled risk to the site as a result of a reservoir breach.

## 6 Overall site assessment

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

The site is not required to pass part b) of the exception test, as it is not located within Flood Zone 3a. However, it must be proven that the development can be safe for their lifetime, which is generally considered to be 100 years for residential development.

### 6.2 Recommendations and site-specific FRA requirements

Based on the evidence presented in the Level 1 SFRA (2026) and this Level 2 SFRA:

- The proposed development of the sites would see a change in the risk classification from water compatible open greenspace to more vulnerable residential development, according to the NPPF.
- It should be appropriate to develop this site for more vulnerable purposes given its location largely within Flood Zone 1.
- A detailed drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Topographic flow paths and areas of ponding should be included in site layout and design.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the Bolton Local Plan, and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; United Utilities; the highways authorities; and the emergency services.

## 7 Licencing

To cover all figures within this report:

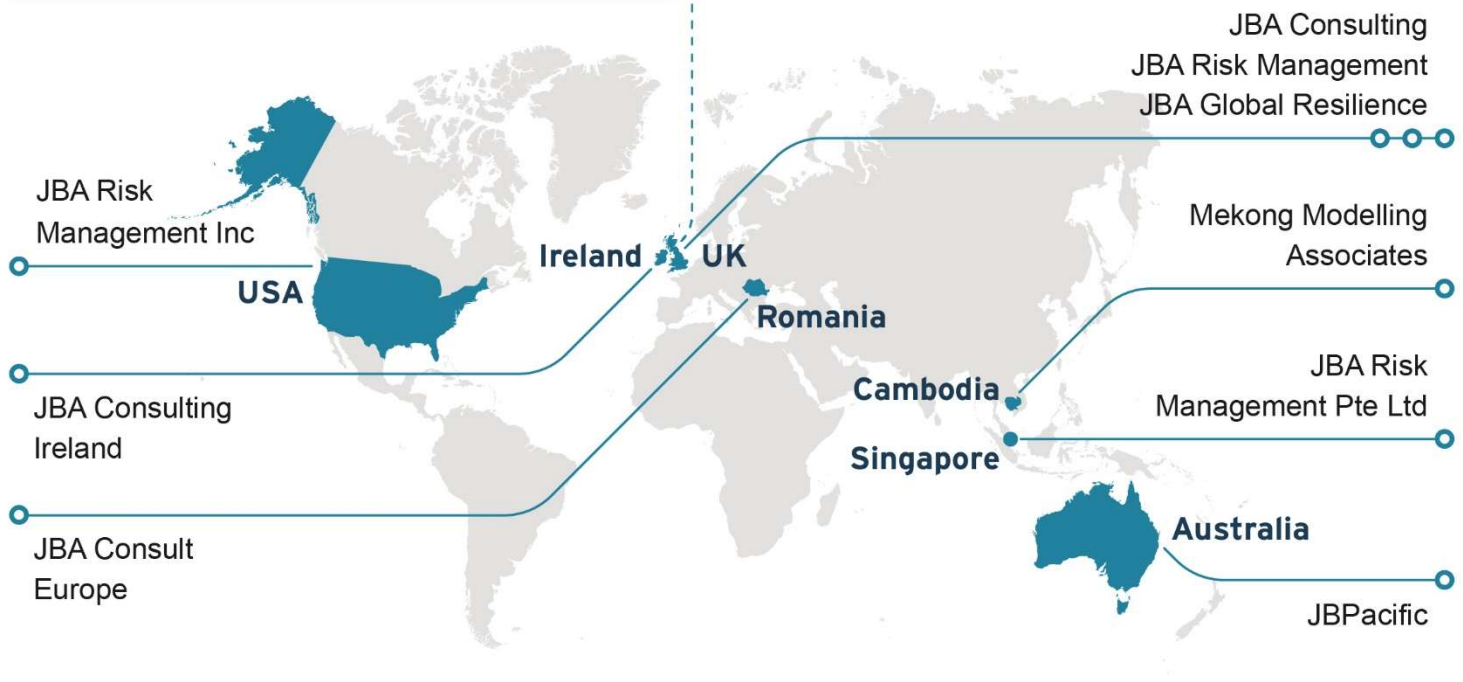
- Contains Environment Agency information © Environment Agency and/or database right [2026]
- Contains public sector information licensed under the Open Government Licence v3.0. © Crown copyright and database rights [2026]
- Bolton Council Ordnance Survey licence number: AC 0000850551 [2026]



### Our Offices

Bristol  
Coleshill  
Cork  
Doncaster  
Dublin  
Edinburgh  
Exeter  
Glasgow  
Haywards Heath  
Leeds  
Limerick

Newcastle  
Newport  
Peterborough  
Portsmouth  
Saltaire  
Skipton  
Tadcaster  
Thirsk  
Wallingford  
Warrington



### Registered Office

1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0) 1756 799919  
info@jbaconsulting.com  
www.jbaconsulting.com

Follow us on  

Jeremy Benn  
Associates Limited  
Registered in  
England  
3246693

JBA Group Ltd is  
certified to  
ISO 9001:2015  
ISO 14001:2015  
ISO 27001:2022  
ISO 45001:2018





# **Bolton Level 2 Strategic Flood Risk Assessment Site Summaries 380-410**

**Site 401**

## **Final Report**

Prepared for  
Bolton Council

Date  
September 2026

## Document Status

|               |                                                              |
|---------------|--------------------------------------------------------------|
| Issue date    | 15 September 2026                                            |
| BIM reference | RLW-JBA-XX-XX-RP-EN-0023                                     |
| Revision      | P03                                                          |
| Prepared by   | Freya Nation BSc (Hons)<br>Analyst                           |
| Reviewed by   | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Project Director  |

---

## Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

---

## Accessibility

JBA aims to align with [governmental guidelines on accessible documents](#) and [WCAG 2.2 AA](#) standards, so that most people can read this document without having to employ special adaptation measures. This document is also optimised for use with assistive technology, such as screen reading software.

# Contract

|                     |                                                                 |
|---------------------|-----------------------------------------------------------------|
| JBA Project Manager | Laura Thompson-Jones                                            |
| Address             | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code    | 2025s1871                                                       |

This report describes work commissioned by Bolton Council by an instruction dated 18 June 2026. The Client's representative for the contract was Sara Dilmamode of Bolton Council. Freya Nation of JBA Consulting carried out this work.

## Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Bolton Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Bolton Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

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

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 June 2026 and 15 September 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.

---

## Acknowledgements

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

---

## Copyright

© Jeremy Benn Associates Limited 2026

---

# Contents

|          |                                                                                                                   |           |
|----------|-------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Background</b>                                                                                                 | <b>1</b>  |
| 1.1      | Site 401                                                                                                          | 1         |
| <b>2</b> | <b>Flood risk from rivers</b>                                                                                     | <b>4</b>  |
| 2.1      | Existing risk                                                                                                     | 4         |
| 2.2      | Impacts from climate change                                                                                       | 5         |
| 2.3      | Historic flood incidents                                                                                          | 5         |
| 2.4      | Flood risk management                                                                                             | 5         |
| 2.5      | Emergency planning                                                                                                | 6         |
| 2.6      | Observations, mitigation options, site suitability, sequential approach to development management - fluvial       | 7         |
| <b>3</b> | <b>Flood risk from surface water</b>                                                                              | <b>9</b>  |
| 3.1      | Existing risk                                                                                                     | 9         |
| 3.2      | Impacts from climate change                                                                                       | 12        |
| 3.3      | Sewer flood risk                                                                                                  | 15        |
| 3.4      | Observations, mitigation options, site suitability, sequential approach to development management - surface water | 15        |
| <b>4</b> | <b>Groundwater, geology and SuDS suitability</b>                                                                  | <b>17</b> |
| <b>5</b> | <b>Residual risk</b>                                                                                              | <b>20</b> |
| 5.1      | Potential blockage                                                                                                | 20        |
| 5.2      | Flood risk from reservoirs                                                                                        | 21        |
| 5.3      | Observations, mitigation options and site suitability - residual risk                                             | 21        |
| <b>6</b> | <b>Overall site assessment</b>                                                                                    | <b>22</b> |
| 6.1      | Can part b) of the exception test be passed?                                                                      | 22        |
| 6.2      | Recommendations and site-specific FRA requirements                                                                | 22        |
| <b>7</b> | <b>Licencing</b>                                                                                                  | <b>23</b> |

## List of Figures

|                                                                                                                                                                                       |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1-1: Existing site location boundary                                                                                                                                           | 2  |
| Figure 1-2: Topography                                                                                                                                                                | 3  |
| Figure 2-1: Existing risk                                                                                                                                                             | 5  |
| Figure 2-2: Natural Flood Management (NFM) potential mapping                                                                                                                          | 6  |
| Figure 2-3: Potential access and escape routes                                                                                                                                        | 7  |
| Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day                                                                                               | 10 |
| Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event                                                                       | 11 |
| Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard                                                            | 12 |
| Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)                                                                          | 13 |
| Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)                                                  | 14 |
| Figure 3-6: 0.1% AEP event surface water flood hazard <sup>1</sup> , as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map) | 15 |
| Figure 4-1: JBA 5m Groundwater Emergence Map                                                                                                                                          | 17 |
| Figure 4-2: BGS Geology - Bedrock and superficial deposits                                                                                                                            | 19 |
| Figure 5-1: Potential blockage location                                                                                                                                               | 20 |

## List of Tables

|                                                                                                                                                                        |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 2-1: Existing flood risk based on percentage area of site at risk                                                                                                | 4  |
| Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map | 9  |
| Table 3-2: Peak rainfall intensity allowances for the Lower Mersey management catchment                                                                                | 13 |
| Table 4-1: Groundwater Hazard Classification                                                                                                                           | 18 |

# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Local Plan Site 401. The content of this report assumes the reader has already consulted the 'Bolton Level 1 SFRA' (2026) and read the 'Bolton Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site 401

- Location: North of Salford Road
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mixed use
- Proposed site use vulnerability: More vulnerable
- Site area (ha): 21.7
- Watercourse: N/A
- Environment Agency (EA) model: N/A
- Summary of requirements from Level 2 SFRA scoping stage:
  - Assessment of surface water flood extent, depths and hazards
  - Assessment of all other sources of flood risk
  - Assessment of flood risk management measures and natural flood management

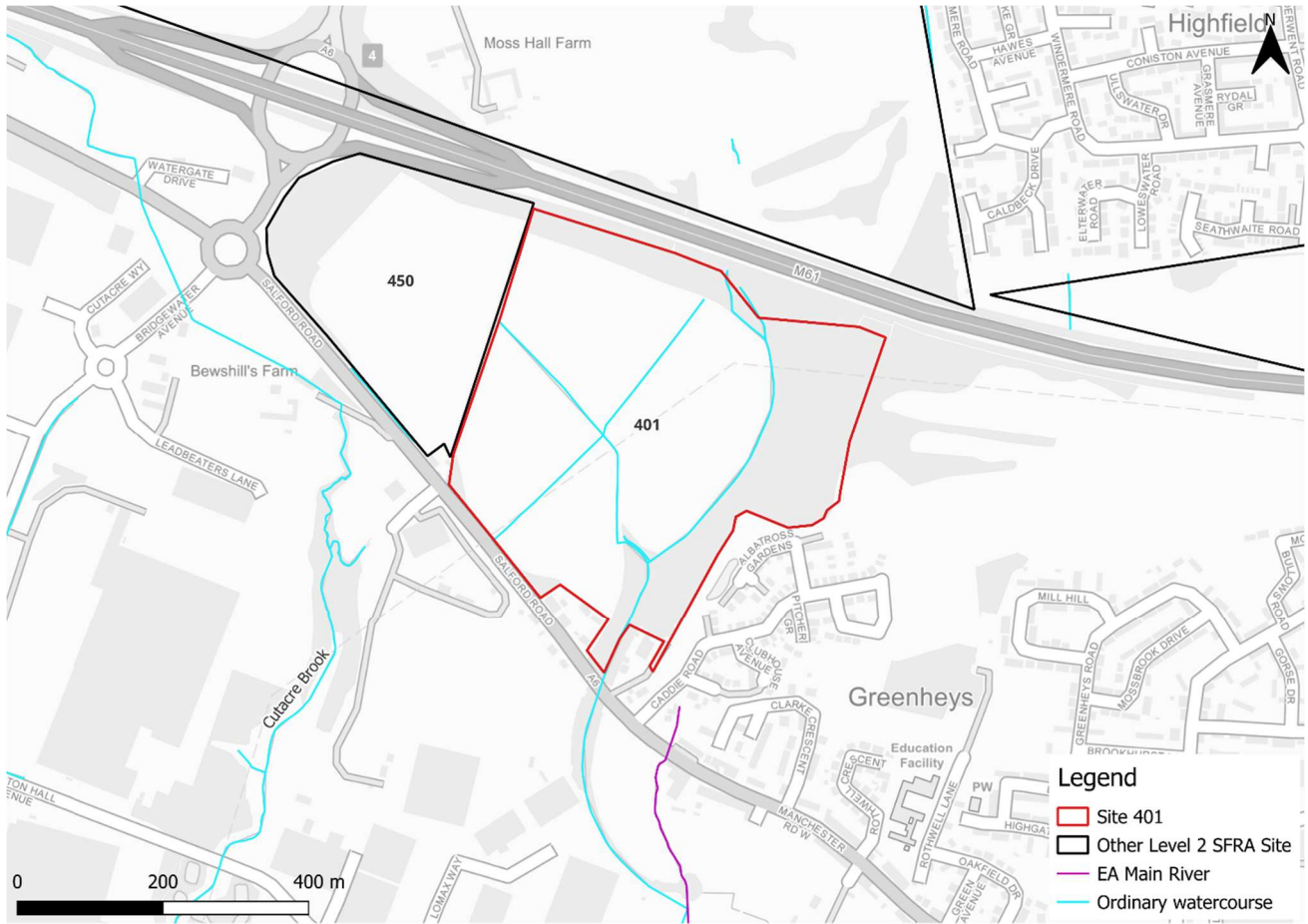


Figure 1-1: Existing site location boundary

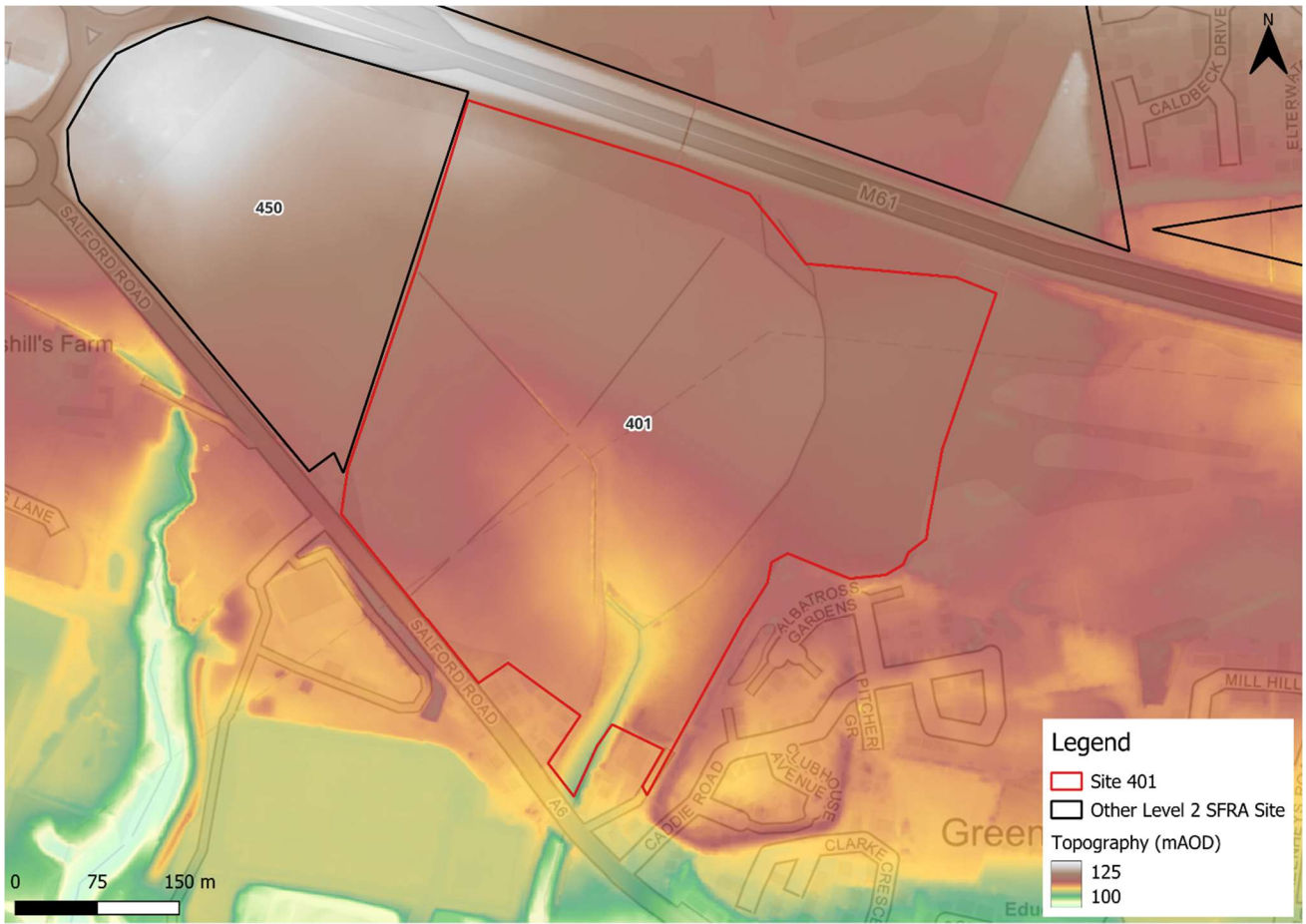


Figure 1-2: Topography

## 2 Flood risk from rivers

### 2.1 Existing risk

#### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (June 2026) and Flood Zone 3b (functional floodplain), as updated through the Bolton Level 1 SFRA, the percentage areas of the site within the flood zones 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.

The entire site is located within Flood Zone 1 and therefore at low risk of flooding from rivers.

There is no detailed model covering the unnamed ordinary watercourses the site. The watercourses are likely to be field drainage ditches. Any site-specific FRA must assess potential fluvial flood risk from these watercourses.

Table 2-1: Existing 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                      |

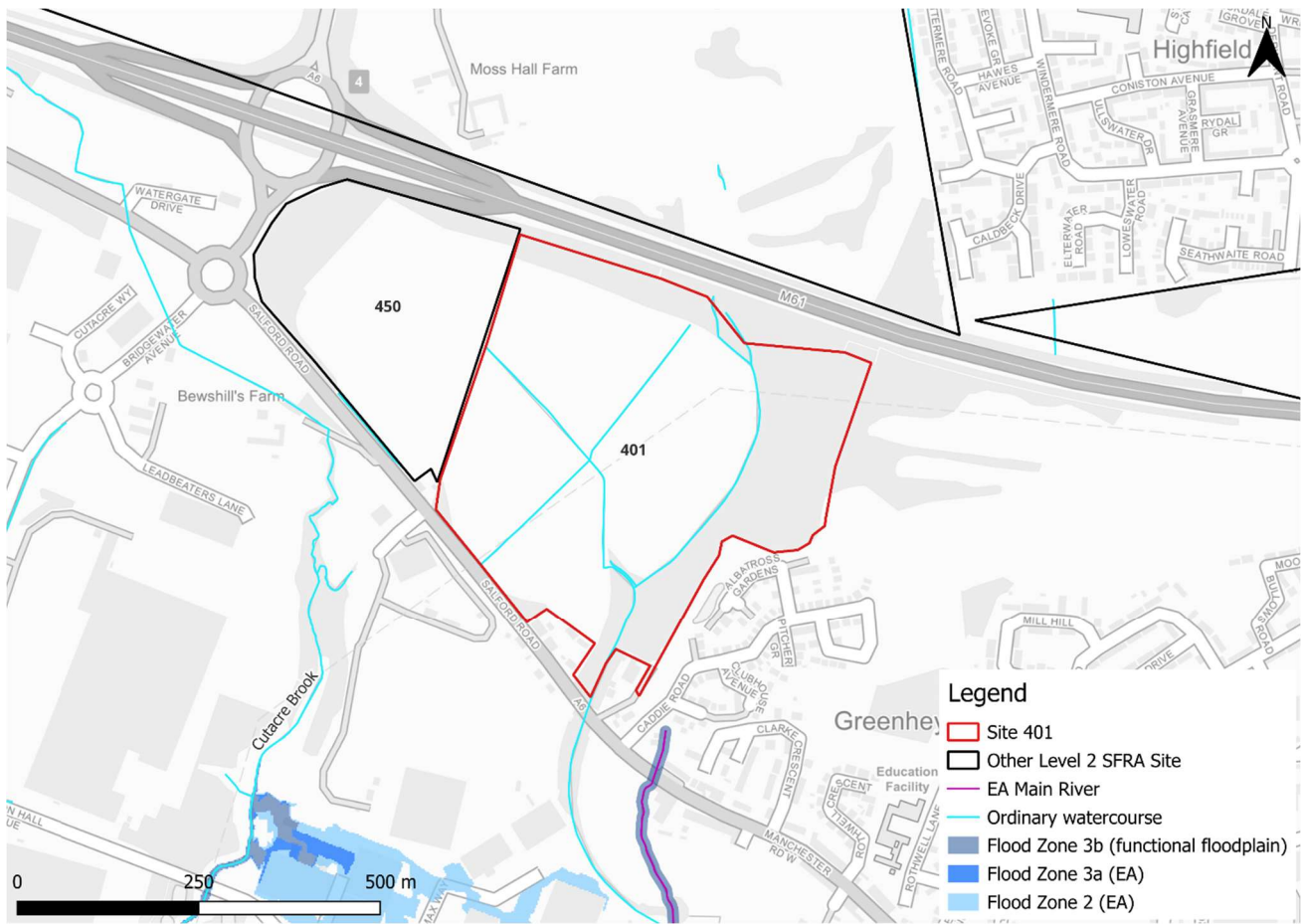


Figure 2-1: Existing risk

## 2.2 Impacts from climate change

### 2.2.1 Flood Map for Planning - climate change

The site is not likely to be at fluvial risk when considering climate change, based on the EA's Flood Map for Planning - Flood Zones plus Climate Change dataset.

## 2.3 Historic flood incidents

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

The LLFA provided its historic floods register. There have been no recorded flooding incidents within the Hulton Ward within which the site is located.

## 2.4 Flood risk management

### 2.4.1 Flood defences

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

## 2.4.2 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. Across the site, there are opportunities for riparian and wider catchment woodland planting to intercept, slow, store and filter water. This can help to reduce flood peaks, flows and frequency. This area is shown on Figure 2-2. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

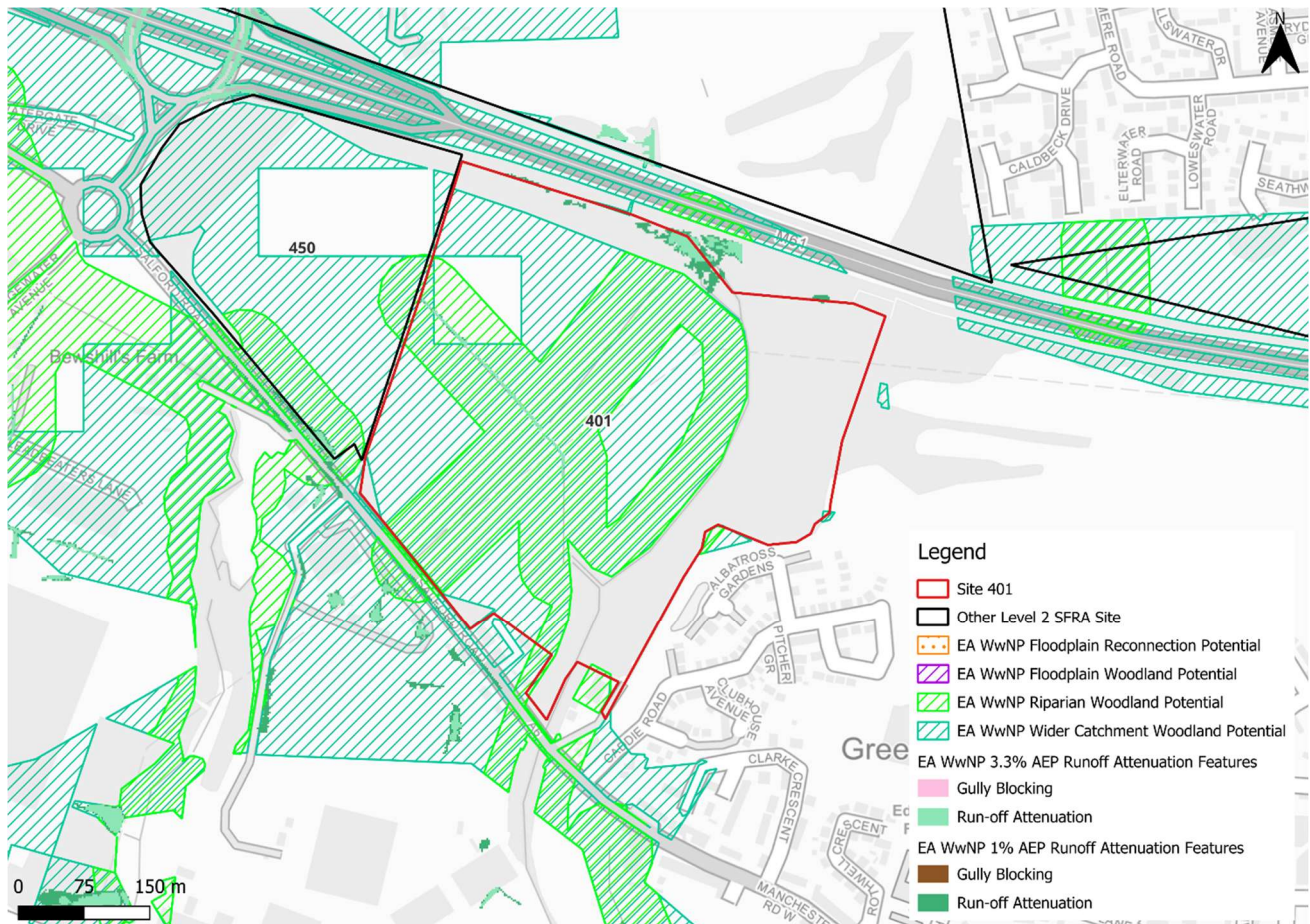


Figure 2-2: Natural Flood Management (NFM) potential mapping

## 2.5 Emergency planning

### 2.5.1 Flood warning

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

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is not located within a FAA.

## 2.5.2 Access and escape routes

Based on available information on fluvial flooding, safe access and escape routes would likely be achievable via the access track leading to Salford Road to the south of the site (Figure 2-3).

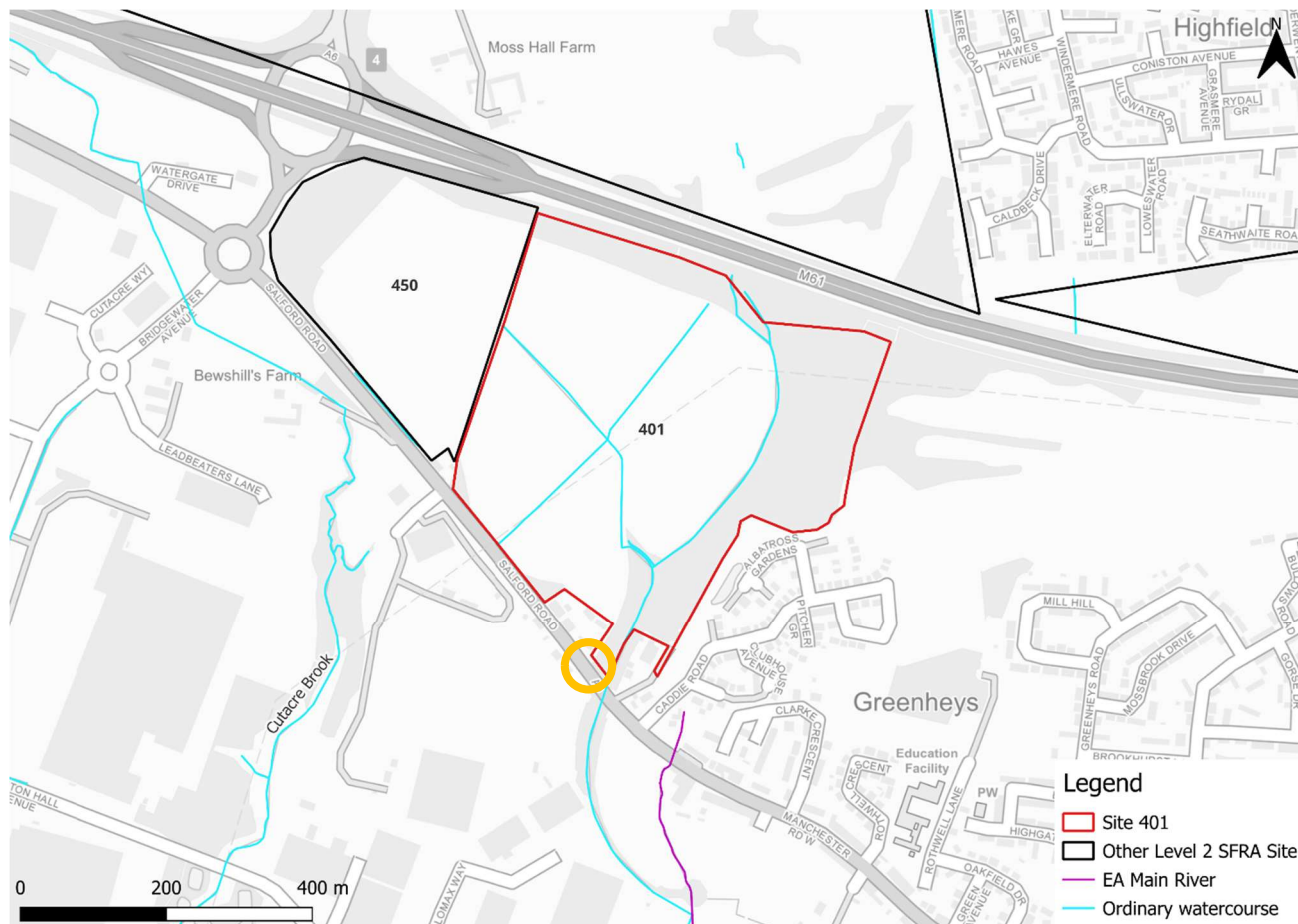


Figure 2-3: Potential access and escape routes

## 2.6 Observations, mitigation options, site suitability, 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 wholly located within Flood Zone 1 and therefore at low risk from rivers.
  - The site is not shown to be at additional risk from climate change.

- There is no detailed model covering the unnamed ordinary watercourses within the site.
- Mitigation:
  - Any site-specific FRA should investigate potential risk from the ordinary watercourses. Modelling may be required to assess fluvial flood extents, depths, velocities and hazards.
  - The ordinary watercourses should be included as green / blue corridors in site design offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.
- Access and escape:
  - Safe access and escape routes would likely be achievable via the access track leading to Salford Road to the south of the site.
  - There should be no obstruction to flows and new access routes over the watercourses should be discouraged. Were access routes to be constructed, they must be designed to not restrict flows in the design event whilst accounting for climate change.

## 3 Flood risk from surface water

### 3.1 Existing risk

#### 3.1.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Present Day

Based on the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Extents Present Day map (June 2026), the majority of the site is situated outside of the 0.1% AEP surface water flood extent (Table 3-1). Flow paths are generally confined to the channels of the ordinary watercourses within the site. There are some areas of ponding within topographic low spots along the northern site boundary also a small area of ponding along the eastern site boundary (Figure 3-1).

Greatest flood depths within the site in the 1% AEP event are shown to be between 0.9 and 1.2m along the channel of the unnamed ordinary watercourse which flows through the site and appears to be culverted beneath Salford Road, adjacent to the southern site boundary (Figure 3-2). Safe access and escape routes would likely remain achievable via the access track leading to Salford Road south of the site.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map

| Less than 0.1% AEP event (% area) | 0.1% AEP event (% area) | 1% AEP event (% area) | 3.3% AEP event (% area) |
|-----------------------------------|-------------------------|-----------------------|-------------------------|
| 92                                | 4                       | 1                     | 3                       |

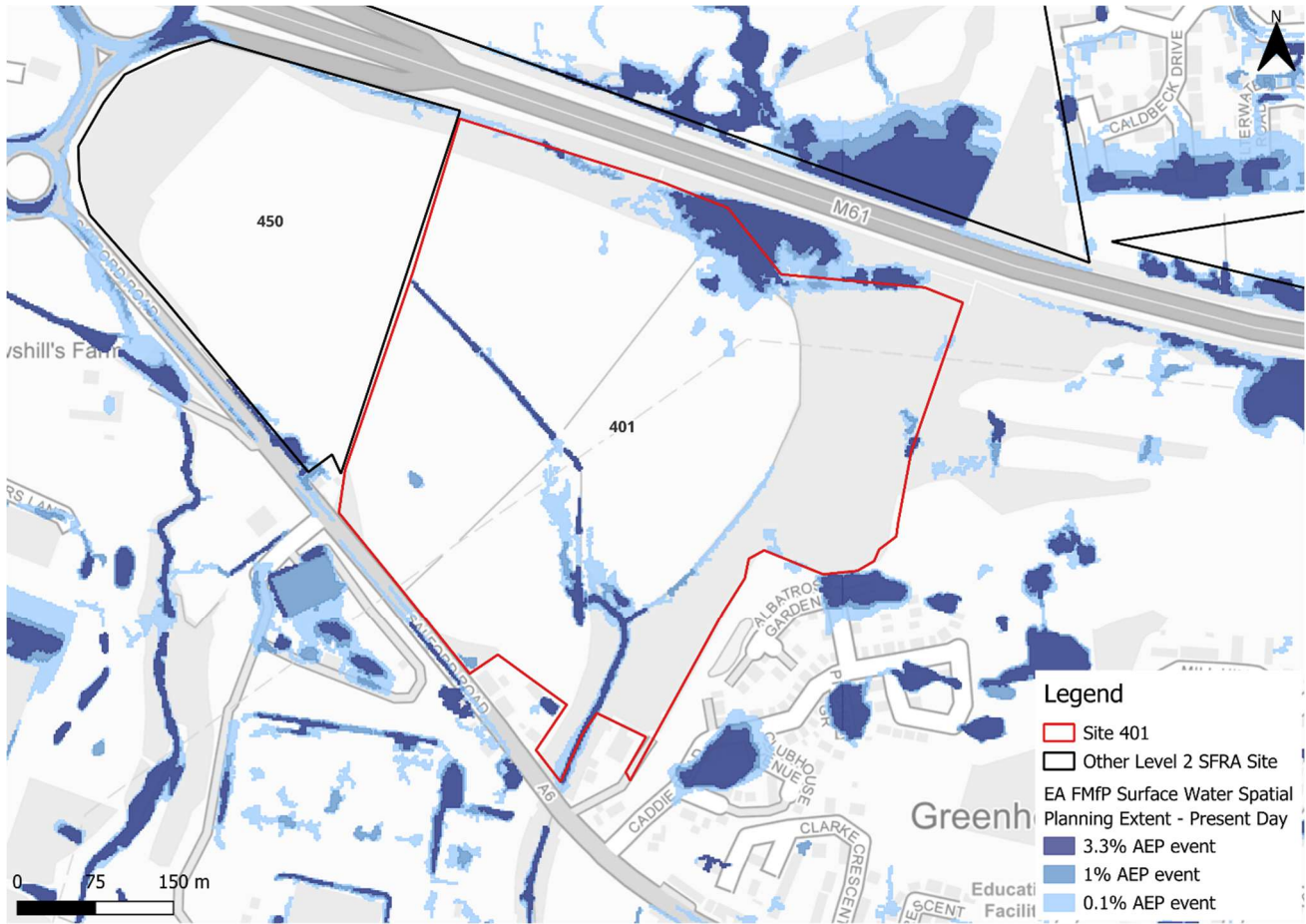


Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day

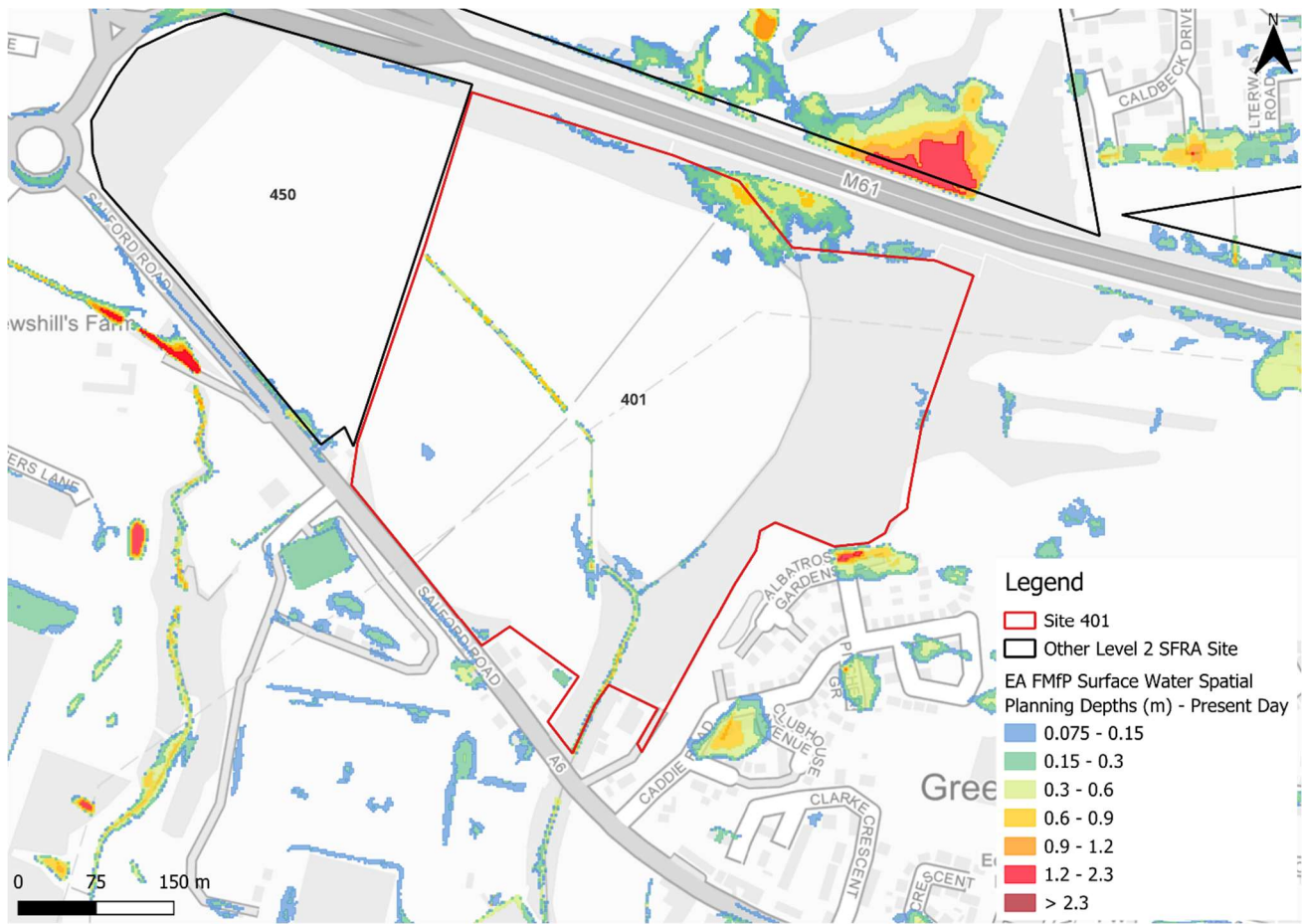


Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event

### 3.1.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning data does not include hazard information suitable for planning purposes. Therefore, this Level 2 SFRA considers the third generation Risk of Flooding from Surface Water (RoFSW) hazard mapping in addition to the Flood Map for Planning - Surface Water Spatial Planning extents and depths, as the best available information. Updated surface water hazard information would need to be confirmed at the site-specific FRA stage.

Based on the EA's national scale third generation RoFSW map, the greatest flood hazard within the site in the 1% AEP surface water event is categorised as 'significant' within the channel of the unnamed ordinary watercourses within the site (Figure 3-3).

There are some differences between the Flood Map for Planning - Surface Water Spatial Planning map and the third generation RoFSW hazard mapping. The Flood Map for Planning - Surface Water Spatial Planning data 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 Flood Map for Planning and third generation RoFSW maps.

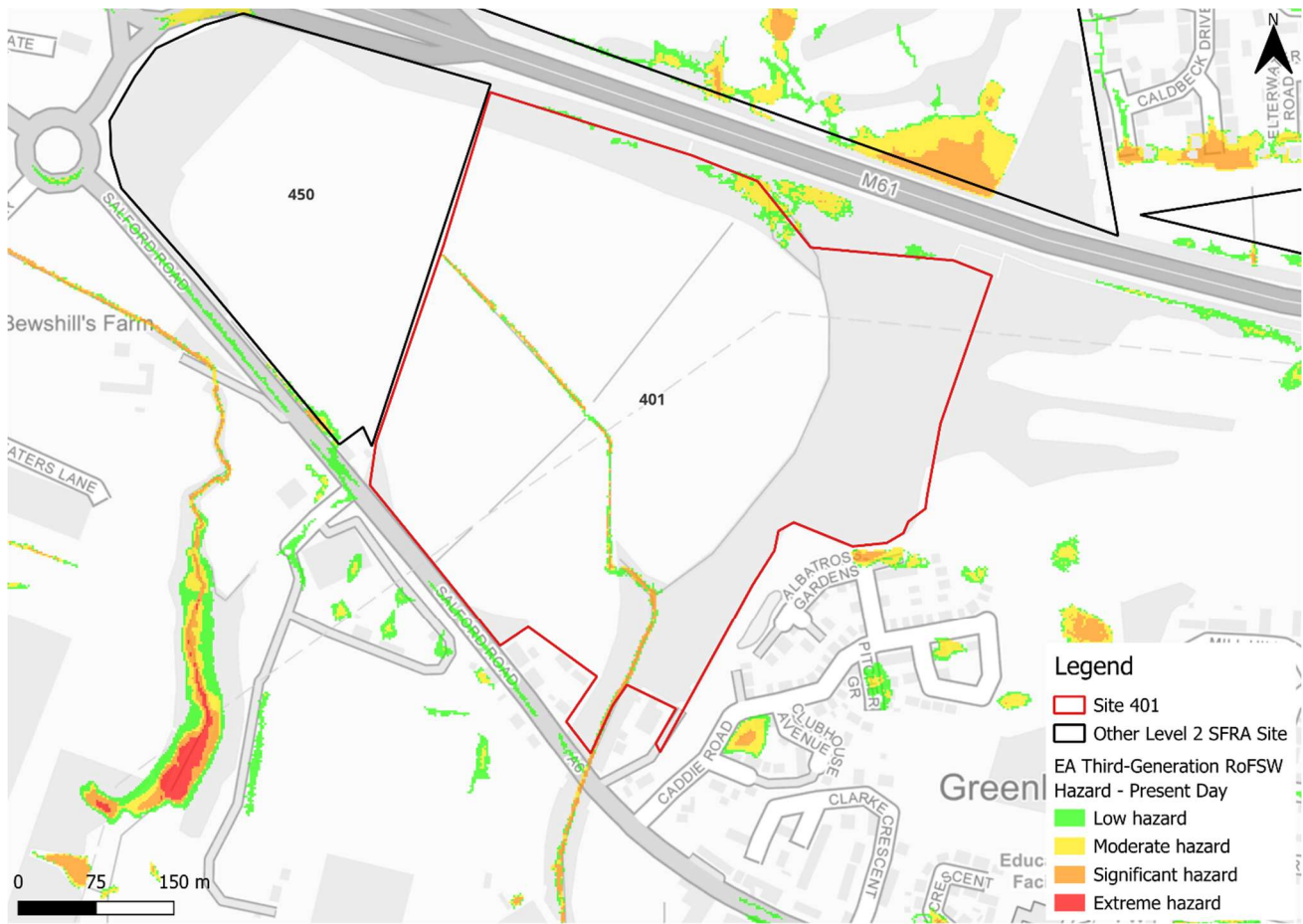


Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard<sup>1</sup>

## 3.2 Impacts from climate change

### 3.2.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Climate Change

The EA's [climate change allowance guidance](#) states that SFRA's should assess the upper end peak rainfall allowance for the 2070s epoch. This dataset is included in the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Climate Change dataset (June 2026). The peak rainfall intensity allowances for the Lower Mersey management catchment are shown in Table 3-2. The allowance for the 0.1% AEP event is not stated in the EA guidance.

<sup>1</sup> 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

Table 3-2: Peak rainfall intensity allowances for the Lower Mersey management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---------------|--------------------------------------|----------------------------------------|
| 3.3% AEP      | 30                                   | 40                                     |
| 1% AEP        | 30                                   | 45                                     |

Figure 3-4 shows the surface water flood extents for the 2070s upper end climate change scenario. Surface water risk increases across the site when considering climate change, with flows paths along ordinary watercourses as well as ponding along the northern site boundary expanding during the 0.1% AEP event. A flow path also forms along Salford Road to the south of the site during the 0.1% AEP plus climate change event.

The greatest flood depths onsite in the 1% AEP event are between 1.2 and 2.3m within the channel of the ordinary watercourse adjacent to the site access point along Salford Road (Figure 3-5). Safe access and escape routes may remain achievable via the south of the site given that greatest depths are confined to within the channel.

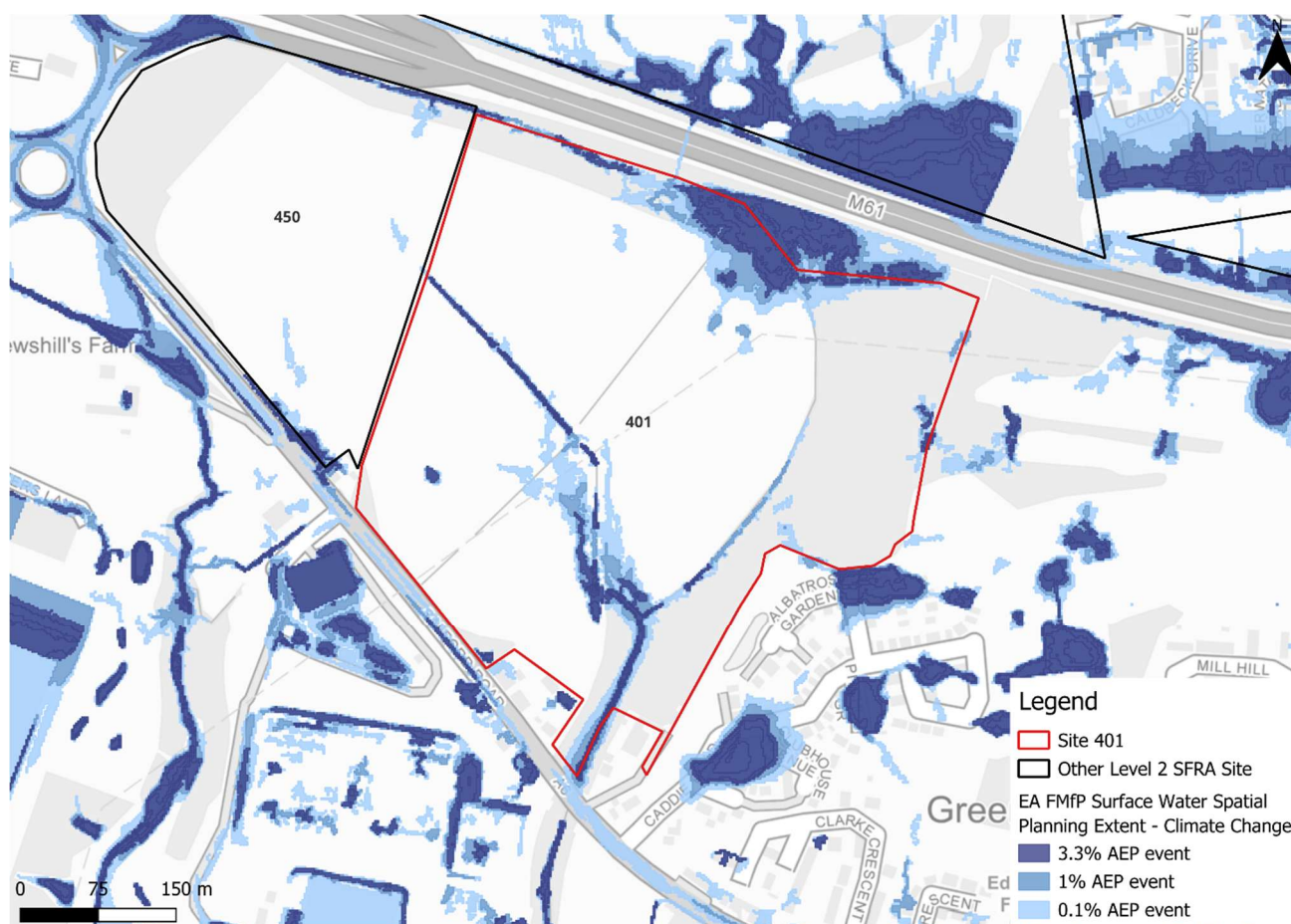


Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)

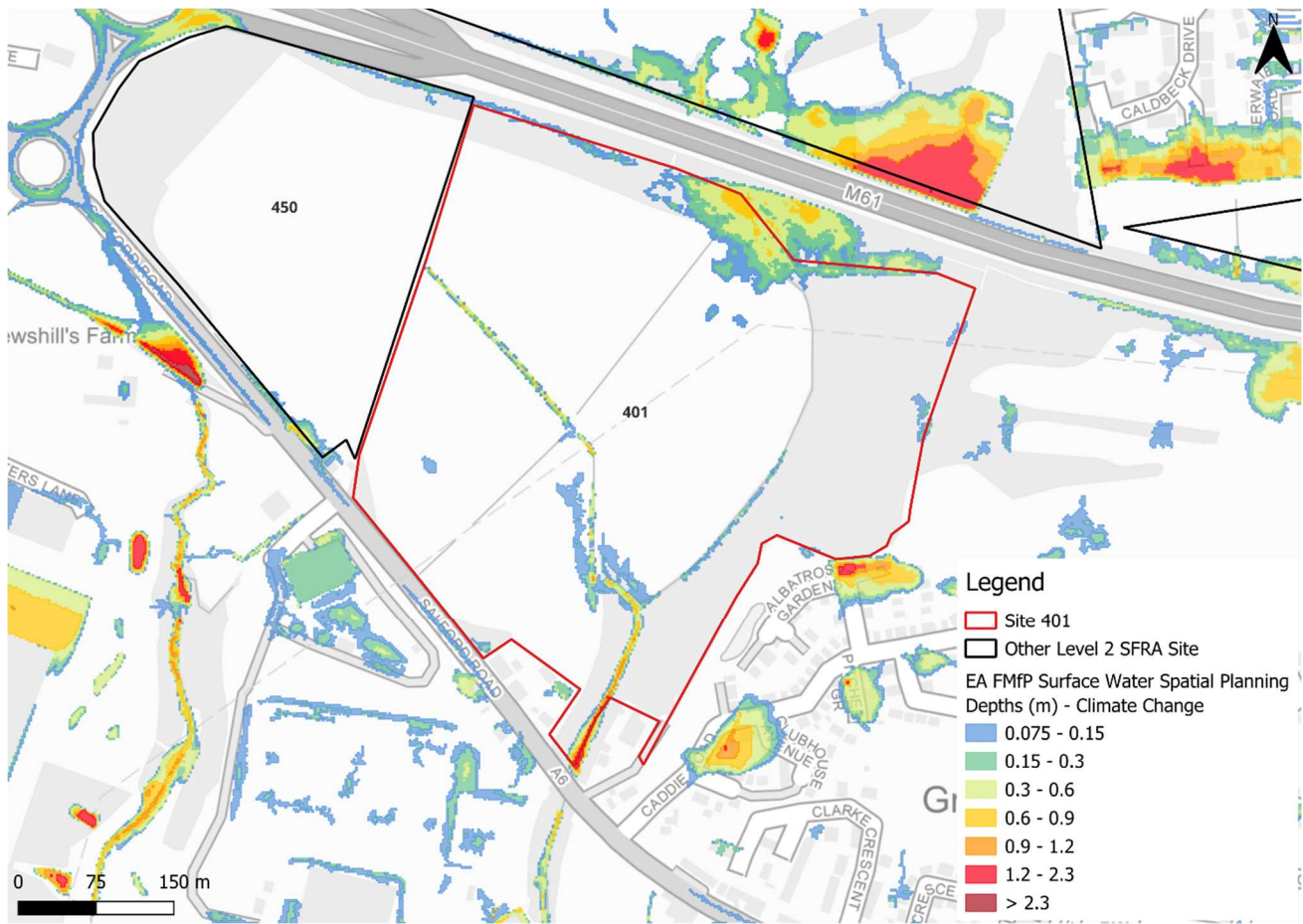


Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)

### 3.2.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning climate change data does not include hazard information suitable for planning purposes. This Level 2 SFRA therefore considers the 0.1% AEP surface water event as a conservative proxy for the 1% AEP event plus climate change, as the best available information to assess surface water flood hazards. The impact of climate change on surface water flood hazards should be considered at the site-specific FRA stage.

Using the RoFSW 0.1% AEP event as a proxy, future surface water flood hazard in the RoFSW 1% AEP event is categorised as 'extreme' within the channel of the ordinary watercourse at the south of the site. Flooding adjacent to the channels of ordinary watercourses is largely categorised as 'low' and the flood hazard within the area of ponding along the northern site boundary ranges from 'low' to 'significant' (Figure 3-6).

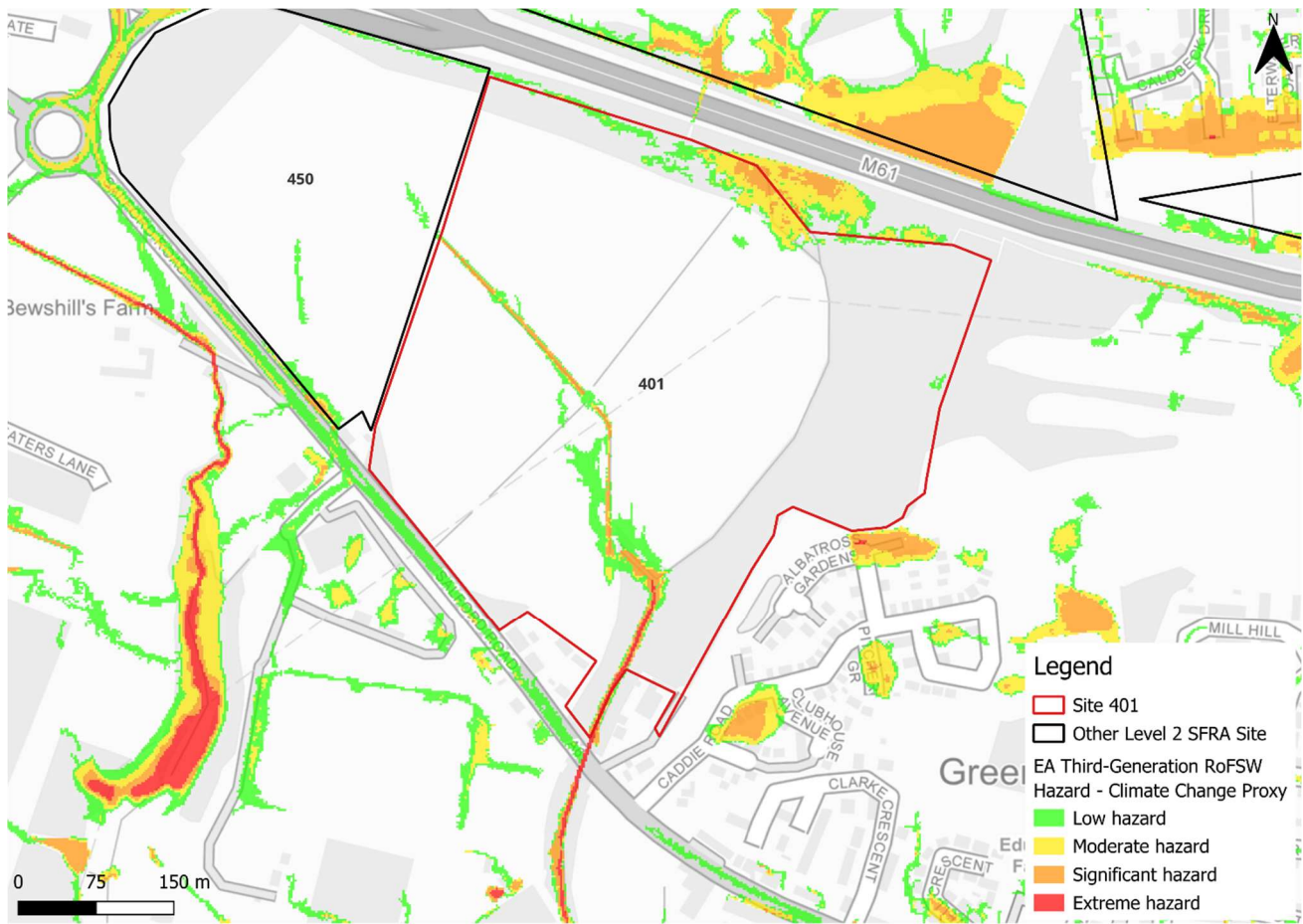


Figure 3-6: 0.1% AEP event surface water flood hazard<sup>1</sup>, as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map)

### 3.3 Sewer flood risk

United Utilities provided their historic risk registers which were aggregated by ward. There are no recorded sewer flooding incidents within the immediate vicinity of the site. There have been three recorded flooding incidents in the Hulton Ward within which the site is located.

### 3.4 Observations, mitigation options, site suitability, sequential approach to development management - surface water

- The majority of the site is situated outside of the 0.1% AEP surface water flood extent, however there are areas of significant surface water ponding along the northern site boundary and flow paths are modelled within the channels of the ordinary watercourses within the site. The areas shown to be at risk in the 3.3% AEP and 1% AEP events would ideally remain as open greenspace for flood mitigation.
- Risk to the site is shown to increase in extent across the site when considering the impact of climate change, with a particularly greater extent of surface water flooding along the northern boundary and within the south of the site.

- Topographic low spots and flow paths should be considered in site design and ideally left in place to flood naturally when required, including for the ordinary watercourses within the site which should be included as blue green corridors in site design.
- Any drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Greenfield runoff rates or betterment should apply. The developer should consult the LLFA and follow local and National SuDS guidance.
- Safe access and escape routes would likely be achievable via the access track leading to Salford Road in all events, given the shallow modelled surface water depths along these routes.

## 4 Groundwater, geology and SuDS suitability

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. Figure 4-1 shows the map covering the site and the surrounding areas. Table 4-1 explains the risk classifications.

The site is within an area where there is no risk of groundwater emergence. Infiltration SuDS may therefore be suitable.

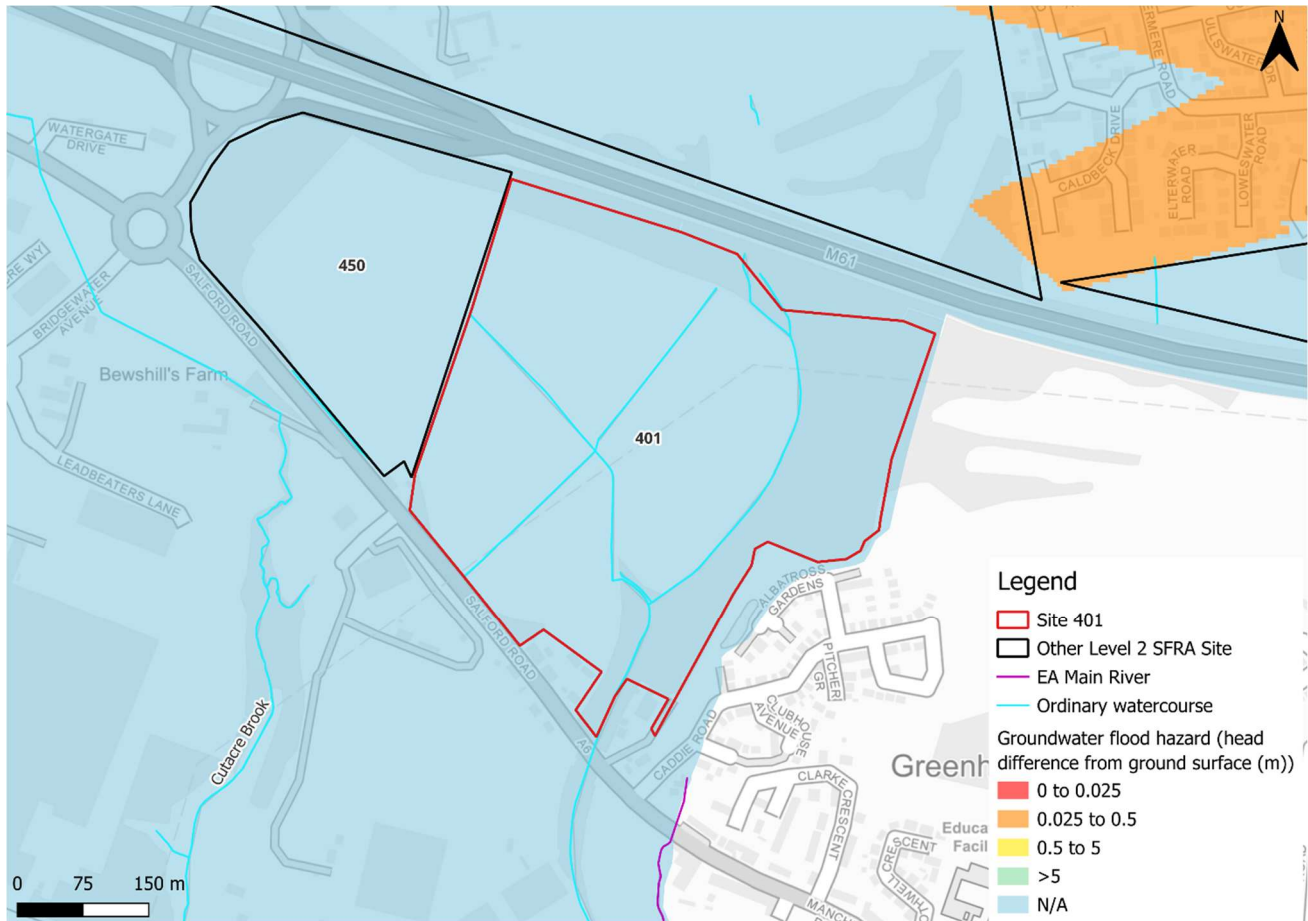


Figure 4-1: JBA 5m Groundwater Emergence Map

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.<br>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. |                                                                                                                                                                                                                                                                                                                                                             |

The underlying bedrock within the site is a combination of mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 4-2). Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, whereas sandstone has a higher permeability. Therefore, it is likely that the bedrock beneath the site will contribute to lower levels of infiltration and lower water tables.

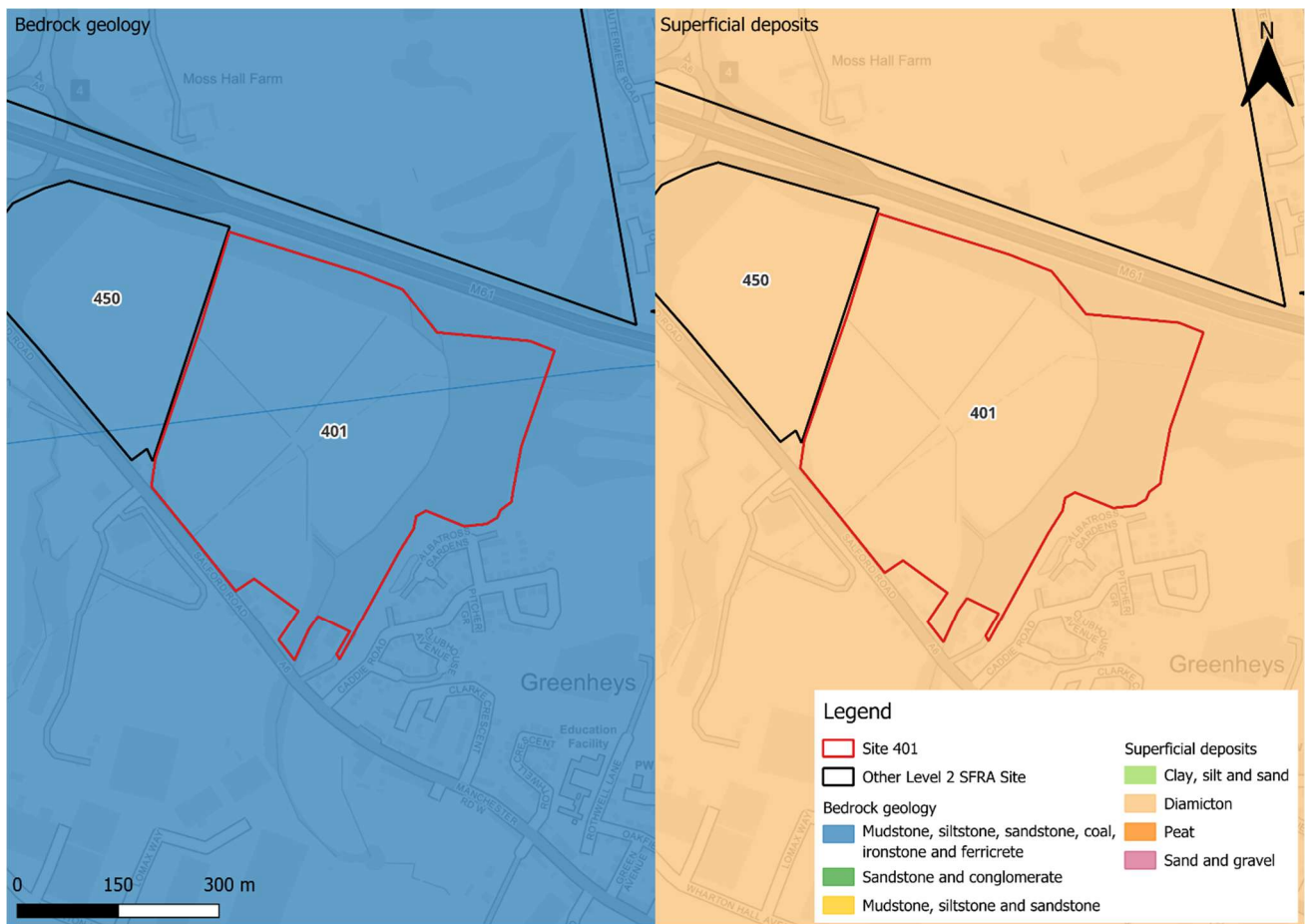


Figure 4-2: BGS Geology - Bedrock and superficial deposits

## 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 comes from the potential blockage or structural failure of the culvert beneath Waterside Gardens to the southwest of the site.

### 5.1 Potential blockage

A blockage or failure of the structure beneath Salford Road may cause water in the channel to back up and cause flooding to the site, depending on the severity of the blockage and magnitude of the flood event. Culvert course, capacity and condition surveys may be required, including for consultation with the culvert owner.

Figure 5-1 indicates the location of the structure beneath Salford Road. The potential residual risk to the site following a blockage of this asset should be assessed through the site-specific FRA.

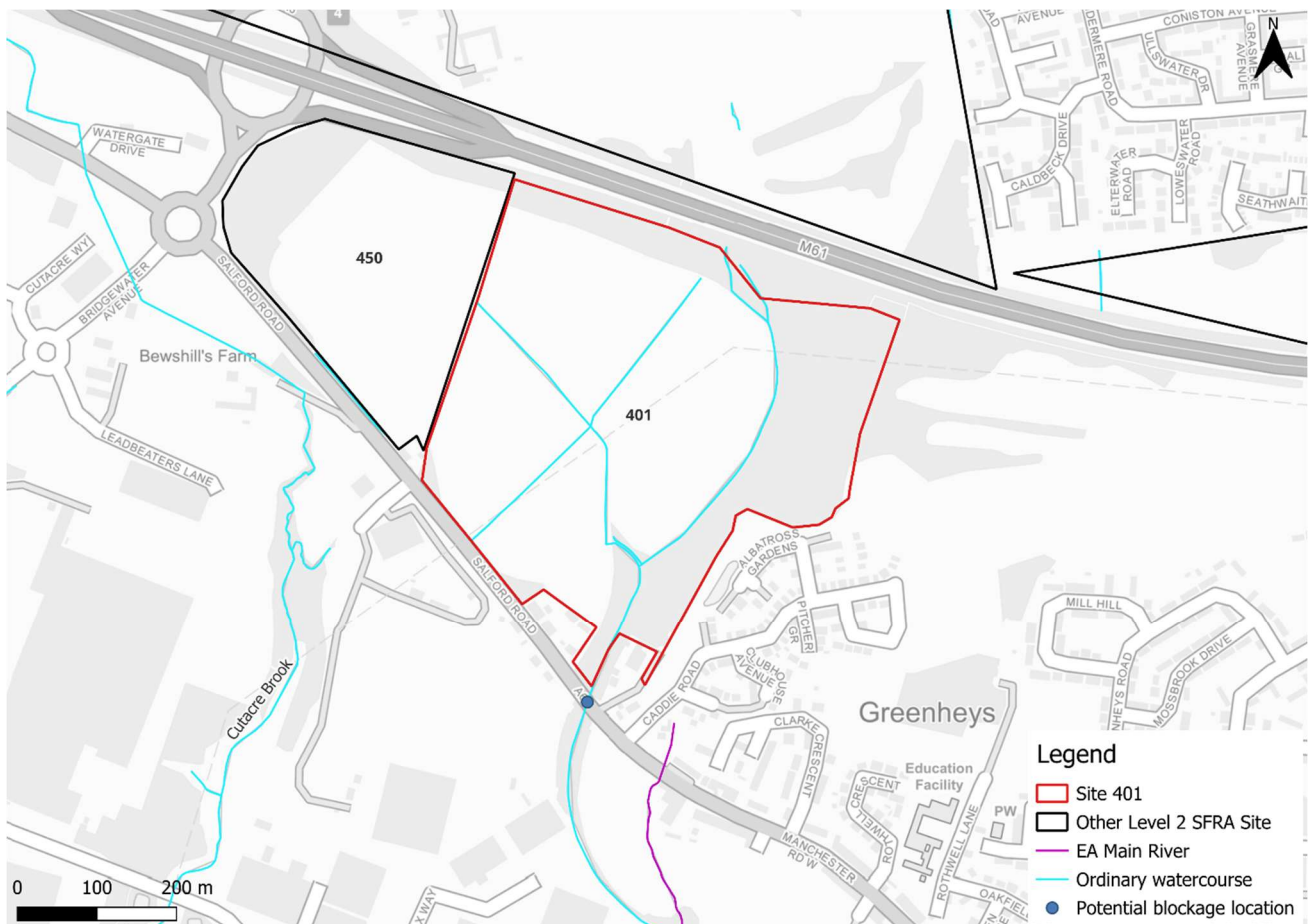


Figure 5-1: Potential blockage location

## 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. The RFM shows that there is no modelled risk to the site as a result of a reservoir breach.

## 5.3 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a blockage of the structure beneath Salford Road to the south of the site. The site-specific FRA should consider modelling a blockage scenario to understand whether there would be any additional risk to 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 test, 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 and 75 years for non-residential development.

### 6.2 Recommendations and site-specific FRA requirements

Based on the evidence presented in the Level 1 SFRA (2026) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- It should be appropriate to develop this site for more vulnerable purposes given its location within Flood Zone 1.
- The ordinary watercourses should be included as green / blue corridors in site design offering multifunctional benefits alongside flood risk mitigation including BNG contributions, and social and amenity benefits.
- There is no detailed model available for the unnamed ordinary watercourses within the site. Therefore, fluvial flood depths, velocities and hazards were unable to be assessed through this Level 2 SFRA. The site-specific FRA should produce a detailed model of the ordinary watercourses, including for the impacts of climate change.
- There should be no obstruction to flows and new access routes over the watercourses should be discouraged. Were access routes to be constructed, they must be designed to not restrict flows in the design event whilst accounting for climate change.
- A drainage strategy will be required at the planning application stage for any new development. This should demonstrate that there will be no increase in surface water flood risk offsite as a result of new development.
- The FRA should undertake a capacity and condition assessment of the culvert beneath Salford Road to the south of the site.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the Bolton Local Plan, and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; United Utilities; the highways authorities; and the emergency services.

## 7 Licencing

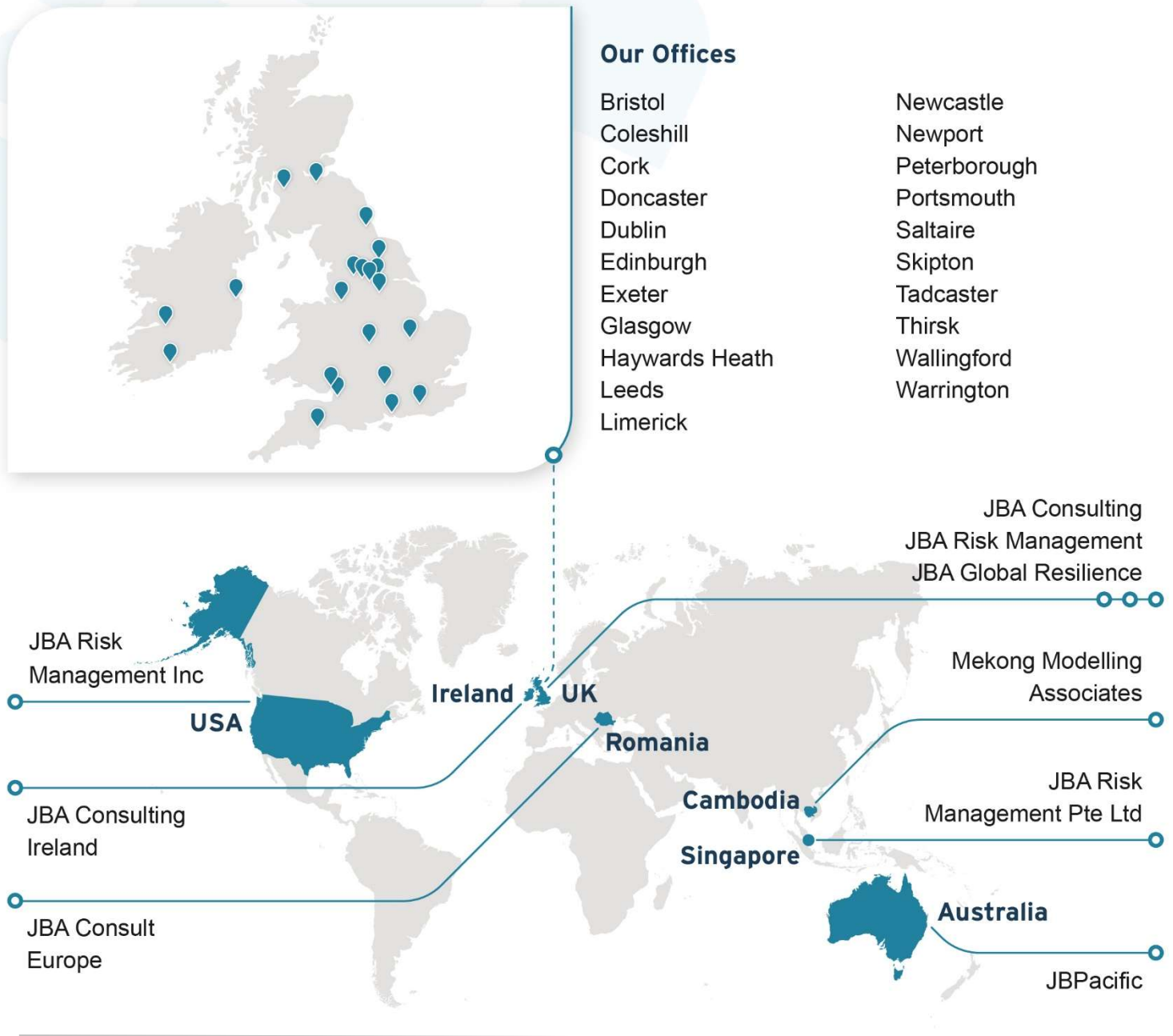
To cover all figures within this report:

- Contains Environment Agency information © Environment Agency and/or database right [2026]
- Contains public sector information licensed under the Open Government Licence v3.0. © Crown copyright and database rights [2026]
- Bolton Council Ordnance Survey licence number: AC 0000850551 [2026]

### Our Offices

Bristol  
Coleshill  
Cork  
Doncaster  
Dublin  
Edinburgh  
Exeter  
Glasgow  
Haywards Heath  
Leeds  
Limerick

Newcastle  
Newport  
Peterborough  
Portsmouth  
Saltaire  
Skipton  
Tadcaster  
Thirsk  
Wallingford  
Warrington



### Registered Office

1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0) 1756 799919  
[info@jbaconsulting.com](mailto:info@jbaconsulting.com)  
[www.jbaconsulting.com](http://www.jbaconsulting.com)

Follow us on  

Jeremy Benn  
Associates Limited  
Registered in  
England  
3246693

JBA Group Ltd is  
certified to  
ISO 9001:2015  
ISO 14001:2015  
ISO 27001:2022  
ISO 45001:2018





# **Bolton Level 2 Strategic Flood Risk Assessment Site Summaries 380-410**

**Site 404**

## **Final Report**

Prepared for  
Bolton Council

Date  
September 2026

## Document Status

|               |                                                              |
|---------------|--------------------------------------------------------------|
| Issue date    | 15 September 2026                                            |
| BIM reference | RLW-JBA-XX-XX-RP-EN-0023                                     |
| Revision      | P03                                                          |
| Prepared by   | Freya Nation BSc (Hons)<br>Analyst                           |
| Reviewed by   | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Project Director  |

---

## Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

---

## Accessibility

JBA aims to align with [governmental guidelines on accessible documents](#) and [WCAG 2.2 AA](#) standards, so that most people can read this document without having to employ special adaptation measures. This document is also optimised for use with assistive technology, such as screen reading software.

# Contract

|                     |                                                                 |
|---------------------|-----------------------------------------------------------------|
| JBA Project Manager | Laura Thompson-Jones                                            |
| Address             | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code    | 2025s1871                                                       |

This report describes work commissioned by Bolton Council by an instruction dated 18 June 2026. The Client's representative for the contract was Sara Dilmamode of Bolton Council. Freya Nation of JBA Consulting carried out this work.

## Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Bolton Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Bolton Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

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

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 June 2026 and 15 September 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.

---

## Acknowledgements

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

---

## Copyright

© Jeremy Benn Associates Limited 2026

---

# Contents

|          |                                                                                                                   |           |
|----------|-------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Background</b>                                                                                                 | <b>5</b>  |
| 1.1      | Site 404                                                                                                          | 5         |
| <b>2</b> | <b>Flood risk from rivers</b>                                                                                     | <b>8</b>  |
| 2.1      | Existing risk                                                                                                     | 8         |
| 2.2      | Impacts from climate change                                                                                       | 9         |
| 2.3      | Historic flood incidents                                                                                          | 9         |
| 2.4      | Flood risk management                                                                                             | 9         |
| 2.5      | Emergency planning                                                                                                | 10        |
| 2.6      | Observations, mitigation options, site suitability, sequential approach to development management - fluvial       | 11        |
| <b>3</b> | <b>Flood risk from surface water</b>                                                                              | <b>12</b> |
| 3.1      | Existing risk                                                                                                     | 12        |
| 3.2      | Impacts from climate change                                                                                       | 15        |
| 3.3      | Sewer flood risk                                                                                                  | 19        |
| 3.4      | Observations, mitigation options, site suitability, sequential approach to development management - surface water | 19        |
| <b>4</b> | <b>Groundwater, geology and SuDS suitability</b>                                                                  | <b>21</b> |
| <b>5</b> | <b>Residual risk</b>                                                                                              | <b>24</b> |
| 5.1      | Flood risk from reservoirs                                                                                        | 24        |
| 5.2      | Observations, mitigation options and site suitability - residual risk                                             | 25        |
| <b>6</b> | <b>Overall site assessment</b>                                                                                    | <b>26</b> |
| 6.1      | Can part b) of the exception test be passed?                                                                      | 26        |
| 6.2      | Recommendations and site-specific FRA requirements                                                                | 26        |
| <b>7</b> | <b>Licencing</b>                                                                                                  | <b>27</b> |

## List of Figures

|                                                                                                                                                                                       |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1-1: Existing site location boundary                                                                                                                                           | 6  |
| Figure 1-2: Topography                                                                                                                                                                | 7  |
| Figure 2-1: Existing risk                                                                                                                                                             | 8  |
| Figure 2-2: Natural Flood Management (NFM) potential mapping                                                                                                                          | 10 |
| Figure 2-3: Potential access and escape routes                                                                                                                                        | 11 |
| Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day                                                                                               | 13 |
| Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event                                                                       | 14 |
| Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard                                                            | 15 |
| Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)                                                                          | 17 |
| Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)                                                  | 18 |
| Figure 3-6: 0.1% AEP event surface water flood hazard <sup>1</sup> , as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map) | 19 |
| Figure 4-1: JBA 5m Groundwater Emergence Map                                                                                                                                          | 21 |
| Figure 4-2: BGS Geology - Bedrock and superficial deposits                                                                                                                            | 23 |
| Figure 5-1: Flood risk from reservoirs                                                                                                                                                | 25 |

## List of Tables

|                                                                                                                                                                        |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 2-1: Existing flood risk based on percentage area of site at risk                                                                                                | 8  |
| Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map | 12 |
| Table 3-2: Peak rainfall intensity allowances for the Douglas management catchment                                                                                     | 16 |
| Table 3-3: Peak rainfall intensity allowances for the Irwell management catchment                                                                                      | 16 |
| Table 4-1: Groundwater Hazard Classification                                                                                                                           | 22 |

# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Local Plan Site 404. The content of this report assumes the reader has already consulted the 'Bolton Level 1 SFRA' (2026) and read the 'Bolton Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site 404

- Location: South of Leigh Tenement Farm
- Existing site use: Agriculture
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Mixed use
- Proposed site use vulnerability: More vulnerable
- Site area (ha): 6.77
- Watercourse: N/A
- Environment Agency (EA) model: N/A
- Summary of requirements from Level 2 SFRA scoping stage:
  - Assessment of surface water flood extent, depths and hazards
  - Assessment of all other sources of flood risk
  - Assessment of flood risk management measures and natural flood management

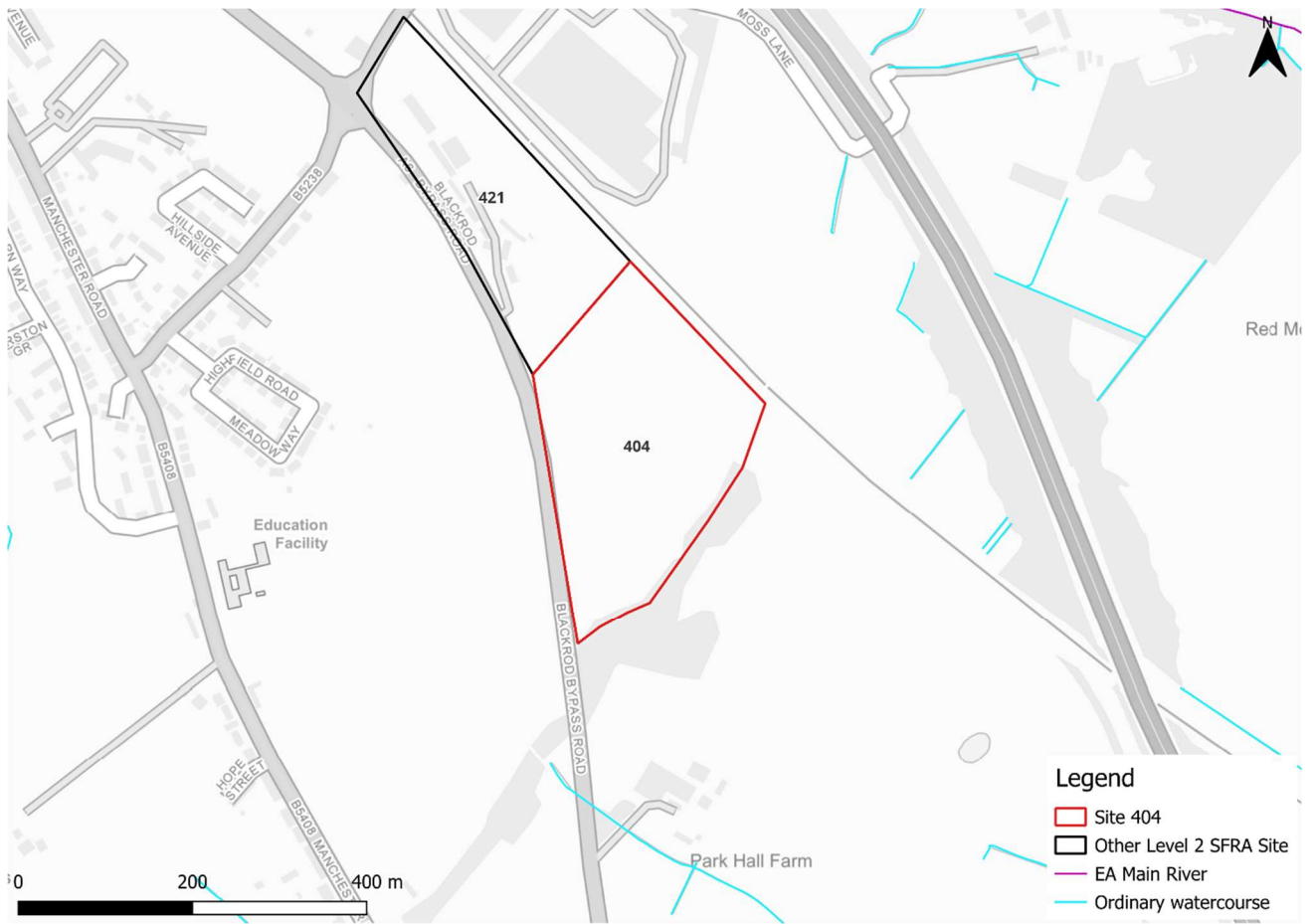


Figure 1-1: Existing site location boundary

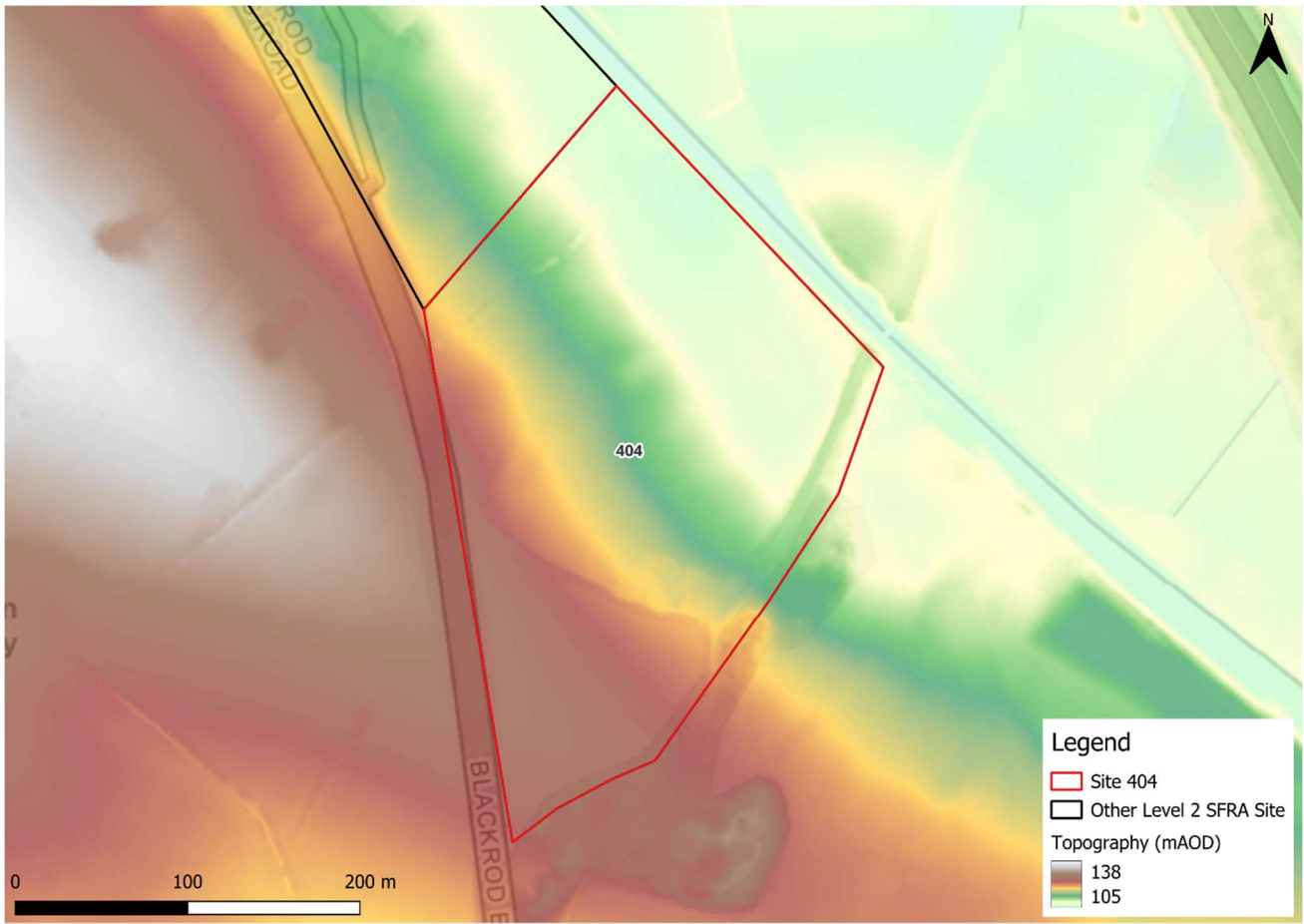


Figure 1-2: Topography

## 2 Flood risk from rivers

### 2.1 Existing risk

#### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (June 2026) and Flood Zone 3b (functional floodplain), as updated through the Bolton Level 1 SFRA, the percentage areas of the site within the flood zones 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.

The entire site is located within Flood Zone 1 and therefore at low risk of flooding from rivers.

Table 2-1: Existing 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                      |

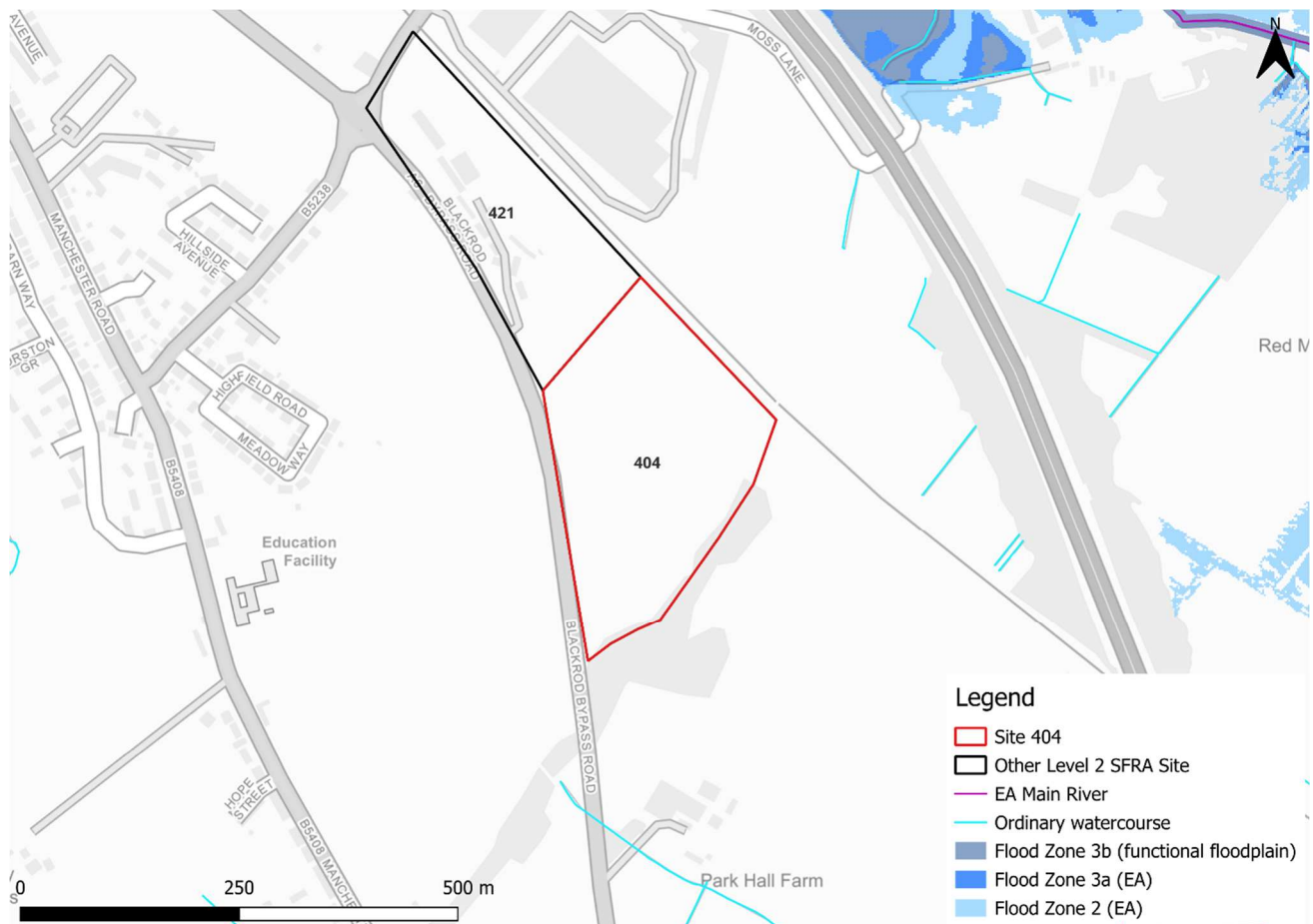


Figure 2-1: Existing risk

## **2.2 Impacts from climate change**

### **2.2.1 Flood Map for Planning - climate change**

The site is not likely to be at fluvial risk when considering climate change, based on the EA's Flood Map for Planning - Flood Zones plus Climate Change dataset.

### **2.3 Historic flood incidents**

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

The LLFA provided its historic floods register. There have been 10 recorded flooding incidents within the Horwich South & Blackrod Ward within which the site is located.

## **2.4 Flood risk management**

### **2.4.1 Flood defences**

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

### **2.4.2 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. Across the site, there are opportunities for runoff attenuation in the 3.3% AEP and 1% AEP events. This can help to reduce peak flow locally for small flood events by intercepting, slowing and filtering surface water runoff. This area is shown on Figure 2-2. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

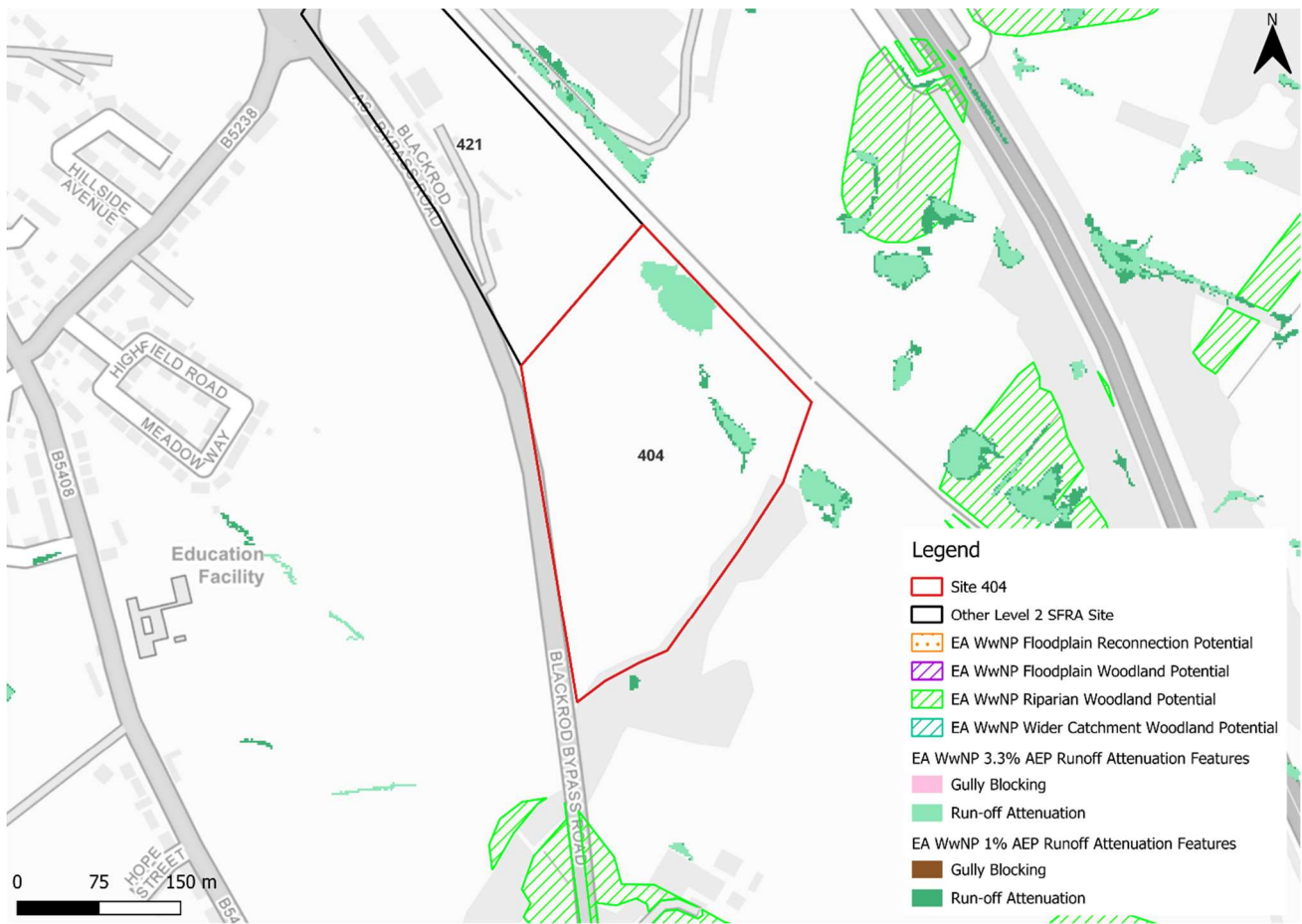


Figure 2-2: Natural Flood Management (NFM) potential mapping

## 2.5 Emergency planning

### 2.5.1 Flood warning

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

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is not located within a FAA.

### 2.5.2 Access and escape routes

Based on available information on fluvial flooding, safe access and escape routes would likely be achievable via the Blackrod Bypass Road to the west of the site (Figure 2-3).

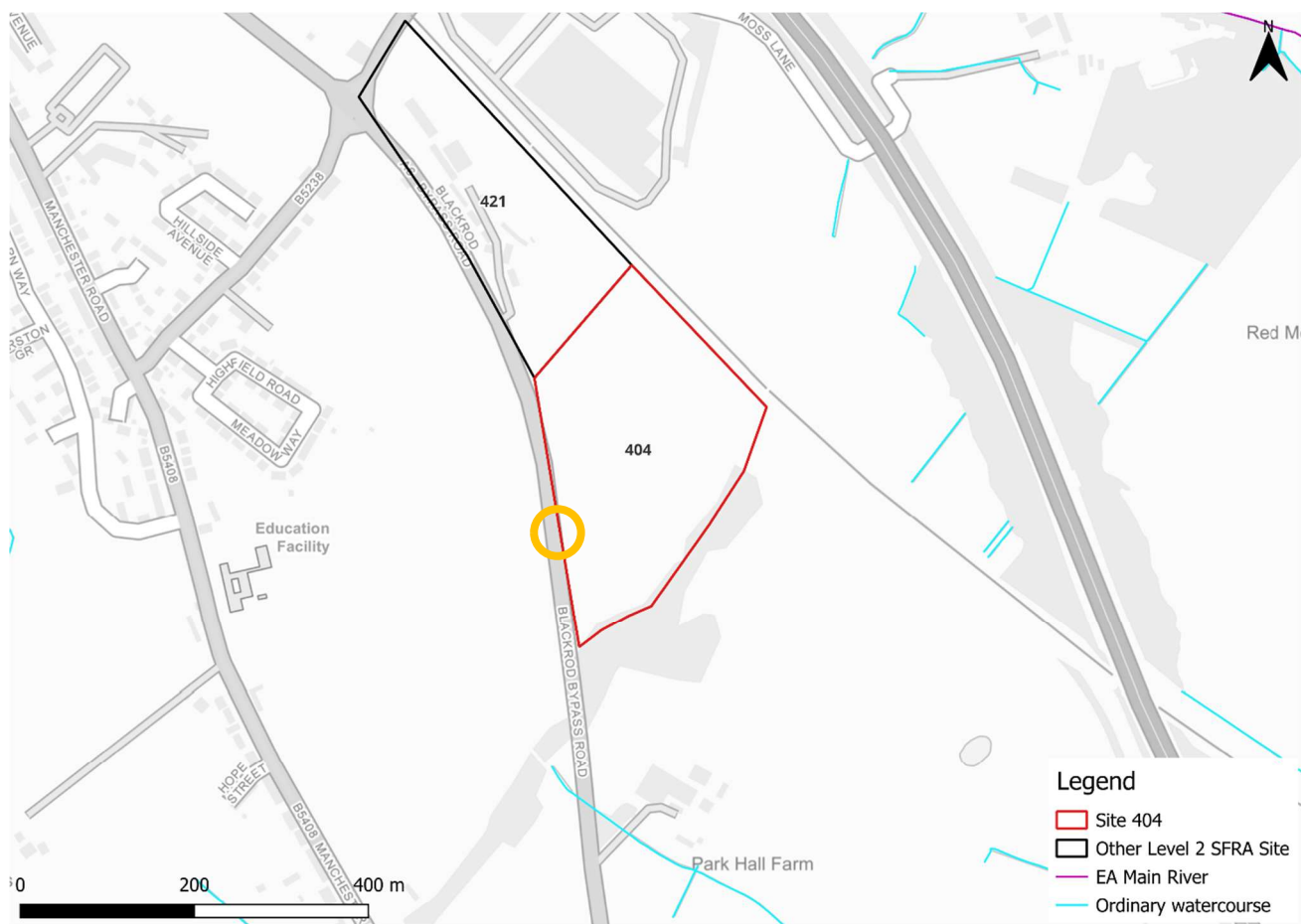


Figure 2-3: Potential access and escape routes

## 2.6 Observations, mitigation options, site suitability, 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 wholly located within Flood Zone 1 and therefore at low risk from rivers.
  - The site is not shown to be at additional risk from climate change.
- Access and escape:
  - Safe access and escape routes would likely be achievable via Blackrod Bypass Road to the west of the site.

## 3 Flood risk from surface water

### 3.1 Existing risk

#### 3.1.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Present Day

Based on the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Extents Present Day map (June 2026), the majority of the site is situated outside of the 0.1% AEP surface water flood extent (Table 3-1). Areas of ponding are present within the northern and eastern sides of the site in all events (Figure 3-1).

Greatest flood depths within the site in the 1% AEP are shown to be significant at between 0.6 and 0.9m within the largest area of ponding in the northern part of the site (Figure 3-2). Safe access and escape routes would likely remain achievable via the Blackrod Bypass Road to the west of the site.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map

| Less than 0.1% AEP event (% area) | 0.1% AEP event (% area) | 1% AEP event (% area) | 3.3% AEP event (% area) |
|-----------------------------------|-------------------------|-----------------------|-------------------------|
| 90                                | 3                       | 1                     | 6                       |

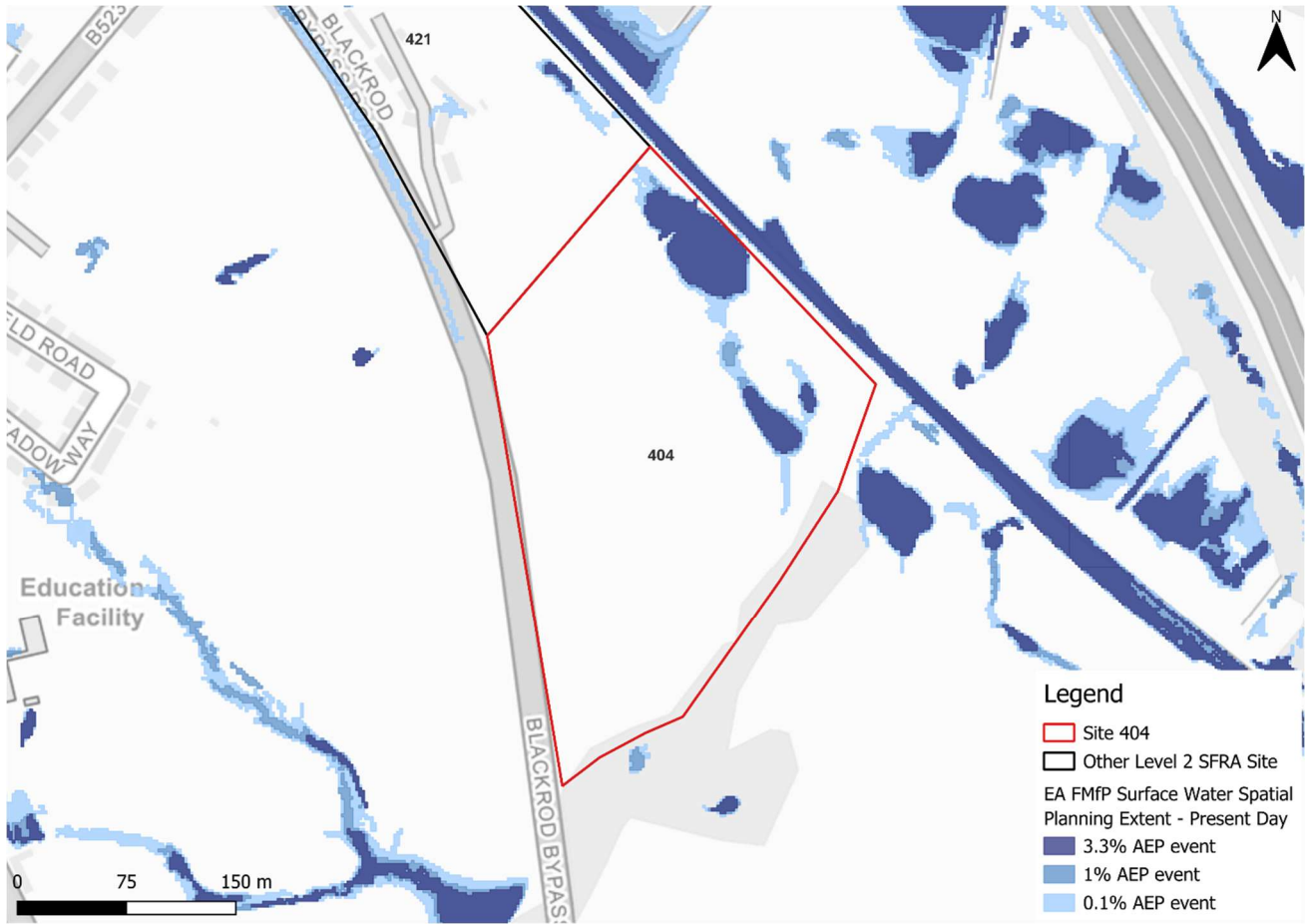


Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day

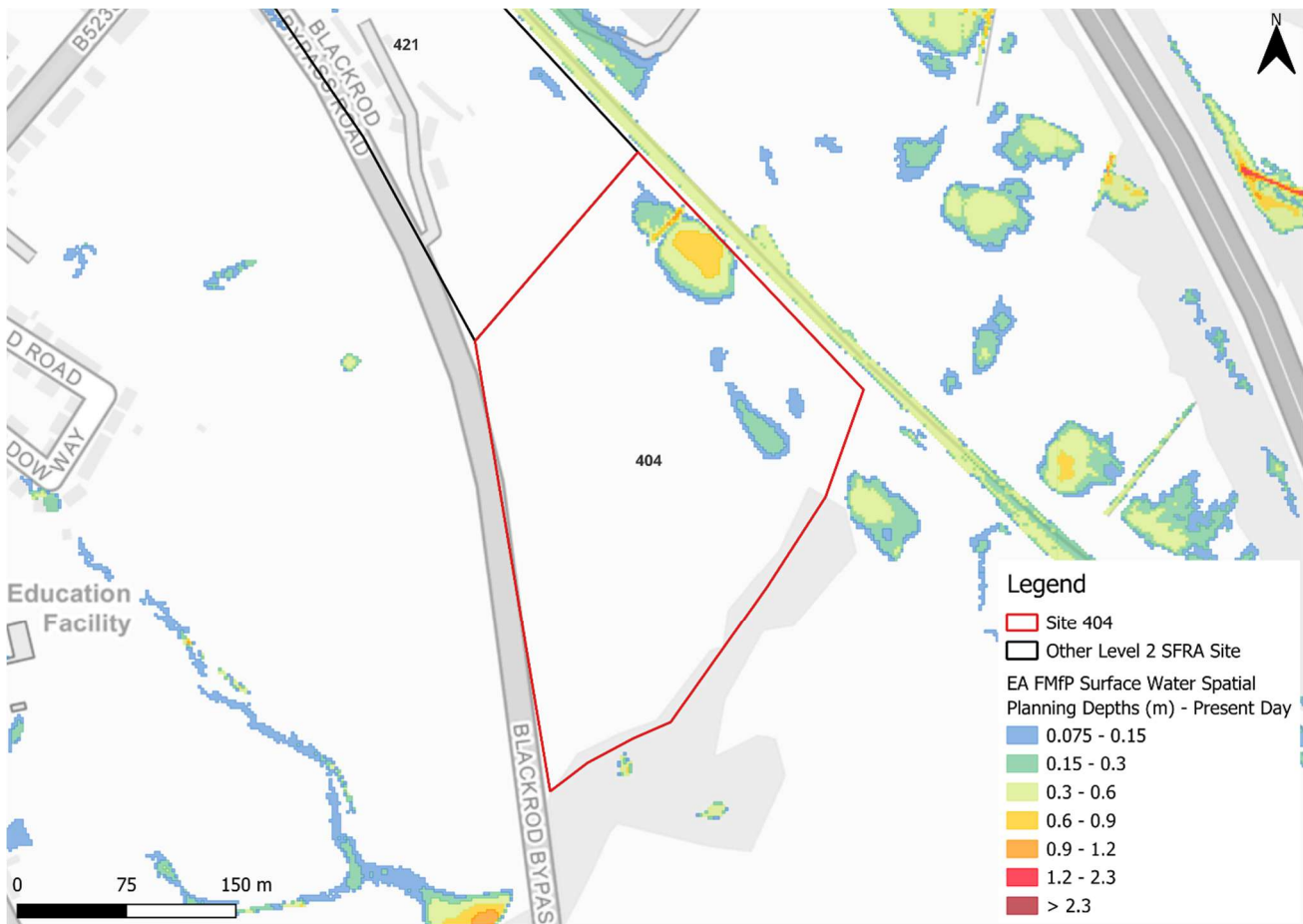


Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event

### 3.1.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning data does not include hazard information suitable for planning purposes.

Therefore, this Level 2 SFRA considers the third generation Risk of Flooding from Surface Water (RoFSW) hazard mapping in addition to the Flood Map for Planning - Surface Water Spatial Planning extents and depths, as the best available information. Updated surface water hazard information would need to be confirmed at the site-specific FRA stage.

Based on the EA's national scale third generation RoFSW map, the greatest flood hazard within the site in the 1% AEP surface water event is categorised as 'significant' within the largest area of ponding in the northern part of the site (Figure 3-3).

There are some differences between the Flood Map for Planning - Surface Water Spatial Planning map and the third generation RoFSW hazard mapping. The Flood Map for Planning - Surface Water Spatial Planning data 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 Flood Map for Planning and third generation RoFSW maps.

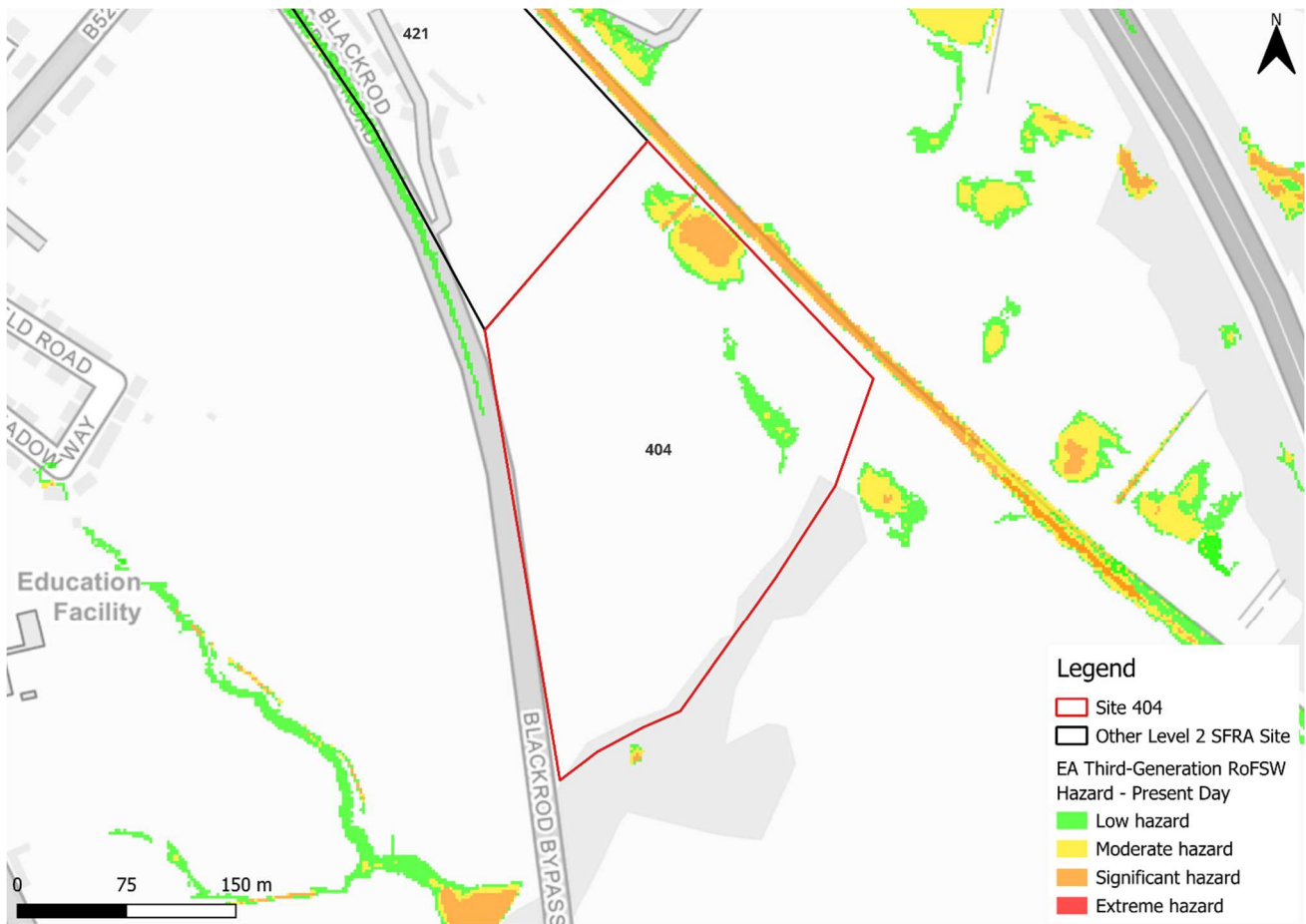


Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard<sup>1</sup>

## 3.2 Impacts from climate change

### 3.2.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Climate Change

The EA's [climate change allowance guidance](#) states that SFRA's should assess the upper end peak rainfall allowance for the 2070s epoch. This dataset is included in the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Climate Change dataset (June 2026). The peak rainfall intensity allowances for the Douglas and Irwell management catchments are shown in Table 3-2 and Table 3-3. The allowance for the 0.1% AEP event is not stated in the EA guidance.

<sup>1</sup> 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

Table 3-2: Peak rainfall intensity allowances for the Douglas management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---------------|--------------------------------------|----------------------------------------|
| 3.3% AEP      | 30                                   | 40                                     |
| 1% AEP        | 35                                   | 45                                     |

Table 3-3: Peak rainfall intensity allowances for the Irwell management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---------------|--------------------------------------|----------------------------------------|
| 3.3% AEP      | 30                                   | 40                                     |
| 1% AEP        | 30                                   | 45                                     |

Figure 3-4 shows the surface water flood extents for the 2070s upper end climate change scenario. Surface water risk increases marginally within the northern and eastern sides of the site when considering climate change, with areas of ponding expanding during the 1% and 0.1% AEP event. A flow path forms between the areas of ponding during the 0.1% AEP plus climate change event. There is also a flow path along Blackrod Bypass Road north of the site, during the 0.1% AEP event when considering climate change.

The greatest flood depths onsite in the 1% AEP event are between 0.9 and 1.2 m within the largest area of ponding in the northern part of the site (Figure 3-5). Safe access and escape routes would likely remain achievable via the Blackrod Bypass Road to the west of the site given that flood depths on the road remain shallow.

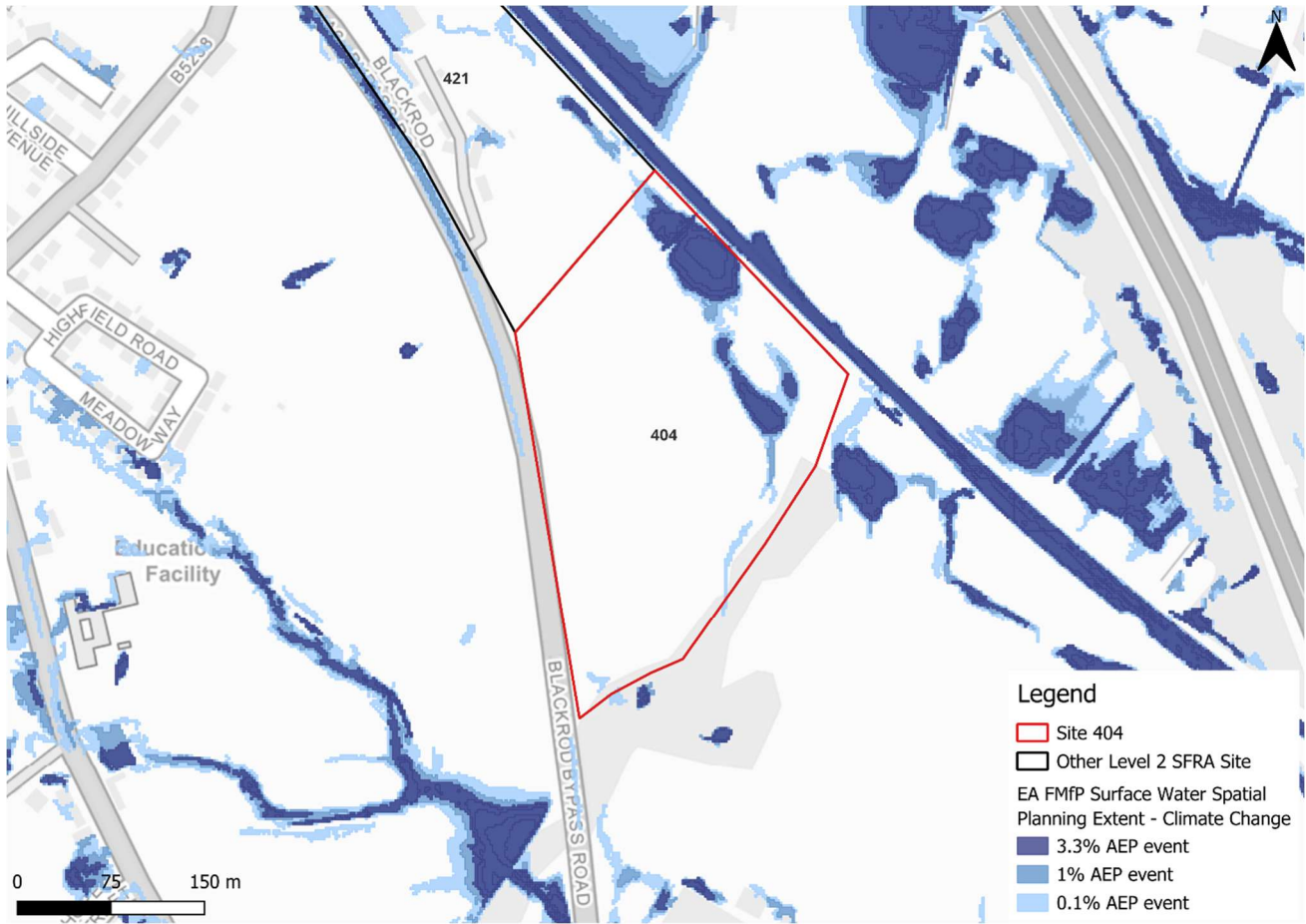


Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)

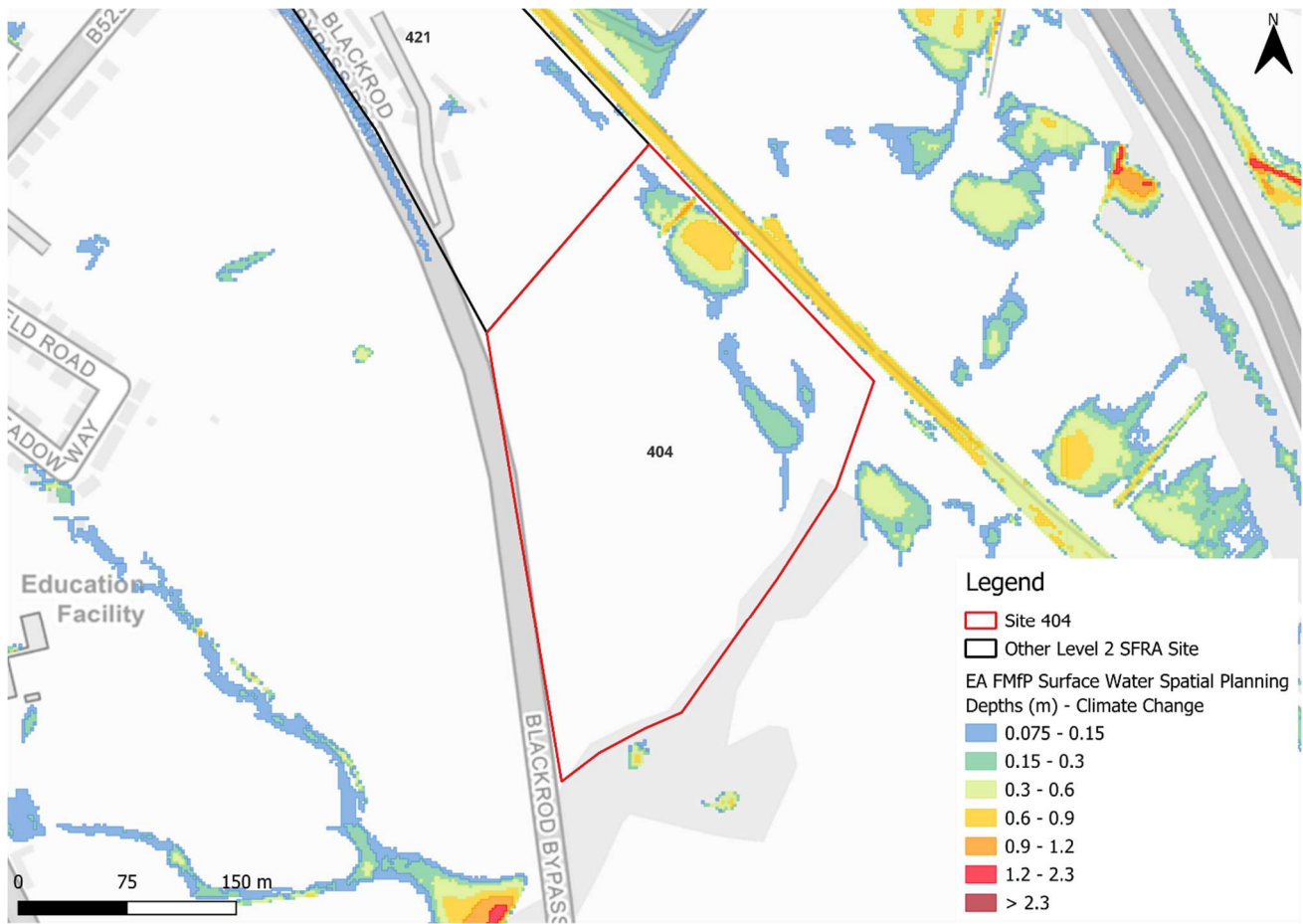


Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)

### 3.2.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning climate change data does not include hazard information suitable for planning purposes. This Level 2 SFRA therefore considers the 0.1% AEP surface water event as a conservative proxy for the 1% AEP event plus climate change, as the best available information to assess surface water flood hazards. The impact of climate change on surface water flood hazards should be considered at the site-specific FRA stage.

Using the RoFSW 0.1% AEP event as a proxy, future surface water flood hazard in the RoFSW 1% AEP event is largely similar to that shown in the present day 1% AEP event. Flooding within the largest area of ponding in the northern part of the site is classified as 'significant' (Figure 3-6).

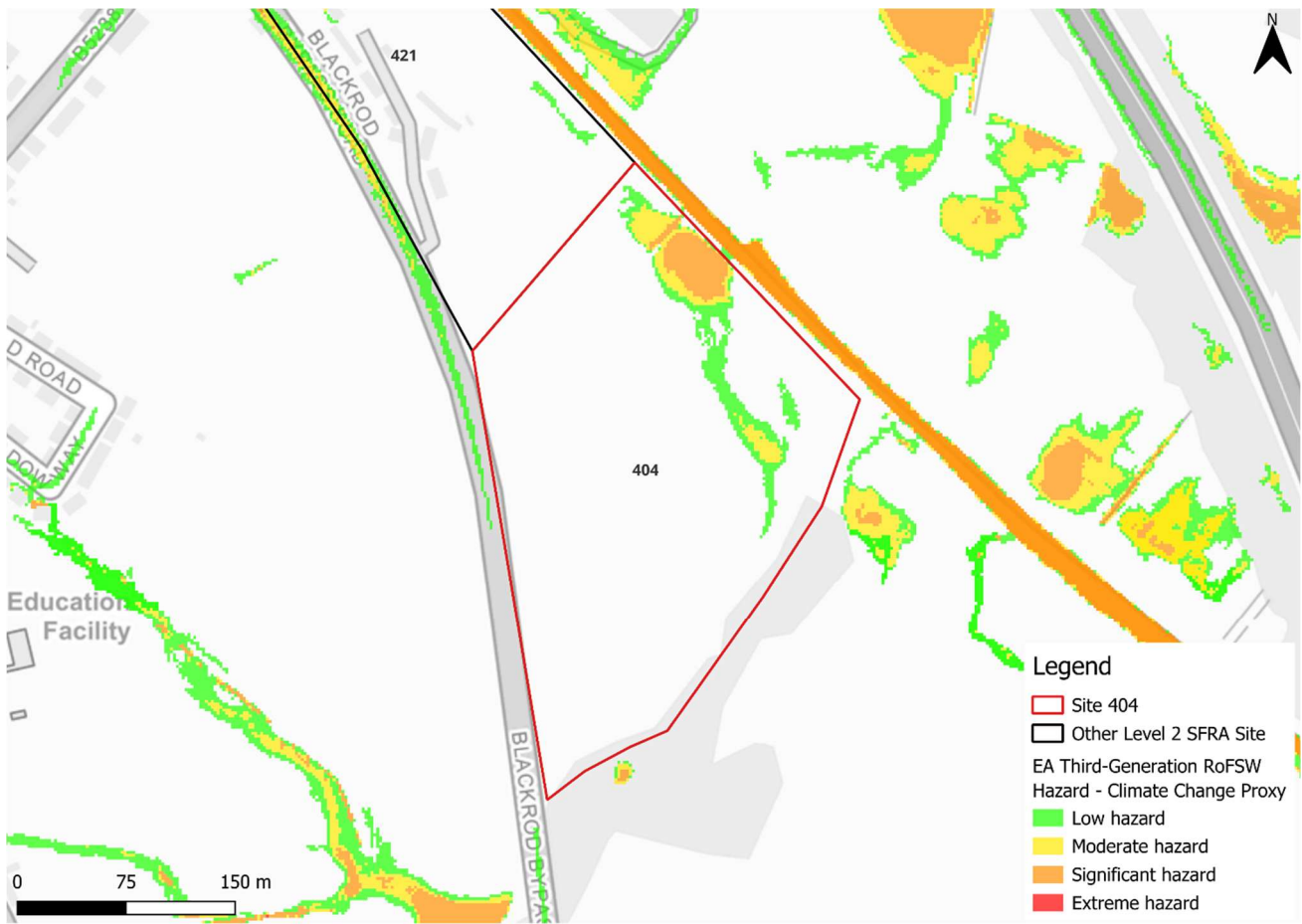


Figure 3-6: 0.1% AEP event surface water flood hazard<sup>1</sup>, as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map)

### 3.3 Sewer flood risk

United Utilities provided their historic risk registers which were aggregated by ward. There are no recorded sewer flooding incidents within the immediate vicinity of the site. There have been 18 recorded flooding incidents in the Horwich South & Blackrod Ward within which the site is located.

### 3.4 Observations, mitigation options, site suitability, sequential approach to development management - surface water

- The majority of the site is situated outside of the 0.1% AEP surface water flood extent, however there are areas of significant surface water ponding within the northern and eastern parts of the site. The areas shown to be at risk in the 3.3% AEP and 1% AEP events would ideally remain as open greenspace for flood mitigation.
- Risk to the site is shown to increase in extent when considering the impact of climate change, with existing areas of ponding expanding and forming a flow path in the 0.1% AEP event, when considering climate change.

- Topographic low spots and flow paths should be considered in site design and ideally left in place to flood naturally when required.
- Any drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Greenfield runoff rates or betterment should apply. The developer should consult the LLFA and follow local and National SuDS guidance.
- Safe access and escape routes would likely be achievable via Blackrod Bypass Road, to the west of the site, in all events.

## 4 Groundwater, geology and SuDS suitability

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. Figure 4-1 shows the map covering the site and the surrounding areas. Table 4-1 explains the risk classifications.

The majority of the site is within an area where there is no risk of groundwater emergence. Infiltration SuDS may therefore be suitable across most of the site. The northern corner of the site is within an area where there is a risk of groundwater flooding to both surface and subsurface assets.

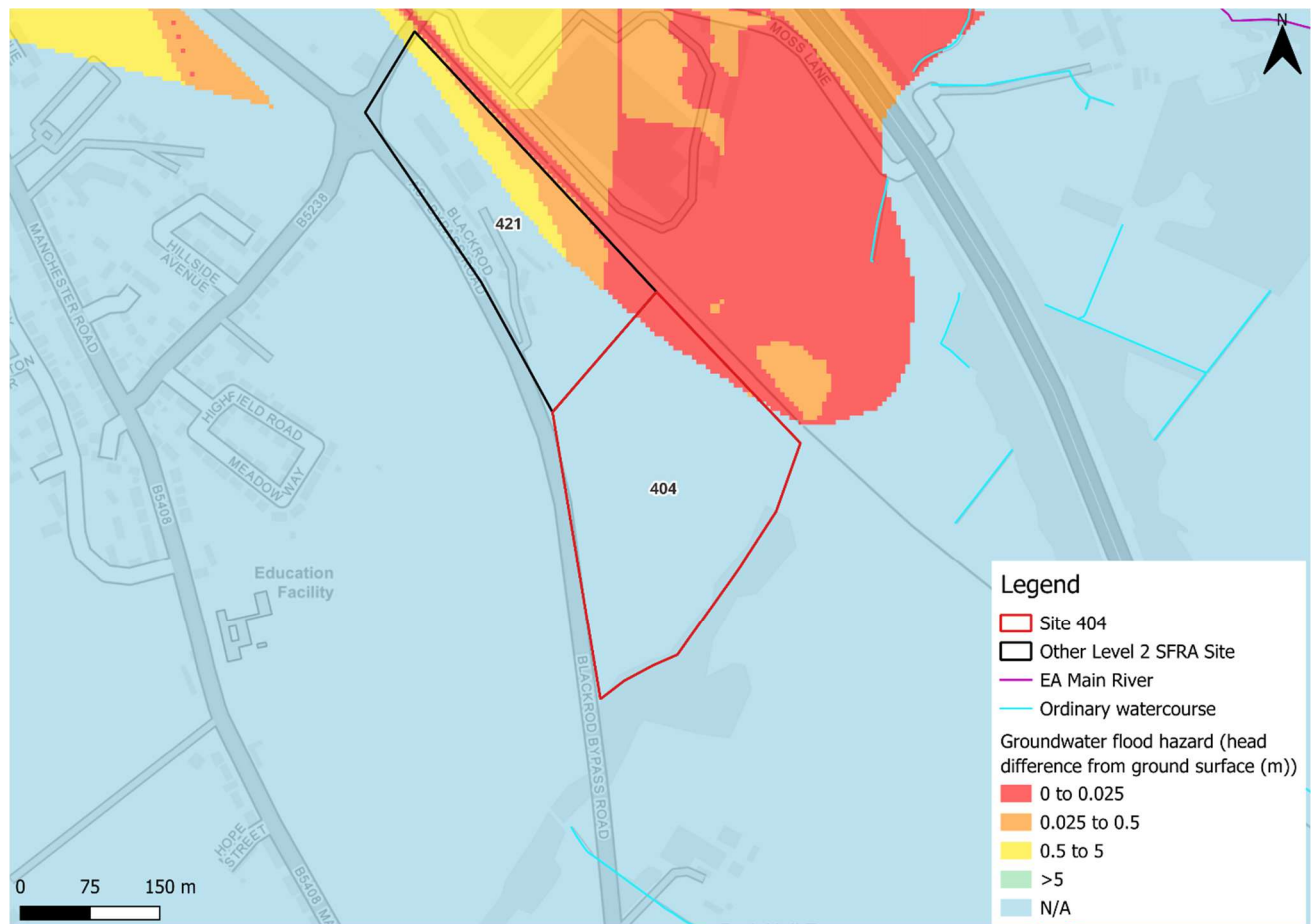


Figure 4-1: JBA 5m Groundwater Emergence Map

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.<br>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. |                                                                                                                                                                                                                                                                                                                                                             |

The underlying bedrock within the site is a combination of mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 4-2). Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, whereas sandstone has a higher permeability. Therefore, it is likely that the bedrock beneath the site will contribute to lower levels of infiltration and lower water tables.

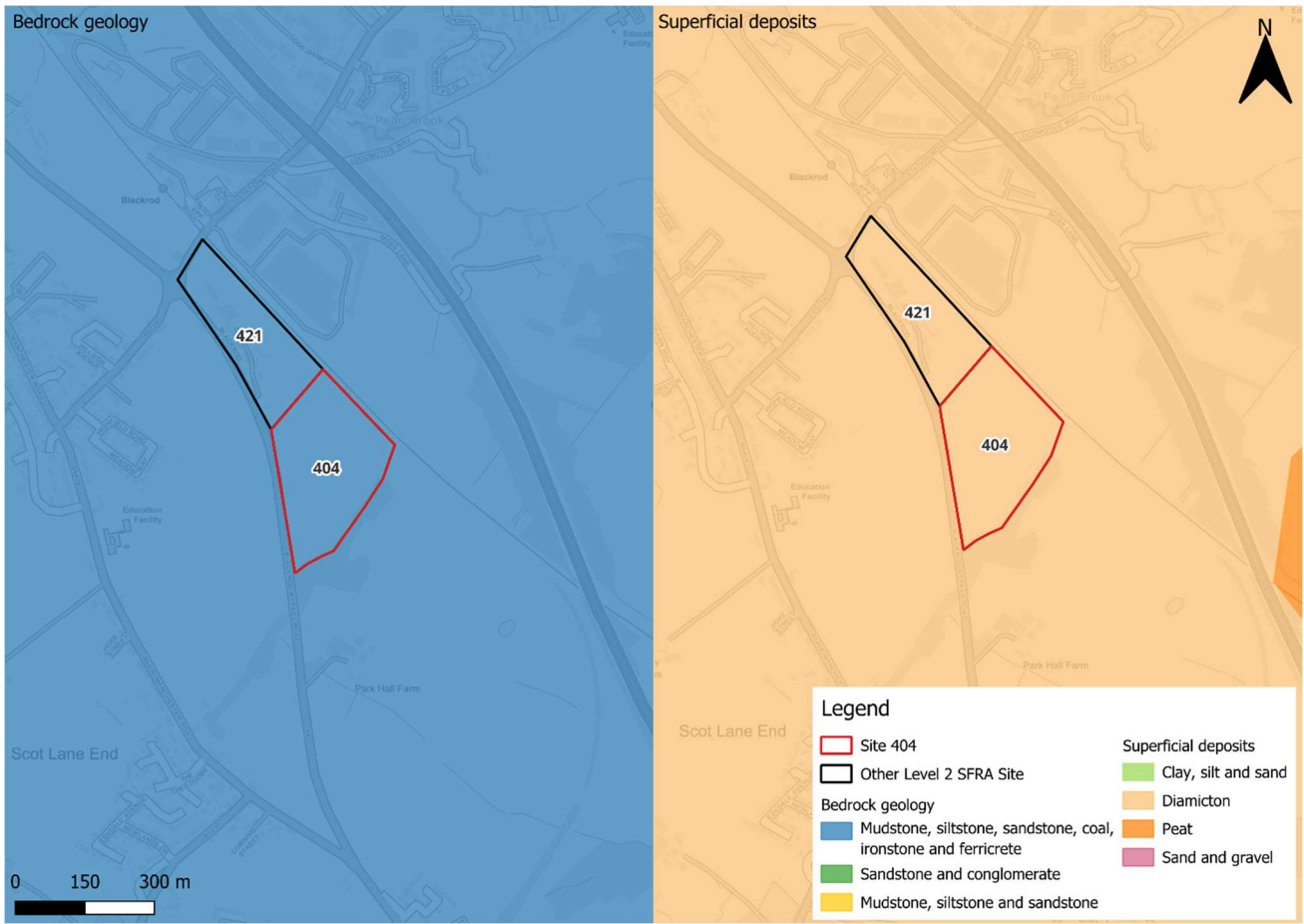


Figure 4-2: BGS Geology - Bedrock and superficial deposits

## 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.

There does not appear to be any residual risk to the site from asset blockage or defence breach.

### 5.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. Figure 5-1 shows the RFM in a 'dry day' and 'wet day' scenario. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is potentially at risk from one reservoir, namely Rivington Lower, which is located within Chorley district. These are both operated by United Utilities.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required from an all-reservoirs panel engineer. The Council should consult the relevant reservoir undertaker to ascertain whether the proposed development could affect the reservoir's risk designation, it's design category or how it is operated. The Council, as category 1 responders, can access more detailed information about reservoir risk and reservoir owners using the [Resilience Direct](#) system.

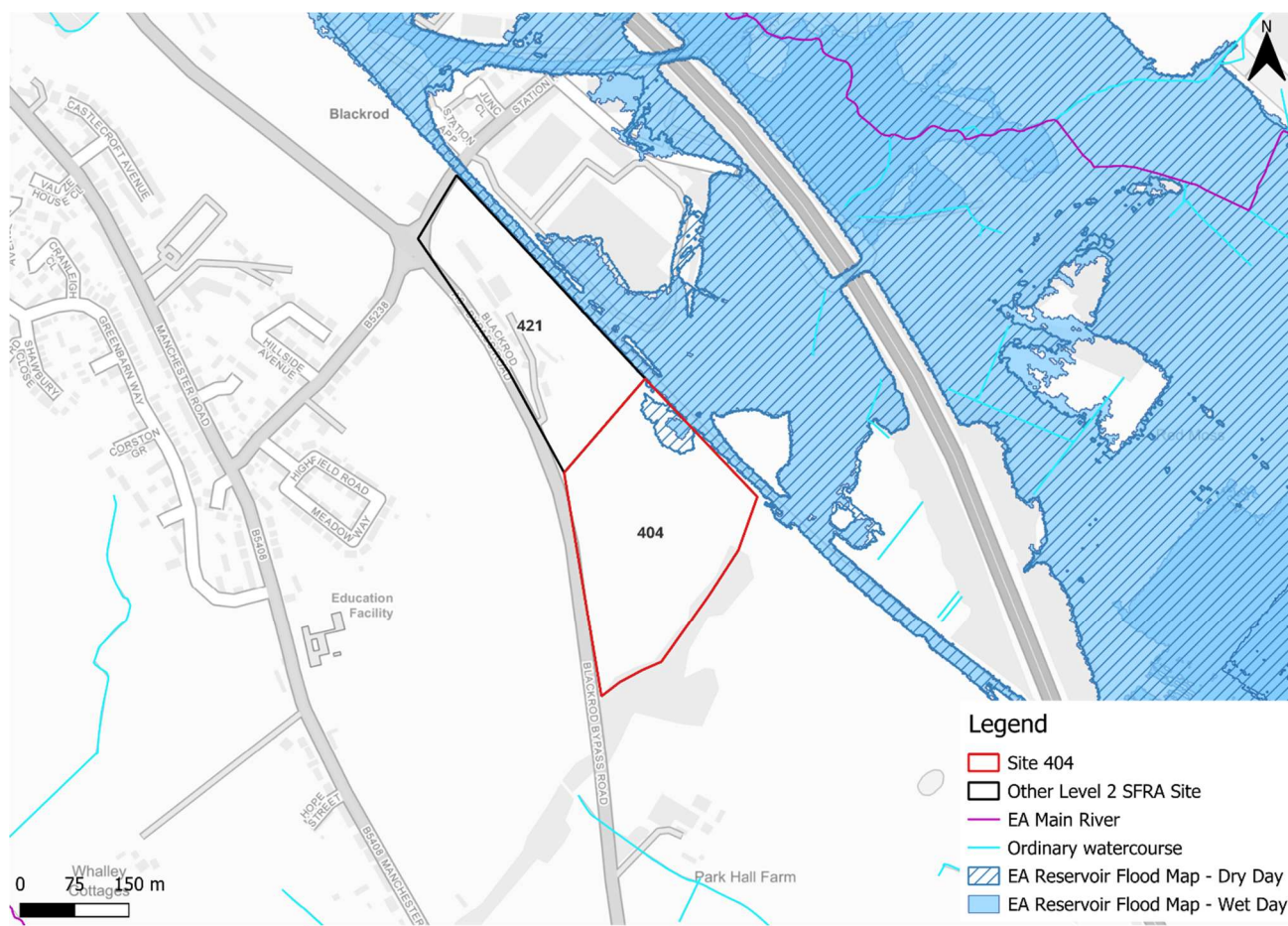


Figure 5-1: Flood risk from reservoirs

## 5.2 Observations, mitigation options and site suitability - residual risk

- The 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).
- The site is at potential residual risk from a breach of Rivington Lower. Given the potential reservoir risk to the site, developers should consider<sup>2</sup>:
  - Consulting with the local resilience forum for advice on emergency planning,
  - Consulting with relevant reservoir owners to understand the impact development may have on their reservoirs, and
  - Using this Level 2 SFRA to understand whether any proposed development will be safe throughout its lifetime.

<sup>2</sup> [Reservoir flood maps: when and how to use them | Environment Agency | 2021](#)

## 6 Overall site assessment

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

This site is not required to pass part b) of the exception test, 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 and 75 years for non-residential development.

### 6.2 Recommendations and site-specific FRA requirements

Based on the evidence presented in the Level 1 SFRA (2026) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- It should be appropriate to develop this site for more vulnerable purposes given its location within Flood Zone 1. The areas within the 3.3% AEP and 1% AEP surface water events, including for climate change, should remain as open greenspace for flood mitigation which would require design.
- A drainage strategy will be required at the planning application stage for any new development. This should demonstrate that there will be no increase in surface water flood risk offsite as a result of new development.
- United Utilities should be consulted to understand whether the proposed development would impact the risk designation of Rivington Lower reservoir.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the Bolton Local Plan, and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; United Utilities; the highways authorities; and the emergency services.

## 7 Licencing

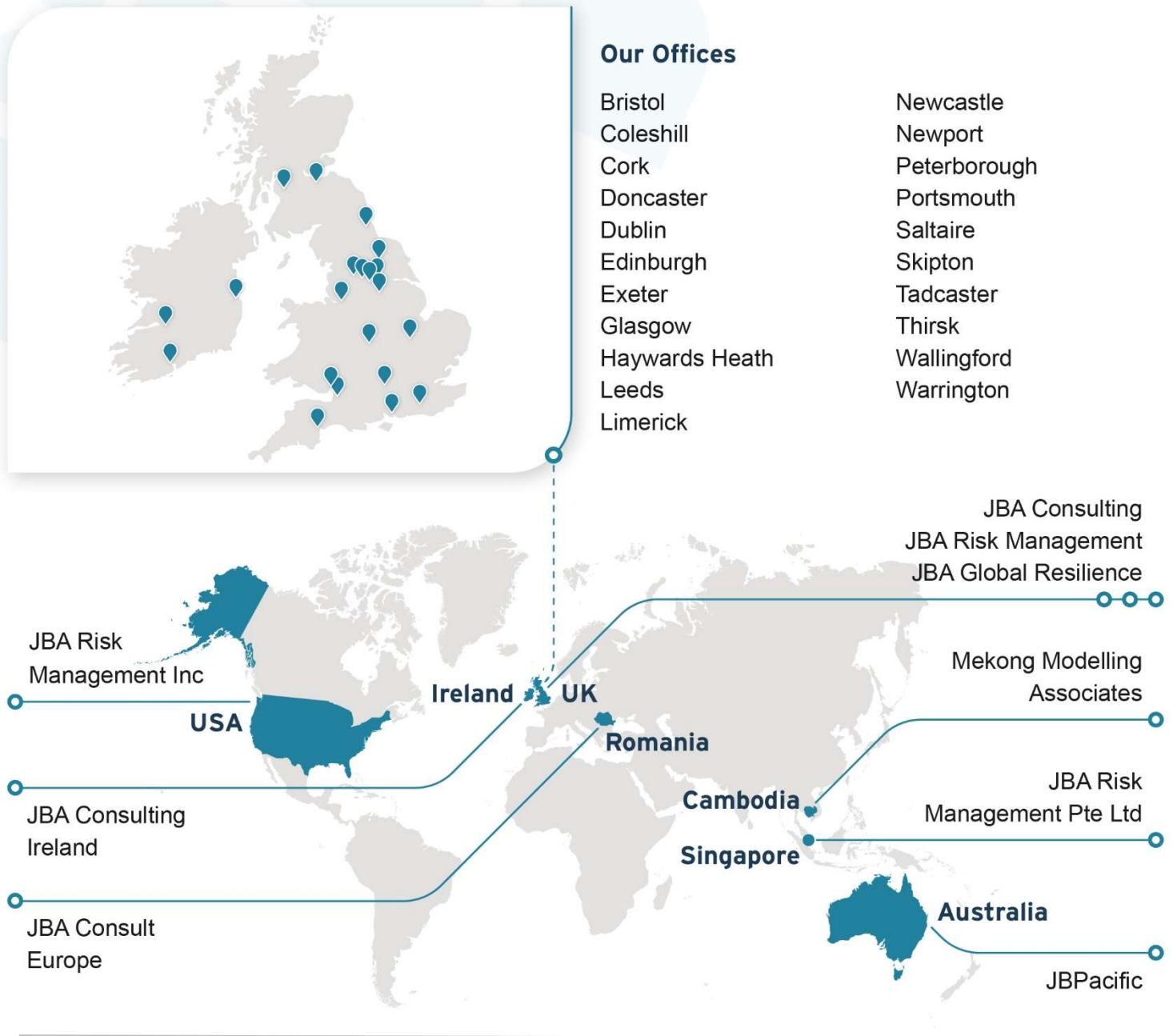
To cover all figures within this report:

- Contains Environment Agency information © Environment Agency and/or database right [2026]
- Contains public sector information licensed under the Open Government Licence v3.0. © Crown copyright and database rights [2026]
- Bolton Council Ordnance Survey licence number: AC 0000850551 [2026]

### Our Offices

Bristol  
Coleshill  
Cork  
Doncaster  
Dublin  
Edinburgh  
Exeter  
Glasgow  
Haywards Heath  
Leeds  
Limerick

Newcastle  
Newport  
Peterborough  
Portsmouth  
Saltaire  
Skipton  
Tadcaster  
Thirsk  
Wallingford  
Warrington



### Registered Office

1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0) 1756 799919  
[info@jbaconsulting.com](mailto:info@jbaconsulting.com)  
[www.jbaconsulting.com](http://www.jbaconsulting.com)

Follow us on  

Jeremy Benn  
Associates Limited  
Registered in  
England  
3246693

JBA Group Ltd is  
certified to  
ISO 9001:2015  
ISO 14001:2015  
ISO 27001:2022  
ISO 45001:2018





# **Bolton Level 2 Strategic Flood Risk Assessment Site Summaries 380-410**

**Site 407**

## **Final Report**

Prepared for  
Bolton Council

Date  
September 2026

## Document Status

|               |                                                              |
|---------------|--------------------------------------------------------------|
| Issue date    | 15 September 2026                                            |
| BIM reference | RLW-JBA-XX-XX-RP-EN-0014                                     |
| Revision      | P03                                                          |
| Prepared by   | Laura Thompson-Jones BSc FRGS<br>Senior Analyst              |
| Reviewed by   | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Project Director  |

---

## Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

---

## Accessibility

JBA aims to align with [governmental guidelines on accessible documents](#) and [WCAG 2.2 AA](#) standards, so that most people can read this document without having to employ special adaptation measures. This document is also optimised for use with assistive technology, such as screen reading software.

# Contract

|                     |                                                                 |
|---------------------|-----------------------------------------------------------------|
| JBA Project Manager | Laura Thompson-Jones                                            |
| Address             | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code    | 2025s1871                                                       |

This report describes work commissioned by Bolton Council by an instruction dated 18 June 2026. The Client's representative for the contract was Sara Dilmamode of Bolton Council. Laura Thompson-Jones of JBA Consulting carried out this work.

## Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Bolton Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Bolton Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

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

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 June 2026 and 15 September 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.

---

## Acknowledgements

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

---

## Copyright

© Jeremy Benn Associates Limited 2026

---

# Contents

|          |                                                                                                                   |           |
|----------|-------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Background</b>                                                                                                 | <b>1</b>  |
| 1.1      | Site 407                                                                                                          | 1         |
| <b>2</b> | <b>Flood risk from rivers</b>                                                                                     | <b>4</b>  |
| 2.1      | Existing risk                                                                                                     | 4         |
| 2.2      | Impacts from climate change                                                                                       | 5         |
| 2.3      | Historic flood incidents                                                                                          | 6         |
| 2.4      | Flood risk management                                                                                             | 6         |
| 2.5      | Emergency planning                                                                                                | 8         |
| 2.6      | Observations, mitigation options, site suitability, sequential approach to development management - fluvial       | 10        |
| <b>3</b> | <b>Flood risk from surface water</b>                                                                              | <b>12</b> |
| 3.1      | Existing risk                                                                                                     | 12        |
| 3.2      | Impacts from climate change                                                                                       | 15        |
| 3.3      | Sewer flood risk                                                                                                  | 18        |
| 3.4      | Observations, mitigation options, site suitability, sequential approach to development management - surface water | 18        |
| <b>4</b> | <b>Groundwater, geology and SuDS suitability</b>                                                                  | <b>20</b> |
| <b>5</b> | <b>Residual risk</b>                                                                                              | <b>23</b> |
| 5.1      | Potential blockage                                                                                                | 23        |
| 5.2      | Potential breach                                                                                                  | 24        |
| 5.3      | Flood risk from reservoirs                                                                                        | 24        |
| 5.4      | Observations, mitigation options and site suitability - residual risk                                             | 25        |
| <b>6</b> | <b>Overall site assessment</b>                                                                                    | <b>27</b> |
| 6.1      | Can part b) of the exception test be passed?                                                                      | 27        |
| 6.2      | Recommendations and site-specific FRA requirements                                                                | 27        |
| <b>7</b> | <b>Licencing</b>                                                                                                  | <b>28</b> |

## List of Figures

|                                                                                                                                                                                       |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1-1: Existing site location boundary                                                                                                                                           | 2  |
| Figure 1-2: Topography                                                                                                                                                                | 3  |
| Figure 2-1: Existing risk                                                                                                                                                             | 5  |
| Figure 2-2: EA Flood Zones plus Climate Change                                                                                                                                        | 6  |
| Figure 2-3: EA AIMS Spatial Flood Defences                                                                                                                                            | 7  |
| Figure 2-4: Natural Flood Management (NFM) potential mapping                                                                                                                          | 8  |
| Figure 2-5: EA Flood Warnings and Flood Alerts                                                                                                                                        | 9  |
| Figure 2-6: Potential access and escape routes                                                                                                                                        | 10 |
| Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day                                                                                               | 13 |
| Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event                                                                       | 14 |
| Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard                                                            | 15 |
| Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)                                                                          | 16 |
| Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)                                                  | 17 |
| Figure 3-6: 0.1% AEP event surface water flood hazard <sup>1</sup> , as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map) | 18 |
| Figure 4-1: JBA 5m Groundwater Emergence Map                                                                                                                                          | 20 |
| Figure 4-2: BGS Geology - Bedrock and superficial deposits                                                                                                                            | 22 |
| Figure 5-1: Potential blockage location                                                                                                                                               | 23 |
| Figure 5-2: Potential breach location                                                                                                                                                 | 24 |
| Figure 5-3: Flood risk from reservoirs                                                                                                                                                | 25 |

## List of Tables

|                                                                                                                                                                              |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 2-1: Existing flood risk based on percentage area of site at risk                                                                                                      | 4  |
| Table 3-1: Existing surface water flood risk based on percentage area at risk using the<br>Flood Map for Planning - Surface Water Spatial Planning Extent Present Day<br>map | 12 |
| Table 3-2: Peak rainfall intensity allowances for the Irwell management catchment                                                                                            | 16 |
| Table 4-1: Groundwater Hazard Classification                                                                                                                                 | 21 |

# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Local Plan Site 407. The content of this report assumes the reader has already consulted the 'Bolton Level 1 SFRA' (2026) and read the 'Bolton Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site 407

- Location: Valley Leisure Park #1
- Existing site use: Leisure / car park
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area (ha): 3.86
- Watercourse: Belmont Brook (unmodelled)
- Environment Agency (EA) model: N/A
- Summary of requirements from Level 2 SFRA scoping stage:
  - Subject to the Exception Test as more vulnerable development in Flood Zone 3a
  - Assessment of fluvial flood extent (depths, velocities and hazards unable to be assessed as watercourse is unmodelled)
  - Assessment of surface water flood extent, depths and hazards
  - Assessment of all other sources of flood risk
  - Assessment of flood risk management measures and natural flood management

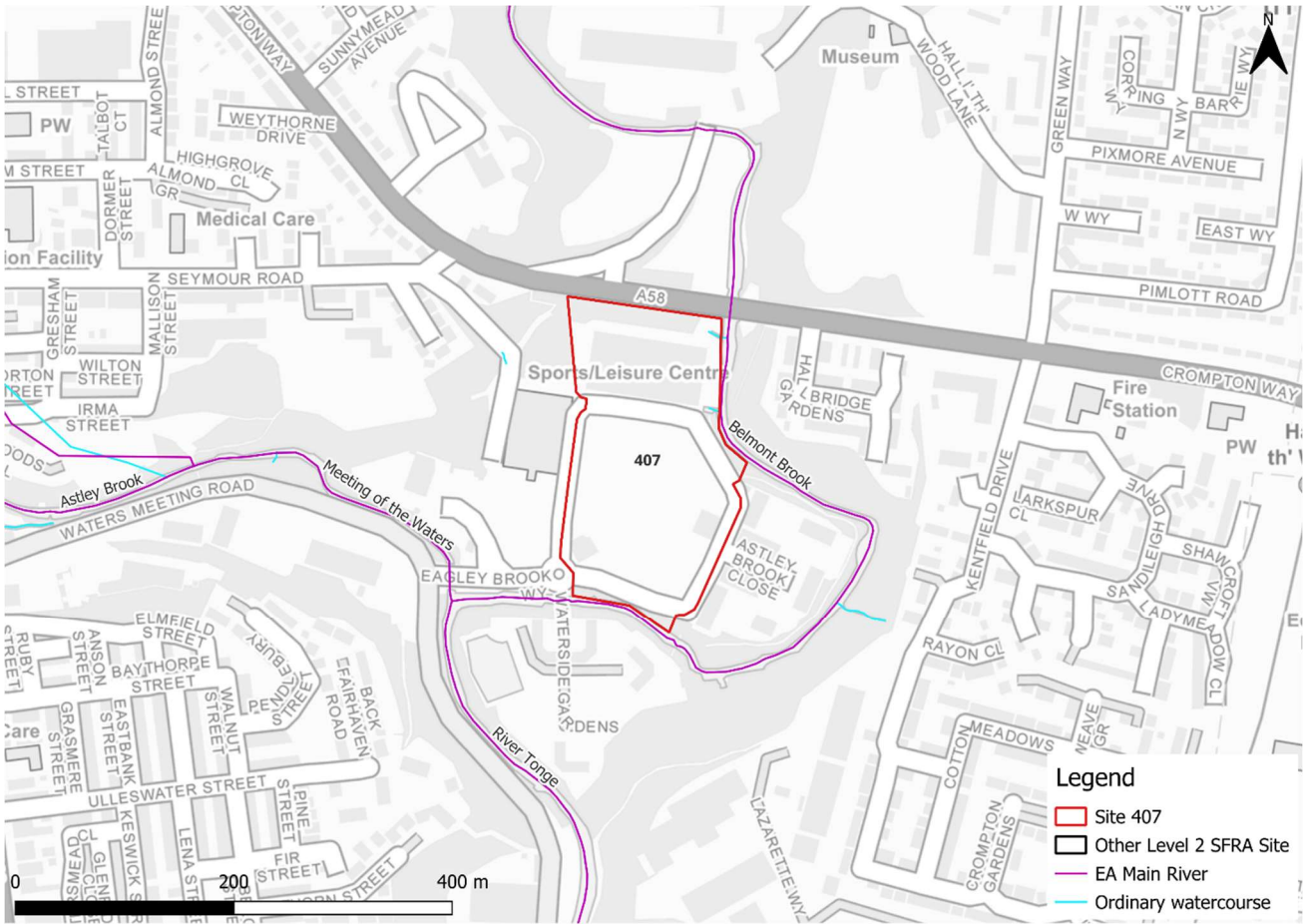


Figure 1-1: Existing site location boundary

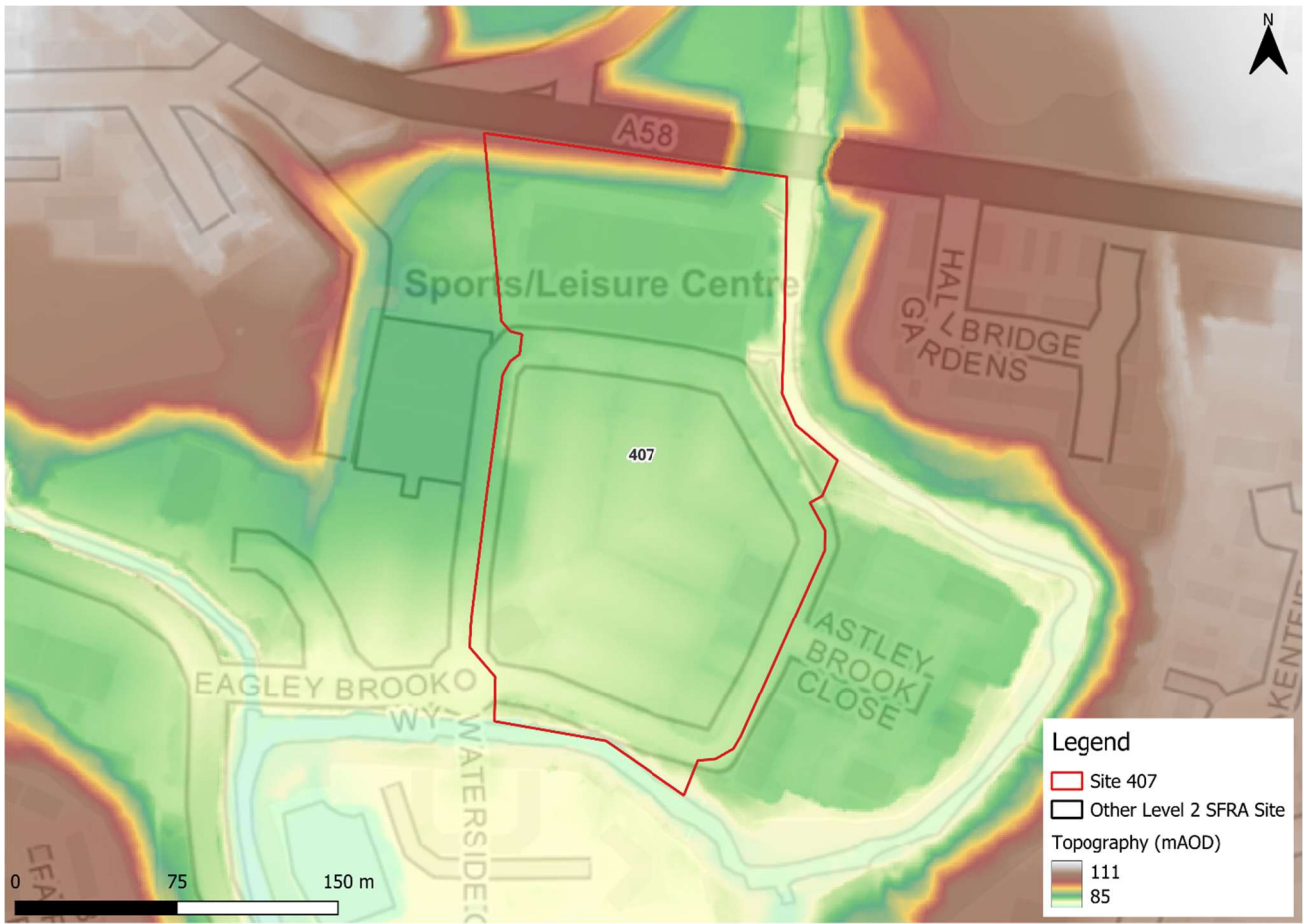


Figure 1-2: Topography

## 2 Flood risk from rivers

### 2.1 Existing risk

#### 2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning (June 2026) and Flood Zone 3b (functional floodplain), as updated through the Bolton Level 1 SFRA, the percentage areas of the site within the flood zones 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 2.4).

Belmont Brook borders the eastern and south boundaries of the site. Within the areas adjacent to Belmont Brook, the site is within the functional floodplain. There should be no development within the functional floodplain. The functional floodplain in this location is based on the EA's New National Model (NNM) dataset 'Rivers and Sea 3.3% defended flood risk extents - present day'.

There is a large area through the centre of the site, covering the existing car park, within Flood Zone 2 and is therefore at medium risk of flooding from rivers. The remaining area of the site is located within Flood Zone 1 and therefore at low risk of flooding from rivers.

There is no detailed model covering the reach of Belmont Brook adjacent to the site. The flood zones of the Flood Map for Planning are based on the NNM. Any site-specific FRA should develop a detailed model of Belmont Brook to assess fluvial flood depths, velocities and hazards.

Table 2-1: Existing 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) |
|-----------------------|-----------------------|------------------------|------------------------|
| 56                    | 38                    | 1                      | 5                      |

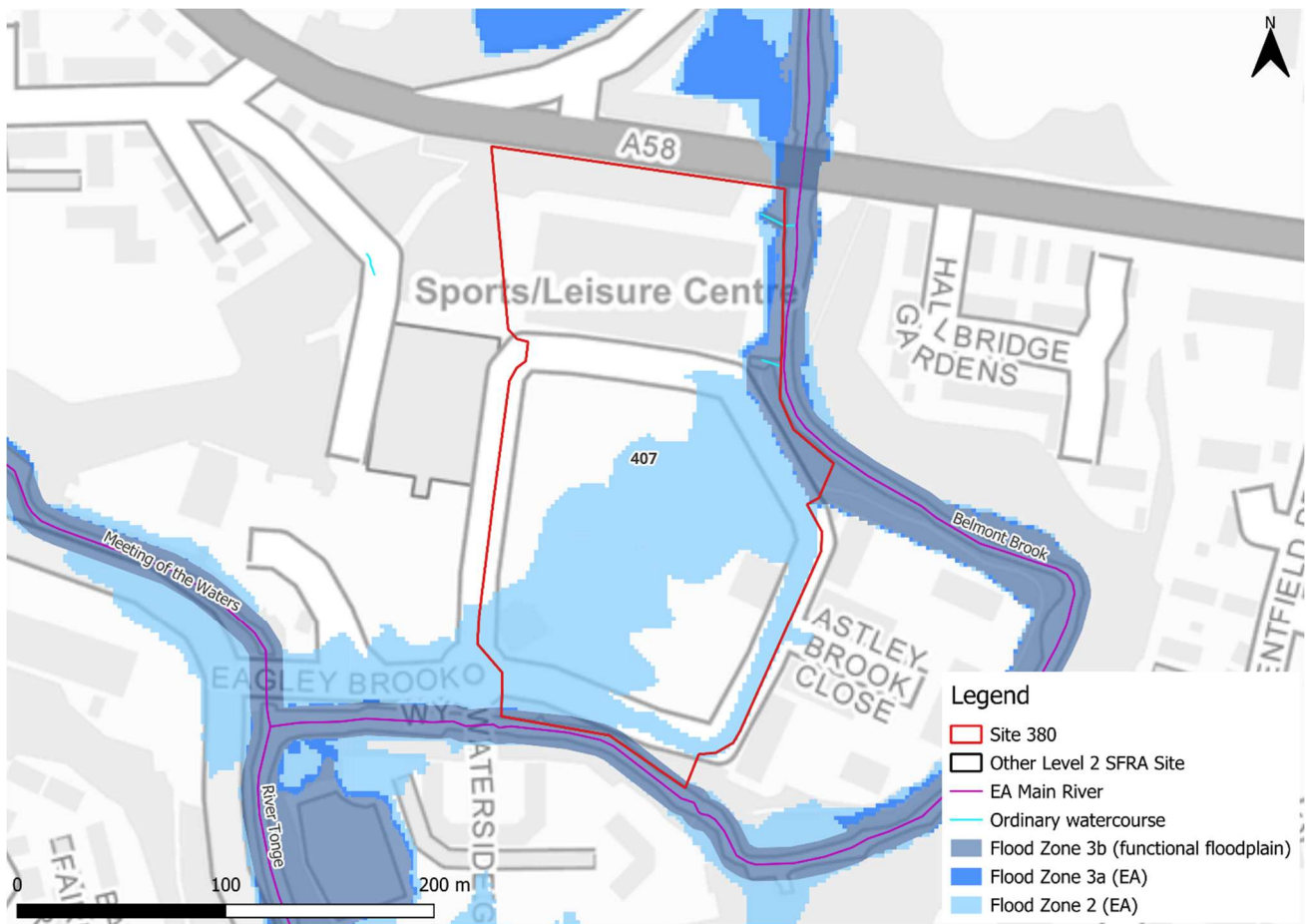


Figure 2-1: Existing risk

## 2.2 Impacts from climate change

### 2.2.1 Flood Map for Planning - climate change

Figure 2-2 shows the EA's Flood Map for Planning - Flood Zones plus Climate Change dataset which includes the central allowance for the 2080s epoch. This dataset represents the impact of climate change on Flood Zone 3a and Flood Zone 2 combined. Fluvial risk to the site is shown to increase significantly when considering climate change, however this would largely be representing the extreme event of Flood Zone 2 plus climate change event.

Any site-specific FRA should develop a detailed model of Belmont Brook to assess fluvial flood depths, velocities and hazards when accounting for climate change.

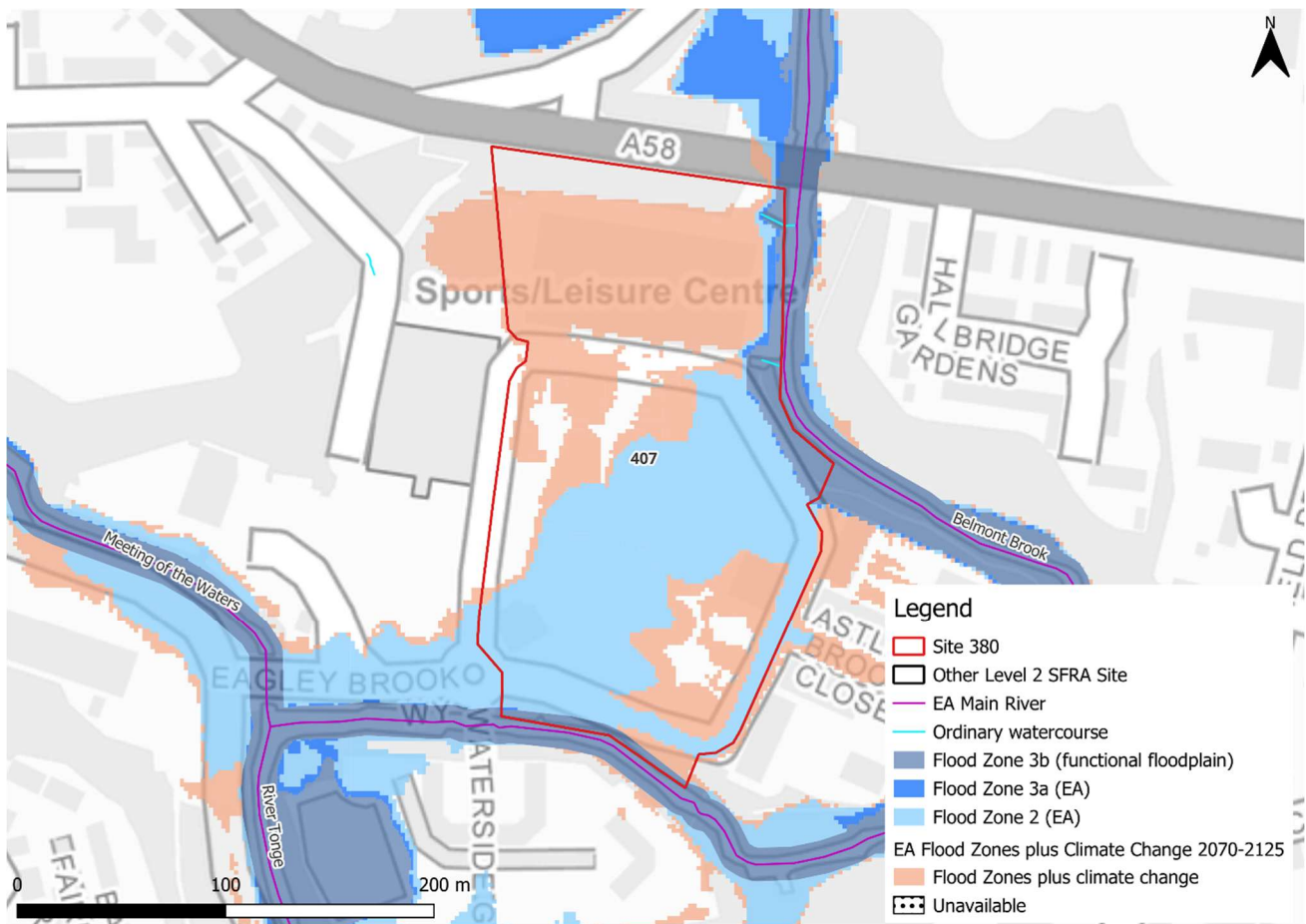


Figure 2-2: EA Flood Zones plus Climate Change

### 2.3 Historic flood incidents

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

The LLFA provided its historic floods register. There have been no recorded historic flood incidents that have occurred within the site or within the Astley Bridge Ward within which the site is located.

### 2.4 Flood risk management

#### 2.4.1 Flood defences

There is a flood defence along the right bank of Belmont Brook, adjacent to the northeastern boundary of the site, as shown in Figure 2-3. However, this does not appear to be raised above the level of the site based on EA LiDAR data (Figure 1-2). The flood defence is an embankment that is owned and maintained by a private individual, company or charity. There is no additional information within the EA AIMS Spatial Flood Defence dataset around the standard of protection or condition of the flood defence. Any site-specific

FRA should undertake a condition survey and an assessment into the current standard of protection of the embankment.

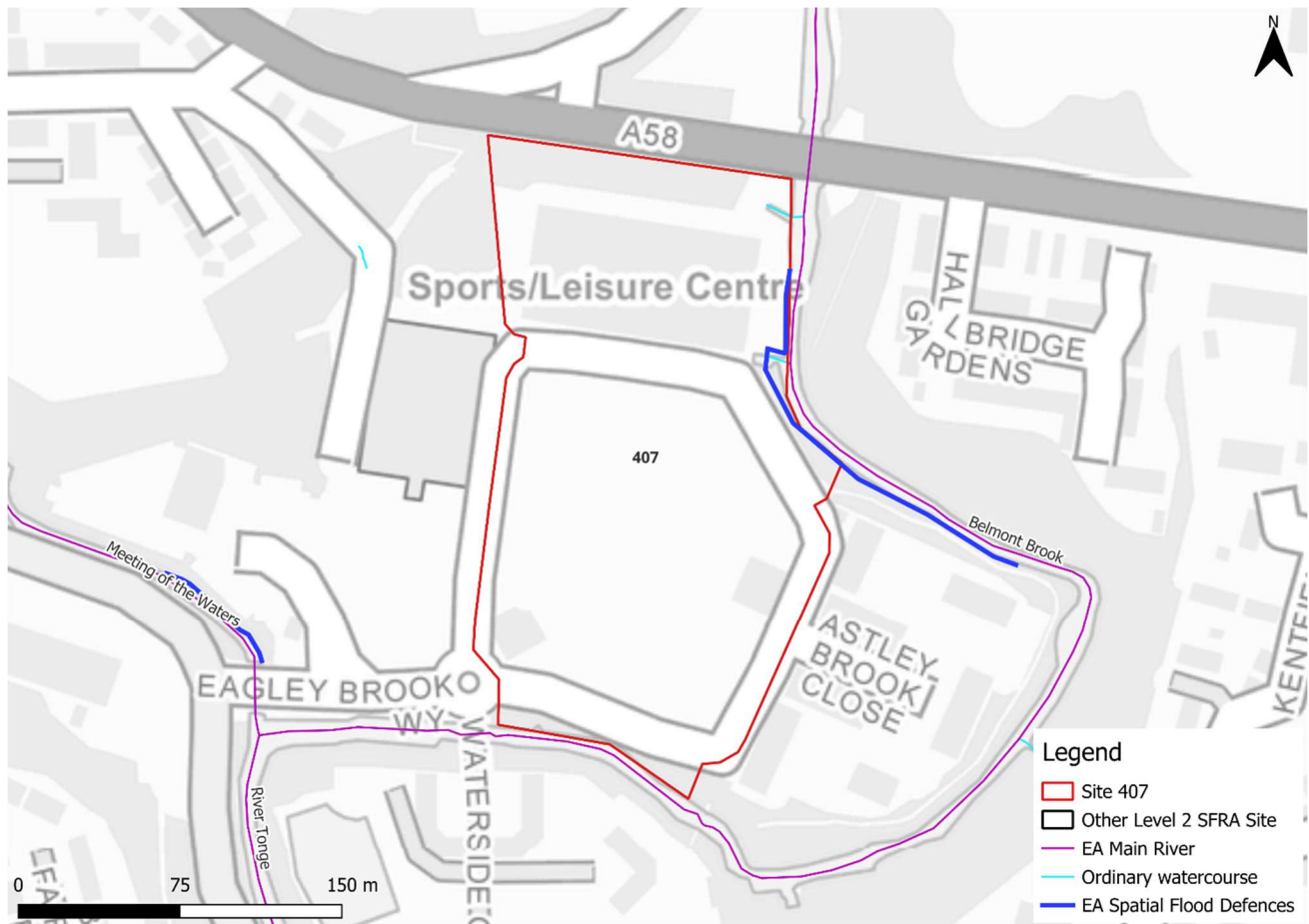


Figure 2-3: EA AIMS Spatial Flood Defences

#### 2.4.2 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 sites and surrounding areas. Within the north of the site, there are opportunities for floodplain reconnection to establish reconnection between a watercourse and its natural floodplain, especially during high flows. This area is shown on Figure 2-4. The WwNP mapping is broadscale and indicative. Further investigation is required for any land shown to have potential for WwNP.

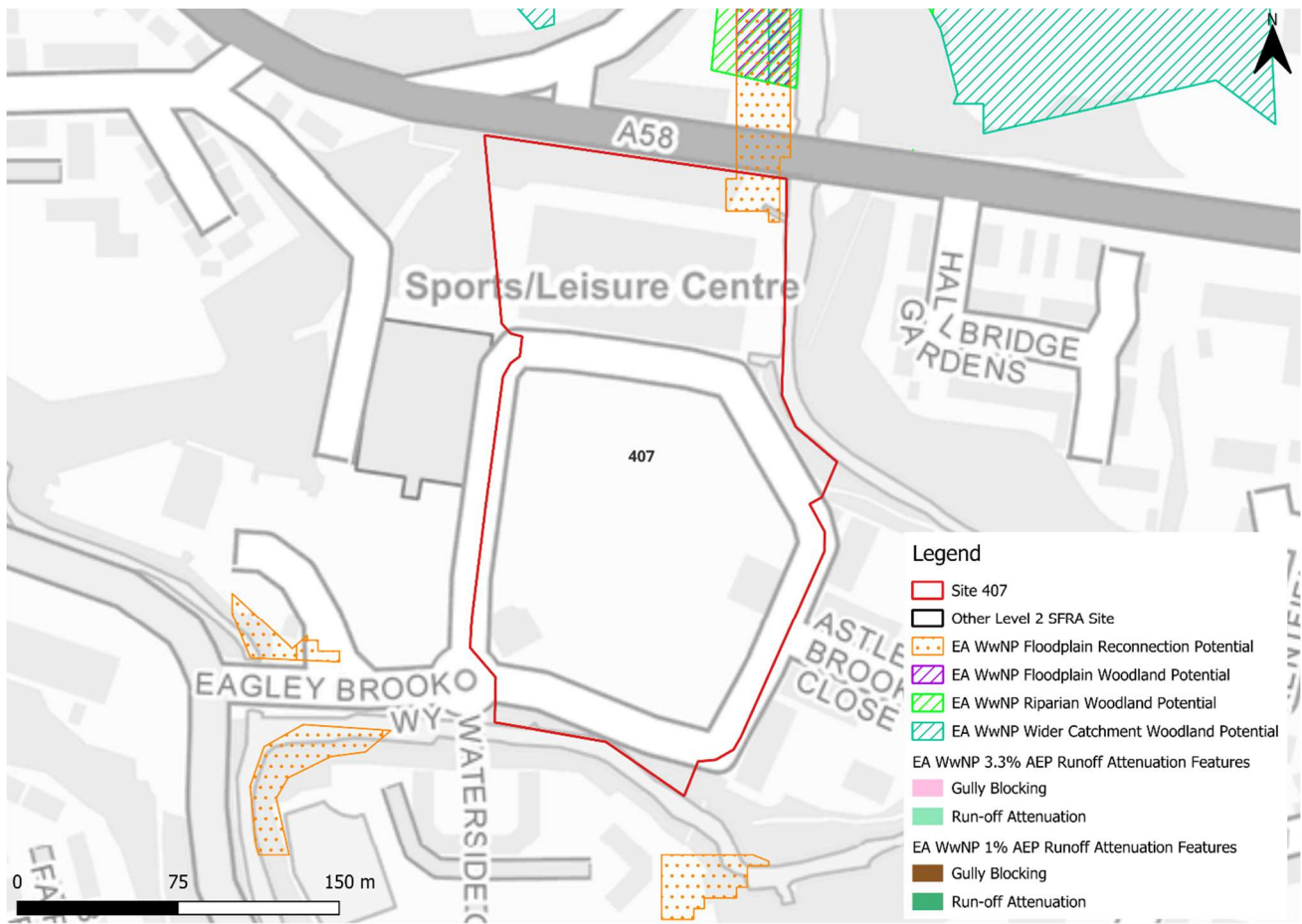


Figure 2-4: Natural Flood Management (NFM) potential mapping

## 2.5 Emergency planning

### 2.5.1 Flood warning

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 majority of the site is located within a FWA, namely the Eagleley Brook and River Tongue at Astley Bridge FWA, as shown in Figure 2-5.

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The majority of the site is also located within a FAA, namely the 013WAFUI - Upper River Irwell catchment with Oldham, Bolton, Rochdale, Haslingden, Ramsbottom and Rawtenstall FAA, as shown in Figure 2-5.

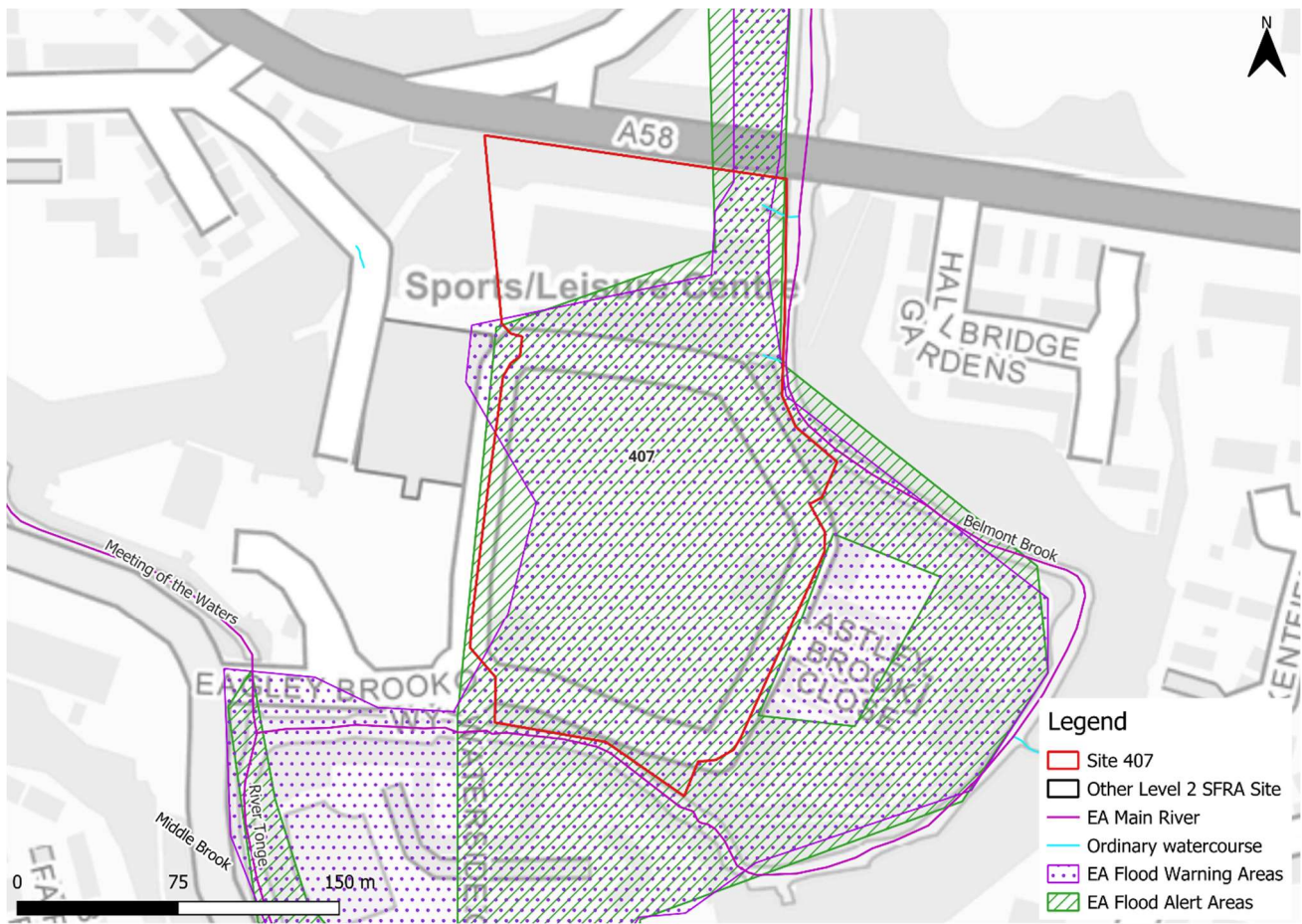


Figure 2-5: EA Flood Warnings and Flood Alerts

### 2.5.2 Access and escape routes

Based on available information on fluvial flooding, the only feasible safe access and escape route to the site is via the A58 to the north, based on present day and future flood risk (Figure 2-6). However, the A58 is raised significantly higher than the level of the site, therefore this may be impractical. All other existing routes are shown to be impacted by fluvial flooding. Safe access and escape routes should be considered further through the site-specific FRA, using detailed flood modelling to assess flood depths, velocities and hazards.

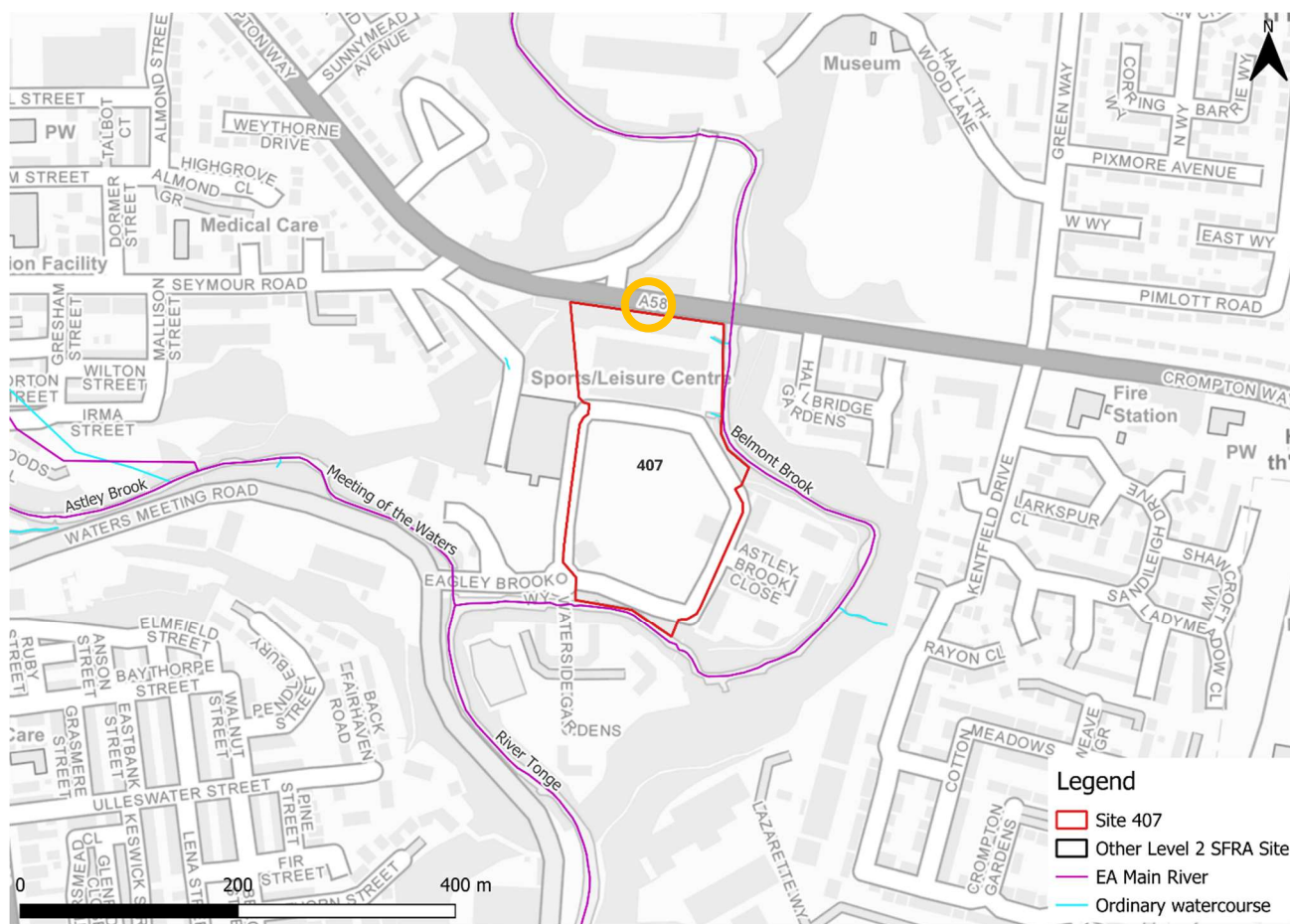


Figure 2-6: Potential access and escape routes

## 2.6 Observations, mitigation options, site suitability, 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 within the functional floodplain along the eastern and southern boundaries of the site, due to risk from Belmont Brook. Development is not permitted within the functional floodplain.
  - Given the site is proposed for more vulnerable uses and partially within Flood Zone 3a the site must be subject to and must pass the exception test.
  - There is a large area of Flood Zone 2 through the centre of the site following the lower topography and there is a significant increase in risk to the site with climate change. However, there is no detailed model covering Belmont Brook.

- Based on current information this site should not be redeveloped for more vulnerable uses.
- Mitigation:
  - Any site-specific FRA should develop a detailed model of Belmont Brook to assess fluvial flood depths, velocities and hazards, particularly for the extreme event, also including for climate change.
  - Were development to be considered, areas adjacent to Belmont Brook should be included in green / blue corridors in site design offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.
  - If works are proposed on or near Belmont Brook, a separate permission may be required. The type of permission needed from the EA will depend on the activity and location proposed.
  - If the development of the site involves any activity within 8m of Belmont Brook, a flood risk activity permit may be required in addition to planning permission.
  - Within the areas of Flood Zone 2, there may be opportunities for less vulnerable uses, such as the existing car park, shops, or businesses to be situated on the ground floor with more vulnerable uses situated on the upper floors. However, safe access and escape routes must still be achievable. Detailed modelling must inform this and flood depths must be manageable without causing risk elsewhere.
- Access and escape:
  - Safe access and escape routes would likely be challenging to achieve at this site.
  - Safe access and escape routes should be considered further through the site-specific FRA, using detailed flood modelling to assess flood depths, velocities and hazards.

## 3 Flood risk from surface water

### 3.1 Existing risk

#### 3.1.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Present Day

Based on the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Extents Present Day map (June 2026), the majority of the site is situated outside of the 0.1% AEP surface water flood extent (Table 3-1). There are some areas of ponding within topographic low spots in the south of the site. There is a significant area of ponding within the north of the site, which coincides with the fluvial climate change extent (Figure 3-1).

Greatest flood depths within the site in the 1% AEP are shown to be shallow, not exceeding 0.3 m (Figure 3-2). Safe access and escape routes would likely be achievable via the southwest of the site, given surface water flood depths are shallow and are confined to the centre of the roundabout.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map

| Less than 0.1% AEP event (% area) | 0.1% AEP event (% area) | 1% AEP event (% area) | 3.3% AEP event (% area) |
|-----------------------------------|-------------------------|-----------------------|-------------------------|
| 71                                | 19                      | 4                     | 6                       |

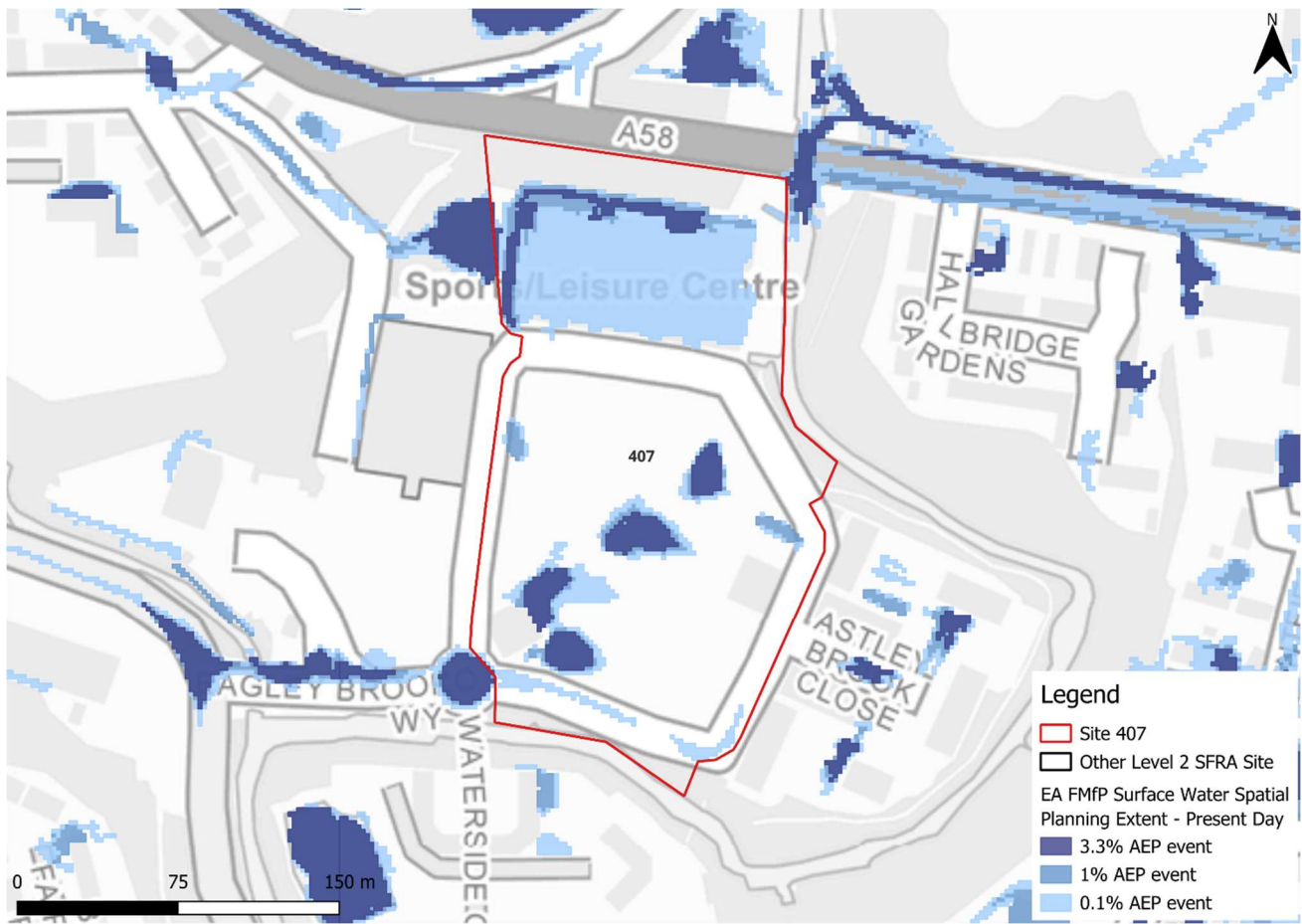


Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day

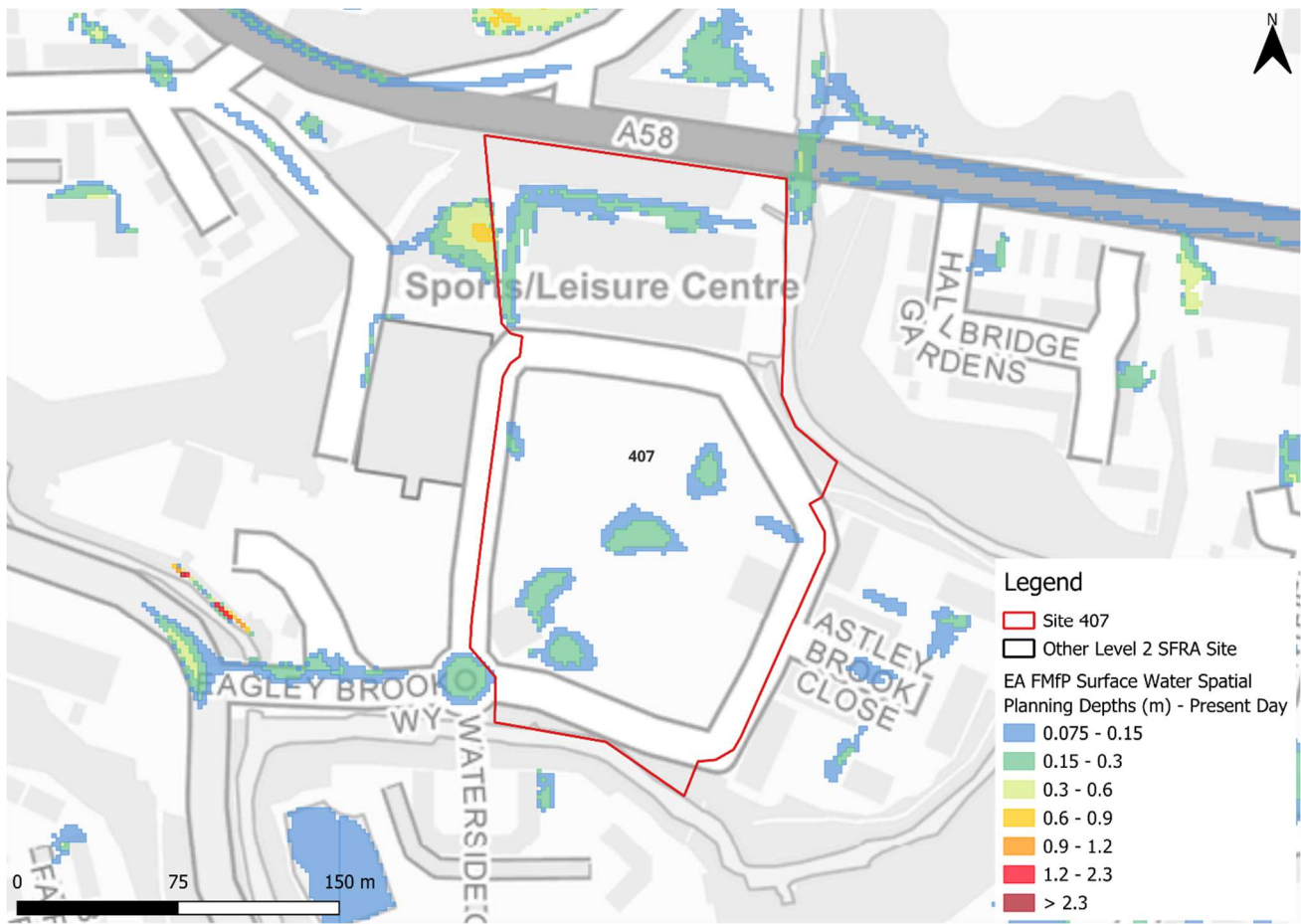


Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event

### 3.1.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning data does not include hazard information suitable for planning purposes.

Therefore, this Level 2 SFRA considers the third generation Risk of Flooding from Surface Water (RoFSW) hazard mapping in addition to the Flood Map for Planning - Surface Water Spatial Planning extents and depths, as the best available information. Updated surface water hazard information would need to be confirmed at the site-specific FRA stage.

Based on the EA's national scale third generation RoFSW map, the greatest flood hazard within the site in the 1% AEP surface water event is categorised as 'significant' adjacent to Belmont Brook (Figure 3-3).

There are some differences between the Flood Map for Planning - Surface Water Spatial Planning map and the third generation RoFSW hazard mapping. The Flood Map for Planning - Surface Water Spatial Planning data 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 Flood Map for Planning and third generation RoFSW maps.

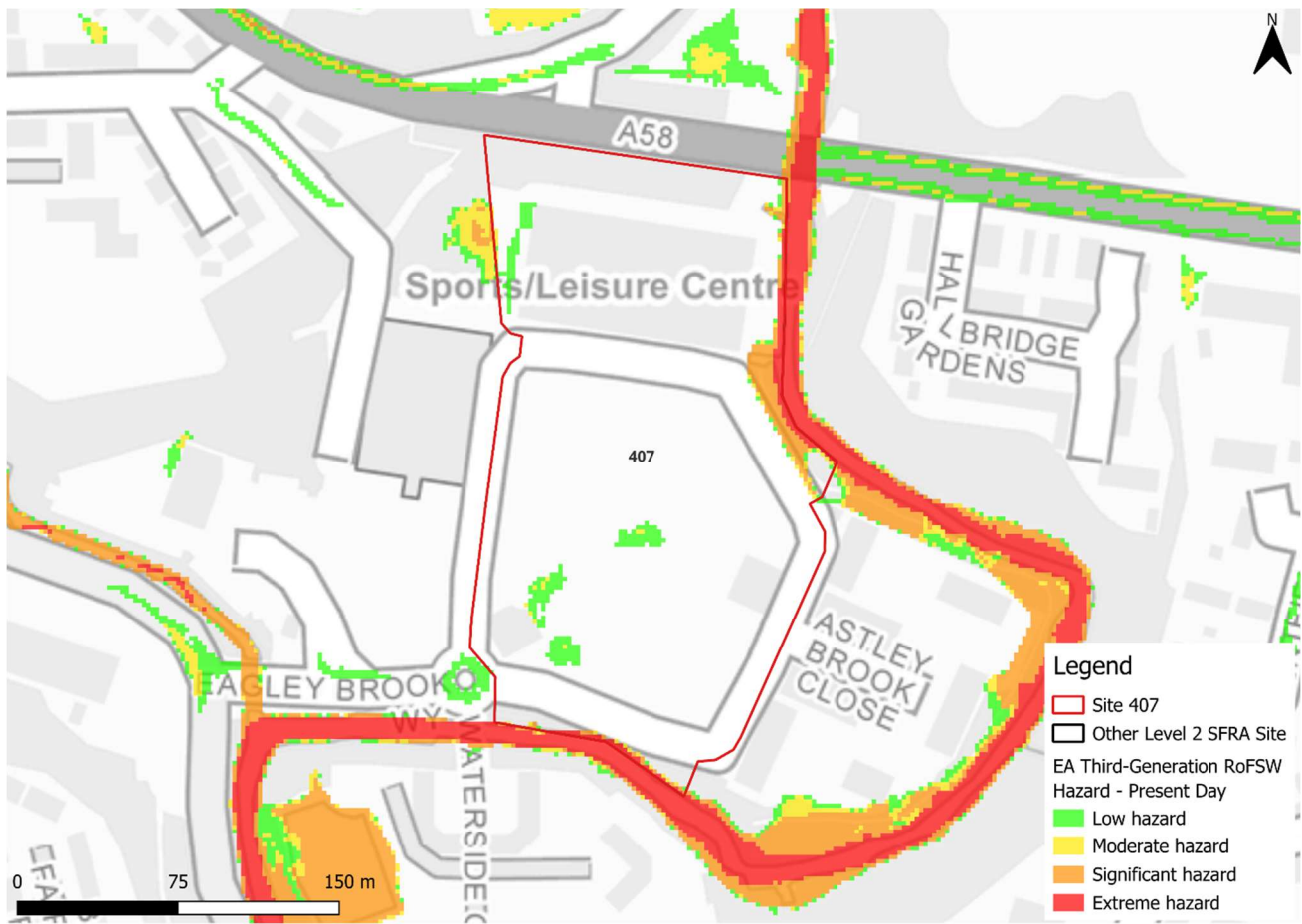


Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard<sup>1</sup>

## 3.2 Impacts from climate change

### 3.2.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Climate Change

The EA's [climate change allowance guidance](#) states that SFRA's should assess the upper end peak rainfall allowance for the 2070s epoch. This dataset is included in the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Climate Change dataset (June 2026). The peak rainfall intensity allowances for the Irwell management catchment are shown in Table 3-2. The allowance for the 0.1% AEP event is not stated in the EA guidance.

<sup>1</sup> 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

Table 3-2: Peak rainfall intensity allowances for the Irwell management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---------------|--------------------------------------|----------------------------------------|
| 3.3% AEP      | 30                                   | 40                                     |
| 1% AEP        | 30                                   | 45                                     |

Figure 3-4 shows the surface water flood extents for the 2070s upper end climate change scenario. Surface water risk increases across the site when considering climate change, particularly within the north in the 1% AEP event. The areas of ponding within the southern half of the site are shown to increase in extent.

The greatest flood depths onsite in the 1% AEP event are between 0.3 and 0.6 m within an area of ponding in the centre of the site (Figure 3-5). Safe access and escape routes would likely be achievable via the southwest of the site given the shallow modelled depths along this route.

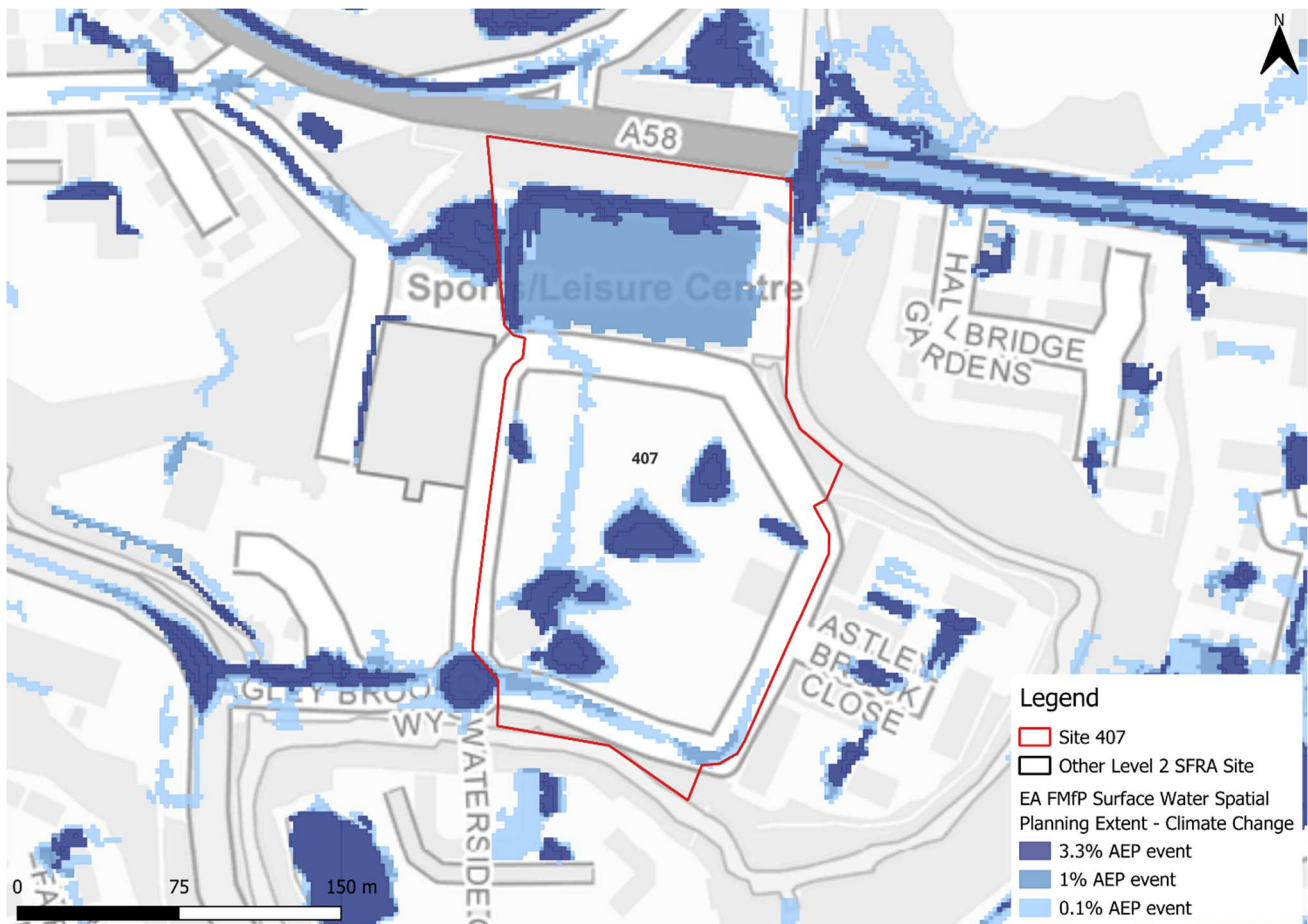


Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)



Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)

### 3.2.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning climate change data does not include hazard information suitable for planning purposes. This Level 2 SFRA therefore considers the 0.1% AEP surface water event as a conservative proxy for the 1% AEP event plus climate change, as the best available information to assess surface water flood hazards. The impact of climate change on surface water flood hazards should be considered at the site-specific FRA stage.

Using the RoFSW 0.1% AEP event as a proxy, future surface water flood hazard in the RoFSW 1% AEP event is categorised as 'significant' through the centre and south of the site, with some areas of 'extreme' hazard adjacent to Belmont Brook (Figure 3-6).

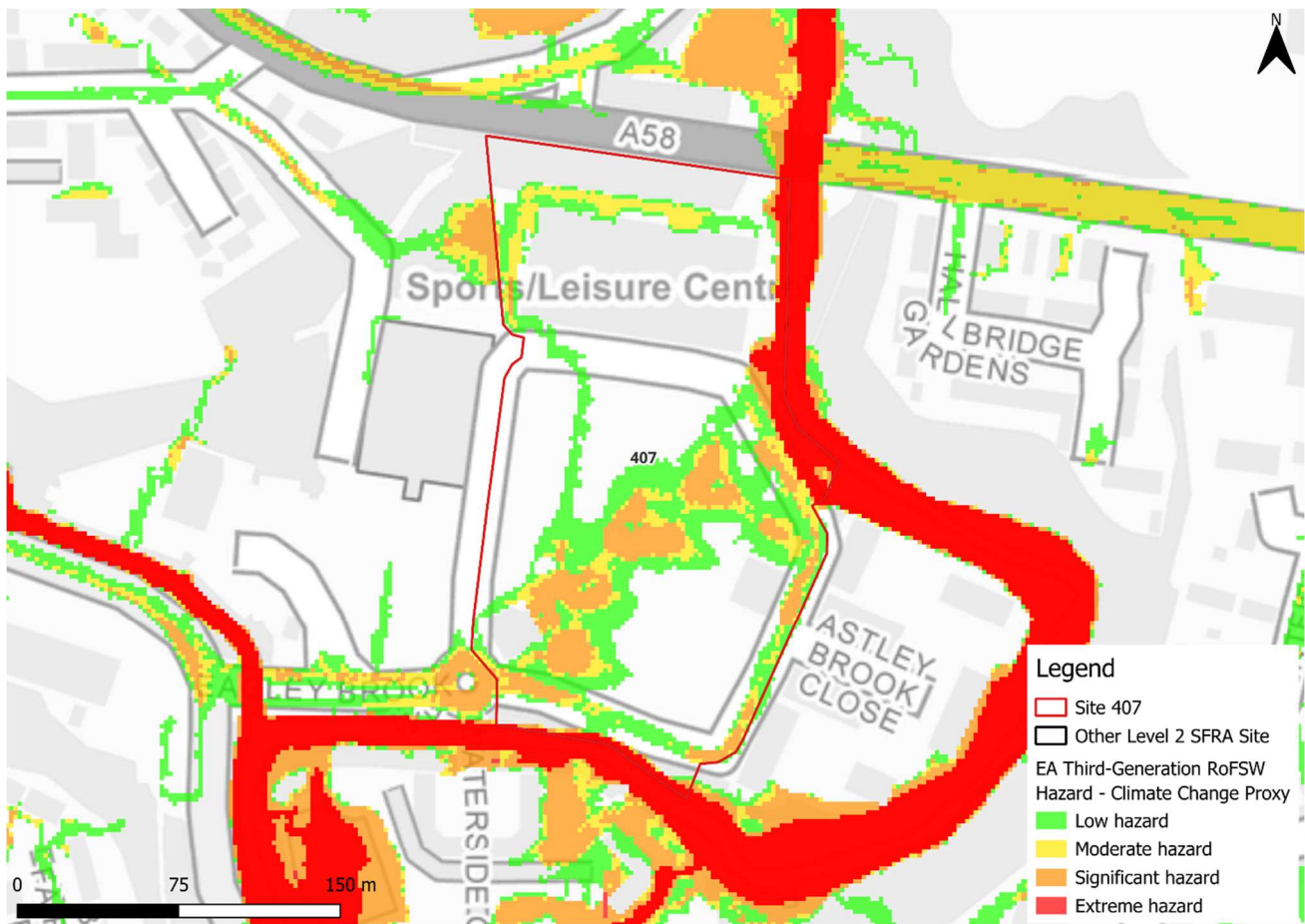


Figure 3-6: 0.1% AEP event surface water flood hazard<sup>1</sup>, as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map)

### 3.3 Sewer flood risk

United Utilities provided their historic risk registers which were aggregated by ward. There are no recorded sewer flooding incidents within the immediate vicinity of the site. There are six recorded historic incidents that have occurred within the Astley Bridge Ward.

### 3.4 Observations, mitigation options, site suitability, sequential approach to development management - surface water

- The majority of the site is situated outside of the 0.1% AEP surface water flood extent, however there are areas of significant surface water ponding within north of the site. Surface water risk appears to be constrained by the existing development present onsite. It is likely the surface water ponding within the north of the site would continue to flow towards the south once the site is cleared, unless the land is regraded.
- There are also a number of areas of ponding within the southern half of the site.
- Risk to the site is shown to increase in extent across the site when considering the impact of climate change, with a particularly greater extent of surface water flooding within the 1% AEP event in the north of the site.

- Any drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Existing brownfield runoff rates or betterment should apply. The developer should consult the LLFA and follow local and 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 employment development or whether further capacity will be required.
- Safe access and escape routes would likely be achievable via the southwest of the site in a surface water flood event.

## 4 Groundwater, geology and SuDS suitability

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. Figure 4-1 shows the map covering the sites and the surrounding areas. Table 5-1 explains the risk classifications.

The majority of the site is located within an area where there is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.

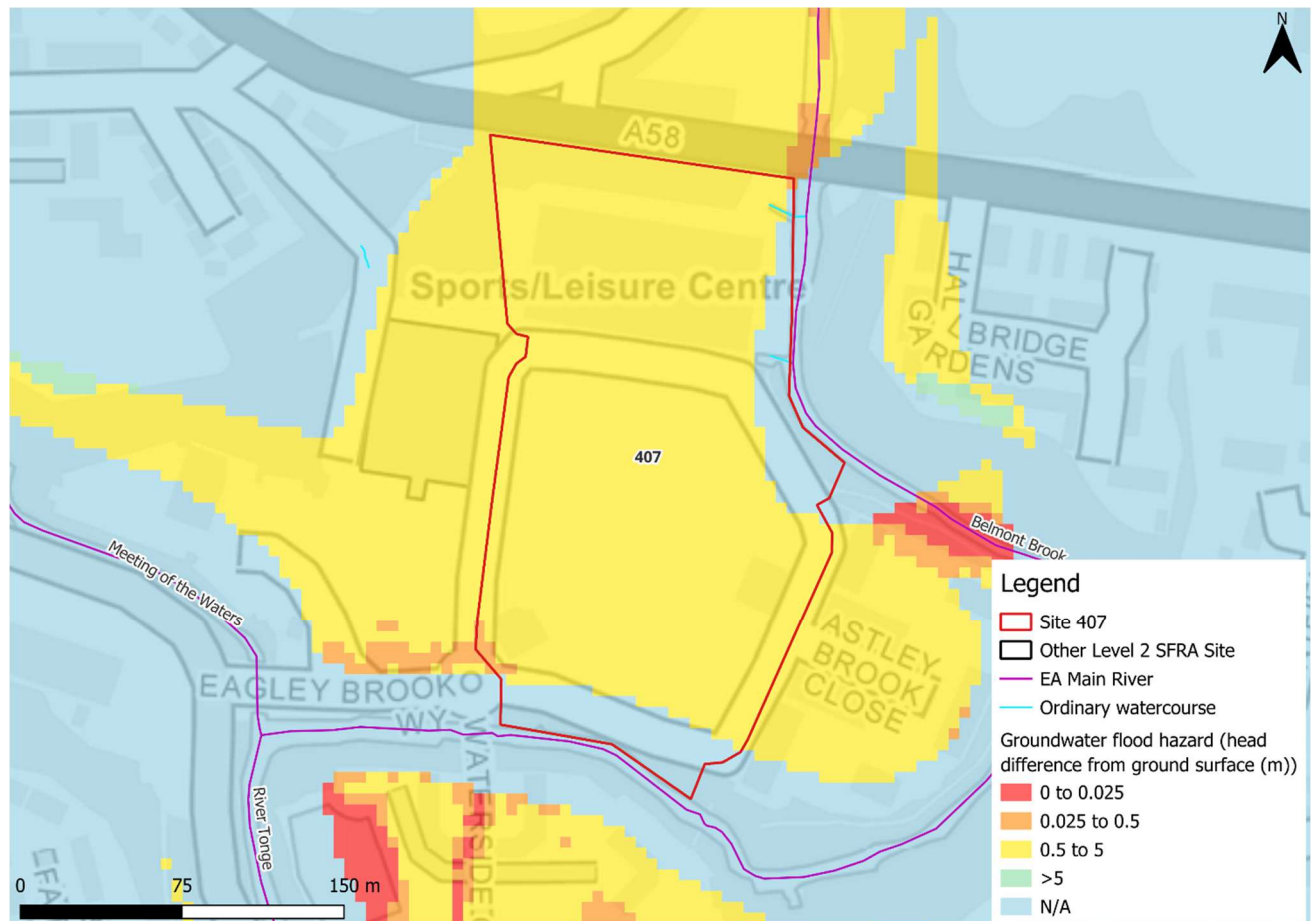


Figure 4-1: JBA 5m Groundwater Emergence Map

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.<br>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. |                                                                                                                                                                                                                                                                                                                                                             |

The underlying bedrock within the site is a combination of mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 4-2). Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, whereas sandstone has a higher permeability. Therefore, it is likely that the bedrock beneath the site will contribute to lower levels of infiltration and lower water tables.



Figure 4-2: BGS Geology - Bedrock and superficial deposits

## 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 comes from the potential blockage or structural failure of the culvert beneath Waterside Gardens to the southwest of the site.

### 5.1 Potential blockage

A blockage or failure of the structure beneath Waterside Gardens may cause water in the channel to back up and cause flooding to the site, depending on the severity of the blockage and magnitude of the flood event. Culvert course, capacity and condition surveys may be required, including for consultation with the culvert owner.

Figure 5-1 indicates the location of the culvert beneath Waterside Gardens. The potential residual risk to the site following a blockage of this asset should be assessed through the site-specific FRA.

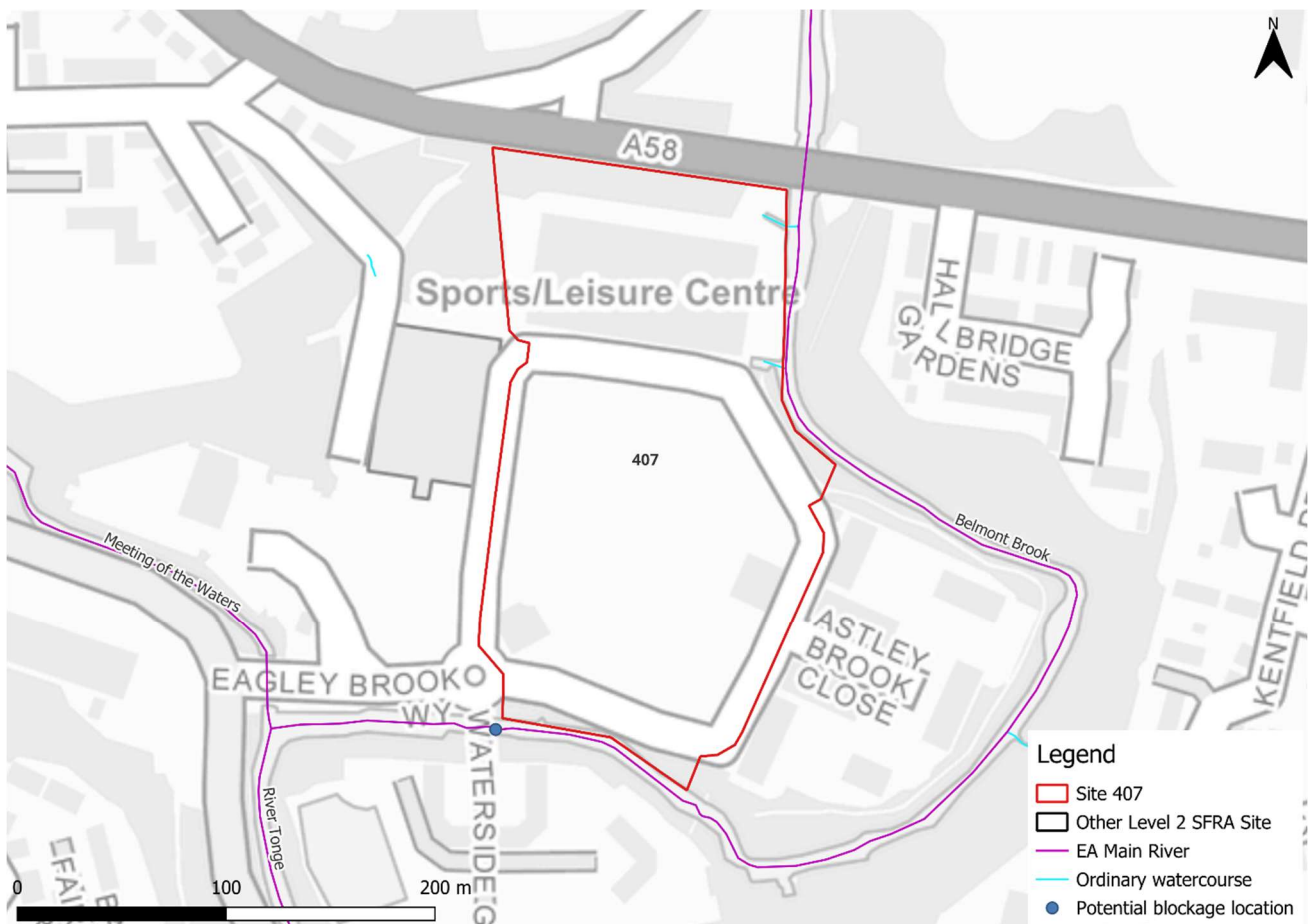


Figure 5-1: Potential blockage location

## 5.2 Potential breach

The site is also at potential residual risk from a breach of the Belmont Brook embankment adjacent to the eastern boundary of the site (Figure 5-2). A private individual, company or charity owns and maintains this defence. The owner of the defence should advise on funding and maintenance arrangements for these defences into the future. Consultation with the EA will also be required on whether this site is suitable for development.

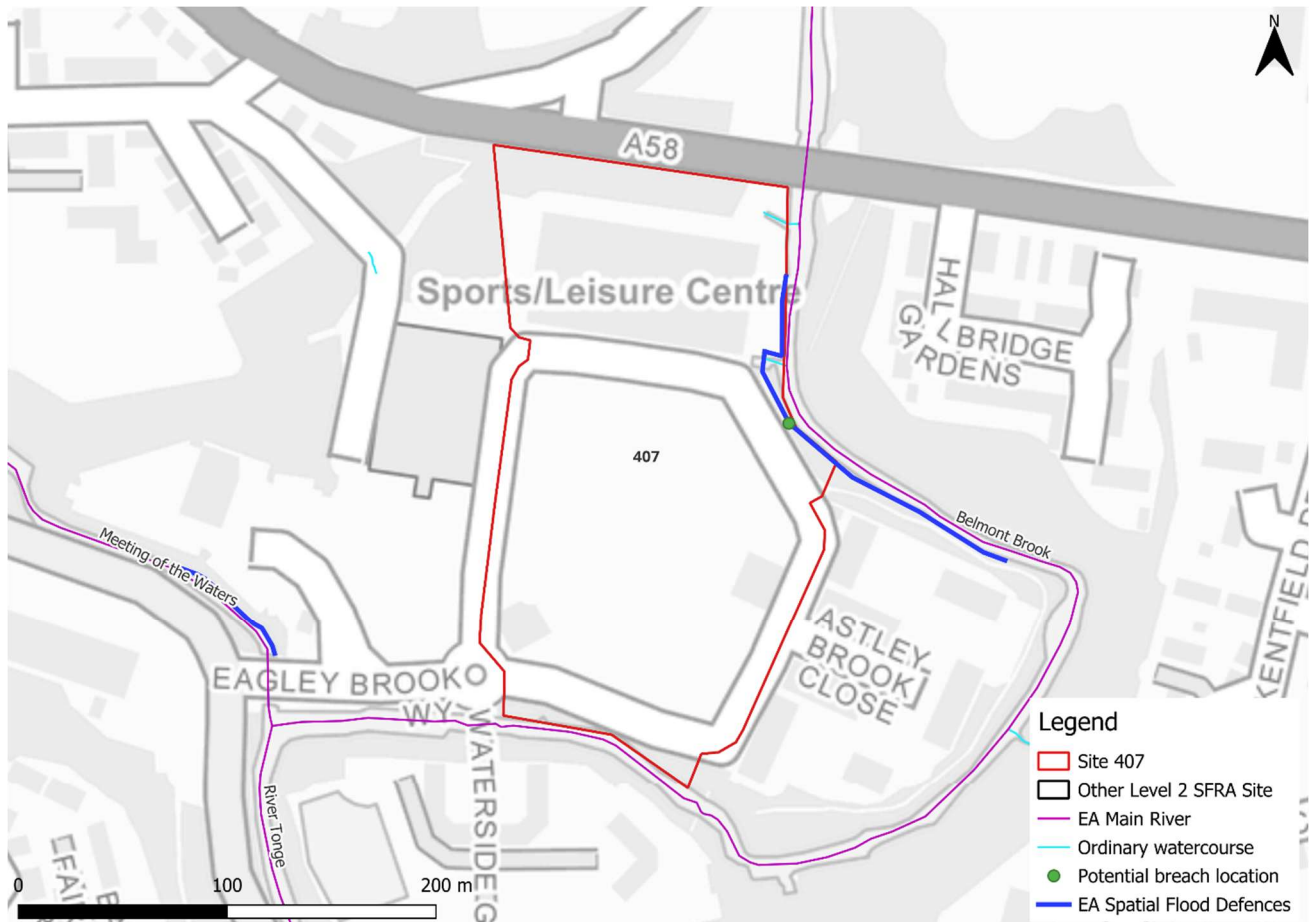


Figure 5-2: Potential breach location

## 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. Figure 5-3 shows the RFM in a 'dry day' and 'wet day' scenario. A 'dry day' scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A 'wet day' scenario assumes a worst-case scenario where a reservoir releases water held on a 'wet day' when local rivers have already overflowed their banks.

The site is potentially at risk from five reservoirs, all of which are located within Blackburn with Darwen authority area. Four of these are operated by United Utilities, with the other being operated by Blue Lagoon Heritage Ltd.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required from an all-reservoirs panel engineer. The Council should consult the relevant reservoir undertaker to ascertain whether the proposed development could affect the reservoir's risk designation, its design category or how it is operated. The Council, as category 1 responders, can access more detailed information about reservoir risk and reservoir owners using the [Resilience Direct](#) system.



Figure 5-3: Flood risk from reservoirs

#### 5.4 Observations, mitigation options and site suitability - residual risk

- The site is at potential residual risk from a blockage of the culvert beneath the Waterside Gardens to the southwest of the site. The site-specific FRA should consider modelling a blockage scenario to understand whether there would be any additional risk to the site.
- The site is also at potential residual risk from a breach of the Belmont Brook embankment adjacent to the eastern boundary of the site. The site-specific FRA should consider modelling a breach scenario to understand the additional risk posed to the site.

- Areas adjacent to culverts and bridges and located behind flood defences are at particular risk from the rapid onset of fast flowing and deep flooding, with little or no warning if structures become blocked or defences are breached. 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).
- Given the residual risk to this site, the following should be considered:
  - Use of flood resistance and resilience measures,
  - Adequate flood warnings and alerts should remain in place, in consultation with the EA,
  - Provision of emergency escape routes including for vehicular access for emergency services. Judgements on whether the site can be regarded as safe will need to consider the feasibility and provision of evacuation from the site during a flood, and
  - Provision of detailed emergency plans and signage for site users.
- Ideally, the sequential test would mean that sites relying on defences to stay safe would be avoided in favour of sites in Flood Zone 1 and not at risk from climate change.
- The site is at potential residual risk from a breach of five reservoirs. Given the potential reservoir risk to the site, developers should consider<sup>2</sup>:
  - Consulting with the local resilience forum for advice on emergency planning,
  - Consulting with relevant reservoir owners to understand the impact development may have on their reservoirs, and
  - Using this Level 2 SFRA to understand whether any proposed development will be safe throughout its lifetime.

---

<sup>2</sup> [Reservoir flood maps: when and how to use them | Environment Agency | 2021](#)

---

## 6 Overall site assessment

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

This site is required to pass part b) of the exception test, given it is proposed for more vulnerable uses and is partially located within Flood Zone 3a. It must also 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 site is not likely to pass the exception test due to present day risk and the increase in risk from climate change. The exception test should be reapplied if detailed model outputs are available for Belmont Brook.

### 6.2 Recommendations and site-specific FRA requirements

Based on the evidence presented in the Level 1 SFRA (2026) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF.
- It is recommended that the site is not developed for more vulnerable uses.
- Were development to be considered, a detailed model of Belmont Brook, including for the impacts of climate change, should be developed to robustly define risk to the site, including flood depths and hazards.
- Detailed modelling may show opportunities for less vulnerable uses, such as the existing car park, shops, or businesses to be situated on the ground floor with more vulnerable uses situated on the upper floors. However, safe access and escape routes must still be achievable.
- A drainage strategy would need to demonstrate that there will be no increase in surface water flood risk offsite as a result of the demolition of the existing buildings on site and the new development.
- The FRA should undertake a capacity and condition assessment of the culvert beneath Waterside Gardens to the northwest of the site and the flood defence embankment along the eastern site boundary. Modelling of culvert blockage and defence breach scenarios should be considered.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the Bolton Local Plan, and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; United Utilities; the highways authorities; and the emergency services.

## 7 Licencing

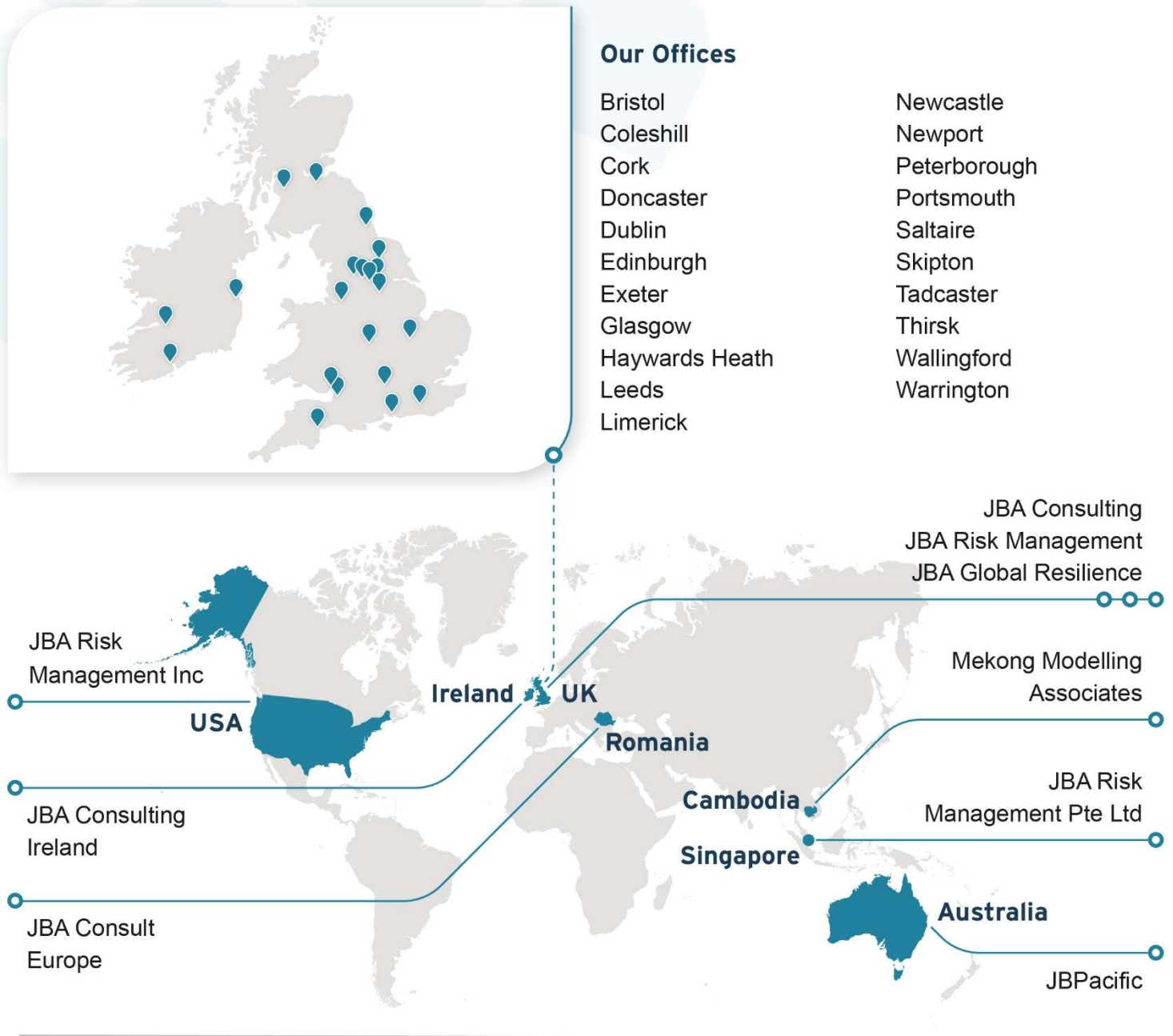
To cover all figures within this report:

- Contains Environment Agency information © Environment Agency and/or database right [2026]
- Contains public sector information licensed under the Open Government Licence v3.0. © Crown copyright and database rights [2026]
- Bolton Council Ordnance Survey licence number: AC 0000850551 [2026]

### Our Offices

Bristol  
Coleshill  
Cork  
Doncaster  
Dublin  
Edinburgh  
Exeter  
Glasgow  
Haywards Heath  
Leeds  
Limerick

Newcastle  
Newport  
Peterborough  
Portsmouth  
Saltaire  
Skipton  
Tadcaster  
Thirsk  
Wallingford  
Warrington



### Registered Office

1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0) 1756 799919  
[info@jbaconsulting.com](mailto:info@jbaconsulting.com)  
[www.jbaconsulting.com](http://www.jbaconsulting.com)

Follow us on  

Jeremy Benn  
Associates Limited  
Registered in  
England  
3246693

JBA Group Ltd is  
certified to  
ISO 9001:2015  
ISO 14001:2015  
ISO 27001:2022  
ISO 45001:2018





# **Bolton Level 2 Strategic Flood Risk Assessment Site Summaries 380-410**

**Site 410**

## **Final Report**

Prepared for  
Bolton Council

Date  
September 2026

## Document Status

|               |                                                              |
|---------------|--------------------------------------------------------------|
| Issue date    | 15 September 2026                                            |
| BIM reference | RLW-JBA-XX-XX-RP-EN-0025                                     |
| Revision      | P03                                                          |
| Prepared by   | Laura Thompson-Jones BSc FRGS<br>Senior Analyst              |
| Reviewed by   | Mike Williamson BSc MSc CGeog FRGS EADA<br>Principal Analyst |
| Authorised by | Mike Williamson BSc MSc CGeog FRGS EADA<br>Project Director  |

---

## Carbon Footprint

The format of this report is optimised for reading digitally in pdf format. Paper consumption produces substantial carbon emissions and other environmental impacts through the extraction, production and transportation of paper. Printing also generates emissions and impacts from the manufacture of printers and inks and from the energy used to power a printer. Please consider the environment before printing.

---

## Accessibility

JBA aims to align with [governmental guidelines on accessible documents](#) and [WCAG 2.2 AA](#) standards, so that most people can read this document without having to employ special adaptation measures. This document is also optimised for use with assistive technology, such as screen reading software.

# Contract

|                     |                                                                 |
|---------------------|-----------------------------------------------------------------|
| JBA Project Manager | Laura Thompson-Jones                                            |
| Address             | Phoenix House, Lakeside Drive, Centre Park, Warrington, WA1 1RX |
| JBA Project Code    | 2025s1871                                                       |

This report describes work commissioned by Bolton Council by an instruction dated 18 June 2026. The Client's representative for the contract was Sara Dilmamode of Bolton Council. Laura Thompson-Jones of JBA Consulting carried out this work.

## Purpose and Disclaimer

Jeremy Benn Associates Limited ("JBA") has prepared this Report for the sole use of Bolton Council and its appointed agents in accordance with the Agreement under which our services were performed.

JBA has no liability for any use that is made of this Report except to Bolton Council for the purposes for which it was originally commissioned and prepared.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

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

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 June 2026 and 15 September 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.

---

## Acknowledgements

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

---

## Copyright

© Jeremy Benn Associates Limited 2026

---

# Contents

|          |                                                                                                                   |           |
|----------|-------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Background</b>                                                                                                 | <b>1</b>  |
| 1.1      | Site 410                                                                                                          | 1         |
| <b>2</b> | <b>Flood risk from rivers</b>                                                                                     | <b>4</b>  |
| 2.1      | Existing risk                                                                                                     | 4         |
| 2.2      | Impacts from climate change                                                                                       | 5         |
| 2.3      | Historic flood incidents                                                                                          | 5         |
| 2.4      | Flood risk management                                                                                             | 5         |
| 2.5      | Emergency planning                                                                                                | 5         |
| 2.6      | Observations, mitigation options, site suitability, sequential approach to development management - fluvial       | 6         |
| <b>3</b> | <b>Flood risk from surface water</b>                                                                              | <b>7</b>  |
| 3.1      | Existing risk                                                                                                     | 7         |
| 3.2      | Impacts from climate change                                                                                       | 10        |
| 3.3      | Sewer flood risk                                                                                                  | 13        |
| 3.4      | Observations, mitigation options, site suitability, sequential approach to development management - surface water | 13        |
| <b>4</b> | <b>Groundwater, geology and SuDS suitability</b>                                                                  | <b>15</b> |
| <b>5</b> | <b>Residual risk</b>                                                                                              | <b>18</b> |
| 5.1      | Flood risk from reservoirs                                                                                        | 18        |
| <b>6</b> | <b>Overall site assessment</b>                                                                                    | <b>19</b> |
| 6.1      | Can part b) of the exception test be passed?                                                                      | 19        |
| 6.2      | Recommendations and site-specific FRA requirements                                                                | 19        |
| <b>7</b> | <b>Licencing</b>                                                                                                  | <b>20</b> |

## List of Figures

|                                                                                                                                                                                       |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 1-1: Existing site location boundary                                                                                                                                           | 2  |
| Figure 1-2: Topography                                                                                                                                                                | 3  |
| Figure 2-1: Existing risk                                                                                                                                                             | 4  |
| Figure 2-2: Potential access and escape routes                                                                                                                                        | 6  |
| Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day                                                                                               | 8  |
| Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event                                                                       | 9  |
| Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard                                                            | 10 |
| Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)                                                                          | 11 |
| Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)                                                  | 12 |
| Figure 3-6: 0.1% AEP event surface water flood hazard <sup>1</sup> , as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map) | 13 |
| Figure 4-1: JBA 5m Groundwater Emergence Map                                                                                                                                          | 15 |
| Figure 4-2: BGS Geology - Bedrock and superficial deposits                                                                                                                            | 17 |

## List of Tables

|                                                                                                                                                                        |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 2-1: Existing flood risk based on percentage area of site at risk                                                                                                | 4  |
| Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map | 7  |
| Table 3-2: Peak rainfall intensity allowances for the Lower Mersey management catchment                                                                                | 11 |
| Table 4-1: Groundwater Hazard Classification                                                                                                                           | 16 |

# 1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Local Plan Site 410. The content of this report assumes the reader has already consulted the 'Bolton Level 1 SFRA' (2026) and read the 'Bolton Level 2 SFRA Main Report' (2026) and is therefore familiar with the terminology used in this report.

## 1.1 Site 410

- Location: Former Westhoughton Service Reservoir
- Existing site use: Open greenspace
- Existing site use vulnerability: Water compatible
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area (ha): 1.32
- Watercourse: N/A
- Environment Agency (EA) model: N/A
- Summary of requirements from Level 2 SFRA scoping stage:
  - Assessment of surface water flood extent, depths and hazards
  - Assessment of all other sources of flood risk
  - Assessment of flood risk management measures and natural flood management

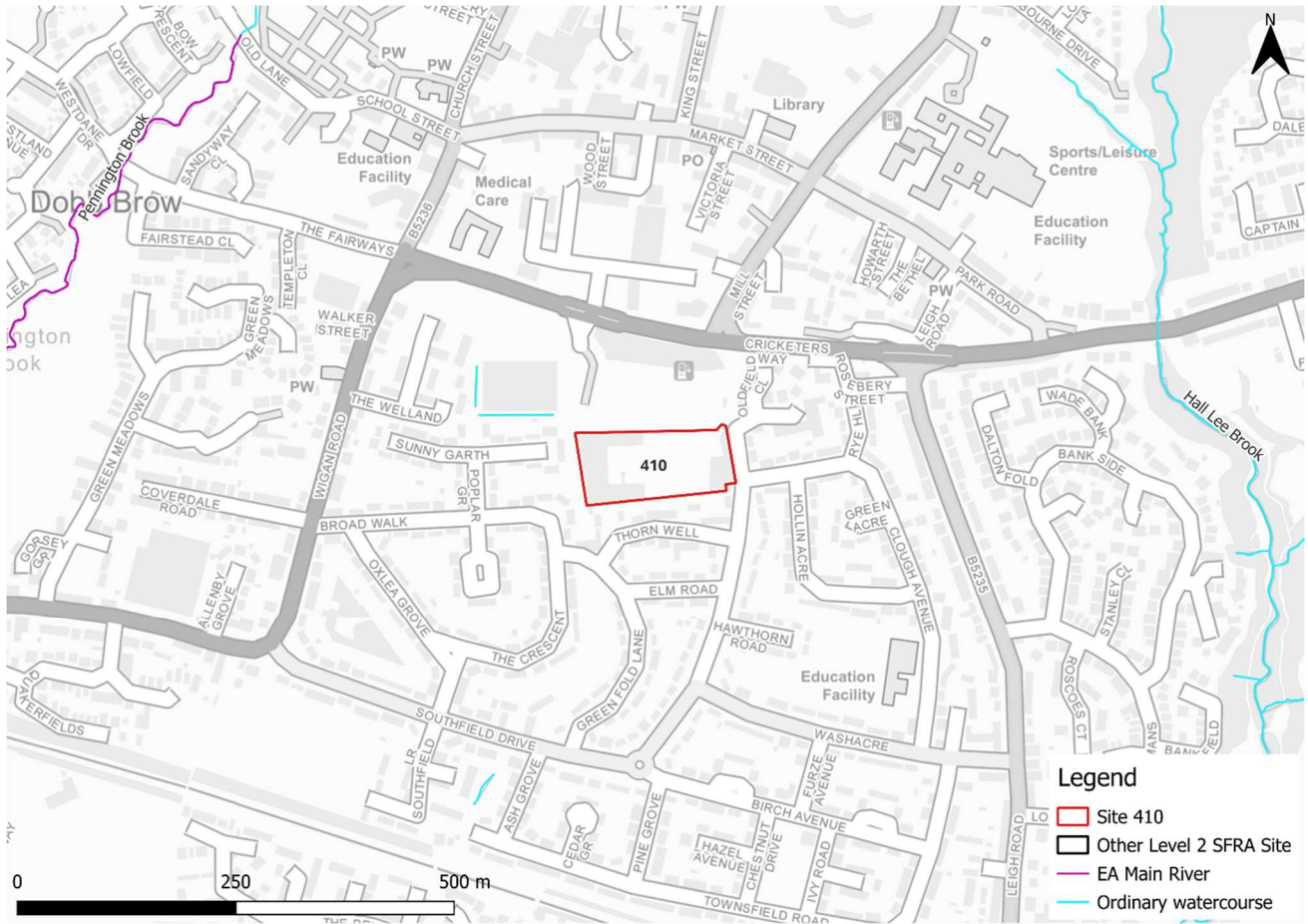


Figure 1-1: Existing site location boundary

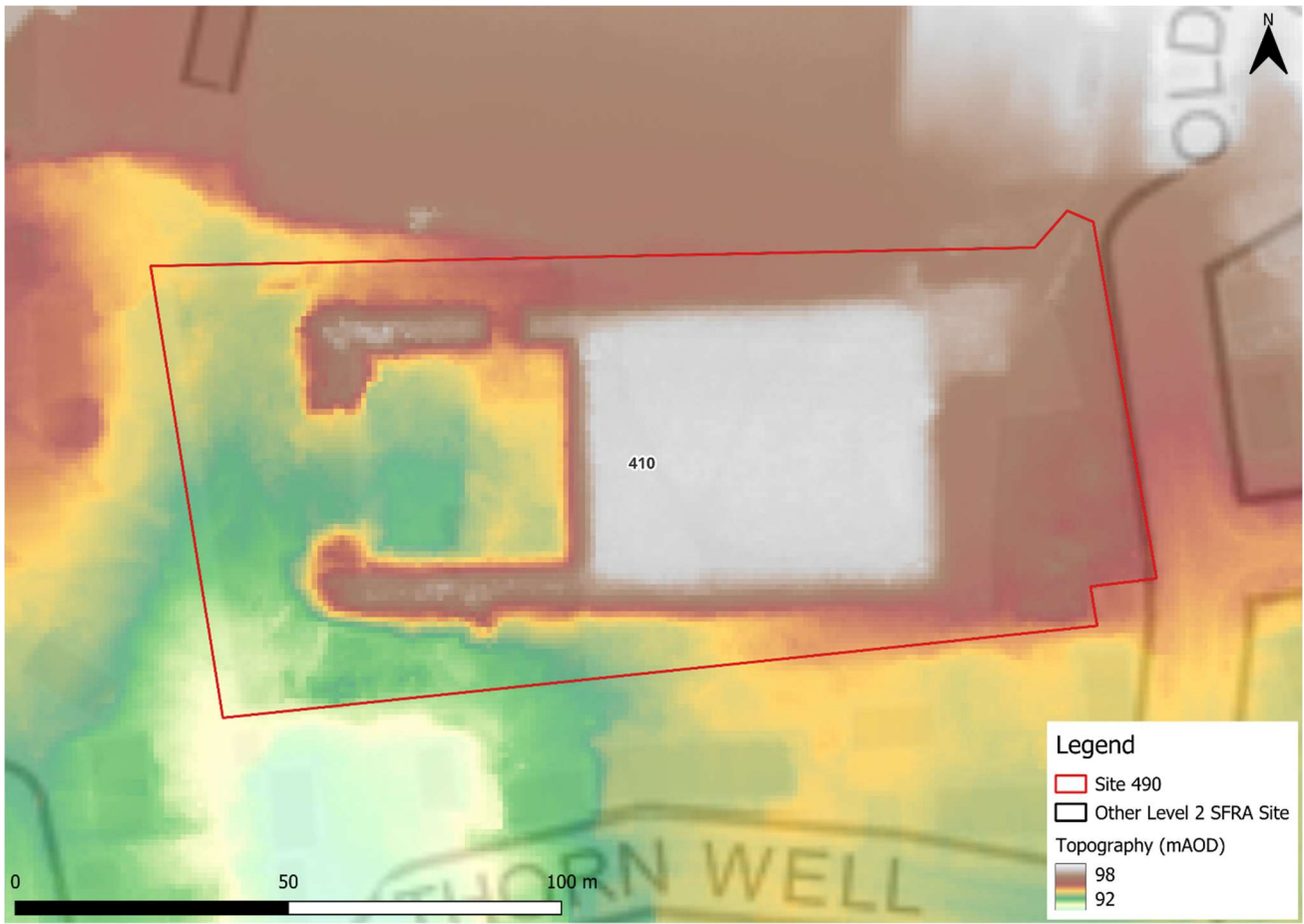


Figure 1-2: Topography

## 2 Flood risk from rivers

### 2.1 Existing risk

#### 2.1.1 Flood Map for Planning and functional floodplain

Based on the Environment Agency's (EA) Flood Map for Planning (June 2026) and Flood Zone 3b (functional floodplain), as updated through the Bolton Level 1 SFRA, the percentage areas of the site within the flood zones 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 2.4).

The entire site is located within Flood Zone 1 and therefore at low risk of flooding from rivers.

Table 2-1: Existing 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                      |

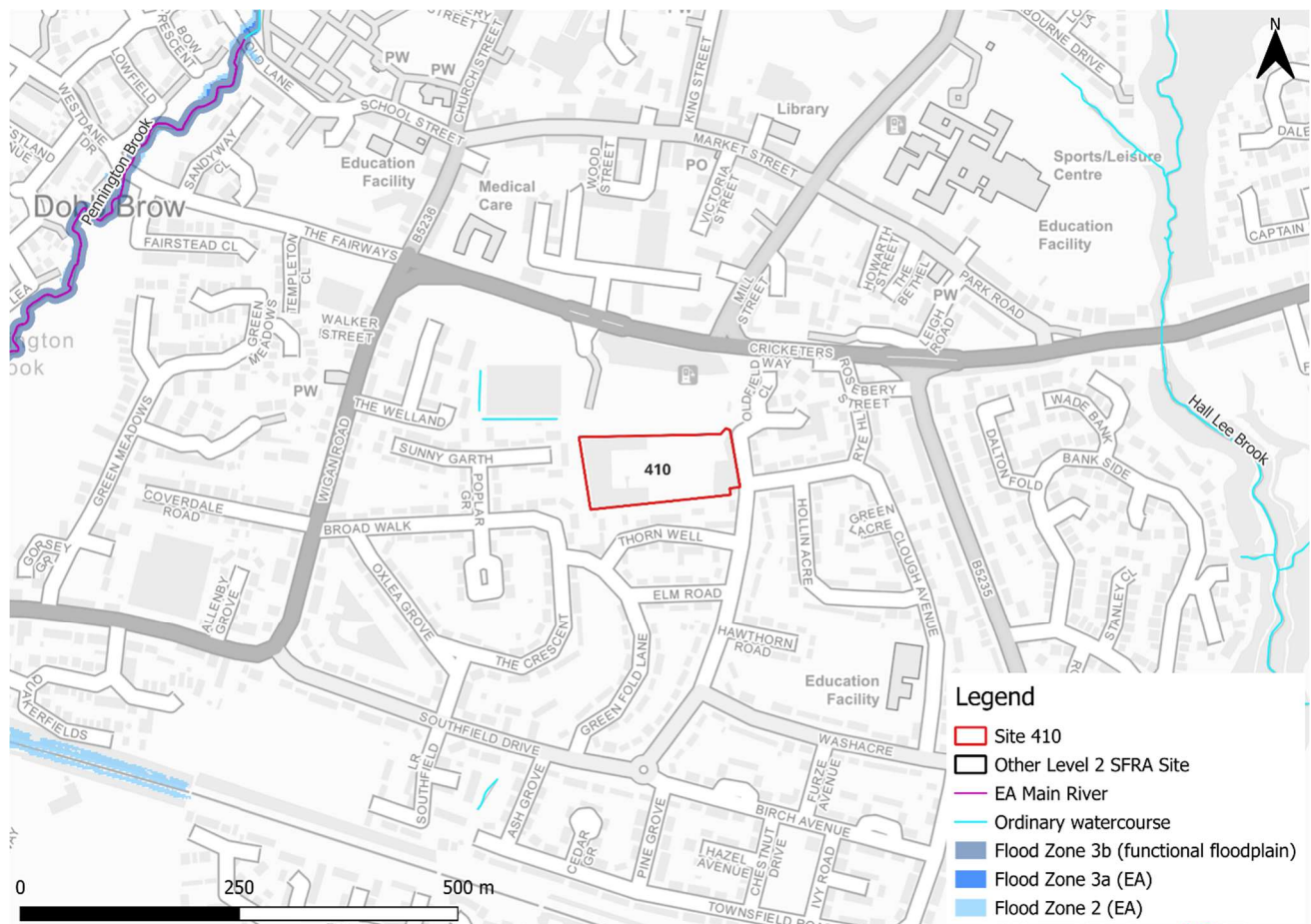


Figure 2-1: Existing risk

## **2.2 Impacts from climate change**

### **2.2.1 Flood Map for Planning - climate change**

The site is not likely to be at fluvial risk when considering climate change, based on the EA's Flood Map for Planning - Flood Zones plus Climate Change dataset.

### **2.3 Historic flood incidents**

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

The LLFA provided its historic floods register. There have been seven recorded flooding incidents within the Westhoughton South Ward within which the site is located. One of these events caused internal flooding to a property south of the site, occurring in 2015.

## **2.4 Flood risk management**

### **2.4.1 Flood defences**

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

### **2.4.2 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 opportunities that could benefit the site.

## **2.5 Emergency planning**

### **2.5.1 Flood warning**

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

Flood alerts may be issued before a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is not located within a FAA.

### **2.5.2 Access and escape routes**

Based on available information on fluvial flooding, safe access and escape routes would likely be achievable via Southfield Drive to the east of the site (Figure 2-2).

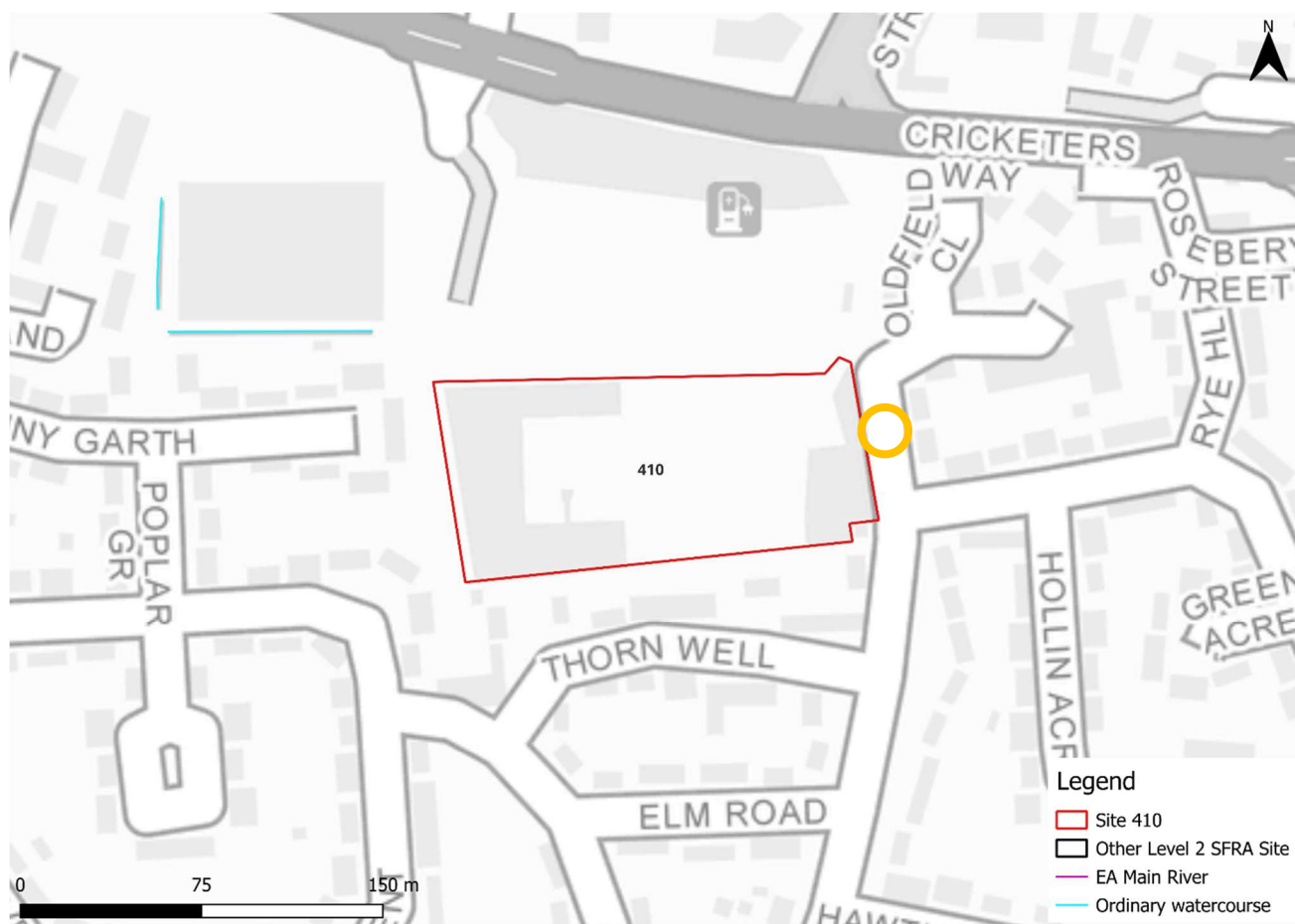


Figure 2-2: Potential access and escape routes

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

- Observations:
  - The proposed development of the site would see a change in the risk classification from water compatible to more vulnerable, according to the NPPF.
  - Given the change in use and therefore vulnerability of the site, the 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 wholly located within Flood Zone 1 and therefore at low risk from rivers.
  - The site is not shown to be at additional risk from climate change.
- Access and escape:
  - Safe access and escape routes would likely be achievable via Southfield Drive to the east of the site.

## 3 Flood risk from surface water

### 3.1 Existing risk

#### 3.1.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Present Day

Based on the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Extents Present Day map (June 2026), the majority of the site is situated outside of the 0.1% AEP surface water flood extent (Table 3-1). Modelled surface water risk to the site is largely confined to a shallow flow path adjacent to the western boundary of the site (Figure 3-1). However, the LiDAR at this site appears to not be representative of current conditions, therefore impacting the modelled surface water risk at the site.

Greatest flood depths in the 1% AEP event are shown to be between 0.3 and 0.6 m (Figure 3-2), however flood depths are largely less than 0.3 m across the area at risk. Safe access and escape routes would likely be achievable via Southfield Drive to the east of the site in all events.

Table 3-1: Existing surface water flood risk based on percentage area at risk using the Flood Map for Planning - Surface Water Spatial Planning Extent Present Day map

| Less than 0.1% AEP event (% area) | 0.1% AEP event (% area) | 1% AEP event (% area) | 3.3% AEP event (% area) |
|-----------------------------------|-------------------------|-----------------------|-------------------------|
| 84                                | 6                       | 3                     | 7                       |

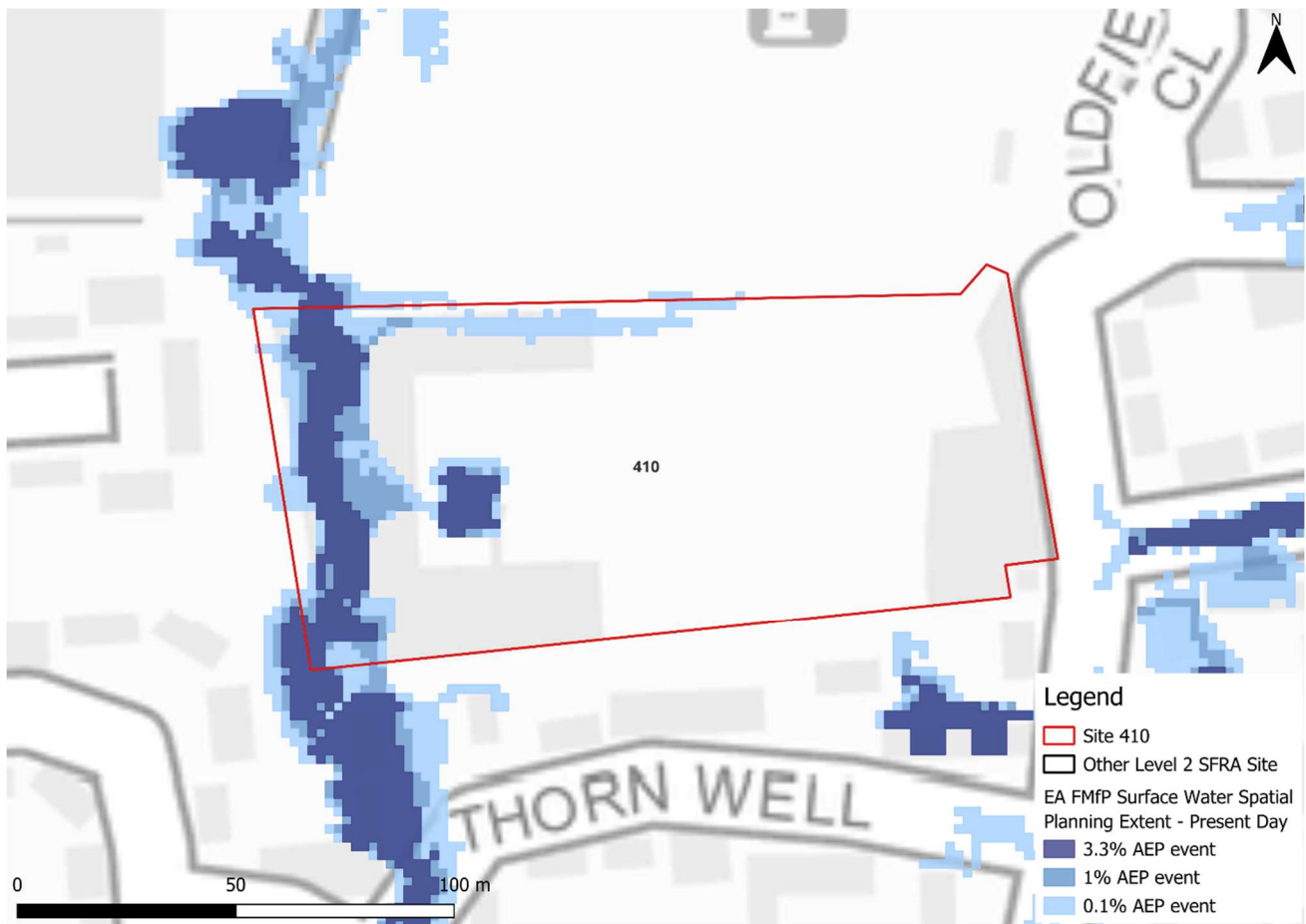


Figure 3-1: Flood Map for Planning - Surface Water Spatial Planning Extents Present Day

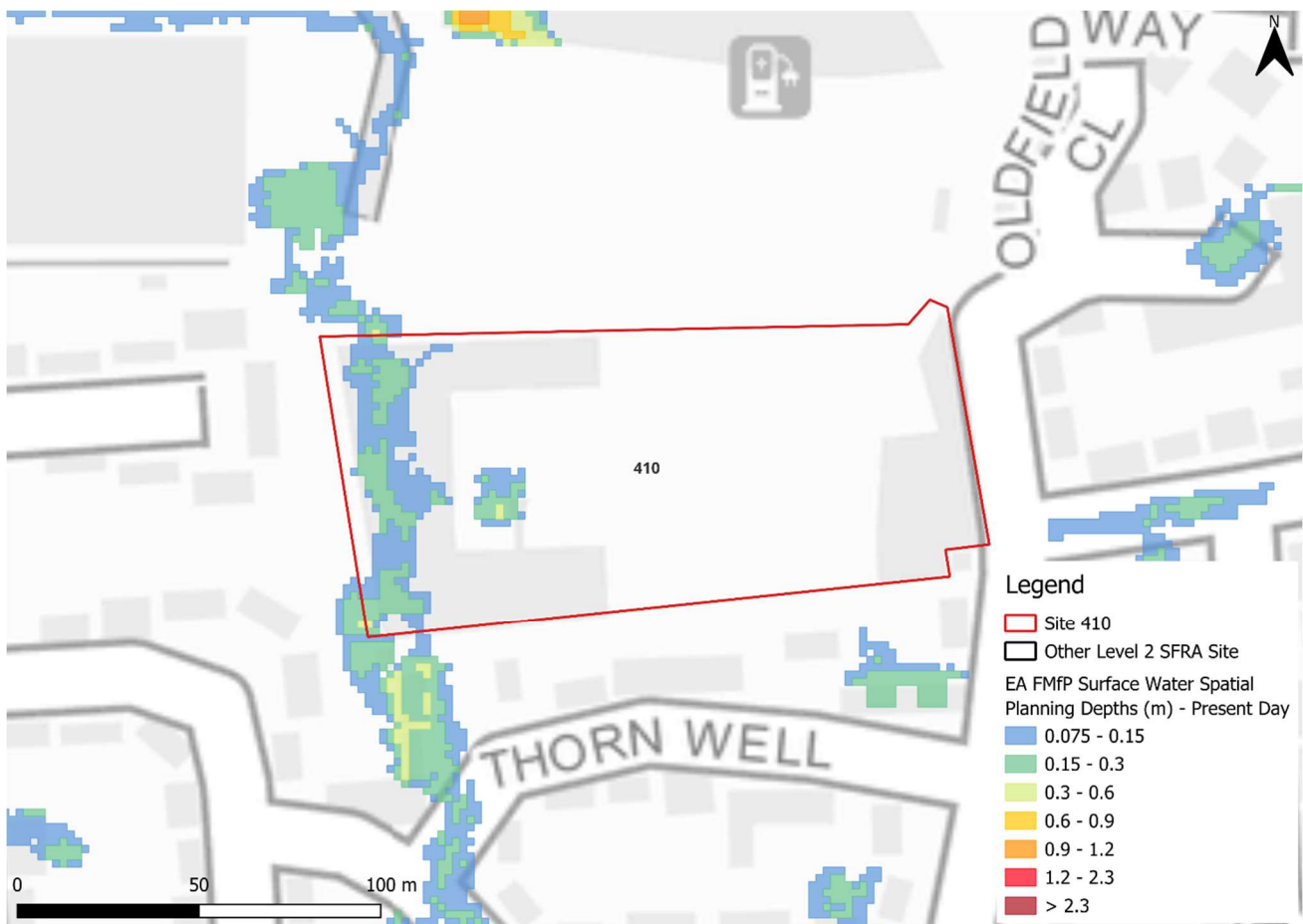


Figure 3-2: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Present Day for the 1% AEP event

### 3.1.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning data does not include hazard information suitable for planning purposes.

Therefore, this Level 2 SFRA considers the third generation Risk of Flooding from Surface Water (RoFSW) hazard mapping in addition to the Flood Map for Planning - Surface Water Spatial Planning extents and depths, as the best available information. Updated surface water hazard information would need to be confirmed at the site-specific FRA stage.

Based on the EA's national scale third generation RoFSW map, the greatest flood hazard in the 1% AEP surface water event is categorised as 'low' (Figure 3-3).

There are some differences between the Flood Map for Planning - Surface Water Spatial Planning map and the third generation RoFSW hazard mapping. The Flood Map for Planning - Surface Water Spatial Planning data 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 Flood Map for Planning and third generation RoFSW maps.

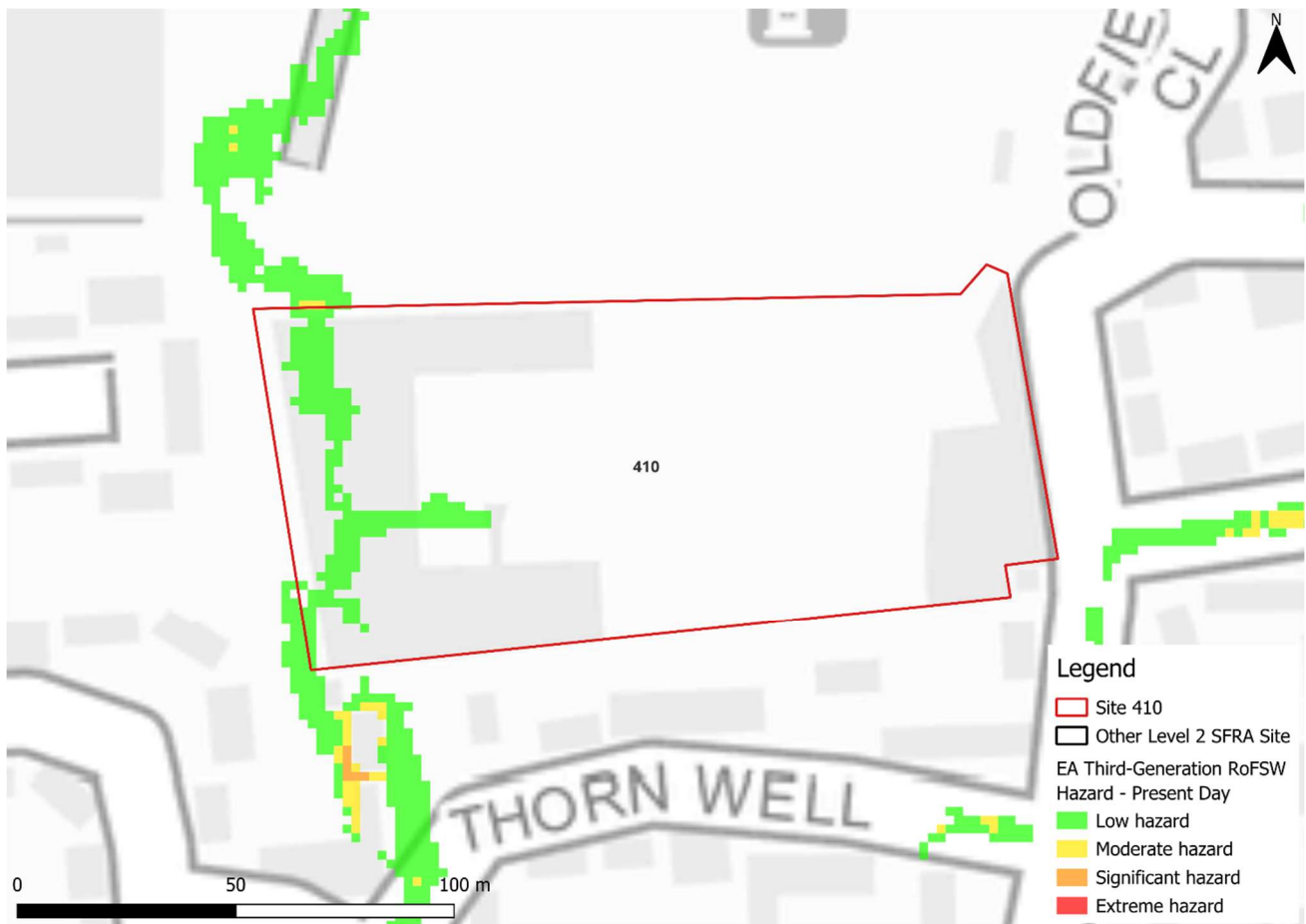


Figure 3-3: Third generation - Risk of Flooding from Surface Water map present day 1% AEP event surface water flood hazard<sup>1</sup>

## 3.2 Impacts from climate change

### 3.2.1 Flood Map for Planning - Surface Water Spatial Planning Extents and Depths Climate Change

The EA's [climate change allowance guidance](#) states that SFRA's should assess the upper end peak rainfall allowance for the 2070s epoch. This dataset is included in the EA's national scale Flood Map for Planning - Surface Water Spatial Planning Climate Change dataset (June 2026). The peak rainfall intensity allowances for the Lower Mersey management catchment are shown in Table 3-2. The allowance for the 0.1% AEP event is not stated in the EA guidance.

<sup>1</sup> 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

Table 3-2: Peak rainfall intensity allowances for the Lower Mersey management catchment

| Return period | Central allowance 2070s (% increase) | Upper end allowance 2070s (% increase) |
|---------------|--------------------------------------|----------------------------------------|
| 3.3% AEP      | 30                                   | 40                                     |
| 1% AEP        | 30                                   | 45                                     |

Figure 3-4 shows the surface water flood extents for the 2070s upper end climate change scenario. Surface water risk remains largely confined to the flow path adjacent to the western site boundary, with another area of ponding extending along the northern boundary.

The greatest flood depths onsite in the 1% AEP event are shown to remain at between 0.3 and 0.6 m (Figure 3-5), however depths are shown to be less than 0.3 m across the majority of the area at risk. Safe access and escape routes would likely remain achievable via Southfield Drive to the east of the site. This route does become inundated in the 0.1% AEP surface water event, however flood depths are shown to rarely exceed 0.15 m.

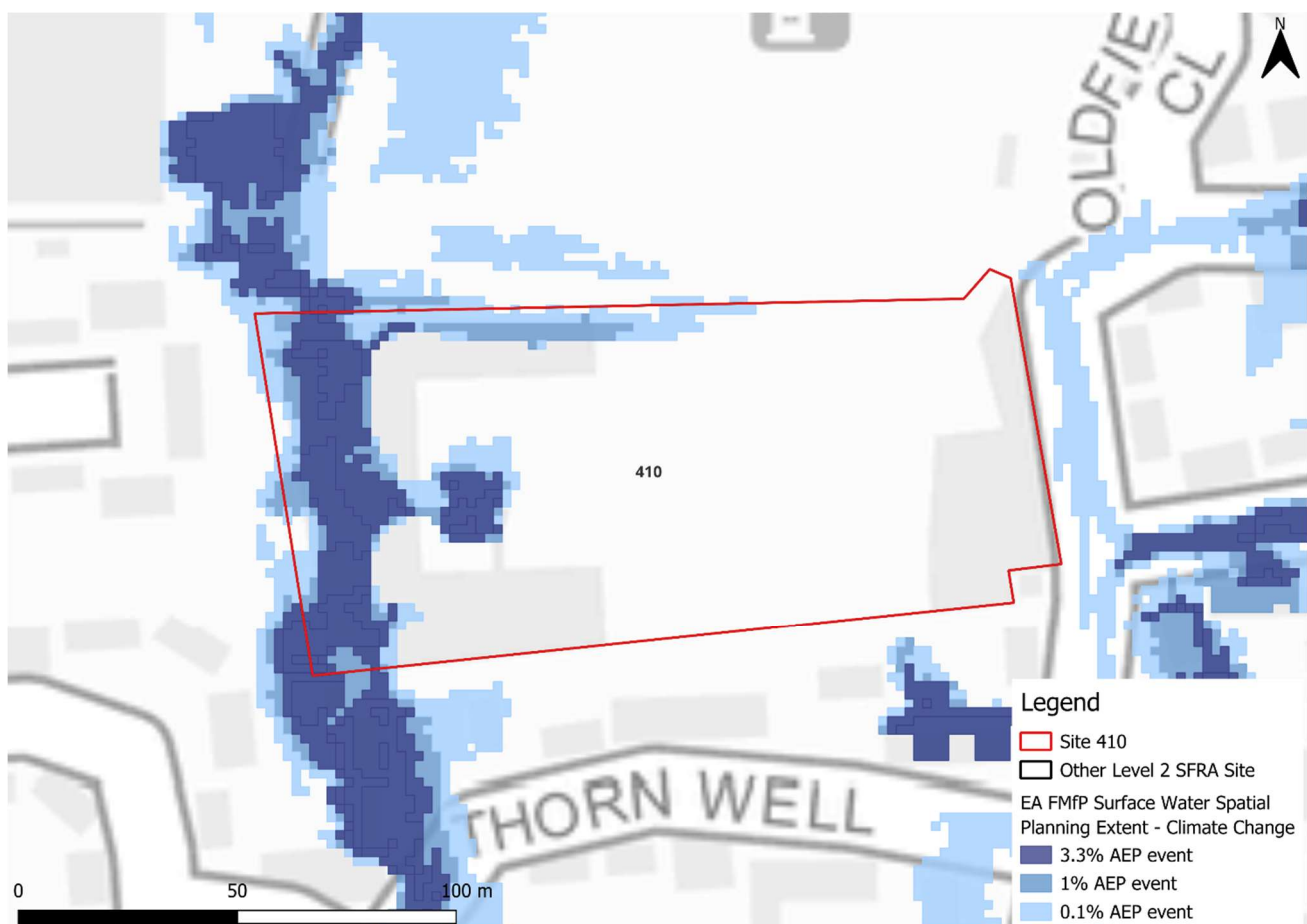


Figure 3-4: Flood Map for Planning - Surface Water Spatial Planning Extents Climate Change (2070s Upper End)

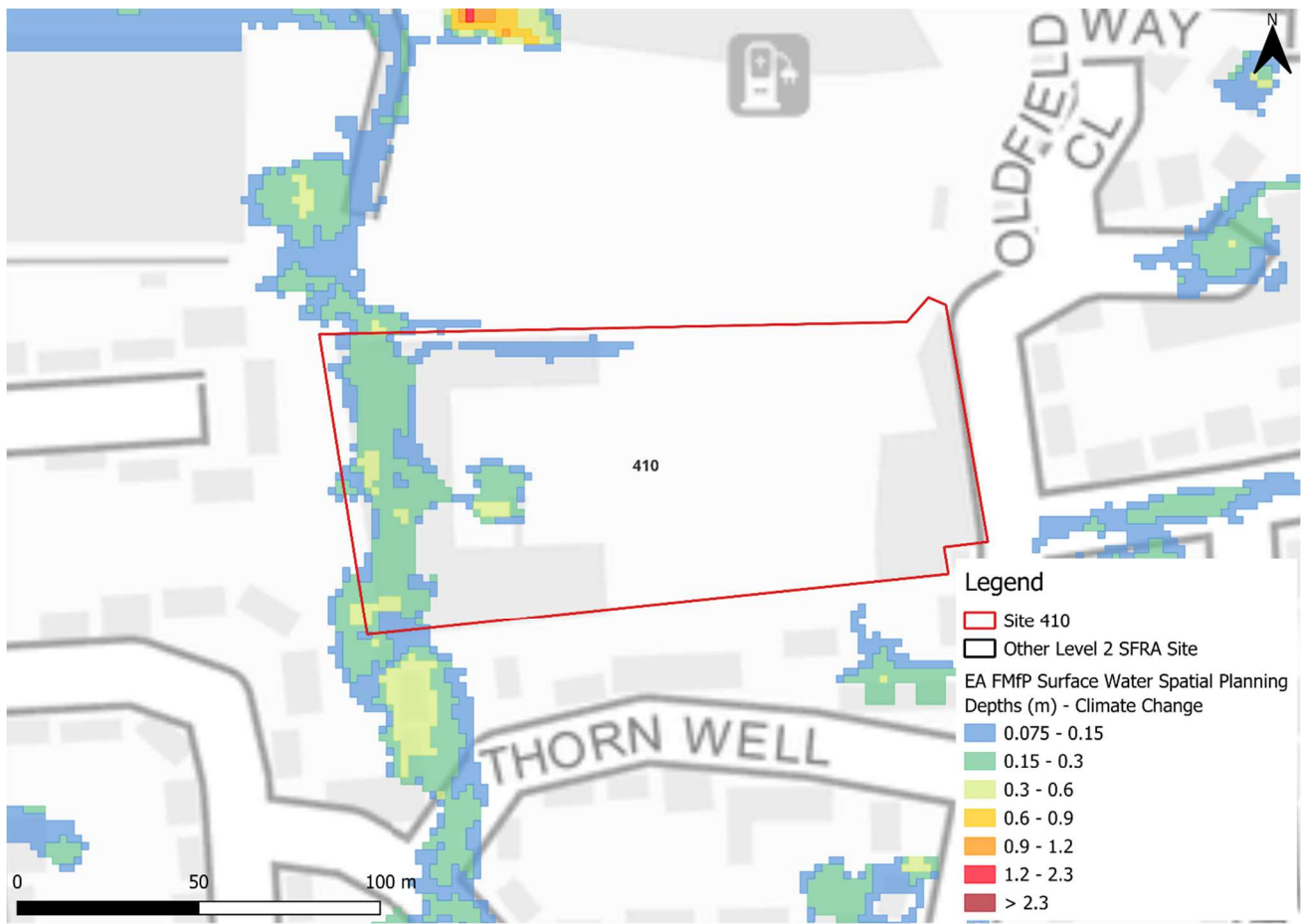


Figure 3-5: Flood Map for Planning - Surface Water Spatial Planning Depths (m) Climate Change for the 1% AEP event (2070s Upper End)

### 3.2.2 Risk of Flooding from Surface Water - Third Generation Hazard

At the time of writing, the EA's latest Flood Map for Planning - Surface Water Spatial Planning climate change data does not include hazard information suitable for planning purposes. This Level 2 SFRA therefore considers the 0.1% AEP surface water event as a conservative proxy for the 1% AEP event plus climate change, as the best available information to assess surface water flood hazards. The impact of climate change on surface water flood hazards should be considered at the site-specific FRA stage.

Using the RoFSW 0.1% AEP event as a proxy, future surface water flood hazard in the RoFSW 1% AEP event is categorised as 'significant' (Figure 3-6).

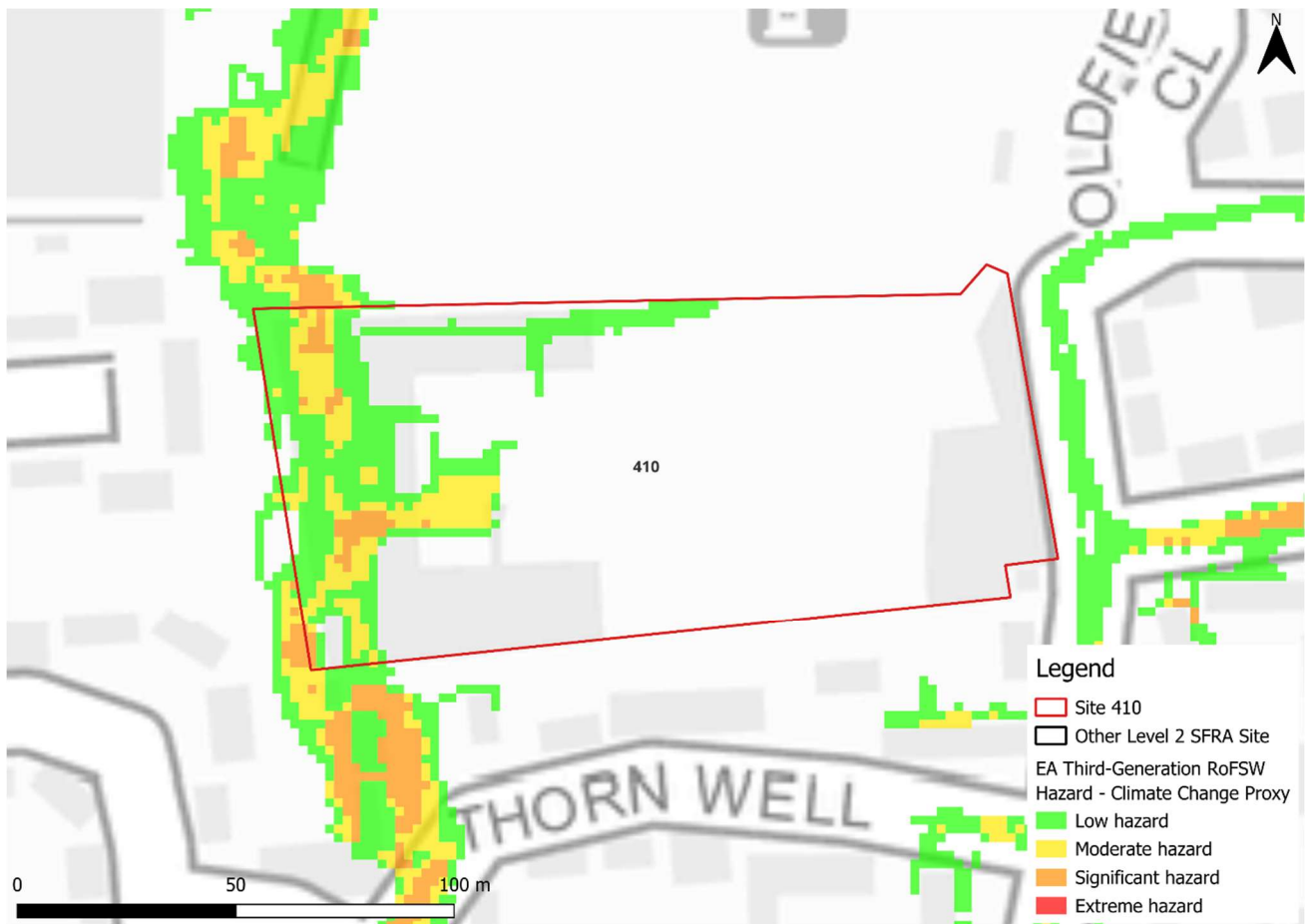


Figure 3-6: 0.1% AEP event surface water flood hazard<sup>1</sup>, as a proxy for the 1% AEP event plus climate change (Third generation - Risk of Flooding from Surface Water map)

### 3.3 Sewer flood risk

United Utilities provided their historic risk registers which were aggregated by ward. There are no recorded sewer flooding incidents within the immediate vicinity of the site. There have been four recorded flooding incidents within the Westhoughton South Ward within which the site is located.

### 3.4 Observations, mitigation options, site suitability, sequential approach to development management - surface water

- Current risk to the site is predominantly very low, with 84% of the site being outside of the 0.1% AEP surface water flood extent. Present day surface water risk in all events is confined to a flow path through the west of the site.
- Risk to the site is shown to largely remain confined to the west of the site when considering the impact of climate change, with an additional area of ponding within the north of the site.
- Topographic low spots and flow paths should be considered in site design and ideally left in place to flood naturally when required. It is recommended that the flow path through the west of the site is included as a green / blue corridor

offering multifunctional benefits alongside flood risk mitigation including Biodiversity Net Gain (BNG) contributions, and social and amenity benefits.

- Any drainage strategy must ensure there is no increase in surface water flood risk elsewhere as a result of new development. Greenfield runoff rates or betterment should apply. The developer should consult the LLFA and follow local and National SuDS guidance.
- Safe access and escape routes would likely be achievable via Southfield Drive.

## 4 Groundwater, geology and SuDS suitability

Risk of groundwater emergence is assessed in this SFRA using JBA's 5m Groundwater Emergence Map. Figure 4-1 shows the map covering the site and the surrounding areas. Table 5-1 explains the risk classifications.

The site is located within an area where there is no risk of groundwater emergence. Infiltration SuDS may therefore be suitable at this site.

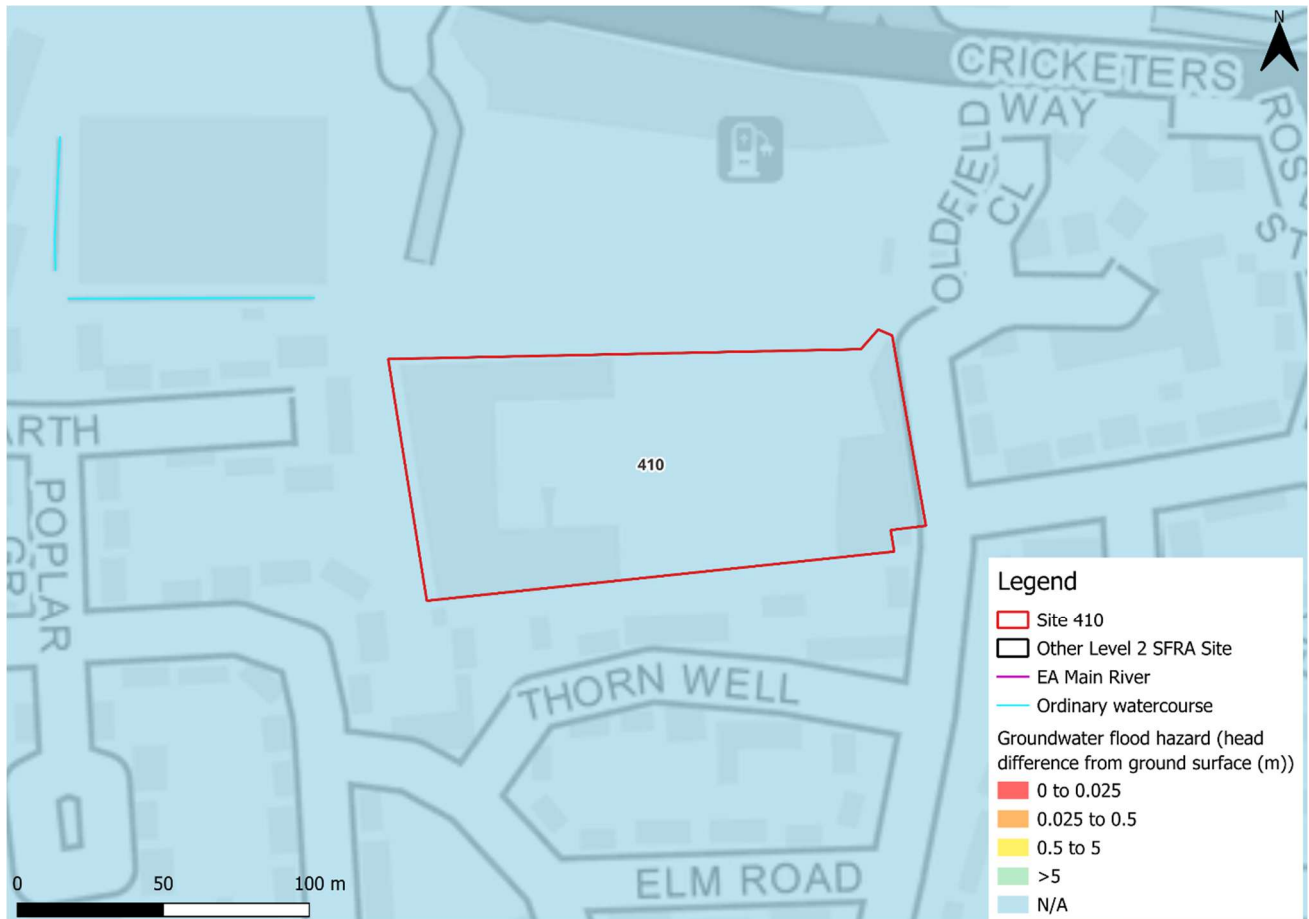


Figure 4-1: JBA 5m Groundwater Emergence Map

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.<br>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. |                                                                                                                                                                                                                                                                                                                                                             |

The underlying bedrock within the site is a combination of mudstone, siltstone, sandstone, coal, ironstone and ferricrete (Figure 4-2). Mudstone, siltstone, coal, ironstone and ferricrete typically have low permeability, whereas sandstone has a higher permeability. Therefore, it is likely that the bedrock beneath the site will contribute to lower levels of infiltration and lower water tables, as reflected in the groundwater mapping (Figure 4-1).



Figure 4-2: BGS Geology - Bedrock and superficial deposits

## 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.

There does not appear to be any residual risk to the site from asset blockage or defence breach.

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

## 6 Overall site assessment

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

This site is not required to pass part b) of the exception test, 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 and site-specific FRA requirements

Based on the evidence presented in the Level 1 SFRA (2026) and this Level 2 SFRA:

- The proposed development of the site would see a change in the risk classification from water compatible to more vulnerable, according to the NPPF.
- It should be appropriate to develop this site for more vulnerable purposes given its location largely within Flood Zone 1 and low surface water flood risk.
- It is recommended that the surface water flow path through the west of the site is included in site design as open space, offering multifunctional benefits alongside flood risk mitigation including BNG contributions, and social and amenity benefits.
- However, surface water risk to the site should be confirmed based on updated ground survey and detailed modelling.
- FRA should be carried out in line with the latest versions of the NPPF; FRCC-PPG; EA online guidance; the Bolton Local Plan, and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with, where applicable, the local planning authority; the lead local flood authority; emergency planning officers; the Environment Agency; United Utilities; the highways authorities; and the emergency services.

## 7 Licencing

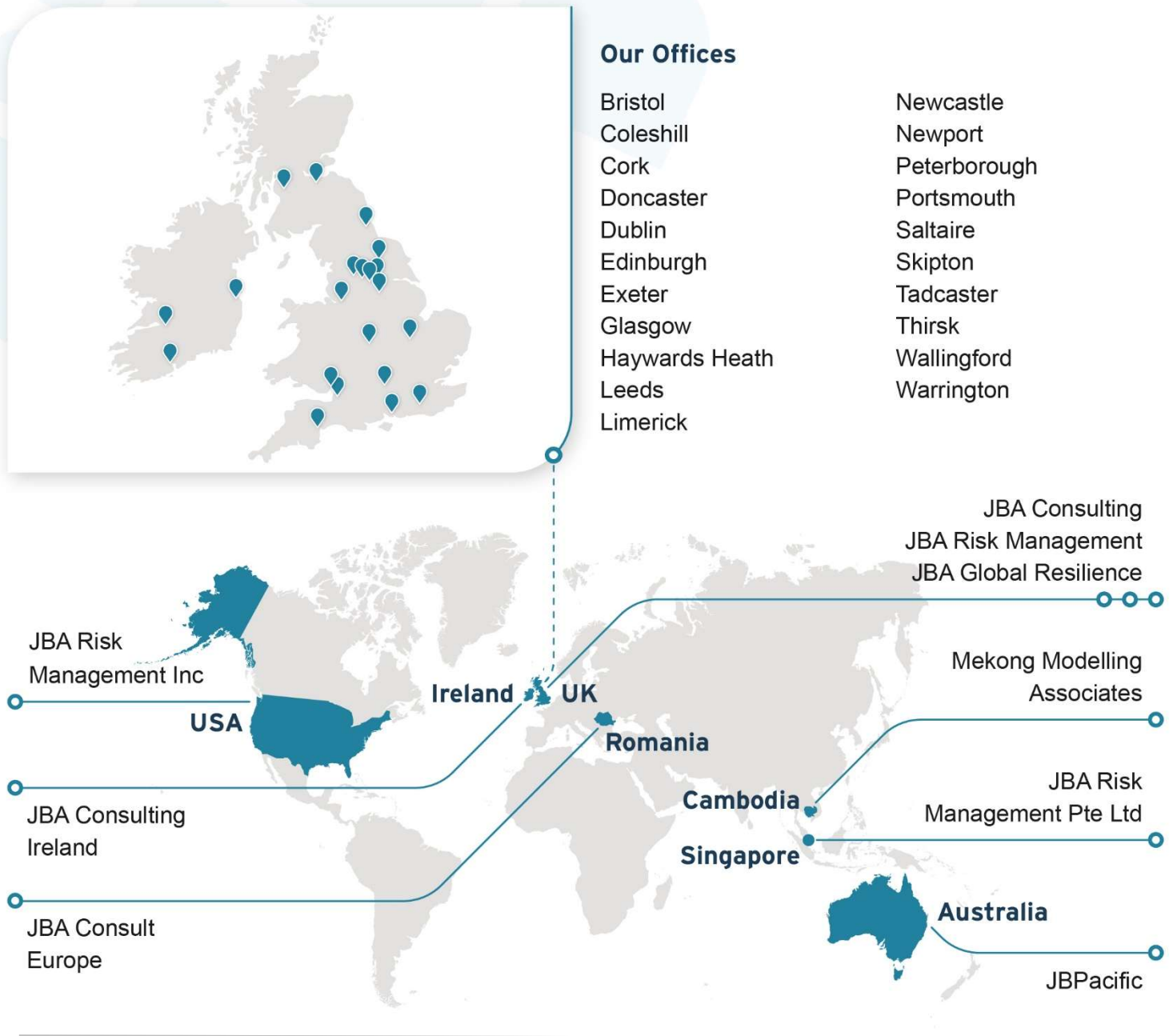
To cover all figures within this report:

- Contains Environment Agency information © Environment Agency and/or database right [2026]
- Contains public sector information licensed under the Open Government Licence v3.0. © Crown copyright and database rights [2026]
- Bolton Council Ordnance Survey licence number: AC 0000850551 [2026]

### Our Offices

Bristol  
Coleshill  
Cork  
Doncaster  
Dublin  
Edinburgh  
Exeter  
Glasgow  
Haywards Heath  
Leeds  
Limerick

Newcastle  
Newport  
Peterborough  
Portsmouth  
Saltaire  
Skipton  
Tadcaster  
Thirsk  
Wallingford  
Warrington



### Registered Office

1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0) 1756 799919  
[info@jbaconsulting.com](mailto:info@jbaconsulting.com)  
[www.jbaconsulting.com](http://www.jbaconsulting.com)

Follow us on  

Jeremy Benn  
Associates Limited  
Registered in  
England  
3246693

JBA Group Ltd is  
certified to  
ISO 9001:2015  
ISO 14001:2015  
ISO 27001:2022  
ISO 45001:2018

