Level 2 Strategic Flood Risk Assessment - Site AB2

A1-C01

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Prepared for:

Newcastle-under-Lyme Borough Council

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Contents

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for AB2. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'Newcastle-under-Lyme Level 1 SFRA' and read the 'Newcastle-under-Lyme Level 2 SFRA Main Report' and is therefore familiar with the terminology used in this report.

1.1 Site details

- **Location:** Land adjoining corner of A500 and M6 southbound, west of Audley.
- **Site area:** 80.94ha.
- **Existing site use:** Greenfield.
- **Proposed site use:** Employment.

1.2 Topography

The Environment Agency (EA) 1m resolution LiDAR shows that the highest elevations are in the south of the site, up to 126.37mAOD, and the site elevation decreases towards the path of the unnamed watercourse through the north of the site. The elevation then rises slightly towards the north, before decreasing to the northern boundary, where the lowest elevations within the site of 90.28mAOD are found. The adjacent land to the north-east of the site is at a higher elevation than the north-east extent of the site itself.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock:
  - Most of the site consists of mudstone bedrock geology, with Sidmouth Mudstone formation in the north of the site and Bollin Mudstone Member across the centre of the site.
  - The south and southwest of the site consists of sandstone bedrock geology of Helsby Sandstone Formation and Chester Formation.
- Superficial:
  - Superficial deposits across most of the site consist of diamicton.
  - There are some small areas across the site with Glaciofluvial deposits consisting of sand and gravel and alluvium consisting of clay, silt, sand and gravel

Soils at the site consist of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is within the eastern, upstream reach of the Englesea Brook Catchment which drains an area of approximately 20.76km². The catchment is predominantly rural, with Englesea Brook originating in Blaterly Green, approximately 1.7km west of the site and flowing north-westwards towards Crewe where it joins the River Weaver.

2.2 Existing drainage features

Within the site there is an unnamed ordinary watercourse (a tributary of the Englesea Brook) flowing in a westerly direction across the site from the eastern boundary to the western boundary. The watercourse is culverted underneath Park Lane before entering the site and underneath the M6 upon exiting the site.

There is also an additional unnamed ordinary watercourse further south in the site (also a tributary of the Englesea Brook). The watercourse appears to originate within the site before flowing west to the western boundary where it is culverted underneath the M6.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment which is based on generalised broadscale modelling.

2.3.2 Description of risk to the site

Most of the site is not shown to be at fluvial flood risk. Flood Zones 2 and 3a are shown to follow the path of the unnamed watercourse through the north of the site. The topography of the site means the fluvial risk is confined to a relatively narrow channel along the path of the watercourse.

Flood Zones 2 and 3a show quite different extents, however, it should be noted that the Flood Zone 3a extent appears to be misaligned as it does not follow the topography of the watercourse, with the lowest elevations of the watercourse channel not showing at flood risk.

In the absence of detailed modelling, Flood Zone 3a (as shown in the EA FMfP) has been used as a proxy for Flood Zone 3b. This may need to be refined further during a site-specific Flood Risk Assessment should development be proposed in the area of the site shown to be at fluvial risk.

The existing unnamed watercourse in the south of the site is not represented by the FMfP, due to its size. Instead, the flood risk from these watercourses is assessed using the EA RoFSW map (Section 2.4).

Table 2-1: Existing fluvial flood risk based on EA FMfP*.

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

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, including the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 includes the Flood Zone 3 percentage. Flood Zone 1 is the remaining area outside Flood Zone 2 (Flood Zone 2 + Flood Zone 1 = 100%).*

2.4 Surface water

2.4.1 Available data

The EA's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

2.4.2 Description of risk to the site

Most of the site is not shown to be at risk of surface water flooding in the 3.3%, 1%, and 0.1% AEP events.
In the 3.3% AEP event, the main area shown to be at surface water flood risk is the low-lying area immediately south of the unnamed ordinary watercourse. This area of risk is shown to extend to north of the watercourse in the western extent of the site and predicted to have depths exceeding 1.20m. Velocities within this area of flood risk are shown to be largely less than 0.25m/s, however it is predicted that a small section to the east could reach velocities of up to 1.00m/s. The hazard classification for the large majority of area of flood risk is 'Danger for Most'. There are also other small areas of ponding throughout the site. The majority of these areas of pooling do not exceed 0.60m in depth, with the exception of an area in the northern site extent which is shown to reach depths of up to 0.90m and an area in the east of the site which is predicted to reach depths of up to 1.20m. For most of the small areas on ponding, velocities are predicted to largely remain below 0.25m/s, however some small parts of these areas may reach up to 1.0m/s. The area of ponding in the south-west of the site is predicted to mainly reach velocities between 0.50m/s and 1.00m/s but small parts could reach up to 2.00m/s. Most of the areas of ponding have a maximum hazard classification of 'Danger for Most'.

In the 1% AEP event, the existing areas at risk in the 3.3% AEP event are shown to increase slightly in extent and new, small areas of ponding are shown to form in the north of the site. Depths, velocities and hazard classifications are shown to remain similar to the 3.3% AEP event, with the exceptions of the area shown to have depths of over 1.20m and the areas with 'Danger for Most' hazard classifications having grown slightly in size.

In the 0.1% AEP event, new flow paths are shown to emerge, incorporating the existing areas of ponding. The main flow paths to emerge are the flow path flowing north-west at the northern site extent before exiting the site onto the A500, the flow path in the centre of the site which flows northwards into the area south of the unnamed ordinary watercourse and two flow paths which flow from the southern site extent into the area in the south-west site

extent which encompasses the additional unnamed ordinary watercourse. Depths for the existing areas of risk remain similar to the 1% AEP event and are shown to largely remain below 0.15m at the new flow paths. Velocities are shown to increase with more areas shown to reach velocities of up to 2.00m/s. However, the area of ponding at the unnamed ordinary watercourse is still mostly shown to be less than 0.25m/s. There is also a minimal amount of area at risk in the south-west of the site which is shown to have velocities in exceedance of 2.00m/s. The existing areas shown to have a 'Danger for Most' hazard classification are predicted to further increase in size and a new area with this classification is shown to emerge in the south-west of the site. The newly emerged flow paths are shown to largely have a hazard classification of 'Very Low Hazard'.

Table 2-2: Existing surface water flood risk based on the RoFSW map.

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	4	4	10
Maximum depth (m)	Greater than 1.20	Greater than 1.20	Greater than 1.20
Maximum velocity (m/s)	0.50 to 1.00	1.00 to 2.00	Greater than 2.00
Maximum hazard classification	Danger for Most	Danger for Most	Danger for Most

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP percentage).*

2.5 Reservoir

Reservoir flood mapping shows the site to be affected by the Dry Day flood extent from Coopers Green reservoir. The Dry Day flood extent impact the south-east site extent and the low-lying areas associated with the two unnamed ordinary watercourses within the site. Flooding from this reservoir extends along the watercourses, west of the site. There are no Wet Day extents available for this reservoir.

2.6 Groundwater

The EA Areas Susceptible to Groundwater Flooding (AStGWF) dataset (1km resolution) suggests that the majority of the site has between 25% and 50% susceptibility to groundwater flooding. The dataset suggests that the north-west site extent has greater than a 75% susceptibility to groundwater flooding.

In contrast, the JBA Groundwater Emergence Map (5m resolution) classifies the majority of the site as having a negligible risk from groundwater flooding due to the nature of the local geological deposits. There is a small area in the centre of the site which is classified as having groundwater levels either at or very near (within 0.025m of) the ground surface.

Based on the RoFSW and topography of the site it is likely that any groundwater that emerges will pool in the north low-lying areas of the site.

This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific Flood Risk Assessment (FRA) stage.

2.7 Sewers

The site is located in a postcode area (ST7) with 41 recorded sewer flooding incidents, according to United Utilities' incident records (for the period from September 2010 to May 2024). However, the incidents are not located in the vicinity of the site with none of the incidents being reported along adjacent roads to the site.

2.8 Flood history

The EA’s historic flooding and recorded flood outline datasets do not have a record of any flooding on or surrounding the site.

3 Climate change

Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard, and frequency of both fluvial and surface water flooding. Please see Section 3.5 of the main Level 2 SFRA report for information on fluvial models and climate change allowances.

Development proposals at the site must address the potential changes associated with climate change and be designed to be safe for the intended lifetime. The provisions for safe access and escape must also address the potential increase in severity and frequency of flooding.

3.1 Fluvial

3.1.1 Available data

In the absence of detailed hydraulic modelling with climate change uplifts, the Flood Map for Planning Flood Zone 2 extent (0.1% AEP) has been used as an indicative 1% AEP event plus climate change flood extent. This can be compared within Flood Zone 3a (1% AEP) to give an indication of areas most sensitive to the impacts of climate change.

3.1.2 Description of risk to the site

Climate change is shown to have a limited impact on fluvial flood risk at the site, with the extents remaining confined to the northern area of the site along the unnamed watercourse.

As discussed in Section 2.3.2 the EA FMfP appears to be misaligned within this area, with the Flood Zone 3a extent not following the lowest lying topography along the watercourse as would be expected. It is likely that the most sensitive area to increased flood risk with climate change will be the low-lying topography along the southern side of the watercourse, although this is not what is currently shown within the EA FMfP extents.

3.2 Surface water

3.2.1 Available data

The latest climate change allowances have been applied to the RoFSW map to indicate the impact on pluvial flood risk.

The design event for rainfall intensities is the 1% AEP event with the upper end climate allowance for the 2070s epoch, which is the 1% AEP plus 45% climate change for the Weaver Gowy Management Catchment which this site falls within.

3.2.2 Description of risk to the site

The 1% AEP plus 45% climate change event largely reflects the extent of the 0.1% AEP event, with some slightly extended areas of ponding. This means that there is quite a

considerable increase in surface water risk between the 1% AEP and 1% AEP plus 45% climate change events, with several new flow paths forming in the north and south of the site.

Depths are shown to largely remain below 0.25m. However, the area of ponding at the unnamed ordinary watercourse is shown to reach depths of up to 1.83m. Velocities also largely reflect the 0.1% AEP event with the lowest velocities of less than 0.25m/s shown to be in the area of ponding along the ordinary watercourse and the highest velocities, of up to 2.54m/s, in the south-west of the site. The area of ponding at the unnamed watercourse is mostly classified as 'Danger for Most', along with other small areas of ponding in the site. Most of the flow paths within the site are classified as 'Very Low Hazard'.

Table 3-1: Comparison of surface water flood risk to the site between the 1% AEP and 1% AEP 2070s Upper End climate change extents.

Event	1% AEP	1% AEP plus 45% climate change
Percentage of site at risk (%)	4	12
Maximum depth (m)	Greater than 1.20	1.83
Maximum velocity (m/s)	1.00 to 2.00	2.54
Maximum hazard classification	Danger for Most	Danger for Most

4 Flood risk management infrastructure

4.1 Defences

The EA AIMS dataset shows that the site is not protected by any formal flood defences.

4.2 Residual risk

The unnamed ordinary watercourses are both culverted under the M6 upon exiting the site on the western boundary. The northern watercourse is also culverted underneath Park Lane before entering the site at the eastern boundary. This could pose a residual risk to the site in the event of a blockage, which could cause water to back up and encroach on the site.

5 Emergency planning

5.1 Flood warnings and alerts

The site is located in the 'Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich' EA Flood Alert Area.

5.2 Access and escape routes

Safe access and escape will need to be demonstrated in the 1% AEP plus climate change fluvial and surface water events. Site drainage proposals should address the requirements for access routes, avoid impeding surface water flows and preserve the storage of surface water to avoid exacerbation of flood risk elsewhere on the site and in the wider catchment.

5.2.1 Existing access

Existing access to the site is from Park Lane which runs along the northern half of the eastern site boundary, Barthomley Road along the south-west site extent, and Moat Lane along the south-east site extent.

5.2.2 Fluvial

Safe access to and from the site can be maintained in the 1% and 0.1% AEP fluvial events. However, as the site is bisected by Flood Zones 2 and 3, access and escape from the northern and southern sections of the site should be considered separately.

5.2.3 Surface water

Safe access and escape to and from the site can be maintained in the 3.3% AEP, 1% AEP, 0.1% AEP and 1% AEP plus 45% climate change events. However, as site is bisected by the surface water flood risk along the path of the unnamed ordinary watercourse, and this flooding is classed as 'Danger for Most' in the site and on Park Lane during all events, access and escape from the northern and southern sections of the site should be considered separately.

There is minimal flood risk to the east and south of the site along Park Lane, Barthomley Road and Moat Lane in all events and any smalls areas of ponding are predicted to remain below 0.15m in depth and classified as 'Very low hazard'. Therefore, safe access and escape to and from the site via these roads is likely to be maintained.

5.3 Dry islands

The site is not located on a dry island.

6 Requirements for drainage control and impact mitigation

6.1 Broadscale assessment of possible SuDS

- The site is considered to have a low susceptibility to groundwater. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system. Below ground development such as basements may not be appropriate at this site.
- BGS data indicates that the underlying geology across the north and central areas of the site consists of mudstone and is likely to be poorly draining. Any proposed use of infiltration should be supported by infiltration testing. Off-site discharge in accordance with the SuDS hierarchy is likely to be required to discharge surface water runoff. However, BGS data indicates that the underlying geology in the south of the site consists of sandstone which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible within this area of the site in accordance with the SuDS hierarchy.
- The site is located within a Groundwater Source Protection Zone. Infiltration techniques may not be suitable and should only be used following the granting of any required environmental permits from the EA for Zones 2, 3 and 4 although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints.
- The site is located within a Nitrate Vulnerable Zone. Therefore, early engagement with the LLFA and the EA is recommended to determine requirements for the site to manage the impact to surrounding watercourses. Consideration of water quality is likely to be of high importance and demonstrated through the use of the Simple Index Approach.
- The site is not located within a historic landfill site.
- Surface water discharge rates should not exceed the existing greenfield runoff rates for the site. Opportunities to further reduce discharge rates should be considered and agreed with the LLFA. It may be possible to reduce site runoff by maximising the permeable surfaces on site using a combination of permeable surfacing and soft landscaping techniques.
- The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during all modelled surface water events. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.

- If it is proposed to discharge runoff to a watercourse or sewer system, the condition and capacity of the receiving watercourse or asset should be confirmed through surveys and the discharge rate agreed with the asset owner.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

- Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, helping meet requirements for the Nitrate Vulnerable Zone. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.
- The unnamed ordinary watercourses in the north and southwest of the site should be integrated into the site drainage strategy as blue-green infrastructure.
- Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development.
- Opportunities to incorporate filtration techniques such as filter strips, filter drains and bioretention areas must be considered.
- Consideration should be made to the existing condition of receiving waterbodies and their Water Framework Directive objectives for water quality. The use of multistage SuDS treatment will improve water quality of surface water runoff discharged from the site and reduce the impact on receiving water bodies.
- Opportunities to incorporate source control techniques such as green roofs, permeable surfaces and rainwater harvesting must be considered in the design of the site.
- The potential to utilise conveyance features such as swales to intercept and convey surface water runoff should be considered. Conveyance features should be located on common land or public open space to facilitate ease of access. Where slopes are >5%, features should follow contours or utilise check dams to slow flows.

7 NPPF and planning implications

7.1 Exception test requirements

The Local Planning Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The sequential test will need to be passed before the Exception test is applied.

The NPPF classifies employment development as 'Less vulnerable'. Therefore, the Exception test is not required for this site. However, it should be noted that 'Less vulnerable' development is not permitted in Flood Zone 3b.

7.2 Requirements and guidance for site-specific Flood Risk Assessment

At the planning application stage, a site-specific FRA will be required as the proposed development site:

- Greater than one hectare.
- Located in Flood Zones 2 and 3.
- At risk of surface water flood both now and in the future.
- At risk of reservoir flooding.

All sources of flooding should be considered as part of a site-specific FRA.

A detailed hydraulic model of the unnamed ordinary watercourses may be required at FRA stage to accurately represent the risk from this watercourse and set the height of any mitigation measures. This would include defining the Functional Floodplain (Flood Zone 3b) extent for the site, noting 'Less vulnerable' development is not permitted in Flood Zone 3b.

Guidance on the requirements for site-specific FRAs can be found in the accompanying Level 2 SFRA report.

7.3 Guidance for site design and making development safe

Development should be steered away from the paths of the unnamed watercourses and the low lying area south of the unnamed ordinary watercourse in the north of the site. Developers should consider utilising these areas as a green corridor or as a location for SuDS.

The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to pre-development greenfield rates, with areas of surface water ponding used as open space and SuDS or water compatible/essential infrastructure uses only.

Arrangements for safe access and escape will need to be provided for the 1% AEP fluvial and surface events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures,

so development and occupants are safe. As the site is bisected by the unnamed watercourse in the north of the site, safe access and escape should be considered separately to the north and south of the site.

Provisions for safe access and escape should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.

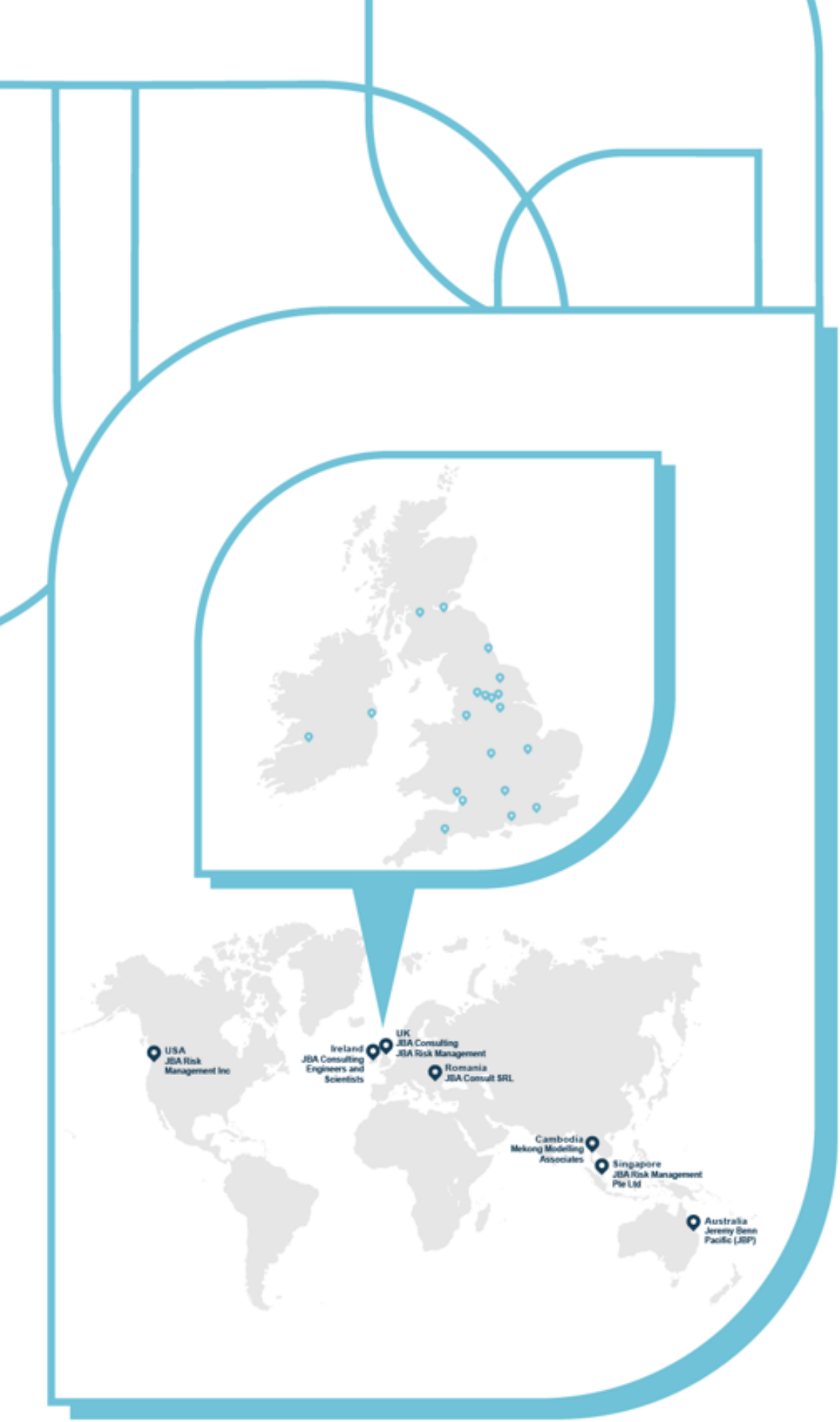
8 Conclusions

The site is affected by fluvial and surface water flooding, but the majority of the site is not shown to be at flood risk. The main area of risk is surrounding the more northern unnamed ordinary watercourse. Additionally, there is residual risk from the culverts to the east and west of the site and reservoir flooding in the Dry Day scenario.

The exception test is not required for this site. However, 'Less vulnerable' development will not be permitted in Flood Zone 3b.

The following points should be considered in development of this site:

- All development should be steered away from the areas of highest risk along the paths of the ordinary watercourses in line with the sequential approach to site layout.
- A site-specific FRA should demonstrate that site users will be safe in the 1% AEP fluvial and surface water events including an allowance for climate change.
- Safe access and escape should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. As the site is bisected by the unnamed watercourse in the north of the site, safe access and escape should be considered separately to the north and south of the site.
- A carefully considered and integrated flood resilient and sustainable drainage design should be put forward, including a site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan and supported by detailed modelling, with development to be steered away from the areas identified to be at highest risk of surface water flooding within the site.
- A detailed hydraulic model of the unnamed drain may be required at FRA stage to accurately represent the risk from the unnamed ordinary watercourses and set the height of any mitigation measures. This would include defining the Functional Floodplain (Flood Zone 3b) extent for the site, noting 'Less vulnerable' development is not permitted in Flood Zone 3b.



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