Level 2 Strategic Flood Risk Assessment – Site AS58

Final Report

April 2026

Prepared for:
Hinckley and Bosworth Borough Council

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Hinckley & Bosworth Borough Council

Contents

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for AS58. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the Hinckley and Bosworth Level 1 SFRA and read the Hinckley and Bosworth Level 2 SFRA Main Report and is therefore familiar with the terminology used in this report.

1.1 Site details

- Location: Land to the west of the residential area of Barwell
- Site area: 136.90ha
- Existing site use: Predominantly greenfield, with a few existing buildings in the north of the site, off Stapleton Lane
- Proposed site use: Mixed Use, primarily residential

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The EA 1m resolution LiDAR shows that the site is largely on higher ground, with elevated terrain being concentrated in the north and the southwest of the site. The ground elevations slope downhill from the north and south towards a stretch of lower elevation which runs through the centre of the site along the path of the Tweed River and to the eastern boundary where there is lower elevation along the path of an unnamed watercourse. The maximum elevation is 119.6mAOD at the northeastern boundary, and the minimum elevation is 100.5mAOD on the western boundary of the site, at the watercourse.

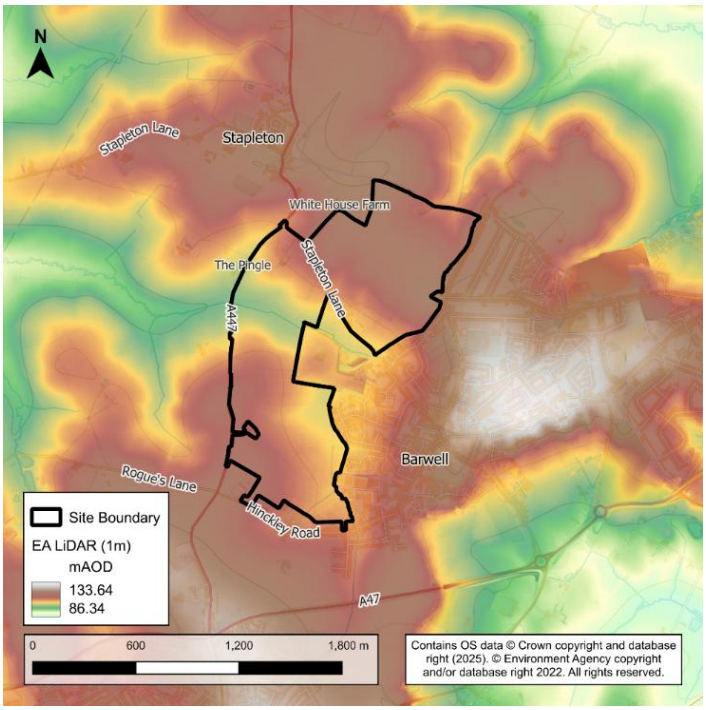


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock - Gunthorpe Member comprising of mudstone
- Superficial deposits:
  - Oadby Till Member, comprising of diamicton, covers most of the site.
  - Glaciofluvial deposits, Mid Pleistocene consisting of sand and gravel, are located in the far north and in isolated spots toward the centre of the southern part of the site.
  - Bosworth Clay Member, comprised of clay and silt, are found along the banks of the watercourse.
  - Alluvium, consisting of clay, silt, sand, and gravel, are found along the path of the watercourse channel.
  - Head, comprised of clay, silt, sand and gravel, underlay the northeast corner of the site.

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 in the upstream end of the 'Stoke Golding Brook from Source to River Sence Water Body' catchment, with the Tweed River flowing through the centre of the site. The catchment upstream of the site is predominantly urban, encompassing part of the town of Barwell.

2.2 Existing drainage features

Running through the centre of the site from a culvert under Stapleton Lane is the Tweed River, which flows in a westerly direction, before entering a culvert under the A447. There is also an unnamed watercourse in the southeastern area of the site, which enters the site through a culvert under Hinckley Road. This unnamed watercourse continues in a northerly direction along the eastern site boundary and is suspected to be culverted beneath Barwell Park (outside the site boundary) before joining the Tweed River on the eastern site boundary. Online imagery also shows a small pond situated along the south border of the site with a small drainage channel which flows in a south-easterly direction across the southeast corner of the site to join the unnamed watercourse on the eastern site boundary.

2.3 Fluvial

2.3.1 Available data

The EA's Flood Map for Planning (FMfP) has been used within this assessment to inform Flood Zones 2 and 3a. Flood Zone 3b has been defined using the EA's Rivers and Sea 3.3% AEP defended flood risk extent.

There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment.

2.3.2 Description of risk to the site

Most of the site is shown to not be at fluvial flood risk.

Flood Zone 2, Flood Zone 3a, and Flood Zone 3b are shown to follow the path of the Tweed River through the centre of the site, flowing east to west. The topography of the site means that fluvial risk is confined to the low-lying areas along the banks of the watercourse.

Flood Zones 2, 3a, and 3b all show similar extents. The extents are shown to widen, particularly in Flood Zone 2, at the western site boundary at the A447, where the watercourse exits the site and flow is restricted as it runs under the highway through a culvert.

The unnamed watercourse along the eastern site boundary is not represented within the EA's FMfP. The risk from this watercourse has been assessed using the EA's Risk of Flooding from Surface Water Map (see 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	1	<1	1

**The percentage flood zones quoted show the percentage of the site at flood risk from that particular flood zone or event, excluding the percentage of the site at flood risk at a higher risk zone, e.g. Flood Zone 2 does not include the Flood Zone 3 percentage.*

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

The RoFSW mapping indicates that surface water flooding extents are primarily aligned with existing watercourses and low-lying areas within the site. Limited areas of the site are affected during the 3.3% AEP and 1% AEP events, which largely follow the path of the unnamed watercourse along the southeast boundary of the site, and along the Tweed River through the centre of the site. The low-lying topography to the west of the unnamed watercourse and higher ground of the urban area along the eastern boundary means the floodplain of the watercourse is mostly within the site and extends away from the watercourse.

During the 0.1% event, surface water extents become more widespread, with more instances of isolated ponding and small flow paths forming, particularly evident in the lower-lying areas in the north of the site. The flood extent along the unnamed watercourse widens within the 0.1% AEP event.

It should be noted that the RoFSW mapping is broadscale and may not properly represent the culvert which runs through Barwell Park. The culvert representation will significantly impact the flood extent in the southeast of the site as the main route for water to drain from this area of the site.

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* (%)	3	1	4
Maximum depth (m)	Exceeds 1.2m	Exceeds 1.2m	Exceeds 1.2m

Event	3.3% AEP	1% AEP	0.1% AEP
Maximum velocity (m/s)	Exceeds 1.0m/s but does not exceed 2.0m/s	Exceeds 1.0m/s but does not exceed 2.0m/s	Exceeds 1.0m/s but does not exceed 2.0m/s
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, excluding the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP does not include the 3.3% AEP percentage).*

2.5 Reservoir

The site is not shown to be at risk of reservoir flooding during the 'dry day' or 'wet day' scenario from the EA reservoir flood maps.

2.6 Groundwater

The JBA Groundwater Emergence Map indicates that most of the site is deemed to be at negligible risk of groundwater emergence due to the nature of the underlying geology or with groundwater emergence levels between 0.5m and 5m below the ground surface where surface manifestation of groundwater is unlikely.

There are areas in the northern and southern areas of the site indicating groundwater levels to be between 0.025m and 0.5m below the ground surface. In the northeast of the site, there are a few instances of groundwater levels being within 0.025m of the surface.

Based on the EA RoFSW mapping and topography of the site, any groundwater that emerges in the north of the site is likely to continue flowing north away from the site. Groundwater emerging in the centre and the south of the site will drain to the watercourses and flow paths within 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

Severn Trent Water were consulted as part of the Regulation 18 process and each of the Strategic Housing and Employment Land Availability Assessment reports to provide comments on known issues of sewer flooding within or surrounding the site. There is some model predicted flooding at the downstream pumping station (Stapleton Lane). The size of site will likely have an adverse impact on downstream network due to limited capacity for the added flows.

This assessment does not negate the requirement that drainage at the site should be in line with the drainage hierarchy (see Section 6.1).

2.8 Flood history

The EA's Historic Flood Map shows no records of flooding at the site.

Information provided by Leicestershire County Council shows a number of historic flooding instances within the vicinity of the site:

- 7 instances of internal flooding and 4 instances of external flooding along Hinckley Road, which runs to the south of the site, in January 2025.
- 1 instance of internal sewer flooding along Hinckley Road, which runs to the south of the site, during Storm Henk in January 2024.
- Highway flooding as a result of blocked gully outfalls along the A447 (Hinckley Road) to the northwest of the site.
- External property and highway flooding due to surface water runoff and maintenance of the culvert along Waterfall Way to the southeast of the site in 2013.

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 4.6 of the Hinckley and Bosworth Level 2 SFRA report for information on 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

The EA's FMfP Flood Zones plus Climate Change layer has been used to indicate areas of the site likely to be at increased flood risk in future.

There is currently no available depth, hazard, or velocity information available within the EA FMfP, therefore, detailed hydraulic modelling is likely to be required during a site-specific Flood Risk Assessment including modelling of the latest climate change uplifts.

3.1.2 Description of risk to the site

The EA's FMfP Flood Zones plus Climate Change layer is similar to the present day Flood Zone 2 extent, with a slight increase in flood extent along the Tweed River through the site. Apart from this increase, the data shows the site is unlikely to be at increased fluvial flood risk in future.

The unnamed watercourse along the eastern site boundary is not represented within the EA's FMfP. The risk from this watercourse has been assessed using the EA's Risk of Flooding from Surface Water Map (see Section 3.2).

3.2 Surface water

3.2.1 Available data

In the absence of suitable climate change data, the 0.1% AEP extent from the EA's RoFSW mapping has been used as a proxy to indicate areas likely to be at risk during the 1% AEP plus climate change event.

3.2.2 Description of risk to the site

The RoFSW mapping shows that most of the site is sensitive to increased risk with climate change. The main difference between the 1% and 0.1% AEP extents is the increase in extent along the unnamed watercourse at the southeastern site boundary and along the Tweed River, and an increase in instances of surface water ponding throughout the site.

Within and surrounding the site maximum depths, velocities and hazard classification remain unchanged between the AEP events, indicating only limited additional surface water hazard under future climate conditions.

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

Tweed River is culverted where it enters the site beneath Stapleton Lane, and again when it exits the site under the A447, creating potential residual risk of a blockage resulting in water backing up within the site. The topography of the site means any water is likely to remain confined to the relatively narrow floodplain of the Tweed River within the centre of the site.

Located just outside the site under Hinckley Road is another culvert, which is historically believed to have resulted in flooding along the road, which runs along the southern border of the site, increasing the risk that water would back up, overtop onto the road, and potentially enter the site.

The unnamed watercourse is suspected to be culverted beneath Barwell Park. This could result in water backing up within the southeast of the site. As shown within the RoFSW mapping flood extent is likely to encompass a considerable area of the southeast of the site but will be confined by the topography so is unlikely to extend further west.

5 Emergency planning

5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning Area but is partially located in the 033WAF307 Flood Alert Area along the path of the Tweed River in the centre of the site.

5.2 Access and escape

Safe access and escape routes 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 Potential access

The site can be accessed from Stapleton Lane, either by approaching from the settlement of Barwell at the east of the site, or from the A447 to the west of the site. Along the site boundary, the A447 runs along the west, and Hinckley Road runs along the south boundary, providing potential access.

5.2.2 Fluvial

The EA FMfP shows the fluvial risk bisects the site and access and escape needs to be considered to the northern and southern parcels of the site

Along the western site boundary along the A447, the highway is at risk of fluvial flooding where it crosses the Tweed River. However, all other access and escape routes are not shown to be impacted during any of the available fluvial flood events, including within the Flood Zones plus Climate Change dataset. Therefore, safe access and escape should be possible to both the northern and southern parcels of the site.

5.2.3 Surface water

The Tweed River bisects the site, dividing it into northern and southern sections. During the 3.3% AEP event, access and escape routes remain largely clear, with a few minor instances of surface water ponding on the east end of Stapleton Lane, and on Hinckley Road just south of the site boundary. The surface water depth along these access routes during this AEP event does not exceed 0.3m, with velocities exceeding 0.25m/s but not exceeding 0.5m/s, and a hazard classification of ‘Danger for Some’.

During the 1% AEP event, surface water increases in extent, minorly increasing the area of ponding along these access and escape routes. During the 0.1% AEP event, surface water extents increase again, creating minor instances of ponding along the A447, and larger extents of ponding along Stapleton Lane and Hinckley Road, with depths exceeding 0.6m,

velocities exceeding 1m/s, and a hazard classification of ‘Danger for Most’, resulting in the only access route into the south of the site being along the A447 from the south.

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

Surface water at the site should be discharged in accordance with the drainage hierarchy as set out in the National standards for SuDS (gov.uk). SuDS that provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity, should be prioritised. SuDS proposals should be discussed with relevant stakeholders (Local Planning Authority, Lead Local Flood Authority, and the EA) at an early stage to understand possible constraints.

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.

The following factors should be considered when assessing whether infiltration is suitable at the site:

- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
- BGS data indicates that the underlying geology is 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 required to discharge surface water runoff.
- The site is not located within a Groundwater Source Protection Zone and there are no restrictions over the use of infiltration techniques with regard to groundwater quality.
- The site is not located within a historic landfill site.

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 (see Section 2.7).

Proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zones 2 and 3 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the Tweed River may be susceptible to surcharging due to water levels in the Tweed River. The impacts flood flows will need to be considered in terms of the attenuation storage requirements of the site and placement of the outfalls.

The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 3.3%, 1% and 0.1% AEP events. The southeastern side of the site and the river corridor along the Tweed River should be integrated into the site drainage strategy as blue-green infrastructure.

6.2 Opportunities for wider sustainability benefits and integrated flood risk management

The following are opportunities for wider sustainability benefits and integrated flood risk management at the 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.
- 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 Tweed River 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. Tweed River is considered to be of Good Ecological Status.

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 residential development as ‘More Vulnerable’.

Should ‘More Vulnerable' development be proposed within the extent of Flood Zone 3a, the Exception Test will be required for this site. 'More 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 1 hectare
- in Flood Zones 2, 3a, and 3b
- at risk of flooding from ordinary watercourse and surface water
- identified as being at increased flood risk in future

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

Consultation with the Local Authority, Lead Local Flood Authority, Water Company, and the EA should be undertaken at an early stage.

Any FRA should be carried out in line with latest guidance including the National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance (PPG), and Hinckley and Bosworth Local Plan Policies.

The development should be designed with mitigation measures in place where required.

7.3 Guidance for site design and making development safe

The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk by the low-lying area surrounding the Tweed River, and the low-lying areas to the south-east of the site where significant surface water risk is evident.

A detailed hydraulic model of the Tweed River and the unnamed watercourse along the eastern site boundary may be required at FRA stage to accurately represent the risk from these watercourses. Detailed survey of the culverts within and surrounding the site is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site.

Developers should consider utilising the land surrounding the watercourses in the centre and southeast of the site as a green corridor.

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.

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.

If proposed works affect an ordinary watercourse, Leicestershire County Council as the Lead Local Flood Authority should be contacted respectively to obtain prior written consent. Any watercourses should be accommodated within the site layout and should not be culverted except for where access is required. The site layout should allow for access to any watercourse for maintenance and they should generally be located within publicly accessible areas. A buffer of at least 8 metres should be maintained between the watercourses and any built development.

8 Conclusions

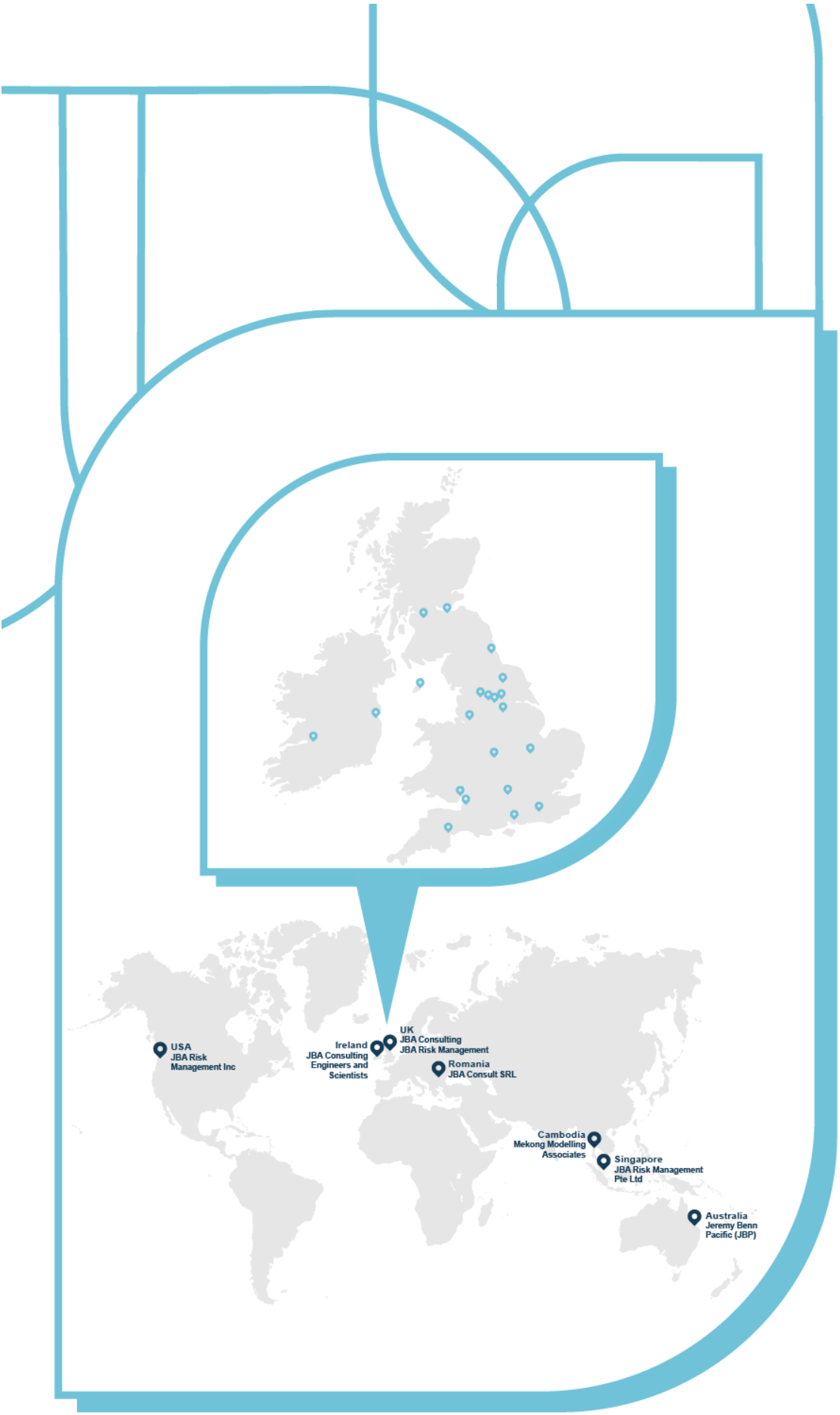
The site is affected by fluvial and surface water flooding, but the majority of the site is not shown to be at flood risk. The centre of the site is at risk from fluvial flooding, and is located within Flood Zones 2, 3a, and 3b. Low-lying areas in the southeast of the site alongside the unnamed watercourse are at risk of flooding from this watercourse, represented within the surface water mapping. There are several culverts within and surrounding the site which present a residual flood risk.

Should ‘More Vulnerable' development be proposed within the extent of Flood Zone 3a, the Exception Test will be required for this site. 'More Vulnerable' development is not permitted in Flood Zone 3b.

A site-specific FRA will be required, because the proposed development site is greater than 1 hectare, in Flood Zones 2, 3a and b, subject to ordinary watercourse and surface water flooding, and identified as being at increased flood risk in the future.

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

- A buffer of at least 8 metres should be maintained between the watercourses and any built development.
- The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the areas of highest risk in the centre and southeast of the site. Developers should consider utilising these areas as green corridors.
- A detailed hydraulic model of the Tweed River and the unnamed watercourse along the eastern site boundary may be required at FRA stage to accurately represent the risk from these watercourses and set the height of any mitigation measures. Detailed survey of the culverts within and surrounding the site is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows these are likely to significantly impact the flood extents within the site.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events, taking into account that the Tweed River bisects the site and the only access to the southern section is via the A447 from the south.
- 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.
- Flood mitigation measures should be implemented then tested to check that they will not displace water elsewhere (for example, if land is raised to permit development in one area, compensatory flood storage will be required in another).



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