Level 2 Strategic Flood Risk Assessment – Site LPR263

Final Report

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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 LPR263. 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 north of Desford Road (B582) between Merrylees Road and Lindridge Lane
- Site area: 31.4ha
- Existing site use: Greenfield
- Proposed site use: Residential

1.2 Topography

Figure 1-1 shows the topography of the site represented by the Environment Agency (EA) 1m resolution LiDAR. The LiDAR shows that the site is largely on higher ground, with lower terrain being concentrated near the northern and northeastern boundaries of the site. Ground elevations slope relatively steeply downhill from south to northeast, towards the paths of the watercourses. The LiDAR shows there is an area of lower elevation in the southwest of the site, where there is a farm field bordered by hedges. The minimum elevation is 111.7mAOD near the northern boundary, and the maximum elevation is 133mAOD near the western boundary of the site.

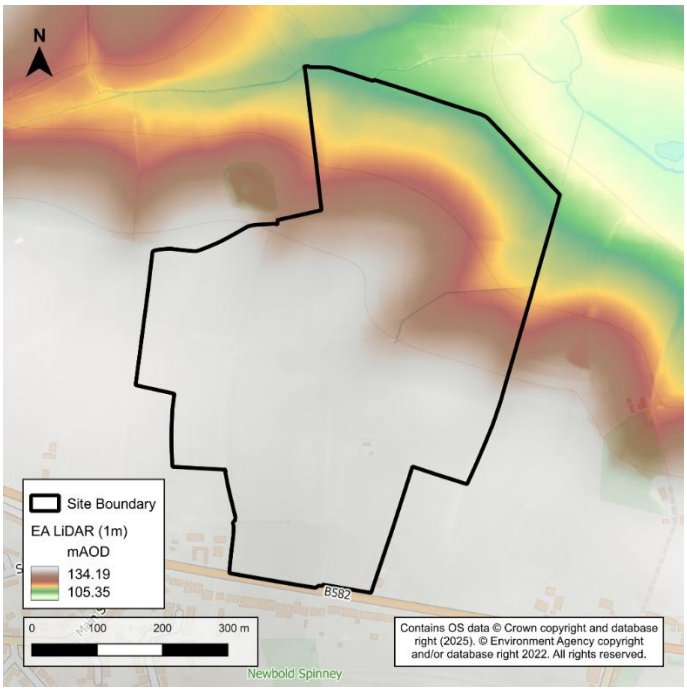


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: mainly Edwalton Member comprising of mudstone, with the northern end of the site being Gunthorpe Member comprising of mudstone with a thin layer of Cotgrave Sandstone Member comprising of sandstone in between the mudstone bands.
- Superficial deposits:
  - Glaciofluvial deposits, Mid Pleistocene comprising of sand and gravel covers most of the site.
  - Alluvium comprising of clay, silt, sand and gravel along the unnamed watercourses near the northern boundary of the site.

Soils at the site consist of mainly loamy soils with naturally high groundwater, with a small area of slightly acid loamy and clayey soils with impeded drainage in the centre and eastern side of the site. Additionally, the northern end of the site is 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 southern boundary of the site is in the Thurlaston Brook Catchment (Tributary of Soar). The remaining of the site is within the Rothley Brook Catchment (Tributary of Soar). The site is in the upstream end of both catchments. Thurlaston Brook is located approximately 7.3km southeast of the site and Rothley Brook is located approximately 2.4km northeast of the site.

Existing drainage features

There are two unnamed watercourses which are within or surround the site. One unnamed watercourse flows in an easterly direction along part of the northern boundary of the site. An additional unnamed watercourse flows in a northeasterly direction from the centre to the eastern side of the site and then flows along the eastern boundary of the site where it joins the other watercourse outside the northern 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 Zones 2, 3a and 3b are shown to follow the path of the unnamed watercourse that flows along part of the northern boundary of the site. The topography of the site means that fluvial risk is confined to the low-lying areas along the banks of the watercourse near the northern boundary and do not extend further south into the site.

In all flood zones, only the northwest part of the northern boundary of the site is shown to be at a fluvial flood risk. Between Flood Zones 3b, 3a and 2, fluvial extents only increase slightly.

The unnamed watercourse that that flows 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 (%)
99	<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 the majority of the site is not at risk from surface water flooding.

During the 3.3% AEP event there are several small areas of surface water ponding in the southern end of the site, with a large area of ponding near the southern boundary of the site in a farm field. There is an additional small area of ponding in the western side of the site.

In the 1% AEP event, the existing areas of surface water ponding increase in extent, mainly the large area of ponding near the southern boundary. New areas of ponding develop near the southwestern boundary, and a flow path begins to form near the unnamed watercourse in the eastern side of the site.

In the 0.1% event, the surface water ponding in the south of the site further increases in extent. There are new areas of ponding that develop near the southwestern and southeastern boundaries, and a flow path further develops within the vicinity of the unnamed watercourse in the east of the site but is not shown to follow the path of the watercourse as shown in the online mapping. There is also a flow path which develops in the north of the site, flowing towards the watercourse on the northern boundary.

Table 2-2 shows the maximum depth, velocity, and hazard classification on the site. The greatest depths are associated with the area of ponding which forms in the south of the site, whilst the greatest velocities are in the flow paths in the north and east of the site, where depths remain below 0.2m. The greatest hazard classification is in the area of ponding in the south of the site and along the unnamed watercourse in the east of the site. Hazard across most of the site remains at 'Very Low Hazard'. In the 0.1% AEP event depths in the east of the site, along the path of the unnamed watercourse exceed 0.6m but do not exceed 0.9m, in the same area in the 1% AEP event, depths exceed 0.3m but do not exceed 0.6m.

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* (%)	2.8	1	3.5
Maximum depth (m)	Exceeds 0.6m but does not exceed 0.9m	Exceeds 0.6m but does not exceed 0.9m	Exceeds 0.9m but does not exceed 1.2m
Maximum velocity (m/s)	Exceed 0.25m/s but does not exceed 0.5m/s	Exceed 0.5m/s but does not exceed 1.0m/s	Exceed 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 shows that the majority of the site, from the centre south, is shown to have groundwater levels between 0.5m and 5m below the ground surface. There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.

There is a layer that transects the northern end of the site where groundwater levels are between 0.025m and 0.5m below the ground surface. In this area, there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.

Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow north towards the watercourse on the northern boundary of the site.

The JBA Groundwater Emergence Map shows that in the north of the site and near the centre of the site between the two areas of groundwater risk there is a negligible risk of groundwater emergence due to the nature of the local geological deposits.

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

This site has not been previously included as part of the Regulation 18 process or Strategic Housing and Employment Land Availability Assessment reports. Therefore, Severn Trent Water have not yet been consulted on sewer flood risk at the site. Severn Trent Water should be consulted at an early stage to discuss drainage requirements at the site and any potential restrictions or limitations within the surrounding sewerage system.

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 no recorded flood incidents 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 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 shows the site is only minorly to be at increased fluvial flood risk in future. Between the present day and the Climate Change layer there is only a slight increase in extent in the northwest corner of the site.

The unnamed watercourse that transects the eastern side of the site and flows along the eastern site boundary is not represented within the EA's FMfP. The future 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 the site is sensitive to climate change. The main difference between the 1% and 0.1% AEP events is that the areas of surface water ponding in the centre and south of the site increase in extent. Additionally, between the 1% and 0.1% new flow paths develop in the north and east of the site.

Within the site, the maximum hazard classification mainly remains unchanged between the AEP events, but depths and velocities increase. The area of ponding in the south increases in depth and hazard. Also, between the AEP events the velocities increase in the northwest corner and the eastern side of the site, indicating 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

There is no residual risk to the site from flood risk management structures.

5 Emergency planning

5.1 Flood warnings and alerts

The site is not located in an EA Flood Warning or Flood Alert Area.

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 only be accessed from the south via Desford Road (B582).

5.2.2 Fluvial

The fluvial flood risk is confined to the northern boundary of the site and will not impact access from the south; therefore, safe access and escape is possible.

5.2.3 Surface water

During the 3.3% AEP event there are access and escape routes remain largely clear, with a few minor instances of surface water ponding on and beside Desford Road (B582). On Desford Road (B582) depths to the east exceed 0.2m but do not exceed 0.3m, velocities are less than 0.25m/s and have a 'Danger for Some' hazard classification.

During the 1% AEP event, existing areas of surface water ponding increase in extent and new areas of ponding develop on Desford Road (B582) to the east and west of the site. On Desford Road (B582) depths to the east exceed 0.2m but do not exceed 0.3m, velocities exceed 0.25m/s but do not exceed 0.5m/s and have a 'Danger for Some' hazard classification. To the west on Desford Road (B582) water depths exceed 0.2m but do not exceed 0.3m, velocities remain less than 0.25m/s and have a 'Danger for Some' hazard classification.

During the 0.1% AEP event, existing areas of surface water ponding increase in extent and several new areas of ponding develop beside Desford Road (B582) in the east and west. On Desford Road (B582) water depths to the east exceed 0.2m but do not exceed 0.3m, velocities exceed 0.25m/s but do not exceed 0.5m/s and have a 'Danger for Some' hazard classification. To the west on Desford Road (B582) water depths exceed 0.2m but do not exceed 0.3m, velocities exceed 0.25m/s but do not exceed 0.5m/s and have a 'Danger for Some' hazard classification.

There is a large area of ponding near the southern boundary of the site within a farm field, however the existing access road to the site is to the right of the field. Within the field,

ponding depths exceed 0.9m but do not exceed 1.2m, velocities exceed 0.5m/s but do not exceed 1m/s and have a ‘Danger for Most’ classification. To the west on Desford Road (B582) velocities exceed 0.25m/s but do not exceed 0.5m/s and have a ‘Danger for Some’ hazard classification. A small area on the road at the junction with Sparkenhoe, water depths exceed 0.3m but do not exceed 0.6m, along the rest of the road there are several small areas where water depths exceed 0.2m but do not exceed 0.3m

Due to the water depths not exceeding 0.3m along the road in the 3.3% and 1% AEP events and given that only a small area in the 0.1% AEP event exceeds 0.3m, as long as any access routes are sited outside of the area of ponding, safe access and escape are likely to be possible.

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:

- Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.
- BGS data indicates that the underlying geology is predominantly 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).

The unnamed watercourse that flows along part of the northern boundary of the site and the tributary of the unnamed watercourse that transects through the eastern side and along the eastern boundary 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 Thurlaston Brook 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. Thurlaston Brook is considered to be of poor 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 will not be permitted within 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 is:

- in Flood Zones 2, 3a, and 3b.
- greater than 1 hectare.
- 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 in the low-lying area surrounding the unnamed watercourses near the northern boundary and eastern side of the site where there is fluvial flood risk. Additionally, development should be away from the southern end of the site, particularly near the southern boundary of the site, where significant surface water risk is evident.

A detailed hydraulic model of the unnamed watercourse and its unnamed tributary along the northern boundary and eastern side of the site may be required at FRA stage to accurately represent the risk from this watercourse.

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

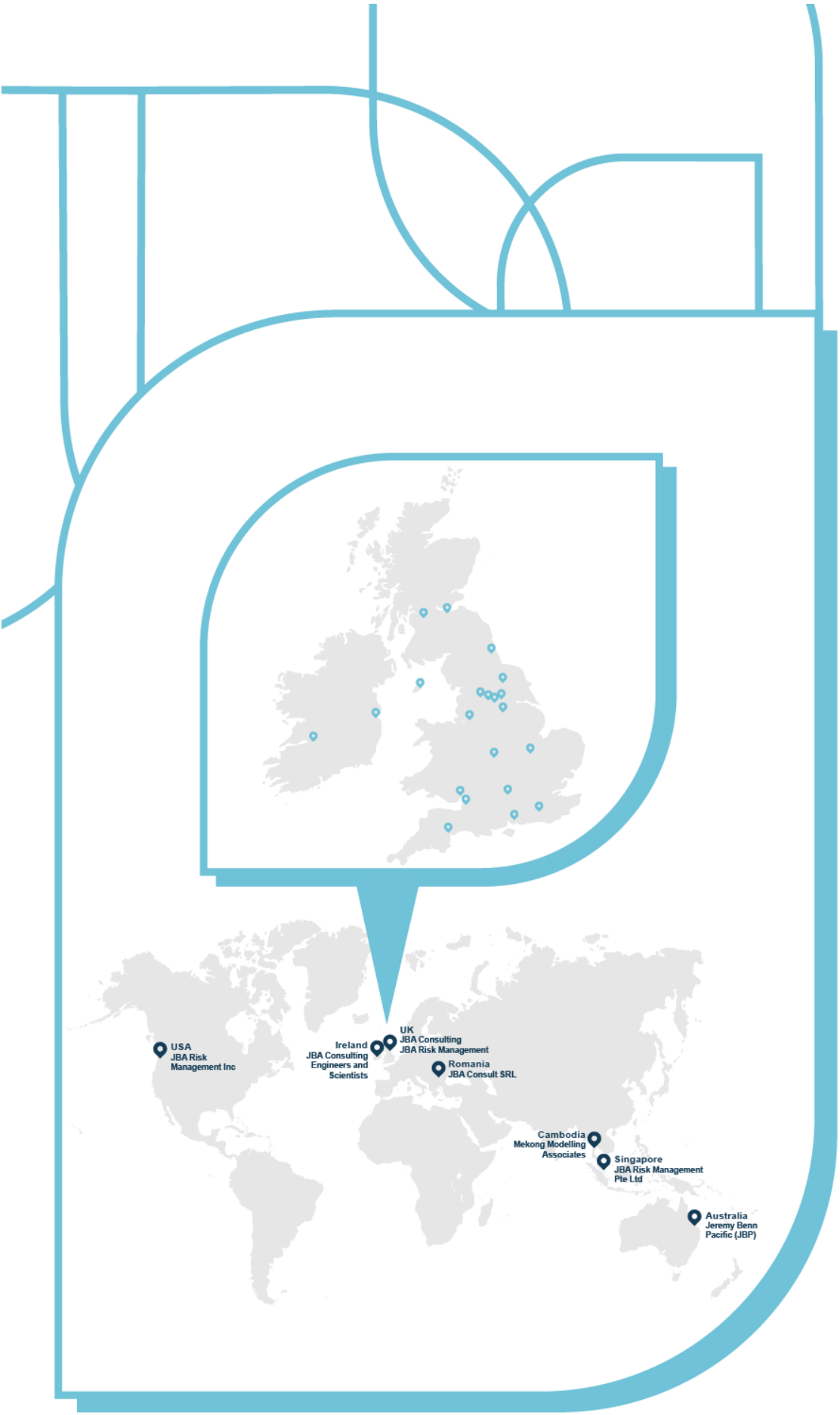
The site is affected by fluvial and surface water flooding, but the majority of the site is not shown to be at flood risk. The northern boundary of the site, in which the unnamed watercourse is located, is at risk from fluvial flooding, and is located within Flood Zones 2, 3a, and 3b. The south and east of the site are at surface water flood risk, with large areas of ponding.

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 will not be permitted within 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 southern end, eastern side, and near the northern boundary of the site. Developers should consider utilising these areas as green corridors and public open space.
- A detailed hydraulic model of the unnamed watercourse that flows along part of the northern boundary and the unnamed tributary of the watercourse that transects the east side of the site may be required at FRA stage to accurately represent the risk from these watercourses.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. This initial assessment shows safe access and escape is likely to be possible, as long as any access routes are sited outside of the area of ponding in 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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