Level 2 Strategic Flood Risk Assessment – Site LPR151 A

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 LPR151 A. 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 southeast of the settlement of Desford
- Site area: 42.1ha
- 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 EA 1m resolution LiDAR shows that the site has a higher elevation to the west, before sloping downhill to an area of lower elevation towards to northeast of the site. The maximum elevation is around 132.2mAOD at the western site boundary, and the minimum elevation is around 93.8mAOD at the northeastern site boundary.

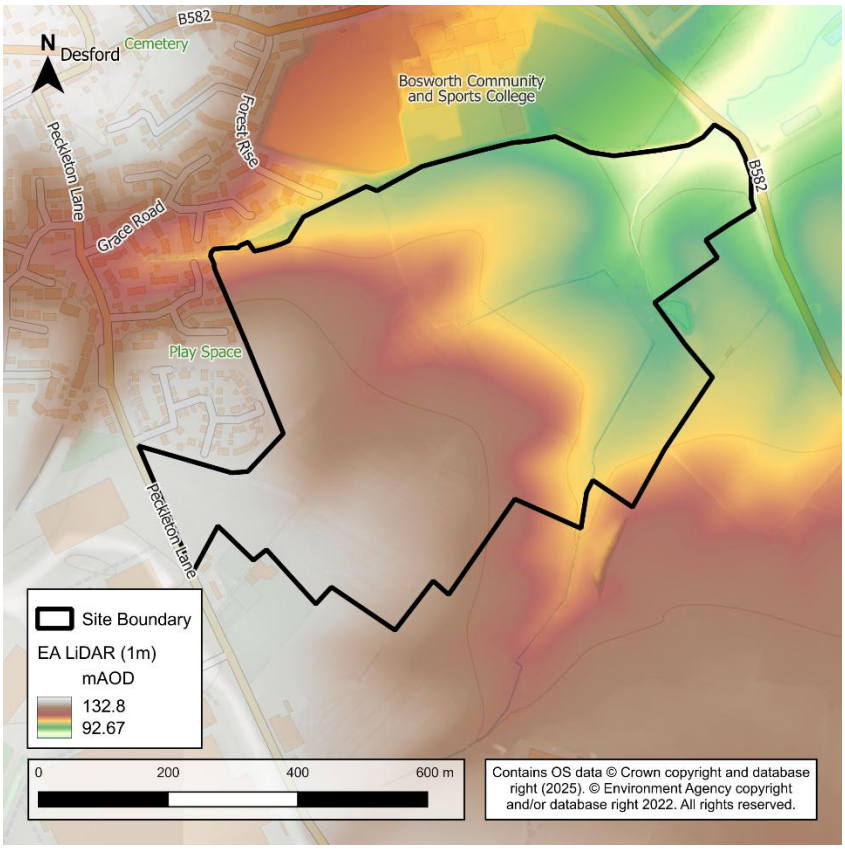


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock:
  - Edwalton Member comprised of mudstone covers most the site.
  - Cotgrave Sandstone Member comprised of sandstone at the northeastern section of the site.
  - Gunthorpe Member consisting of mudstone to the northeastern site boundary.
- Superficial deposits:
  - There are no superficial deposits present throughout the majority of the site.
  - Glaciofluvial deposits, Mid Pleistocene comprised of sand and gravel is present along the western site boundary.
  - Alluvium, comprised of clay, silt, sand and gravel, is present in the northeastern 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 Rothley Brook Catchment (tributary of the River Soar) catchment, in the residential area of Desford. The catchment draining to the site is approximately 0.9km^2. There are three unnamed watercourses within the site, running along the northern site boundary, the southeastern site boundary, and one which bisects the east of the site.

2.2 Existing drainage features

An unnamed watercourse flows along the northern site boundary, flowing east before entering a suspected culvert under the B582. Bisecting the eastern parcel of the site is another unnamed watercourse, which flows east before entering the suspected culvert. Along the southeastern site boundary, an unnamed watercourse flows northeast before joining the other unnamed watercourses, flowing through the suspected culvert under the B582, before joining Rothley Brook. Just outside of the eastern site boundary is an existing pond.

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.

2.3.2 Description of risk to the site

The site is not shown to be at fluvial flood risk based on the EA's FMfP.

The unnamed watercourses along the northern site boundary, in the southeast of the site, and that bisect through the centre of the site are not represented within the EA's FMfP. The risk from these watercourses has been assessed using the EA's Risk of Flooding from Surface Water Map (see Section 2.4).

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

Within the site, there are three surface water flow paths representing ordinary watercourses at the northern site boundary, bisecting the site, and along the southeastern site boundary. During the 3.3% and 1% AEP events, surface water flow paths are largely aligned to the existing watercourses and the low-lying land surrounding them, with some areas of surface water ponding to the west of the site. During the 0.1% AEP event, the flow paths become more extensive. Flow paths still follow the ordinary watercourses and the low-lying areas around them, with the flow path which aligns with the watercourse that bisects the site increasing substantially.

The maximum depths, velocities and hazards (shown in Table 2-1) align with the lowered topography of the watercourse channels. The areas of risk surrounding the watercourses are generally shown to remain below 0.3m in depth in all AEP events. There are some areas where velocities exceed 1.0m/s with hazard classification of 'Danger for Most' in the 0.1% AEP event along the south side of the southeastern watercourse.

Table 2-1: Existing surface water flood risk based on the RoFSW map.

Event	3.3% AEP	1% AEP	0.1% AEP
Percentage of site at risk* (%)	1.8	1.3	4.9
Maximum depth (m)	Exceeds 0.9m but does not exceed 1.2m	Exceeds 1.2m	Exceeds 1.2m
Maximum velocity (m/s)	Exceeds 1.0m/s but does not exceed 2.0m/s	Exceeds 2.0m/s	Exceeds 2.0m/s
Maximum hazard classification	Danger for Most	Danger for All	Danger for All

** 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 most of the site is not shown to be at risk of groundwater emergence due to the nature of the underlying geological deposits.

Groundwater levels are at least 5m below the ground surface in the west of the site meaning flooding from groundwater is not likely.

To the east of the site, groundwater levels are between 0.025m to 0.5m to the southeast, and within 0.025m of the ground surface to the northeast, where the bedrock geology is sandstone.

Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow to the east of the site to the area of lower elevation.

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.

Development of this site would result in capacity issues in the Desford sewer network and likely result in the requirement to upsize pipes and upgrade of a pumping station. Therefore, Severn Trent Water should be consulted at an early stage to discuss drainage requirements for the site.

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 one instance of highway flooding at the eastern site boundary of the B582 reported to be as a result of poor maintenance of the ordinary watercourse.

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.

3.1.2 Description of risk to the site

The EA's FMfP Flood Zones plus Climate Change layer shows the site is unlikely to be at increased fluvial flood risk in future.

The unnamed watercourses at the northern site boundary, south east of the site, and that bisects the site are not represented within the EA's FMfP within the site. 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 increased risk with climate change along the lower topography aligned with the watercourses. The extents along each flow path increase between the 1% AEP and 0.1% AEP events. There is also a considerable increase in velocity with much larger areas of the flow paths exceeding 1.0m/s in the 0.1% AEP event. This increases the areas of risk indicated to have hazard classification of 'Danger for Some' and '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 watercourses within the site flow east out of the site under the B582 through a suspected culvert, creating potential risk of water backing up and entering the site. The RoFSW mapping shows a small area of ponding upstream of the road and there is residual risk of a culvert blockage increasing the risk in the northeast of the site.

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 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

Potential access may be provided by:

- Peckleton Lane to the west of the site
- The B582 to the east of the site
- Forest rise to the north of the site
- Bambrook Close to the north of the site

5.2.2 Fluvial

Access and escape are not shown to be impacted during any of the available fluvial flood events, including within the Flood Zones plus Climate Change dataset.

5.2.3 Surface water

Surface water flow paths divide this site into three main parcels, one being at the eastern site boundary, one at the southeastern site boundary, and the other the main remaining parcel of the site.

During all AEP events, surface water flow paths are largely aligned to the existing watercourses and the low-lying land surrounding them, with a couple of areas of surface water ponding to the west of the site. Potential access to the parcels at the eastern site boundary and southeastern site boundary would only be possible from the B582 during these events. Access from the north along the B582 is likely to be impeded as depths exceed 0.6m, with velocities are around 1m/s, and hazard classification of 'Danger For All' where the unnamed watercourses cross the road. However, access and escape from the south may be possible with depths not exceeding 0.3m, velocities remaining below 1.0m/s and hazard classification of 'Danger for Some' along the road.

Access and escape routes to the main site parcel via the B852, Forest Rise, and Bambrook Close during these events is cut off by surface water flow paths, with the depth exceeding 0.9m, velocities exceeding 1m/s, and a hazard classification of 'Danger for All'. Potential access from Peckleton Lane from the north is likely to be impeded where the unnamed

watercourse to the north of the site crosses it with depths exceeding 0.3m, velocities exceeding 0.5m/s, and a hazard classification of 'Danger for Most'. However, access and escape from Peckleton Lane from the south is likely to remain unimpeded. There are some areas of surface water risk along the road but depths do not exceed 0.3m, velocities remain below 1.0m/s (and are mostly below 0.5m/s) and the hazard classification is 'Very Low Hazard'.

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 covering the majority of the site comprises of mudstone and is likely to be poorly draining. Any proposed use of infiltration must 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 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 unnamed watercourses at the northern site boundary, southeast of the site, and that bisects the site should be integrated into the site layout 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 must 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 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.

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'.

The Exception Test is not required for this site because the site is located entirely in fluvial Flood Zone 1 of the EA FMfP

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
- at risk of flooding from ordinary watercourse and surface water
- identified as being at increased flood risk in the 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 areas surrounding the unnamed watercourse and around the suspected culvert underneath the B582 where significant surface water risk is evident.

Developers should consider utilising low-lying areas surrounding the unnamed watercourses as a green corridor or as a location for SuDS.

A detailed hydraulic model of the unnamed watercourses may be required at FRA stage to accurately represent the risk from this watercourse. Detailed survey of the suspected culvert underneath the B582 is likely to be required to ensure this is properly represented within the modelling.

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 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.

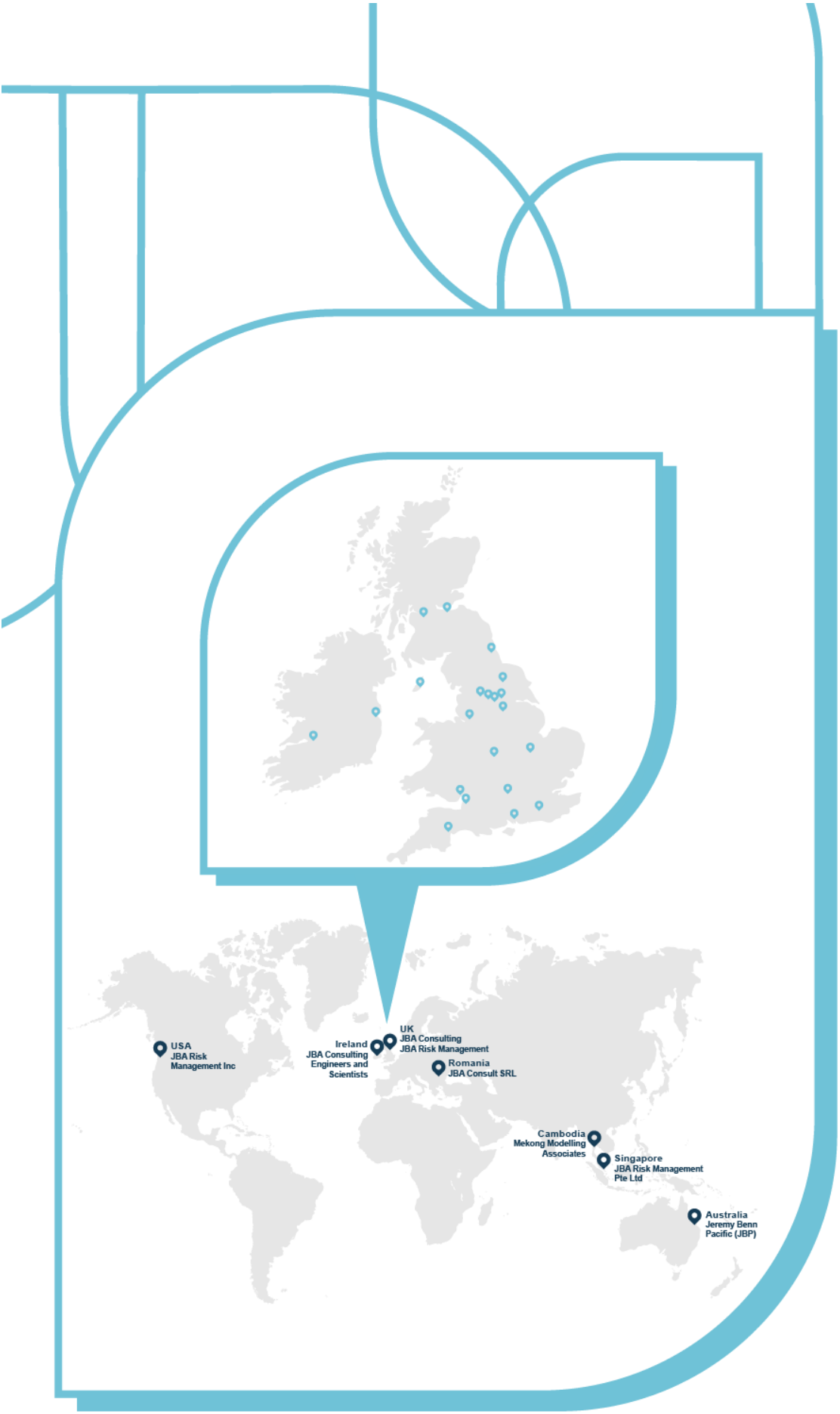
8 Conclusions

Low-lying areas in the east of the site along the unnamed watercourses are at risk of flooding, represented within the surface water mapping. There is a suspected culvert to the east of the site under the B582, which presents a residual flood risk. The JBA Groundwater Emergence map shows instances of groundwater being within 0.025m of the ground surface and is likely that any groundwater that emerges will flow to the area of low elevation to the east of the site.

The Exception Test is not required for the site, because it is located entirely in fluvial Flood Zone 1. However, a site-specific FRA will be required, because the proposed development site is one hectare or greater in Flood Zone 1, is subject to ordinary watercourse and surface water flooding, and is 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 along the ordinary watercourses within the site. Developers should consider utilising these areas as green corridors.
- A detailed hydraulic model of the unnamed watercourses along the northern site boundary, the southeastern site boundary, and that bisects the site 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 culvert downstream of the site is likely to be required to ensure it is properly represented within the modelling as the available flood risk mapping shows this is likely to impact the flood extent within the site.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events.
- 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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