Level 2 Strategic Flood Risk Assessment – Site AS445

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 AS445. 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 south of Desford Road (B582), between Kirkby Lane and Brascote Lane
- Site area: 24.12ha
- Existing site use: Predominantly greenfield with existing building onsite.
- 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 the highest elevations within the site are in the northeast and elevations slope downhill towards the southwest and Thurlaston Brook. The minimum elevation is 125.7mAOD in the southwestern corner of the site, near the channel of Thurlaston Brook, and the maximum elevation is 132.8mAOD near the northeastern boundary of the site.

The LiDAR shows that in the northeastern end of the site there are lines of lower elevation within areas of higher elevation. Based on the base mapping this area is farmland and the representation of elevation likely represents plough lines within the field.

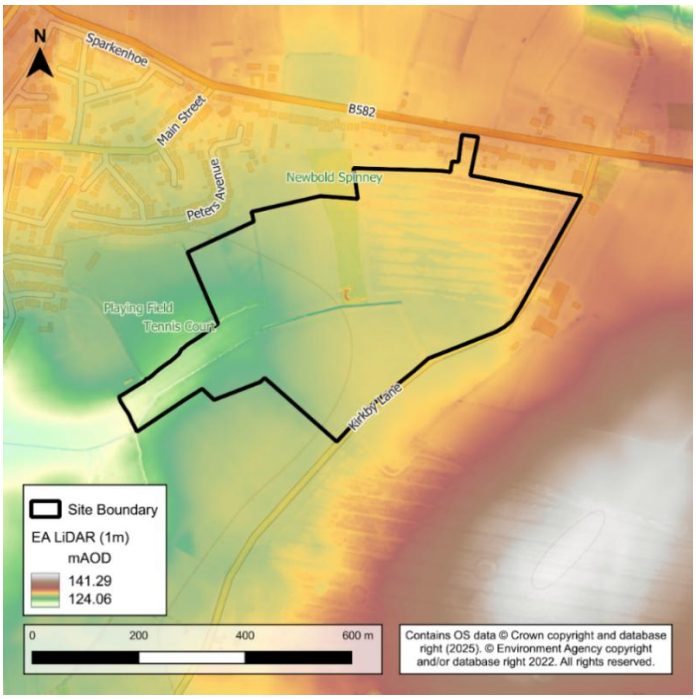


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: mainly Gunthorpe Member comprising of mudstone. However, a layer of Cotgrave Sandstone Member comprising of sandstone is present through the centre, separating the Edwalton Member comprising of mudstone located in the northeastern side of the site.
- Superficial deposits:
  - Glaciofluvial deposits, Mid Pleistocene comprising of sand and gravel cover most of the site.
  - Alluvium comprising of clay, silt, sand and gravel located in the southwest corner of the site.

Soils at the site consist mainly of loamy soils with naturally high groundwater, with a small area of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils in the northeast corner of the site.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is at the upstream end of the Thurlaston Brook Catchment (Tributary of Soar). The source of the Thurlaston Brook begins in the centre of the site and flows in a south westerly direction, exiting the site by the southwestern corner. The catchment upstream of the site predominantly rural.

2.2 Existing drainage features

Thurlaston Brook originates within the centre of the site, flowing in a south westerly direction and exiting the site through the southwestern corner.

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.

Thurlaston Brook, which transects from the centre of the site, 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).

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 the existing watercourse within the site.

In the 3.3% there is no consistent surface water flow path, but there are areas of surface water ponding, confined to the areas of lowest elevation surrounding the Thurlaston Brook in the southwestern corner of the site. As mentioned in Section 1.2, the lines of lower elevation in the northeastern end and eastern boundary have multiple areas of surface water ponding.

During the 1% AEP event, new locations of surface water ponding develop near the eastern side, southwestern, northern boundaries of the site, and the surface water ponding on the northern and eastern boundary of the site increases in extent.

During the 0.1% AEP event the surface water ponding in the northeastern end and near the northern boundary of the site significantly increases in extent. In this event, the areas of small ponding along the channel of Thurlaston Brook develops into a surface water flow path that transects through the centre of the site. The locations of the surface water ponding near, on, and just outside of the eastern boundary remain consistent; however, new areas of ponding develop between each event, resulting in an increase in ponding extent as the AEP increases.

The greatest depths, velocities, and hazard on the site (shown in Table 2-1) are associated with the channel of Thurlaston Brook. Depths across the rest of the site mostly remain below 0.3m, with velocities typically less than 0.5m/s and maximum hazard classification of 'Danger for Some' but mostly 'Very Low Hazard'.

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* (%)	5.6	1.8	7.7
Maximum depth (m)	Exceeds 1.2m	Exceeds 1.2m	Exceeds 1.2m
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 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 is shown to have groundwater levels are 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 an area in the southwestern corner of the site where groundwater levels are either at or very near (within 0.025m of) the ground surface. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic

low spots. Surrounding this area, groundwater levels are between 0.025m and 0.5m below the ground surface. Within this zone 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 in a south-westerly direction, following the topography to the low-lying areas in the west and southwest of the site.

In the southwest corner, the area surrounding the watercourse channel is shown as having a negligible risk from groundwater flooding 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

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. The site is considered to have a high potential impact on the sewerage infrastructure. There are multiple assets downstream of the site with model predicted flooding. Development could adversely impact the downstream sewer infrastructure.

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 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.

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.

Thurlaston Brook 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 quite sensitive to climate change. Between the 1% and 0.1% AEP events the surface water ponding extents increase significantly, particularly near the eastern border of the site and in the southwest corner of the site near Thurlaston Brook.

Surface water ponding extents on and beside the northern, eastern, and southern boundaries of the site increase significantly between the 1% and 0.1% AEP events and new areas of ponding develop.

The maximum depth, velocity and hazard classification categories on the site remain unchanged between the AEP events, which are representative of the risk within the watercourse, however in the northeast area of the site there are much larger areas with depths exceeding 0.3m and velocities of greater than 0.25m/s in the 0.1% AEP event than the 1% AEP event.

Near the northern boundary of the site in the 0.1% surface water has a hazard classification increases to ‘Danger for Most’. Additionally, along the eastern boundary of the site and the northwestern corner of the site in the 0.1% velocities increase to 0.5m/s. along the southwestern boundary water depths increase from exceeds 0.6m but does not exceed 0.9m to exceeds 0.9m but does not exceed 1.2m.

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 be accessed from the east via Kirkby Lane or from the north via Desford Road.

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

Access and escape from Kirkby Lane to the east are likely to remain passible in all modelled AEP events. During the 3.3% AEP and 1% AEP events, there are some instances of surface water ponding on centre Kirkby Lane adjacent to the site, with the largest area at the junction with Hunts Lane (B582). Depths on Kirkby Lane 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. In the 0.1% AEP event, the extent of surface water ponding on the roads increases, especially near the junction between Kirkby Lane and Hunts Lane (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' classification.

Access and escape from Desford Road to the north is also likely to remain passible in all modelled AEP events. There are small areas of surface water ponding which develop along Desford Road at its junction with Kirkby Lane, however depths are shown to remain below 0.2m, with velocities below 0.5m/s and a hazard classification of '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 at least 5m below ground level and groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding.
- 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).

The Risk of Flooding from Surface Water (RoFSW) mapping indicates the presence of surface water flow paths during the 0.1% AEP event. Thurlaston Brook 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 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 it is not shown to be at fluvial flood risk within the EA Flood Map for Planning.

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:

- 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

Due to the extent of the surface water flooding on the site, finished Floor Levels should be raised above the expected height of flooding in line with the EA's guidance and any raising of ground levels should ensure that flood risk is not increased elsewhere.

If proposed works affect an ordinary watercourse, Leicestershire County Council as the Lead Local Flood Authority should be contacted 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 detailed hydraulic model of Thurlaston Brook 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 watercourse and any built development.

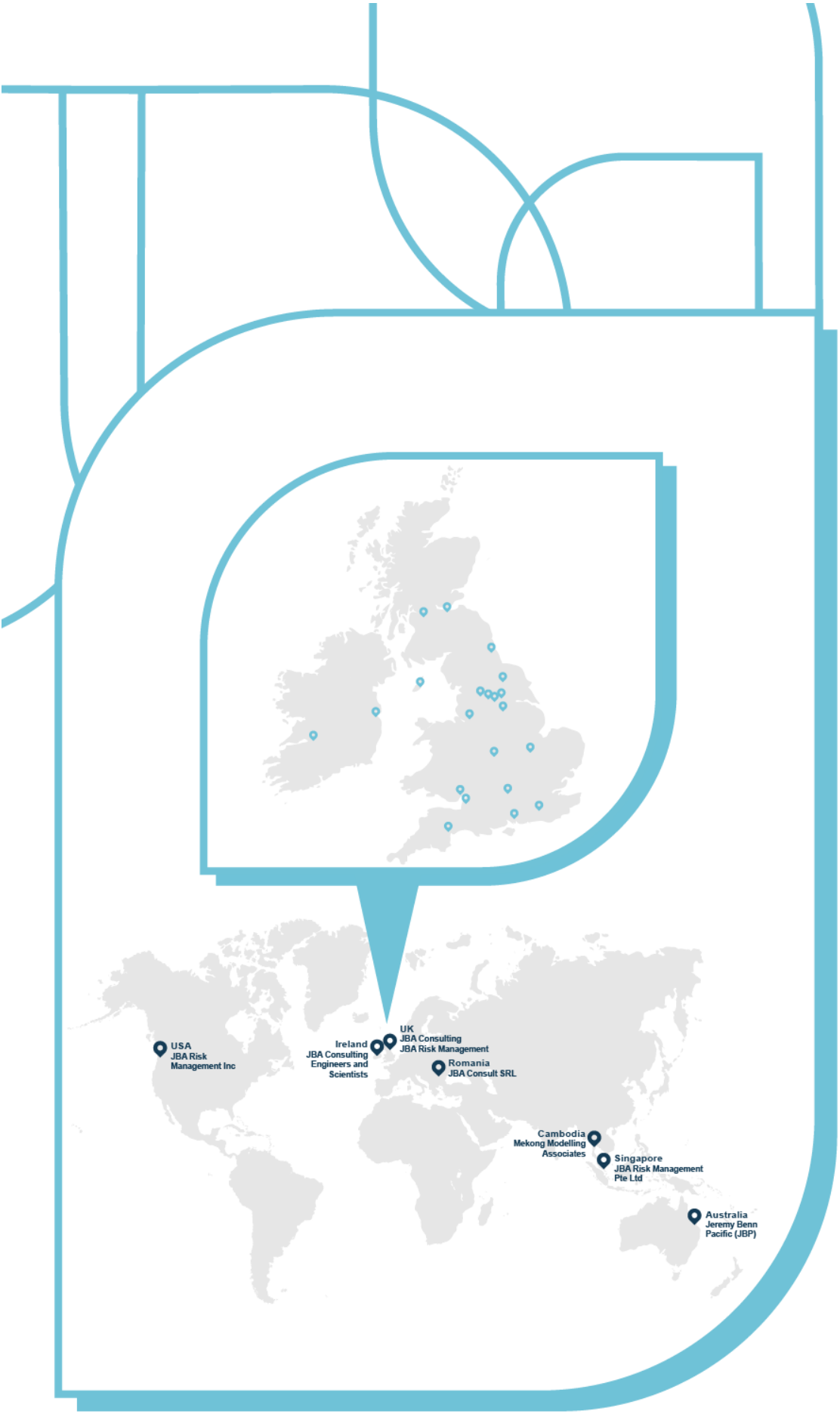
8 Conclusions

The site is affected by surface water flooding, with the most at risk areas being the northern and eastern parts of the site. There is also fluvial risk from Thurlaston Brook, represented within the surface water mapping, that originates in the centre of the site and flows in a south-westerly direction through the site. Severn Trent Water have also identified potential issues with sewer flooding downstream of the site which could be exacerbated by development at the site.

The Exception Test is not required, because the site is not shown to be at fluvial flood risk within the EA Flood Map for Planning. However, a site-specific FRA will be required, because the proposed development site is one hectare or greater in Flood Zone 1, 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 watercourse and any built development.
- Due to the extent of the surface water flooding on the site, finished Floor Levels should be raised above the expected height of flooding in line with the EA's guidance and any raising of ground levels should ensure that flood risk is not increased elsewhere.
- A detailed hydraulic model of Thurlaston Brook that transects through the centre of the site may be required at FRA stage to accurately represent the risk from this watercourse. Existing flow paths should be retained and integrated with blue-green infrastructure and public open space.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. This initial assessment has shown safe access and escape are likely to be possible (using the 0.1% AEP surface water event as a proxy for climate change).
- 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.
- Severn Trent Water should be consulted at an early stage on drainage proposals for the site and to ensure that development at the site does not exacerbate downstream sewer flooding issues.



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