Level 2 Strategic Flood Risk Assessment – Site LPR85

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 LPR85. 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 northwest of the settlement of Desford
- Site area: 14.69ha
- Existing site use: Predominantly greenfield, existing buildings onsite in the southeastern corner
- 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 is predominantly at a higher elevation in the south and centre of the site, before the elevation slopes steeply downhill towards the northern site boundary. The maximum elevation is 133.3mAOD in the south of the site, and the minimum elevation is 104.2mAOD in the northeast site corner.

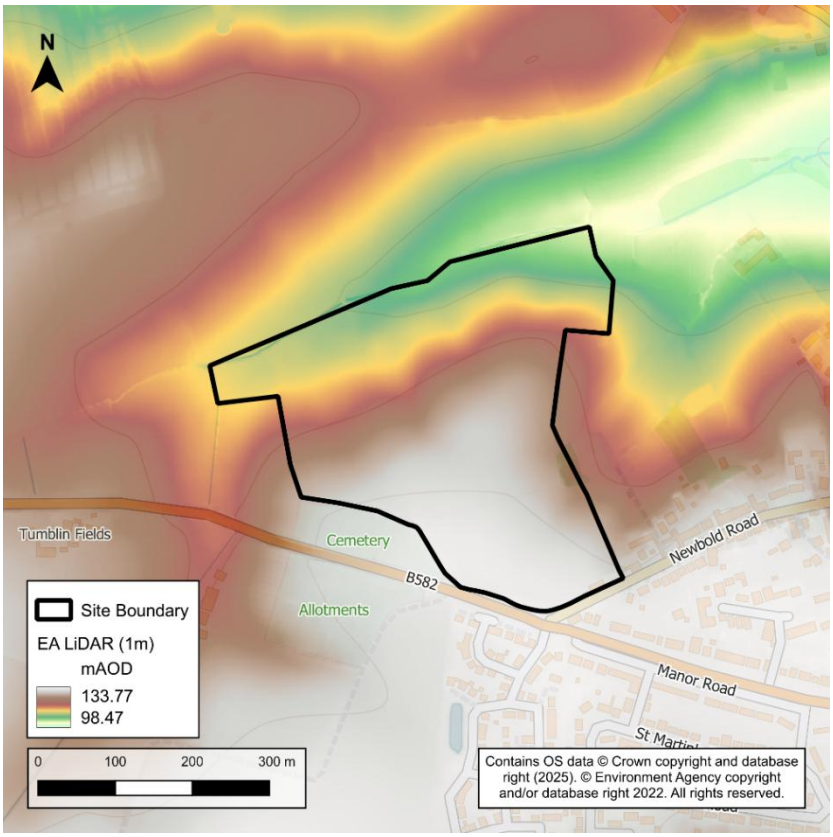


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock:
  - Edwalton Member and Gunthorpe Member comprising of Mudstone across most of the site.
  - Bands of Edwalton Member comprising dolomitic siltstone in the centre of the site.
  - A band of Cotgrave Sandstone Member comprising of sandstone to the north of the site.
- Superficial deposits:
  - The superficial geology for the majority of this site is unknown as no information is available for this location.
  - There are Glaciofluvial deposits, Mid Pleistocene comprising of sand and gravel at the southern site boundary.

Soils at the site consist of:

- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils in the south of the site.
- Slightly acid loamy and clayey soils with impeded drainage in the centre and the north of the site.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is in the upstream end of Rothley Brook Catchment (trib of Soar) catchment, in the residential area of Desford. The catchment draining to the site is approximately an area of 1.3km^2. There is an unnamed watercourse flowing east along the northern border of this site, flowing east for approximately 1.25km, where it joins Rothley Brook. The upstream catchment is predominantly rural but encompasses the western side of Desford.

2.2 Existing drainage features

An unnamed watercourse is culverted under the B582 to the southwest of the site before continuing north adjacent to the western site boundary. The watercourse then flows west to east along 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.

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 watercourse along the northern 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).

2.4 Surface water

2.4.1 Available data

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

2.4.2 Description of risk to the site

Most of the site is not shown to be at risk of surface water flooding.

The RoFSW mapping indicates that surface water flooding extents are primarily aligned with the existing watercourse and low-lying areas in the north of the site. In all AEP events,

there is a surface water flow path that follows the existing watercourse flowing north along the western site boundary and then east along the northern boundary of the site.

In the 3.3%, 1% and the 0.1% AEP events, the risk primarily follows the lowered topography along the northern site boundary where the unnamed watercourse flows, with a small flow path emerging in the 0.1% AEP event at the northwestern site boundary. In all events, there is a small area of surface water ponding which develops along the southern site boundary adjacent to the B562 highway, as well as another small area of ponding adjacent to the eastern site boundary in an area of lower elevation. Depths in these areas of ponding on the site are not shown to exceed 0.6m and mostly remain below 0.3m with a maximum hazard classification of 'Danger for some'.

The greatest surface water depths, velocities, and hazard on the site are associated with the unnamed watercourse (Table 2-1).

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* (%)	2.3	1.3	2.8
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 All	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 most of the site is shown to be at negligible risk of groundwater emergence due to the nature of the underlying geology.

The JBA Groundwater Emergence Map shows a path in the north of the site where groundwater emergence levels are within 0.025m of the surface, aligning with where the bedrock geology sandstone. The JBA Groundwater Emergence Map also shows the groundwater levels in the southern area of the site are between 0.5m and 5m below the ground surface.

Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow to the area of low elevation at the northern site boundary.

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 model predicted flooding downstream. The size of site will likely have an adverse impact on the foul and combined sewer network downstream. 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 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.

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 watercourse is 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 most of the site is not sensitive to increased risk with climate change. The main difference between the 1% and 0.1% AEP events is the increase in extent along the unnamed watercourse at the northern site boundary, particularly in the northwestern corner of the site. During the 0.1% AEP, a new surface water flow path appears along the west of 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

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 B582 and from Newbold Road to the south 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

The RoFSW mapping indicates that potential access and escape from the B582 is possible from the east of the site, and Newbold Road to the south.

The RoFSW mapping indicates that surface water flooding may impact potential access and escape from the north and west of the site. During the 3.3%, 1%, and 0.1% AEP events, surface water flooding impacts potential access and escape along the B582 from the west where surface water flows across the highway, cutting off access. The depth of surface water along the B582 exceeds 0.3m, with velocity which exceeds 1m/s but does not exceed 2m/s, and a hazard classification of ‘Danger for Most;, which may impact access and escape during these AEP events.

5.3 Dry islands

There is a small dry island which forms in the northwest corner of the site during the 1% and 0.1% AEP modelled surface water events.

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 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 has areas within its boundary designated by the Environment Agency as being a historic landfill site. A thorough ground investigation will be required as part of a detailed site-specific FRA to determine potential mitigation for contamination and the impact this may have on SuDS. As such, proposed SuDS should be discussed with the relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

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 event. The unnamed watercourse and flow path along the northern site 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 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

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 where significant surface water risk is evident. Developers should consider utilising the flow path along the northern site boundary as a green corridor or as a location for SuDS.

A detailed hydraulic model of the unnamed watercourse along the northern site boundary may be required at FRA stage to accurately represent the risk from these watercourses.

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 event 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.

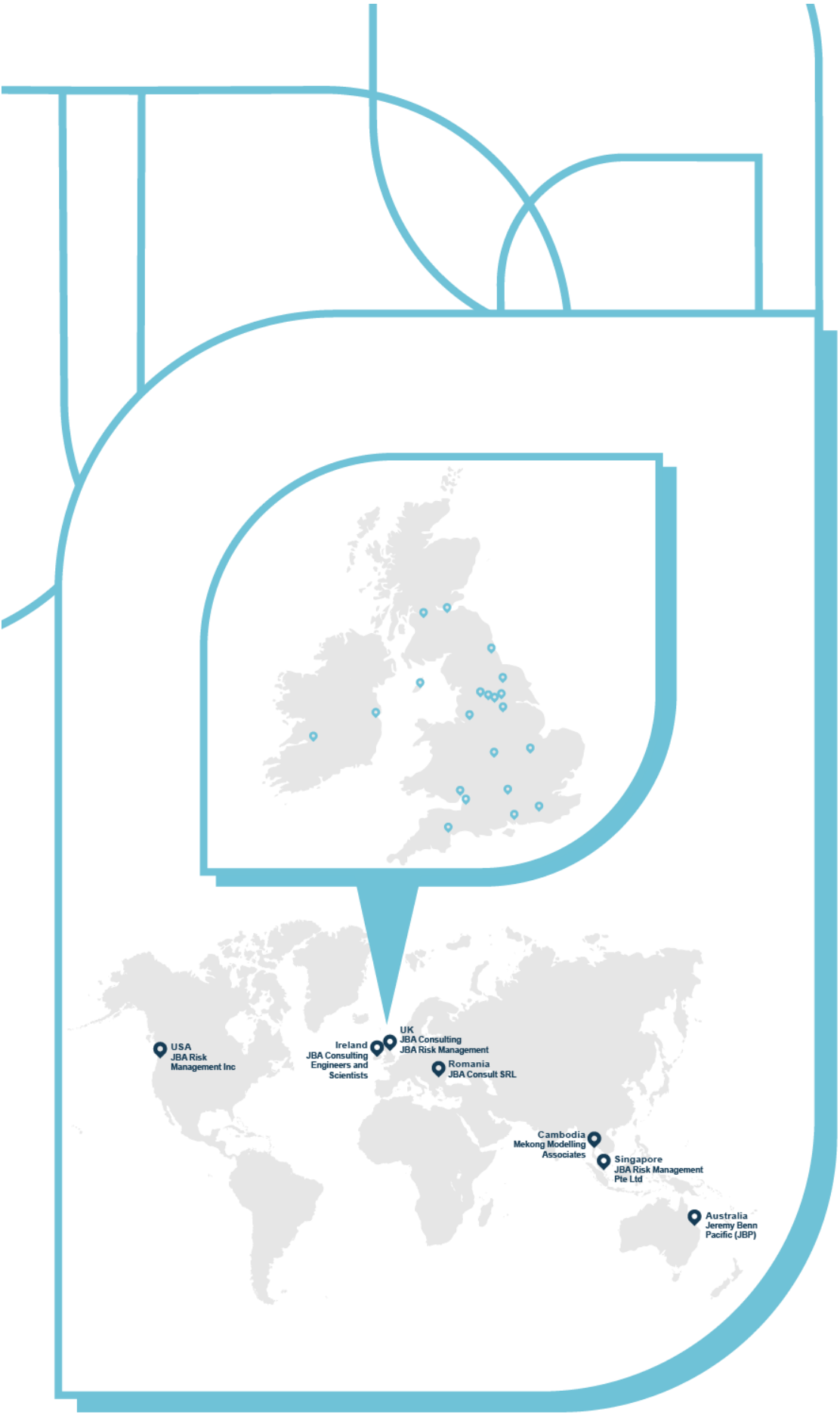
8 Conclusions

Most of the site is not shown to be at risk of flooding. However, low-lying areas in the north of the site along the unnamed watercourse are at risk of flooding from this watercourse, represented within the surface water mapping. The JBA Groundwater Emergence map shows instances of high groundwater emergence risk in the north of the site. Potential access and escape from the west may be impeded by the unnamed watercourse, but access and escape are likely to be possible when approaching from the east.

The Exception Test is not required for the sites, because they are located entirely in fluvial Flood Zone 1. However, a site-specific FRA will be required, because the proposed development sites are one hectare or greater in Flood Zone 1 and is subject to ordinary watercourse and surface water flooding.

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 north of the site. Developers should consider utilising these areas as green corridors.
- A detailed hydraulic model of the unnamed watercourse along the northern site boundary may be required at FRA stage to accurately represent the risk from this watercourse and set the height of any mitigation measures. Detailed survey of the culvert under the B582 is likely to be required to ensure this is properly represented within the modelling as the available flood risk mapping shows this is likely to influence potential access and escape from the west along the B582.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change surface water event. This initial assessment has shown that access and escape from the east of the site is likely to be possible whilst access and escape from the west may be impeded by the unnamed watercourse.
- 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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