Level 2 Strategic Flood Risk Assessment – Site LPR196

Final Report

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Prepared for:
Hinckley and Bosworth Borough Council

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Hinckley & Bosworth Borough Council

Contents

Contents **2**

1 Background **4**
1.1 Site details 4
1.2 Topography 4
1.3 Geology and soils 5

2 Sources of flood risk **6**
2.1 Location of site within the catchment 6
2.2 Existing drainage features 6
2.3 Fluvial 6
2.4 Surface water 6
2.5 Reservoir 7
2.6 Groundwater 7
2.7 Sewers 8
2.8 Flood history 8

3 Climate change **9**
3.1 Fluvial 9
3.2 Surface water 9

4 Flood risk management infrastructure **10**
4.1 Defences 10
4.2 Residual risk 10

5 Emergency planning **11**
5.1 Flood warnings and alerts 11
5.2 Access and escape 11
5.3 Dry islands 12

6 Requirements for drainage control and impact mitigation **13**
6.1 Broadscale assessment of possible SuDS 13
6.2 Opportunities for wider sustainability benefits and integrated flood risk management 13

7 NPPF and planning implications 15
7.1 Exception Test requirements 15
7.2 Requirements and guidance for site-specific Flood Risk Assessment 15
7.3 Guidance for site design and making development safe 15

8 Conclusions 17

1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for LPR196. 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: In the northwest of Groby on the outskirts of Leicester, west of Windmill Rise and east of Quarry Park
- Site area: 2.98ha
- Existing site use: Brownfield with existing buildings 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. There is a raised embankment with trees along the northern and western boundaries of the site, which is approximately 8 metres higher than the rest of the site. There are also areas at a higher elevation in the west, including a raised car park. The maximum elevation in the site is 115.2mAOD by the northwest boundary. Aside from these higher areas, the remaining areas of the site are at a lower elevation. The minimum elevation is 98.8mAOD along the northeastern site boundary.

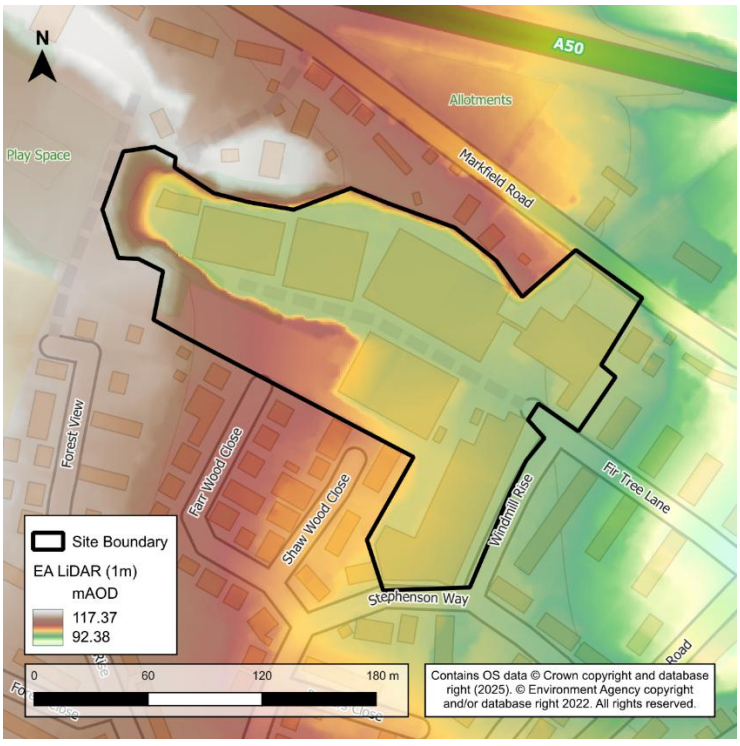


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: A broad area across the north and south are underlain by South Charnwood comprised of diorite. The remainder of the site, in the northwest, northeast, and southwest, is underlain by Edwalton Member comprised of mudstone.
- Superficial deposits: Thrussington Till Member comprised of diamicton is found along the northern and northeastern boundary. There are no superficial deposits present across the rest of the site.

Soils at the site consist of:

- Slightly acid loamy and clayey soils with impeded drainage across the majority of the site.
- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils by the southern area of the site by Stephenson Way.

2 Sources of flood risk

2.1 Location of site within the catchment

The site is located in the mid-reach of Rothley Brook (tributary of Soar) catchment. Rothley Brook flows in a northeasterly direction approximately 2km south and east of the site. The site sits around 700m south of the northeastern borough boundary. The catchment contains several settlements, including Bagworth and Thornton upstream, Ratby and Groby midstream, and Thurcaston and Rothley downstream. A large portion of the catchment is also rural farmland and woods. Woodland areas include Bagworth Heath Woods and Browns wood upstream, and Martinshaw Wood and Sheet Hedges Wood further midstream.

2.2 Existing drainage features

Based on online mapping, there are no existing drainage features within the site.

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.

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

In the 3.3% AEP event, there are two areas of ponding that cover less than 1% of the site. There is an area of surface water pooling in the northwest, as well as parallel to the southern boundary. Flood depths here exceed 0.9m, velocities reach 0.5m/s but do not exceed 1m/s and the maximum hazard classification is 'Danger for Most'.

In the 1% AEP event, the portion of the site at risk increases by 4.8%. The flood extent shows similar depth, velocity and hazard to the 3.3% AEP event. There are several new areas of ponding, including across the north and an area in the south.

The risk increases significantly by 28.6% in the 0.1% AEP event. This risk is concentrated across much of the north of the site in a large area of ponding. There is also a flow path that continues southeast from the large ponding across towards Fir Tree Lane. The area of ponding in the south also increases in the 0.1% AEP event. Maximum depths exceed 0.9m and the maximum hazard classification is 'Danger for Most' along the southern site boundary and maximum velocities exceed 1.0m/s at the flow path to the southeast. However, large parts of the risk on the site remain below 0.3m in depth and have hazard classification of 'Very Low Hazard'.

It should be noted that the existing areas of surface water flood risk on the site are influenced by the representation of the existing buildings. Within the 0.1% AEP extent, three of these buildings are predicted to flood internally which accounts for a significant proportion of the surface water risk on the site.

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	4.8	28.6
Maximum depth (m)	Exceeds 0.9m but does not exceed 1.2m	Exceeds 0.9m but does not exceed 1.2m	Exceeds 0.9m but does not exceed 1.2m
Maximum velocity (m/s)	Exceeds 0.5m/s but does not exceed 1.0m/s	Exceeds 0.5m/s but does not exceed 1.0m/s	Exceeds 1.0m/s but does not exceed 2.0m/s
Maximum hazard classification	'Danger for Most'	'Danger for Most'	'Danger for Most'

** The percentage surface water extents quoted show the percentage of the site at surface water risk from that particular event, excluding the percentage of the site at flood risk at a higher risk zone (e.g. the 1% AEP does not include the 3.3% AEP percentage).*

2.5 Reservoir

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

2.6 Groundwater

The JBA Groundwater Emergence Map shows that the site is not shown to be at risk from 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

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 low potential impact on sewerage infrastructure with no known network constraints or predicted sewer flood risk within the network.

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 incident of internally property flooding in 2017 on Markfield Road east of 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.

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

Surface water flood risk on the site is predicted to increase with climate change. The flood extent increases by 28.6% between the 1% AEP event and the 0.1% AEP event, covering most of the north of the site. A new flow path also emerges within the site flowing from the northwest to the southeast. Maximum depth and hazard are similar to the 1% AEP in the same area of ponding to the south of the site. However, maximum velocities exceed 1.0m/s at the south of the flow path.

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 surface water event. 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

There is currently one road leading directly into the site from Fir Tree Lane in the east of the site. The site is also partially bordered by Windmill Rise and Stephenson Way in the east and Markfield Road in the northeast. Forest View, Far Wood Close, and Shaw Wood Close also lead towards the site in the south and west.

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

In all AEP events there is a flow path which forms along Ratby Road, flowing north to the junction with Markfield Road and then continuing in a north-easterly direction.

There is an area of ponding which forms at the junction of Ratby Road and Markfield Road in the 3.3% AEP event, however depths are not shown to exceed 0.2m on the road with hazard classification of 'Very Low Hazard' so access and escape is unlikely to be impeded. Access and escape from all other potential access routes are shown to remain free from risk in the 3.3% AEP event.

In the 1% AEP event, the area of ponding at the junction of Ratby Road and Markfield Road increases in size with additional small areas of ponding developing on Shaw Wood Close and on Markfield Road, but the other immediate roads remain clear. Maximum depths do not exceed 0.2m, maximum velocities exceed 0.25m/s but do not exceed 0.5m/s and the maximum hazard classification is 'Very Low Hazard' so access and escape are unlikely to be impeded.

In the 0.1% AEP event, there are flow paths which develop along Fir Tree Lane through the site, Markfield Road, and Ratby Road. The ponding at the junction of Markfield Road and Ratby Road becomes part of a larger flow path. Maximum depths at the junction of Markfield Road and Ratby Road are shown to exceed 0.3m with a hazard classification of 'Danger for Some' which made impede access and escape through this junction. But risk on

the other roads is shown to remain below 0.3m with a hazard classification of 'Very Low Hazard' so safe access and escape to the site is still likely to be possible.

Overall, access and escape to the site are likely possible in all events. There is surface water risk across the surrounding roads, particularly in the 0.1% AEP event. However, depths do not exceed 0.2m for the majority of the areas of risk. The main exception is at the junction between Markfield Road and Ratby Road, where depths exceed 0.3m in the 0.1% AEP event.

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

- The site is not considered to be susceptible to groundwater flooding, due to the nature of the local geological conditions. This should be confirmed through additional site investigation work.
- BGS data indicates that the underlying geology is mudstone and diorite 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.
- As the site is brownfield consideration of land contamination will be required in determining the potential suitability for infiltration at the site.

If it is proposed to discharge runoff to a sewer system, the condition and capacity of the receiving asset should be confirmed through surveys and the discharge rate agreed with the asset owner (see Section 2.7).

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 pre-development discharge rates for the site and should be designed to be as close to greenfield runoff rates as reasonably practical in consultation 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.

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, because the site is not shown to be at fluvial flood risk within 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 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

Detailed surface water modelling of the site, including topographic survey, may be required within an FRA to inform the site layout and drainage strategy.

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. The site should be designed so that the more vulnerable parts of the development are steered outside of the areas of surface water ponding.

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.

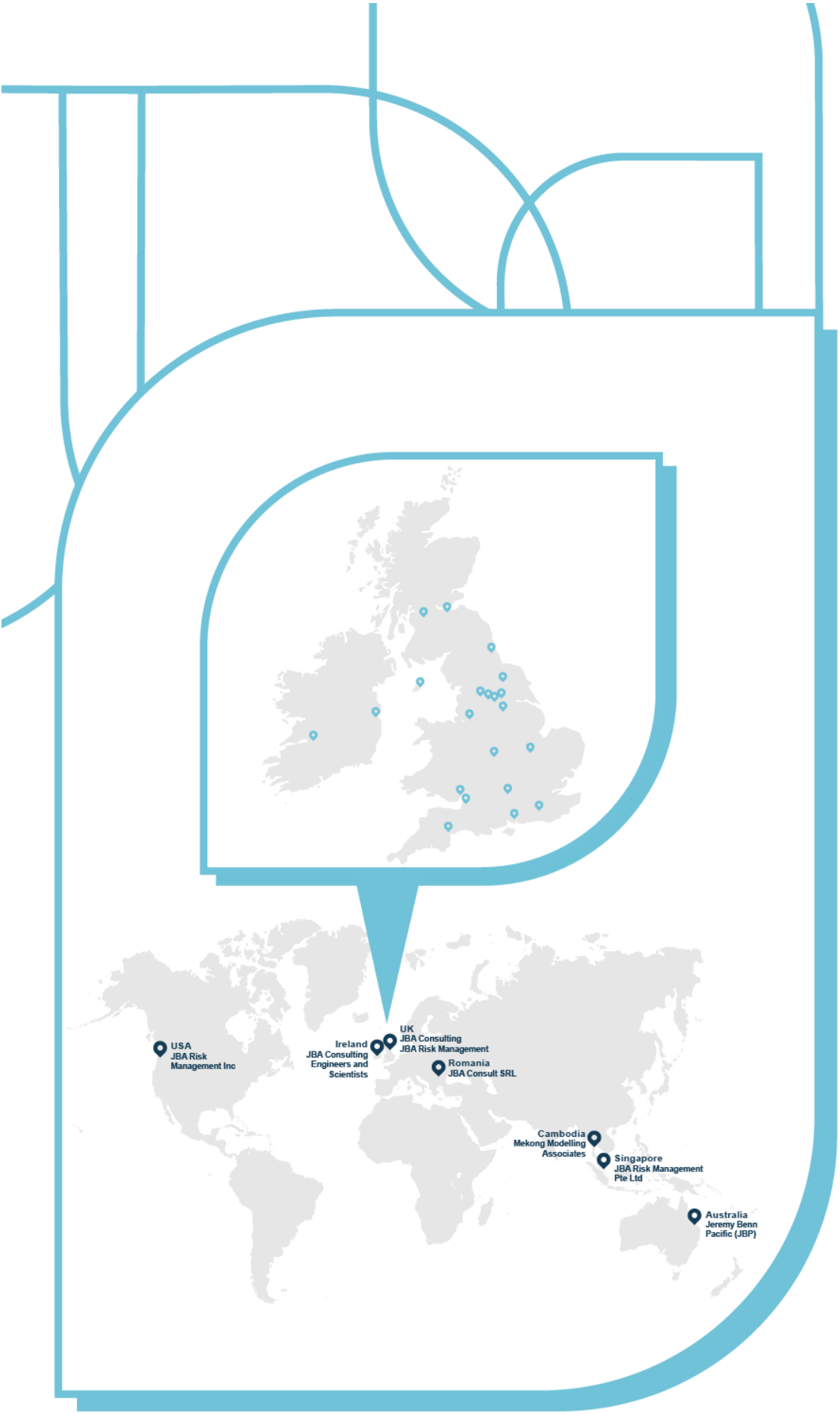
8 Conclusions

The site is shown to be at surface water flood risk, but not at fluvial risk. In the 3.3% and 1% AEP events, there are several areas of surface water ponding across the site. The risk increases significantly by 28.6% in the 0.1% AEP event. This risk is concentrated across much of the north of the site in a large area of ponding, but it should be noted that this area of risk is influenced by the presence of existing buildings which are predicted to experience internal flooding. There is also a flow path that continues southeast from the large pooling towards Fir Tree Lane.

The Exception Test is not required, because the site is not shown to be at fluvial flood risk within the EA FMfP. However, a site-specific FRA will be required, because the proposed development sites are one hectare or greater in Flood Zone 1, subject to 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:

- Further assessment of the surface water risk to the sites should be undertaken as part of a site-specific FRA. This is likely to include a requirement for detailed modelling and topographic survey to quantify the volume of surface water risk at the sites and ensure that any modification of ground levels required as part of the site design will not displace surface water and increase flood risk off the sites.
- 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. The site should be designed so that the more vulnerable parts of the development are steered outside of the areas of surface water ponding.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change surface water event. This initial assessment using the 0.1% AEP event (as a proxy for climate change) has shown that there are a lot of surface water flow paths which develop on the surrounding roads, but safe access and escape is still likely to be possible.
- 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.
- 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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