

Level 2 Strategic Flood Risk Assessment – Site LPR252

Final Report

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Prepared for:
Hinckley and Bosworth Borough Council

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for LPR252. 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 Watling Street (A5) between Nuneaton Lane and Barr Lane
- Site area: 56.5ha
- Existing site use: greenfield with existing buildings onsite in the south of the site.
- Proposed site use: Main proposed use is residential (housing), but the site may also include a care home, offices, and warehouses

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 elevated terrain is concentrated in the southwestern and northwestern corners of the site which slope downhill towards lower elevation in the centre of the site. Additionally, there are areas of high elevation in the eastern side of the site which slope gently downhill towards the centre of the site. The minimum elevation is 90.1mAOD in the south of the site, near the channel of the Change Brook, and the maximum elevation is 113.8mAOD in the northwestern corner of the site.

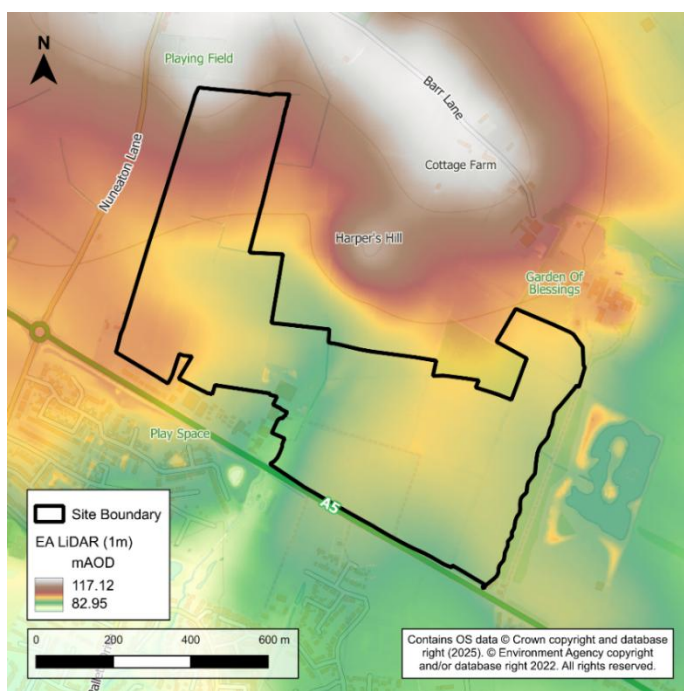


Figure 1-1: Topography of the site.

1.3 Geology and soils

Geology at the site consists of:

- Bedrock: Mercia Mudstone Group comprised of mudstone.
- Superficial deposits:
 - Bosworth Clay Member comprised of clay and silt covers most of the site.
 - Anker Sand and Gravel is located in a small area in the eastern side of the site.
 - Thrussington Till Member comprised of diamicton is located along the southern boundary of the site.
 - Alluvium comprised of clay, silt, sand and gravel is present through the centre of the site, along Change Brook.
 - Layer of Oadby Till Member comprised of diamicton and Wolston Sand and Gravel comprised of sand and gravel are layered in the northern corner of the site.

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

2 Sources of flood risk

2.1 Location of site within the catchment

The majority of the site is within the upstream end of the Anker from Wem Brook to River Sence Water Body Catchment. The eastern side of site is within the upstream end of the Sketchley Brook Catchment. Both catchments in which the site is located are predominantly rural.

Existing drainage features

Change Brook flows along the northern boundary and through the centre of the site in a southerly direction. Change Brook leaves the site through the southern boundary of the site, where it is culverted beneath Watling Street (A5).

Two unnamed tributaries join Change Brook: one flowing in a southerly direction along the northeast boundary and one flowing in an easterly direction through the northwest area of the site.

There is a large water body/pond located approximately 125m east of the eastern boundary of 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.

The unnamed watercourses and Change Brook 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

The RoFSW mapping indicates that the main area of risk is aligned with Change Brook where it flows through the centre of the site. The other areas of risk deviate from the paths of the unnamed watercourses in the north and west of the site but form prominent flow paths.

During the 3.3% AEP event there is a surface water flow path that follows the path of Change Brook along the northern boundary of the site which transects through the centre of the site and exits through the southern boundary where it is culverted beneath Watling Street (A5). There are areas of ponding in the western side and near the southeastern boundary of the site. Additionally, there are small areas of ponding outside of all site boundaries.

During the 1% AEP event, the risk along Change Brook increases in extent. An unnamed tributary bisects from Change Brook along the northern boundary of the site. A surface water flow path develops and separates the western side of the site into two parcels, the flow path is adjacent to the unnamed watercourse. The existing areas of surface water ponding within and surrounding the site increase in extent and several small new areas of ponding develop outside of all site boundaries.

In the 0.1% event, the flow paths that transect the western side of the site and the centre of the site increase in extent. The flow path that flows along the northern boundary significantly increases in extent. The existing areas of surface water ponding within and surrounding the site increase in extent and there are several new areas of ponding that develop near the northern boundary and in the northeastern corner of the site.

The maximum surface water velocities, depths and hazard values detailed in Table 2-1, are located near the southern boundary of the site, where Change Brook is culverted beneath Watling Street (A5). There is an area in the centre of the site and in the western side of the site where surface water depths exceed 0.6m but do not exceed 0.9m, other areas of the site depths exceed 0.2m but do not exceed 0.3 or are below 0.2m.

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* (%)	4.4	2.0	4.9
Maximum depth (m)	Exceeds 1.2m	Exceeds 1.2m	Exceeds 1.2m
Maximum velocity (m/s)	Exceeds 1.0m/s but does not	Exceeds 2.0m/s	Exceeds 2.0m/s

Event	3.3% AEP	1% AEP	0.1% AEP
	exceed 2.0m/s		
Maximum hazard classification	Danger for Most	Danger for Most	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 the majority of the site is not shown to be at risk from groundwater emergence.

There is a small area near the eastern boundary of the site and in the northwest of the site, where 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. Within the area near the eastern boundary, there is a smaller area 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.

Based on the EA RoFSW mapping and topography of the site it is likely that any groundwater that emerges will flow to the low lying areas in the centre and near the southern boundary of the site.

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.

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.

Change Brook and the unnamed watercourses are not represented within the EA's FMfP within the site. The future risk from these watercourses 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. The main difference between the 1% and 0.1% AEP events is that the surface water ponding in the western side of the site increases in extent and develops into a flow path, flowing towards Change Brook. Additionally, between the 1% and 0.1% events a surface water flow path develops outside the northern boundary of the site, which flows through the centre of the site towards Change Brook.

In the 1% AEP event, there are small areas of surface water ponding in the northeastern, northern, northwestern, and southeastern boundaries. These areas of ponding increase in

extent in the 0.1% event, with new areas of ponding developing in the northeastern corner of the site.

Within the site maximum depths and velocities remain unchanged between the AEP events, but the hazard classification increases to 'Danger for All' in the ponding in the centre and near the southern boundary of the site, indicating additional surface water hazard under future climate conditions. Along the northern boundary of the site, along the path of Change Brook, in the 0.1% the hazard values are also reach 'Danger for All'.

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

Change Brook is culverted where it exits the site under Watling Street (A5) creating a residual risk with water backing up upstream of the culvert onto the site in the south. There is potential residual risk of a culvert blockage causing the existing area of risk to increase. The topography of the site means any water is likely to remain confined to the lower lying floodplain of the watercourse in the centre and near the southern boundary 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

The site can be accessed from the south via Watling Street (A5) and from the east via an access road from Watling Street (A5).

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 modelled AEP events, the risk associated with Change Brook is shown to bisect the site, therefore access and escape to the eastern and western site parcels need to be considered separately.

In the 3.3% AEP event, access and escape routes remain largely clear. There is an instance of surface water ponding to the east of Watling Street (A5). There are several areas of surface water ponding beside Watling Street (A5) in the east and near where Change Brook is culverted. Depths on Watling Street (A5) are predicted to remain less than 0.2m, velocities are less than 0.25m/s and have a 'Very Low Hazard' classification.

Therefore, access and escape routes are likely to remain passible to both sides of the site. There are several areas of ponding along the access road to the east of the site. Water depths on the road are less than 0.2m, velocities exceed 0.25m/s but do not exceed 0.5m/s and have a 'Very Low Hazard' classification. Access and escape to the east of the site using the access road remain likely passible.

During the 1% AEP event, access and escape routes remain largely clear. Ponding on the roads to the east increases slightly in extent with an additional area of ponding on the west of Watling Street (A5) on the roundabout. The areas of ponding beside Watling Street (A5) increase in extent slightly. In this event, water depths exceed 0.2m but do not exceed 0.3m, velocities are less than 0.25m/s and have a 'Very Low Hazard' classification. Therefore, access and escape to both sides of the site are likely to remain passible. In the 1% AEP event, there are additional areas of surface water ponding to the south of the road near the

junction with Watling Street, water depths on the road exceed 0.2m but do not exceed 0.3m, velocities exceed 0.5m/s but do not exceed 1.0m/s and have a 'Very Low Hazard' classification. Therefore, access and escape to the east side of the site is likely to remain possible.

During the 0.1% AEP event, access and escape routes remain largely clear, ponding on the roads to the east increase slightly in extent with several new areas of ponding on the west of Watling Street (A5) on and surrounding the roundabout. The areas of ponding beside Watling Street (A5) slightly increase in extent. In this event, depths on Watling Street (A5) exceed 0.2m but do not exceed 0.3m, velocities exceed 1.0m/s but do not exceed 2m/s, and have a 'Danger for Some' hazard classification. Therefore, access and escape to both sides of the site are likely to remain possible. In the 0.1%, areas of surface water ponding on the road increase in extent slightly, the main increase is beside the road to the east opposite the water body. On the access road to the east water depths exceed 0.2m but do not exceed 0.3m, velocities exceed 1.0m/s but do not exceed 2.0m/s and have a 'Danger for Some' classification. Therefore, access and escape to the east side of the site is likely to remain possible.

In the 1% and 0.1% AEP events, the northern area of the site is also bisected by a flow path through the western side of the site. However, depths along this flow path are predicted to mostly remain below 0.2m, with velocities exceeding 0.5m/s but remaining below 1.0m/s, and hazard classification mostly remaining as 'Very Low Hazard'. Therefore, this is unlikely to impede access and escape to the northern parcel of the site.

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 \(gov.uk\)](https://www.gov.uk/national-standards-for-suds). 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 in all AEP events. Change 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 Change 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. Change Brook is considered to be of moderate 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'.

The Exception Test is not required for this site because it 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 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

The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the highest areas of risk along Change Brook and the flow paths within the western side and northeastern corner of the site. A detailed hydraulic model of Change Brook and the unnamed watercourse may be required at FRA stage to accurately represent the risk from these watercourses. Additionally, the section where the unnamed watercourse is culverted under Watling Street (A5) should be included, with scenarios addressing potential blockages. This should include topographic and channel survey to fully represent the capacity of the watercourses, as these are not necessarily fully represented within the EA's 1m LiDAR due to their small size.

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 water 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 shown to be entirely within Flood Zone 1. However, the site is affected by fluvial flooding from ordinary watercourses, shown within the surface water mapping. The main areas of risk are through the centre of the site along the path of Change Brook and the southern boundary, and in the western side of the site. Change Brook is culverted under the A5 which is shown to constrict the flow under the road with water backing up upstream. There is a residual risk of culvert blockage increasing this area of risk.

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 greater than one hectare, 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 Change Brook and any built development.
- The site layout must adopt a sequential approach by steering more vulnerable aspects of the development away from the highest areas of risk along Change Brook and the flow paths within the western side and northeastern corner of the site.
- A detailed hydraulic model of Change Brook that bisects the centre of the site and the unnamed watercourse that bisects the western side of the site may be required at FRA stage to accurately represent the risk from these watercourses. Detailed survey of the culvert under the A5 is likely to be required to ensure these are properly represented within the modelling as the available flood risk mapping shows this culvert is likely to significantly impact the flood extents within the south of the site.
- Safe access and escape routes should be demonstrated in the 1% AEP plus climate change fluvial and surface water events. This should be considered separately to the eastern and western sides of the site where the site is bisected by Change Brook.
- 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.

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