

Appendix B - Data sources used in the SFRA

1.1 Historical flooding

Leicestershire County Council provided information on historic flood incidents through their published Section 19 Flood Investigation Reports and highway flooding hotspots.

Leicestershire Fire and Rescue Service provided a list of historic flooding locations based on their local knowledge.

The Environment Agency's (EA's) Historic Flood Map and Recorded Flood Outlines dataset were also used to understand the flood history across the study area.

Section 4.2 of the Main Report documents the historic flooding records obtained.

1.2 Fluvial flooding

1.2.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a within this SFRA show the same extent as the online EA's Flood Map for Planning (FMfP) (which incorporates latest modelled data) except for the EA's Rothley Brook (2022) model and Shenton Brook (2015) model. Here, the latest undefended model outputs have been used in preference to the EA's FMfP. These extents are shown in the Appendix A: GeoPDFs as Modelled Flood Zones 2 and 3a.

In agreement with the EA, the River Anker model was not used to inform Flood Zones 2 and 3a, due to its age and uncertainty around the model outputs in this location. Instead, the EA FMfP should be used in this location.

The extents of the models used for this SFRA are shown in Figure 1 and Table 1 details the models available for use in this SFRA.

Over time, the online mapping is likely to be updated more often than the SFRA, so SFRA users should check there are no major changes in their area.

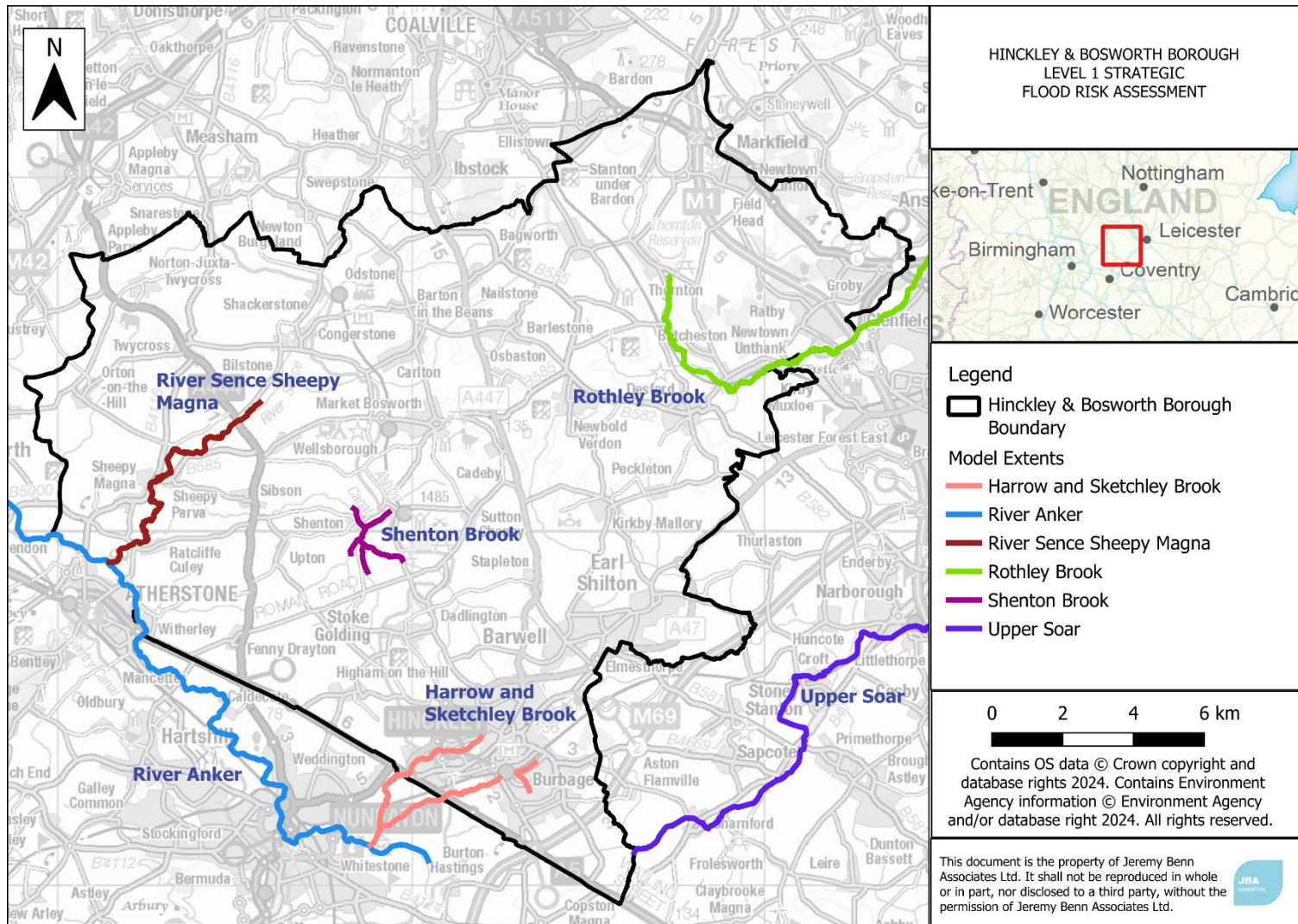


Figure 1: Extents of the available fluvial hydraulic models across Hinckley and Bosworth.

Table 1: Details of models available for use within this SFRA.

Model	Year	Software	Does the model include defences?	Included in FMfP?
Rothley Brook	2022	FMP-TUFLOW	Yes	No
Upper Soar	2018	FMP-TUFLOW	No	Yes
River Anker	2006	ISIS	No	No
Harrow and Sketchley Brook	2013	ISIS-TUFLOW	Yes	Yes
River Sence Sheepy Magna	2013	ISIS-TUFLOW	No	Yes
Shenton Brook	2015	ISIS-TUFLOW	No	No

1.2.2 Functional Floodplain (Flood Zone 3b)

Flood Zone 3b, as shown in Appendix A mapping, has been compiled for the study area as part of this SFRA and is based on the 3.3% AEP defended extents produced from detailed hydraulic models, where available, which is in line with the latest Planning Practice Guidance (PPG). In areas of detailed hydraulic models where the 3.3% AEP extents were not available, the 2% AEP extent has been used as a conservative proxy. The following list details the outputs used for each of the available hydraulic models:

- Rothley Brook - 3.3% AEP (defended)
- Upper Soar - 3.3% AEP
- Harrow and Sketchley Brook - 2% AEP (defended)
- River Sence Sheepy Magna - 2% AEP
- Shenton Brook - 3.3% AEP

For areas not covered by detailed hydraulic models, a precautionary approach has been adopted for Flood Zone 3b with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a (1% AEP).

1.2.3 Fluvial climate change

3.3% AEP (Functional floodplain - Flood Zone 3b)

None of the EA hydraulic models provided for this SFRA currently have available outputs for 3.3% AEP plus climate change events so a pragmatic approach has been used in agreement with the EA. No models were re-run specifically for this as part of

this Level 1 SFRA, however, the uplifts for Rothley Brook were run for the 3.3% AEP event whilst applying the uplifts to the 1% AEP event.

Where model data was available, the model inflows were used to align a 3.3% AEP plus climate change (central allowance) event with the nearest representative return period output, to act as a more accurate proxy, rather than defaulting to Flood Zone 3a which may be more conservative. The flood extents of the chosen return period events were merged to form a composite proxy (named "Indicative 3.3% AEP Central (modelled proxy)" in the Appendix A mapping).

Where there was no modelling present, the proxy defaults to Flood Zone 3a of the EA's Flood Map for Planning, and for Ordinary Watercourses where there is no national mapping available, the 1% AEP risk of surface water flooding dataset has been used as a proxy to infer risk.

Table 2: Model outputs used to form a proxy for Flood Zone 3b plus climate change.

Model	Flood Zone 3b representation	Central 2080s allowance	Peak flows comparison - FZ3b + Central CC	FZ3b + CC Proxy Used
Upper Soar	3.3%	28%	Between the 1.3% and 1% AEP	1% AEP
Harrow and Sketchley Brook	2%	22%	Between the 1% AEP and 0.5% AEP	1% AEP
River Sence Sheepy Magna	2%	22%	Between the 1.3% and 1% AEP	1% AEP
Shenton Brook	3.3%	22%	Between the 1.3% and 1% AEP	1% AEP

1% AEP (Flood Zone 3a)

In the Tame Anker and Mease Management Catchment, there has been minimal changes between the previous climate change uplifts (+20%, +30%, and +50%) for the Humber RBD and the current uplifts (+22%, +30%, and +51%) for the central, higher central, and upper end uplifts for the 2080s epoch. Therefore, the existing 1% AEP plus climate change outputs, uplifted as part of the previous joint Leicestershire and Leicester City Level 1 SFRA, have been used for the modelled watercourses within this Management Catchment.

In agreement with the EA, as part of this SFRA the Rothley Brook model was uplifted for the latest climate change allowances for the 1% AEP event in the 2080s epoch for the Soar Management Catchment (+28%, +37%, and + 60%).

For areas with no hydraulic modelling, the modelled 0.1% AEP outline is used as an indicative climate change extent. This is appropriate given the Upper End climate change estimates are often similar to the 0.1% AEP/ Flood Zone 2 extents; therefore, the differences in the effects of climate change are anticipated to be minimal.

0.1% AEP (Flood Zone 2)

None of the EA hydraulic models provided currently have available outputs for 0.1% AEP plus climate change events. Uplifting existing models with climate change allowances for the 0.1% AEP event presents significant time and cost implications due to practical issues as most models are not built to run events of this magnitude, and often present instabilities and an inability to run. As such, the impacts of climate change on the 0.1% AEP event have not been assessed within this Level 1 SFRA.

1.3 Surface water flooding

Mapping of surface water flood risk in the study area has been taken from the Risk of Flooding from Surface Water (RoFSW) maps published online by the EA. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the EA, and any potential developers to focus their management of surface water flood risk.

The RoFSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water.

Table 3: RoFSW risk categories.

Category	Definition
High	Flooding occurring as a result of rainfall with a greater 3.3% AEP
Medium	Flooding occurring as a result of rainfall of between a 1% and 3.3% AEP
Low	Flooding occurring as a result of rainfall of between 0.1% and 1% AEP

Although the RoFSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRA for local authorities. If a site is indicated in the EA mapping to be at risk from surface water flooding, a more detailed assessment should be considered to illustrate the flood risk more accurately at a site-specific scale.

1.3.1 Surface water climate change

The 0.1% AEP surface water extent can be used as an indication of surface water risk, and risk to smaller watercourses that are too small to be covered by the EA's Flood Zones.

Modelled Climate Change uplifts for the 3.3% and 1% AEP events were developed as part of this SFRA and are presented in in Appendix A: GeoPDFs as 'Climate Change Surface Water Extent (Modelled)' for the following events and scenarios:

- 3.3% AEP with +35% uplift (2070s Upper End allowance)
- 1% AEP with +40% uplift (2070s Upper End allowance)

1.4 Sewers

Severn Trent Water provided their Hydraulic Sewer Flooding Risk Register for the borough which includes a list of properties which have reported at least one incidence of external or internal sewer flooding between 1 January 2004 and 19 March 2024.

The data using truncated postcodes to avoid identifying specific streets or properties.

Section 4.6 of the Main Report presents this data.

1.5 Groundwater

Two datasets were used to assess potential areas that are likely to be at higher risk of groundwater flooding:

- The EA's Areas Susceptible to Groundwater Flooding (AStGWF) dataset, showing the degree to which areas are susceptible to groundwater emergence based on geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring, i.e., it is a hazard, not risk, based dataset.
- The JBA Groundwater Emergence map, showing the likelihood of groundwater emergence posing a risk to both surface and subsurface assets, based on predicted groundwater levels. This divides groundwater emergence into five categories:
 - 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.
 - 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.

- 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.
- Groundwater levels are at least 5m below the ground surface. Flooding from groundwater is not likely.
- No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

Section 4.7 of the Main Report details the approach adopted in this SFRA to assess the risk of groundwater flooding.

1.6 Canals

The Canal and River Trust provided the locations of recorded breaching and overtopping incidences within the borough.

Section 4.8 of the Main Report presents this data.

1.7 Reservoirs

The risk of inundation because of reservoir breach or failure of reservoirs within the area has been mapped using the outlines produced as part of the National Reservoir Flood Mapping (RFM) study and are shown online on the Long-Term Risk of Flooding website at the time of publication.

The EA provide two flooding scenarios for the reservoir flood maps: a 'dry-day' and a 'wet-day'. The 'dry-day' scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The 'wet-day' scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood.

The EA also provides the 'fluvial contribution' extent which shows the extent of river flooding added to the reservoir model to determine the impacts of failure on a wet-day. This can be compared with the FMfP Rivers and Sea dataset to see the impact the reservoir flooding has.

Section 4.9 of the Main Report presents the reservoirs affecting the borough.

1.8 Flood defences

The EA supplied the location of all flood defences within the district in their AIMS database, including information relating to the type of flood defence and their standard of protection.

Section 6 of the Main Report provides information on flood defences and schemes.

1.9 Overview of supplied data

Table 4 below provides an overview of the supplied data from stakeholders which has been used to inform the Hinckley and Bosworth Borough SFRA. Hyperlinks are provided where the datasets are openly available for download.

Table 4: Summary of data supplied to inform the Hinckley and Bosworth Borough SFRA.

Source of flood risk	Data used to inform the assessment	Data supplier
Historic (all sources)	Historic flood map (data.gov.uk) Recorded flood outlines (data.gov.uk)	Environment Agency
Historic (all sources)	Section 19 Flood Investigation Reports (leicestershire.gov.uk) Highway flooding	Leicestershire County Council
Historic (all sources)	Historic flooding locations	Leicestershire Fire and Rescue Service
Fluvial (including climate change)	Rothley Brook (2022) 1D-2D FMP-TUFLOW model Upper Soar (2018) 1D-2D FMP-TUFLOW model River Anker (2006) 1D ISIS model Harrow and Sketchley Brook (2013) ISIS-TUFLOW model River Sence Sheepy Magna (2013) ISIS-TUFLOW model Shenton Brook (2015) 1D-2D ISIS-TUFLOW model	Environment Agency
Fluvial (including climate change)	Flood Map for Planning Flood Zone 3 (data.gov.uk) and Flood Zone 2 (data.gov.uk) Risk of Flooding from Rivers and Sea (data.gov.uk) Flood Storage Areas (data.gov.uk)	Environment Agency
Surface water (including climate change)	Risk of Flooding from Surface Water (data.gov.uk)	Environment Agency
Canals	Records of overtopping and/or breach incidents	Canal and River Trust
Sewers	Internal and external historic drainage records	Severn Trent Water
Groundwater	Areas Susceptible to Groundwater Flooding dataset	Environment Agency (via Hinckley and Bosworth)

Source of flood risk	Data used to inform the assessment	Data supplier
	Source Protection Zones (data.gov.uk)	Borough Council)
Groundwater	Groundwater emergence map	JBA
Reservoir	National Inundation Reservoir Mapping (Long term flood risk map) Dry Day (data.gov.uk) extents Wet Day (data.gov.uk) extents Fluvial Contribution (data.gov.uk) extent	Environment Agency
Flood defences	AIMS Spatial Flood Defences (data.gov.uk) Reduction in Risk of Flooding from Rivers and Sea due to defences (data.gov.uk)	Environment Agency
Flood warnings and alerts	Flood Warning Areas (data.gov.uk) Flood Alert Areas (data.gov.uk)	Environment Agency
Cross-boundary impacts	Neighbouring authority sites and Local Plan information, to help assess cross-boundary impacts and the cumulative impact assessment	Planners at neighbouring authorities (Blaby District Council, Charnwood Borough Council, North Warwickshire Borough Council, North West Leicestershire District Council, Nuneaton and Bedworth Borough Council, Rugby Borough Council and Leicester City Council)
Other datasets	Aquifer Designation maps (Bedrock Geology and Superficial Deposits)	Environment Agency (via Hinckley and Bosworth Borough Council)