Appendix F - Cumulative Impact Assessment

1. Background

1.1 Introduction

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages. Paragraph 171 of the National Planning Policy Framework (NPPF, 2024) states:

'Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.'

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume. Whilst the loss of storage for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. There are also risks of development causing modified flow regimes from sites creating an alignment in peak flows in downstream watercourses and resulting in greater flood risk as a result of the development.

Conditions imposed by Hinckley and Bosworth Borough Council should allow for mitigation measures so any increase in runoff as a result of development is properly managed and should not exacerbate flood risk issues, either within, or outside of the Councils' administrative area.

The cumulative impact of development should be considered at both the Local Plan making and the planning application and development design stages. Appropriate mitigation measures should be undertaken to ensure flood risk is not exacerbated, and where possible the development should be used to reduce existing flood risk issues.

To understand the impact of future development on flood risk in Hinckley and Bosworth borough, catchments were identified where development may have the greatest potential effect on flood risk, and where further assessment would be required within a Level 2 Strategic Flood Risk Assessment (SFRA) or site-specific Flood Risk Assessment (FRA). To identify the catchments at greatest risk, various factors were considered, including the potential change in developed area within each catchment, communities sensitive to increased risk of surface water and fluvial flooding, and records of historic flooding. Where catchments have been identified as sensitive to the cumulative impact of development, the assessment sets out planning policy recommendations to help manage the risk.

2. Assessment of cross-boundary issues

The study area is bordered by North West Leicestershire district along the north boundary, Charnwood borough to the northeast, Blaby district to the east, Rugby borough to the south, Nuneaton and Bedworth borough to the southwest, and North Warwickshire borough to the west.

The borough lies across two catchments: the Tame, Anker and Mease catchment covers the west of the borough, and the Soar catchment covers the east. The highest elevations follow Charnwood Forest, starting in the northeast of the borough and extending down to Hinckley. The lowest elevations are in the west of the borough, drained by the River Sence and its tributaries, and a number of smaller watercourses along the southwestern border. These flow west to join the River Anker. The northeast of the borough is drained by Rothley Brook, which flows in an easterly direction to join the River Soar.

Rothley Brook originates within the borough and then flows in a southeasterly direction between the settlements Desford and Botcheston and through the eastern border of the borough into Blaby district. Outside the borough it then continues in a north-easterly direction to its confluence with the River Soar.

The River Sence has its source outside the northern border of the borough, in North West Leicestershire district, and flows in a south-westerly direction through the western side of the borough, joined by several tributaries including Shenton Brook. It joins the River Anker where it flows along the border between Hinckley and Bosworth borough and North Warwickshire borough.

The River Anker has its source outside the southern border of the borough, near Wolvey in Rugby borough, and flows in a north-westerly direction along the southwestern border of the borough, before continuing in a north-westerly direction flowing through North Warwickshire borough to join the River Tame in Tamworth borough.

The neighbouring authorities and main rivers are shown in Figure 2-1.

The neighbouring authorities were contacted for information on their site allocations, to determine where development in neighbouring authorities may impact or be impacted by development within Hinckley and Bosworth borough.

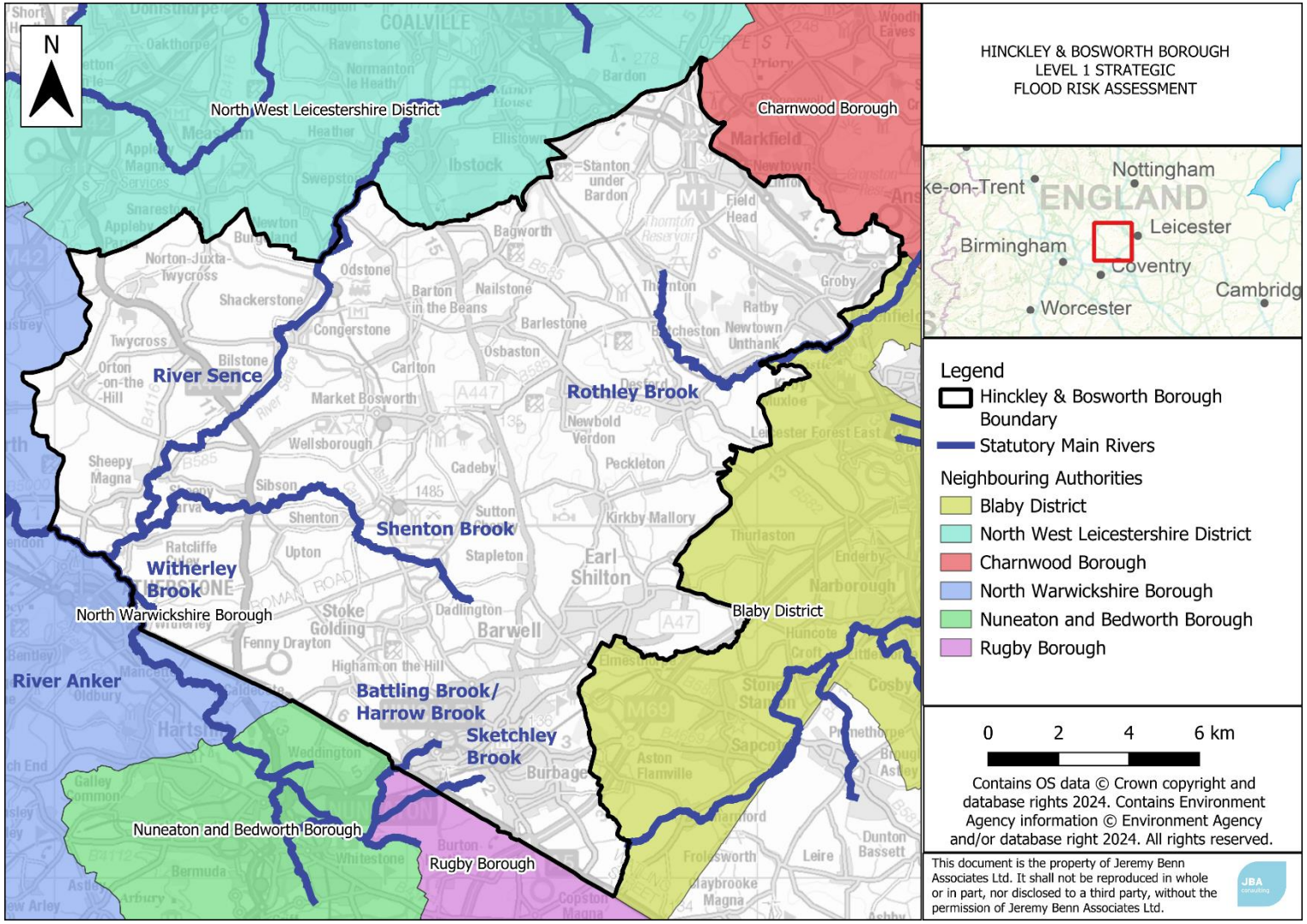


Figure 2-1: Neighbouring authorities and cross-boundary watercourses.

3. Cumulative Impact Assessment

3.1 Methodology

For the Cumulative Impact Assessment (CIA), Hinckley and Bosworth borough was assessed at a catchment level using the Water Framework Directive (WFD) catchments, with these catchments shown in Figure 3-1.

There are a total of 16 WFD catchments which fall within the borough to some extent, however the 'Black Brook from Source to Grace Dieu Brook' catchment has less than 1% of its area within Hinckley and Bosworth borough and is not an area with proposed allocations within the borough so it has therefore been removed from the assessment.

There are four stages to the Level 1 CIA:

1. Assess sensitivity to increases in fluvial and surface water flood risk.
    - This will be assessed by calculating the change in the building area shown to flood from the 1% AEP to the 0.1% AEP event for fluvial and surface water flooding respectively, given as a percentage of the total building area in the catchment.
2. Identify historic flooding incidents.
    - Identify the total number of historic (sewer and highway) flooding incidents within each catchment.
3. Assess the catchments with the highest degree of proposed new development.
    - This will be assessed by calculating the percentage area of each catchment covered by proposed development.
4. Identify the most sensitive catchments to increased risk.
    - Rank catchments in each category.
    - Discussion of catchments which are at higher risk in all categories/individual categories.
    - Policy recommendations for developments in higher risk catchments.

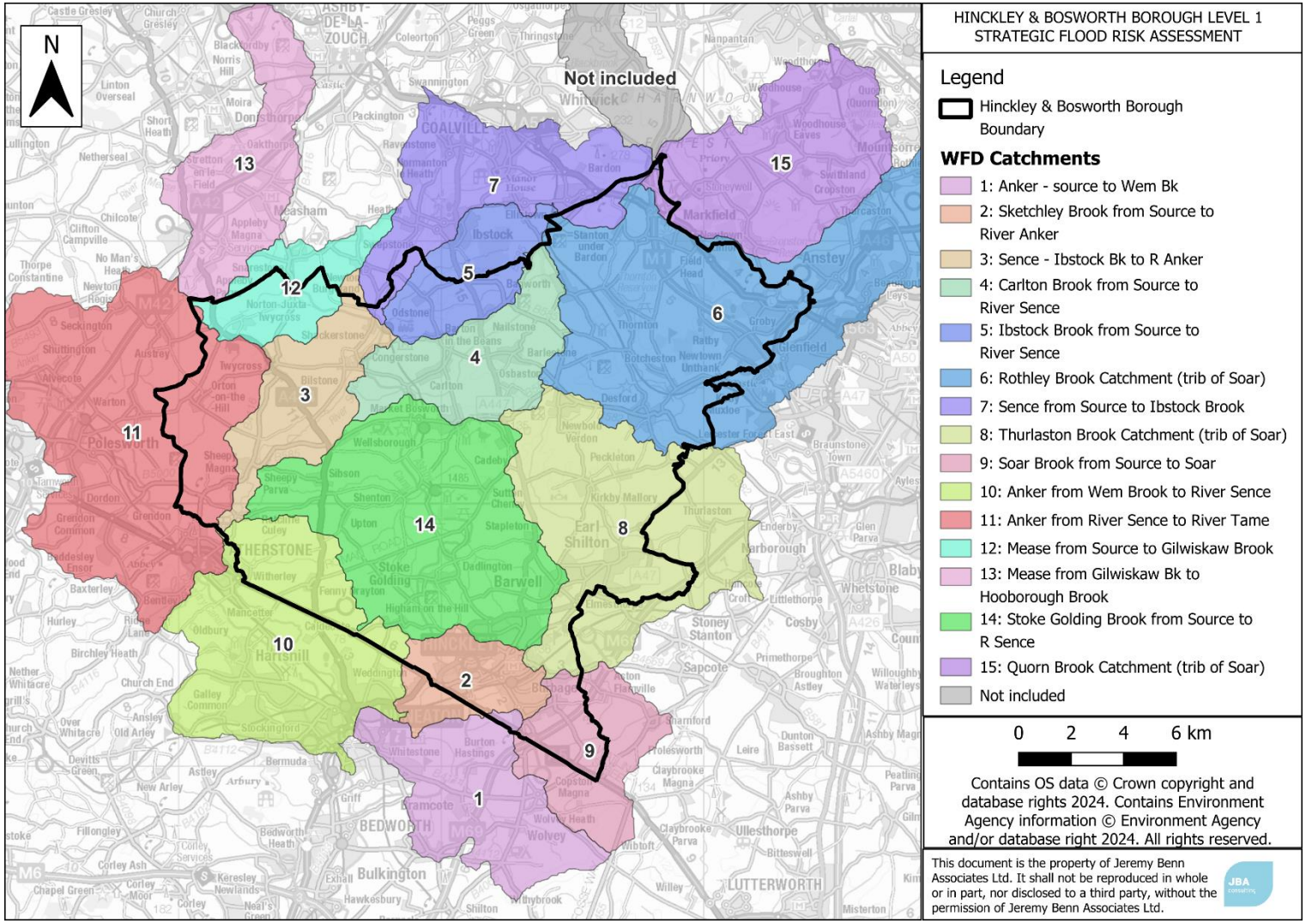


Figure 3-1: WFD catchments across Hinckley and Bosworth borough.

Table 3-1 summarises the datasets used within the Hinckley and Bosworth CIA.

Catchments within the study area were ranked on four metrics: sensitivity to increased fluvial flood risk, sensitivity to increased risk of surface water flooding, prevalence of recorded historic flood incidents (limited by the data available), and the area of new development proposed within the catchment.

The final results of this assessment gave a rating of low, medium, or high risk for each metric, for each catchment within the study area, the boundaries of which were derived from the WFD catchments. The rating of each catchment in each of these assessments was combined to give an overall ranking.

Table 3-1: Summary of datasets used within the broadscale CIA.

Dataset	Coverage	Sources of data	Use of data
Catchment boundaries	Hinckley and Bosworth borough and neighbouring authorities	Water Framework Directive catchments	Assessment of susceptibility to cumulative impacts of development by catchment
OS Open Zoomstack Local Buildings	Hinckley and Bosworth borough and neighbouring authorities	Ordnance Survey (open source)	Built area for the assessment of flood risk
Risk of Flooding from Surface Water	Hinckley and Bosworth borough and neighbouring authorities	EA	Assessing the built area at risk of surface water flooding within each catchment
Fluvial Flood Zones 2 and 3a	Hinckley and Bosworth borough and neighbouring authorities	EA Flood Map for Planning	Assessing the built area at risk of fluvial flooding within each catchment
Future development areas (recently built out sites/sites under construction/sites with planning permission/previously allocated sites/currently allocated sites)	Hinckley and Bosworth borough and neighbouring authorities	Hinckley and Bosworth borough and neighbouring authorities	Assessing the impact of proposed future development on risk of flooding

3.1.1 Sensitivity to increases in fluvial flooding

This is the measure of the increase in the built area at risk of fluvial flooding from the 1% AEP event to the 0.1% AEP event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk.

The OS Open Zoomstack Local Buildings layer was used to identify the built area within the catchments as this is an open data source which provides full coverage of the borough and cross boundary catchments.

The buildings layer was intersected with the 1% and 0.1% AEP fluvial flood extents separately to determine the built area flooded in each catchment, in each flood extent. The difference between the two values was then taken as a percentage of the total built area within the catchment to allow comparison between catchments of different sizes.

3.1.2 Sensitivity to increases in surface water flooding

This is the measure of the increase in the built area at risk of surface water flooding in a 1% AEP event to a 0.1% AEP event and follows the same process as for fluvial flood risk, see Section 3.1.1 for further details.

3.1.3 Historic flood risk

Records of flooding incidences across the borough were provided by Leicestershire County Council highways and Severn Trent Water. No historic flooding data was made available for the other neighbouring authorities. Therefore, historic events in catchments that cross these local authorities' boundaries are unknown.

Details of historic flood events can be found in Section 4.2 of the main SFRA report. The historic data was represented as point data, where each point represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly).

A count of each historical flood incident was conducted for each catchment to determine the historic flood risk within the catchments. Where over 50% of the catchment lies outside Hinckley and Bosworth borough, where historic flooding data was not available, the historic assessment result was not included in calculating the overall ranking for the catchment. The historic assessment was therefore excluded from the following catchments:

- Anker - source to Wem Bk
- Sence from Source to Ibstock Brook
- Soar Brook from Source to Soar
- Anker from Wem Brook to River Sence
- Anker from River Sence to River Tame
- Mease from Gilwiskaw Bk to Hooborough Brook
- Quorn Brook Catchment (tributary of Soar)

3.1.4 Growth in the area

Hinckley and Bosworth Borough Council provided their Strategic Housing and Economic Land Availability Assessment (SHELAA) sites (dated 18 July 2024). This is the best available data for the proposed new development within the catchment and therefore was used within this assessment.

Site allocations were also provided by all neighbouring authorities.

The area of new development within each catchment was calculated for each option, expressed as a percentage of the total catchment area to determine the potential for increases in flood risk as a result of new development. At this stage the whole area of each development was considered, with no land use assumptions for the development areas.

3.1.5 Ranking the results

The results for each assessment were ranked into high, medium, and low susceptibility to increased risk as shown in Table 3-2. Ranking delineations were given at natural breaks in the results.

The ranking results were combined from the three assessments to give an overall high, medium, and low ranking for all catchments within Hinckley and Bosworth borough. Each catchment was assigned a score for each assessment based on its ranking (high = 3, medium = 2, low = 1) and these were then averaged to produce a final score and ranking.

Fluvial flood risk by its nature is limited to the areas immediately adjacent to watercourses whilst surface water flooding can occur at any location across the borough, which explains the higher bands for surface water flood risk when compared with fluvial flood risk.

There is currently no national guidance available for assessing the cumulative impacts of development. These rankings provide a relative assessment of the catchments within Hinckley and Bosworth borough and are not comparable across other boroughs/districts. The thresholds used have been based on natural breaks in the data and professional judgement.

Table 3-2: Ranking assessment criteria

Flood risk ranking	Percentage of properties at increased risk of fluvial flooding	Percentage of properties at increased risk of surface water flooding	Total number of historic flooding incidents	Percentage area of catchment covered by new development
Low risk	<=0.5	<=2.5	<=20	<=10
Medium risk	<=1.5, >0.5	<=3, >2.5	<=50, >20	<=15, >10
High risk	>1.5	>3	>50	>15

3.1.6 Assumptions

The assumptions made when conducting the CIA are shown in Table 3-3.

Table 3-3: Assumptions of the CIA.

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Fluvial flood risk	Climate change proxy	Used the Flood Map for Planning Flood Zone 2 as an indicative estimate of the impacts of climate change across the district.	Although detailed climate change modelling was available for some watercourses, the broader Flood Map for Planning covers the entire area of the catchments both within and outside the district and therefore provided a consistent approach for this high level assessment.
Surface water flood risk	Climate change proxy	Used the 0.1% AEP extent from the Risk of Flooding from Surface Water map as an indicative estimate of the impacts of climate change across the study area.	Although the Risk of Flooding from Surface Water map was uplifted for climate change as part of this study, the uplifts were only applied to the study area, the Risk of Flooding from Surface Water map covers the entire area of the catchments both within and outside the study area and therefore provided a consistent approach for this high level assessment.
Historic flooding incidents	Total number of historic events and severity of flooding	Only flooding incidents recorded that could be georeferenced with XY coordinates to produce GIS files were used. Each point represents a location where it is known there has been at least one flood incident. The severity of the historic flooding	GIS data sources provided the most accurate results possible for the location of historic flooding incidents across the borough.

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
		event relating to the point has not been considered, just the total number of points within each catchment where there has been a flood incident.	
Historic flooding incidents	Coverage	Historic data provided by Leicestershire County Council and Severn Trent Water only covered Hinckley and Bosworth borough and therefore does not provide data across some of the larger cross-boundary catchments.	Best available historic data has been used. To reduce any impacts of the limited data coverage, for catchments where greater than 50% of their area lies outside the borough, the historic assessment was not included within the overall ranking as the count is likely to be a considerable underestimate for these catchments.
Development	Area of development	Have assumed all promoted sites provided are taken forward to development. Have not considered whether sites are greenfield or brownfield sites (with brownfield regeneration having the potential to reduce flood risk) or the proposed allocation type and land use of the site.	This is a reasonable worst-case scenario as we do not have further information to inform which sites are most likely to go forward to development.

3.2 Overall rankings

A Red-Amber-Green (RAG) rating was applied to the catchments, with red being high, amber being medium, and green being low sensitivity to increased flood risk. The RAG ratings are shown in Table 3-2. The catchments with an average score of greater than 2 were deemed high risk.

The following catchments are identified as high risk:

- Anker from Wem Brook to River Sence
- Sketchley Brook from Source to River Anker
- Rothley Brook Catchment (tributary of Soar)

The following catchments are identified as medium risk:

- Anker - source to Wem Bk
- Thurlaston Brook Catchment (tributary of Soar)
- Soar Brook from Source to Soar
- Anker from River Sence to River Tame
- Measure from Source to Gilwiskaw Brook
- Stoke Golding Brook from Source to R Sence
- Quorn Brook Catchment (tributary of Soar)

The results of the RAG assessments are shown in Figure 3-2.

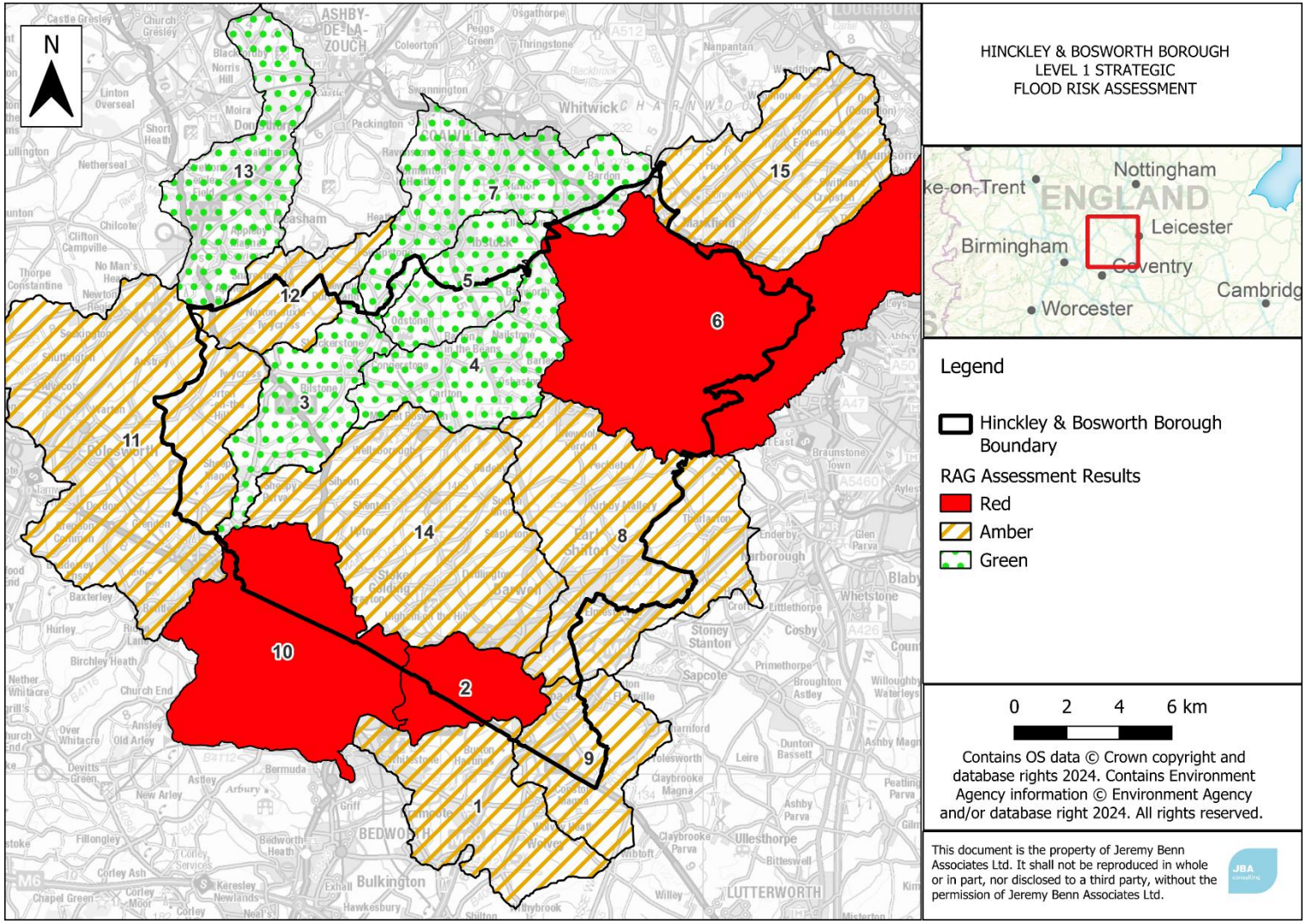


Figure 3-2: Results of the RAG assessment for Hinckley and Bosworth borough.

4. Level 1 SFRA Policy recommendations

4.1 Broadscale recommendations

All developments are required to comply with the 2024 NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments comply with the latest guidance and legislation relating to flood risk and sustainable drainage, and appropriate consideration is given to surface water flow paths and storage, proposals should normally not increase flood risk downstream.

The high-level CIA for Hinckley and Bosworth borough has highlighted areas where there is the potential for development to have a cumulative impact on flood risk. Catchments have been identified as high, medium, or low risk, relative to the other catchments within the borough.

Flood risk can be affected by several different factors, which have been assessed as part of the CIA. As a result, incremental action, and betterment in flood risk terms across the entire borough should be supported where possible.

The following policy recommendations therefore apply to all catchments within the study area:

- Hinckley and Bosworth Borough Council should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the area to other local authorities in order to minimise any cross boundary issues of cumulative impacts of development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance, and management on all development sites. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible. Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure where practicable. Developers should refer to the relevant Lead Local Flood Authority (LLFA) guidance for the requirements for SuDS in Hinckley and Bosworth borough. Further guidance on SuDS can be found in Section 9 of the Main Report.
- Leicestershire County Council as LLFA will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should consider all sources of flooding to ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.
- Where appropriate, the opportunity for NFM in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should not be supported, and day-lighting existing culverts should be promoted through new developments.
- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) unless it can be demonstrated that this is not practicable. If it is demonstrated that greenfield rates are not practicable then the

runoff rates should be restricted to the closest rate that is practicable but not exceeding the existing brownfield runoff rate.

- Where required, site-specific FRAs should explore opportunities to provide wider community flood risk benefits through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either by the provision of additional storage on site e.g. through oversized SuDS, NFM techniques, green infrastructure, and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.
- Hinckley and Bosworth Borough Council should consider requiring developers to contribute to community flood defences outside of their red line boundary to provide wider benefits and help offset the cumulative impact of development.

Specific recommendations are made for high and medium risk catchments below. If any future windfall sites are proposed within these catchments, then developers should also consider the recommendations detailed so that existing flooding issues in the catchment are not exacerbated by any future development and options for betterment are considered.

4.2 Recommendations for high and medium risk catchments

These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to ascertain the true storage needs and potential at each site at the planning application stage. The FRA should consider the potential cumulative effects of all proposed development and how this affects sensitive receptors.

The following recommendations are made for high and medium risk catchments:

- The LLFA and LPA should consult with Local Not-For-Profit organisations such as wildlife trusts, rivers trusts, and catchment partnerships. This will help to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk.
- The LPA should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and NFM features. The EA Working with Natural Processes (WWNP) mapping can help identify where NFM features may be suitable (see Section 7.2 of the Main Report for further details). Investigations should seek to determine where developments have the potential to contribute towards works to reduce flood risk and enable regeneration in catchments as well as contributing to the wider provision of green infrastructure.
- Use of oversized SuDS should be considered, where viable, to provide betterment beyond the existing greenfield runoff rate.
- Opportunities for retrofitting of SuDS in existing developed areas should be sought to reduce runoff rates from existing developments.

Specific recommendations are made for each of the high risk catchments below:

Anker from Wem Brook to River Sence

This catchment covers the rural areas in the southwest of the borough. To the south the catchment is more urbanised where it lies across Nuneaton and Bedworth borough and North Warwickshire borough.

This catchment ranked as high risk for sensitivity to both increased fluvial and surface water flood risk and medium risk for increased development.

There are a couple of potential large greenfield sites within the borough around Fenny Drayton with several flow paths emerging in this area, flowing both south and west towards the River Anker. Use of NFM techniques and oversized SuDS on these sites could provide the opportunity for betterment, decreasing fluvial flood risk downstream along the path of the River Anker.

Sketchley Brook from Source to River Anker

This catchment covers much of the settlements of Hinckley and Burbage, ranking medium risk for potential development and sensitivity to fluvial flood risk, and high risk for sensitivity to surface water risk and prevalence of historic flooding incidences, particularly sewer flood incidences. Developers should consult with Severn Trent Water at an early stage to identify key areas of sewer flood risk.

Areas sensitive to increased surface water risk are predominantly in the upstream urban areas of the catchment, along the main flow paths through Hinckley and Burbage. SuDS retrofit within these existing developed areas could provide opportunities to reduce the existing runoff rates and decrease surface water flood risk downstream.

There are several potential large greenfield sites particularly in the west side of the catchment. Use of NFM techniques and oversized SuDS on these sites could provide the opportunity for betterment, decreasing fluvial flood risk downstream along Harrow Brook.

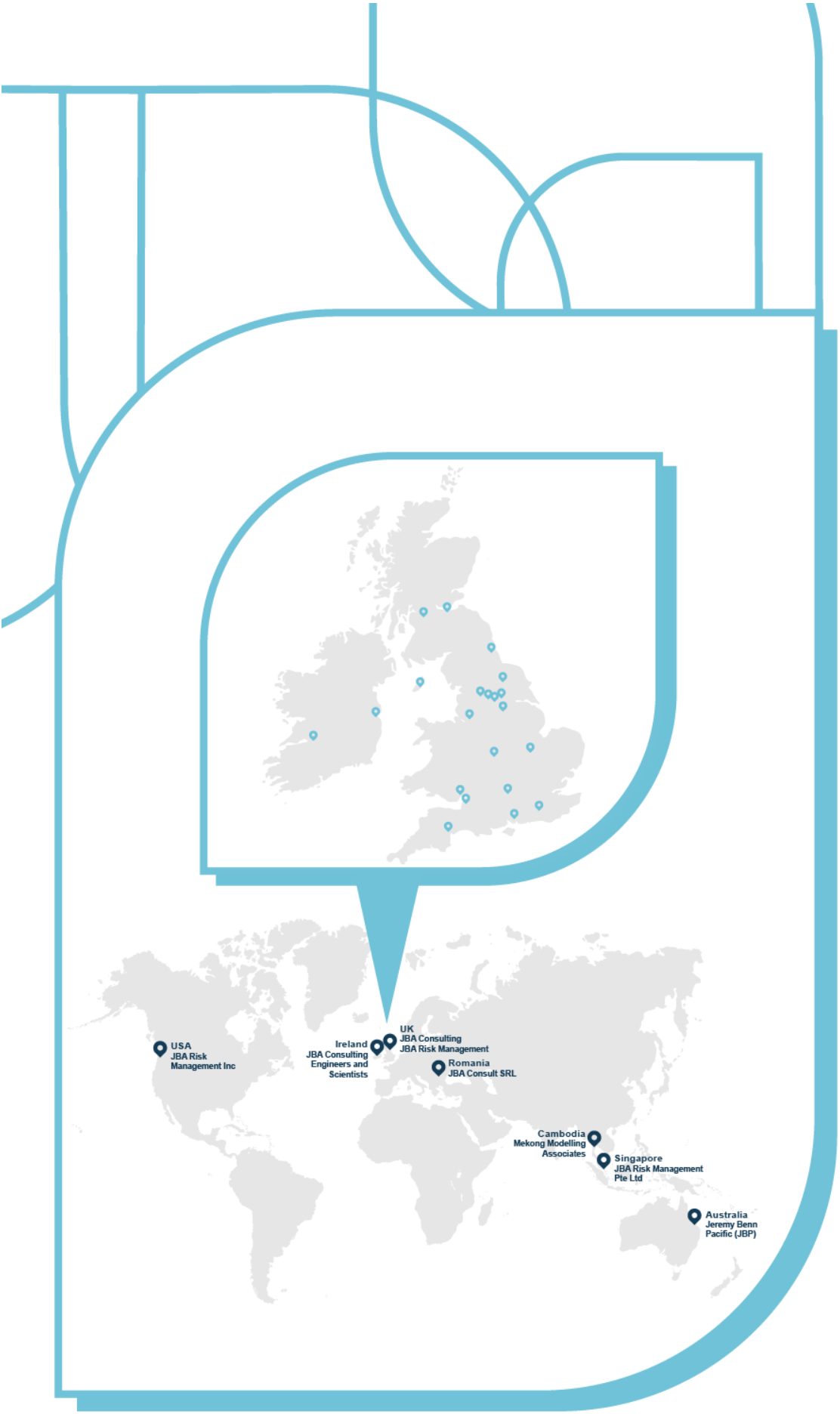
Rothley Brook Catchment (tributary of Soar)

This catchment covers most of the northeast corner of the borough and is rural within the borough but more urbanised downstream where it includes parts of the northwest side of the Leicester urban centre.

This catchment ranked as high risk for sensitivity to increased surface water risk and prevalence of historic incidences and medium risk for proposed development.

The most sensitive areas for increased surface water risk are shown to be in the settlements of Markfield and Ratby. SuDS retrofit within these existing developed areas could provide opportunities to reduce the existing runoff rates and decrease surface water flood risk downstream.

There are several potential greenfield site locations across this catchment where use of NFM techniques and oversized SuDS could be used to intercept surface water flow routes and decrease flood risk downstream.



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