Blaby District Council Level 1 Strategic Flood Risk Assessment

Final Report

December 2020

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Blaby District Council

the heart of Leicestershire

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Revision history

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S3-P01		Tom McGowan, Blaby District Council
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Contract

This report describes work commissioned by Tom McGowan, on behalf of Blaby District Council, by a letter dated 28th August 2020. Joanne Chillingworth, Daniel Bloomfield, Ed Mumford, Tom Smith and Samuel Watkiss of JBA Consulting carried out this work.

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Purpose

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JBA Consulting has no liability regarding the use of this report except to Blaby District Council.

Acknowledgements

We would like to acknowledge the assistance of

- Blaby District Council
- Environment Agency
- Leicestershire County Council
- Severn Trent Water
- Canal and River Trust
- Leicestershire Fire and Rescue Service; and
- Planners at the neighbouring authorities

Carbon footprint

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Executive summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the production of the new Local Plan. This is a Level 1 Strategic Flood Risk Assessment (SFRA) and it will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

Introduction

This Strategic Flood Risk Assessment (SFRA) provides an update to the 2014 Level 1 SFRA. This study provides a comprehensive and robust evidence base to support the new Blaby District Council Local Plan. The key objectives are:

- To update the Council's 2014 SFRA, taking into account the most recent policy and legislation in the National Planning Policy Framework (2019).
- To collate and analyse the latest available information and data for current and future (i.e. climate change) flood risk from all sources, and how these may be mitigated.
- To inform decisions in the emerging Local Plan, including the selection of development sites and planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support the Council's preparation of the Local Plan.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the emerging Local Plan.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments and outline specific measures or objectives that are required to manage flood risk.

Summary of flood risk in Blaby District

- There are numerous recorded flooding incidents across northern areas of the district, such as Leicester Forest East and Glenfield. Rural villages in the west and south-west of the district such as, Sharnford, Thurlaston and Stoney Stanton also see flooding. Events of flooding are also distributed across areas such as Glen Parva and Blaby.
- The main rivers associated with fluvial flooding are the River Soar, which poses a flood risk to some rural settlements and areas along the banks as it flows through Croft and Littlethorpe, the River Sence as it flows past Blaby, the Rothley Brook as it flows past Glenfield, an unnamed watercourse flowing through Cosby, and the Thurlaston Brook and the Whetstone Brook, which pose a flood risk to more remote rural settlements.
- Surface water risk largely follows the topography of watercourses, but there are also additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments. The largest surface water flow paths exist in the south-west rural areas of the district, for example a large flow path through Sharnford and in the north of Blaby. Other flow paths exist across the district, e.g. those affecting Glenfield.
- The post codes most frequently flooded from sewer flooding, as recorded in Severn Trent Water's Hydraulic Flooding Risk Register (HFRR) are LE2 9, LE3 2, LE3 3, LE3 8, LE9 4 and LE19 2.

- Areas at risk of flooding today are likely to become at increased risk in the future and the frequency of flooding will also increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that the Council works with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the district.
- The Areas Susceptible to Groundwater Flooding map shows that, in general, the majority of Blaby District is between the >=25% to 50% and >=50% to <75% susceptible classifications, therefore it is at medium risk of groundwater flooding. Parts of the district, particularly around Littlethorpe, Stoney Stanton and east of Countesthorpe fall within higher susceptibility classifications (>=75%) and are therefore at higher risk from groundwater flooding.
- There is one canal located within Blaby District, the Grand Union Canal. This has the potential to interact with other watercourses which flood in the area and become a conduit for flow paths during flood events or in a breach scenario. There has been one recorded incident of canal overtopping in the district. The canal overtopping incidents occurred west of Glen Parva.
- There is a potential risk of flooding from two reservoirs, both outside the district boundary. There are no records of flooding from reservoirs in the study area. The level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

How to use this report

Planners

The SFRA provides recommendations regarding all sources of flood risk in Blaby District, which can be used to inform policy on flood risk within the Local Plan. This includes how the cumulative impact of development should be considered.

It provides the latest flood risk data and guidance to inform the Sequential Test and provides guidance on how to apply the Exception Test. The council can use this information to apply the Sequential Test to strategic allocations and identify where the Exception Test will also be needed.

The SFRA provides guidance for developers, which can be used by development management staff to assess whether site specific Flood Risk Assessments meet the required quality standard.

Developers

For sites that are not strategic allocations, developers will need to use this SFRA to help apply the Sequential Test. For all sites, whether strategic allocations or windfall sites, developers will need to apply the Exception Test and use information in a site-specific Flood Risk Assessment to inform this test at planning application stage.

When assessing sites not identified in the Local Plan (windfall sites), developers should use evidence provided in this SFRA to apply the Sequential Test as well as providing evidence to show that they have adequately considered other reasonably available sites.

This SFRA provides guidance for the application of the Sequential and Exception Tests at a site level and for detailed site-specific Flood Risk Assessments.

This is a strategic assessment and does not replace the need for site-specific Flood Risk Assessments where a development is either within Flood Zones 2 or 3 or greater than a hectare in Flood Zone 1. In addition, a Surface Water Drainage Strategy will be needed for all major developments in any Flood Zone to satisfy Leicestershire County Council, the Lead Local Flood Authority (LLFA).

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed Flood Risk Assessment. To do this, they should refer to Chapter 5, Appendix A (Interactive PDF mapping) and Appendix B (Data sources used in the SFRA). At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, due to be updated by the Environment Agency in 2019), inform masterplanning and prove, if required, whether the Exception Test can be passed. As part of the Environment Agency's updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed assessment of climate change as part of the planning application process when preparing FRAs.

Developers need to ensure that new development does not increase surface water runoff from a site. Chapter 9 provides information on the surface water drainage requirements of Leicestershire County Council as LLFA. Sustainable Drainage Systems should be considered at the earliest stages that a site is developed which will help to minimise costs and overcome any site-specific constraints.

Flood Risk Assessments will need to identify how flood risk will be mitigated to ensure the development is safe from flooding. In high risk areas, the Flood Risk Assessment will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

Any developments located within an area protected by flood defences and where the standard of protection is not of the required standard (either now or in the future) should be identified and the use of developer contributions considered to fund improvements.

Neighbourhood plans

The SFRA provides information on the sources of flooding and the variation in the risk across the borough, which organisations are involved in flood risk management and their latest strategic plans, current plans for major flood defences, the requirements for detailed Flood Risk Assessments and to inform the site selection process

Neighbourhood planners can use this information to assess the risk of flooding to sites within their community, using Chapter 5, the sources of flooding in Blaby District and the flood mapping in the appendices. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas.

These maps highlight on a broadscale where flood risk from fluvial, surface water, groundwater and the effects of climate change are most likely. These maps are useful to provide a community level view of flood risk but may not identify if an individual property is at risk of flooding or model small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this broadscale mapping. Similarly, all known recorded historical flood events for the borough are listed in Section 5.1 and this can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned by Leicestershire County Council are outlined in Section 6.4 and Section 8.4 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

A cumulative impact assessment has been carried out which has identified which catchments in Blaby District are more sensitive to the cumulative impact of development and where more stringent policy regarding flood risk is recommended. Any development in these areas should seek to contribute to work that reduces wider flood risk in those catchments.

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Abbreviations and definitions

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability – The probability (expressed as a percentage) of a flood event occurring in any given year.
AStGWf	Areas Susceptible to Groundwater flooding
Brownfield	Previously developed parcel of land
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, Main River and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Cumecs	A measure of flow rate. One cumec is shorthand for cubic metre per second; also m^3/s.
Defra	Department for Environment, Food and Rural Affairs
Design flood	This is a flood event of a given annual flood probability, which is generally taken as "fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year)"
DTM	Digital Terrain Model
DPD	Development Plan Document
EA	Environment Agency
EU	European Union
Exception Test	Set out in the NPPF, the Exception Test is a method used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The Exception Test is applied following the Sequential Test.
FCERM	Flood and Coastal Erosion Risk Management
FEH	Flood Estimation Handbook
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Map for Planning	The Environment Agency Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
FWA	Flood Warning Area
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a River
FRA	Flood Risk Assessment - A site-specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FSA	Flood Storage Area
FWMA	Flood and Water Management Act
FWS	Flood Warning System
GI	Green Infrastructure – a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and urban fringe
Greenfield	Undeveloped parcel of land
Ha	Hectare
IDB	Internal Drainage Board
Indicative Flood Risk Area	Nationally identified flood risk areas based on the definition of 'significant' flood risk described by Defra and WAG.
JBA	Jeremy Benn Associates
LFRMS	Local Food Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
m AOD	metres Above Ordnance Datum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NRD	National Receptor Database
NRIM	National Reservoir Inundation Mapping
NVZs	Nitrate Vulnerability Zones
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
PFRA	Preliminary Flood Risk Assessment
Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity.
RBMP	River Basin Management Plan

RFCC's	Regional Flood and Coastal Committee
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
Riparian owner	A riparian landowner, in a water context, owns land or property, next to a river, stream or ditch.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Risk Management Authority	Operating authorities who's remit and responsibilities concern flood and / or coastal risk management.
RoFfSW	Risk of Flooding from Surface Water (formerly known as the Updated Flood Map for Surface Water (uFMfSW))
Sequential Test	Set out in the NPPF, the Sequential Test is a method used to steer new development to areas with the lowest probability of flooding.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
SoP	Standard of Protection - Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event return period. For example, a flood embankment could be described as providing a 1 in 100-year standard of protection.
SPD	Supplementary Planning Document
SPZ	(Groundwater) Source Protection Zone
Stakeholder	A person or organisation affected by the problem or solution or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.
WFD	Water Framework Directive – Under the WFD, all waterbodies have a target to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline. River Basin Management Plans (RBMPs) set out the ecological objectives for each water body and give deadlines by when objectives need to be met.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> ***"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.".***
>
> (National Planning Policy Framework, paragraph 156)

JBA Consulting were commissioned by Blaby District Council to prepare a Level 1 Strategic Flood Risk Assessment (SFRA). This study provides a comprehensive and robust evidence base to support the production of the new Local Plan. This document provides an update to the 2014 Joint SFRA for Blaby District Council.

This 2020 SFRA will be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk.

1.2 Local Plan

The Blaby District New Local Plan will update the local planning policy framework currently set by the Core Strategy (2013) and the Delivery Development Plan Document (DPD) (2019) and will look forward to at least 2036. The aim of the Local Plan is to establish a planning framework for future development, identifying how much land is available and where such land should be provided for new homes and employment, alongside associated infrastructure.

1.3 Levels of SFRA

The **Planning Practice Guidance** (PPG) (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Strategic-Flood-Risk-Assessment-section) identifies the following two levels of SFRA:

- **Level 1**: where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the Sequential Test.
- **Level 2**: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all necessary development, creating the need to apply the National Planning Policy Framework's (NPPF) Exception Test. In these circumstances the assessment should consider the detailed nature of the flood characteristics within a Flood Zone and assessment of other sources of flooding.

This Level 1 SFRA is intended to aid Blaby District Council in applying the Sequential Test for their site allocations and identify where the application of the Exception Test may be required via a Level 2 SFRA.

1.4 SFRA outputs

- Identification of policy and technical updates.
- Identification of any strategic flooding issues which may have cross boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewers, groundwater, reservoirs and canals.
- Review of historic flooding incidents.

- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.
- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.5 SFRA study area

Blaby District Council's administrative area covers an area of approximately 130km^2 and has a population of approximately 100,421 (2018 estimate by the Office of National Statistics).

Blaby District is bound by Charnwood Borough Council, Leicester City Council, Harborough District Council, Hinckley and Bosworth Borough Council, Oadby and Wigston District Council and Rugby Borough Council.

Blaby District's land uses vary between the north, mostly urban with larger villages which are part of the principal urban area of Leicester (such as Braunstone, Blaby, Narborough and Glenfield), and the south and east which are predominantly rural and contain settlements such as Thurlaston, Sapcote and Croft.

Figure 1-1 and Figure 1-2 show the study area and the neighbouring Local Authorities.

Blaby District is also covered solely by Severn Trent Water as a water and sewerage provider, and hence this is not shown on the mapping.

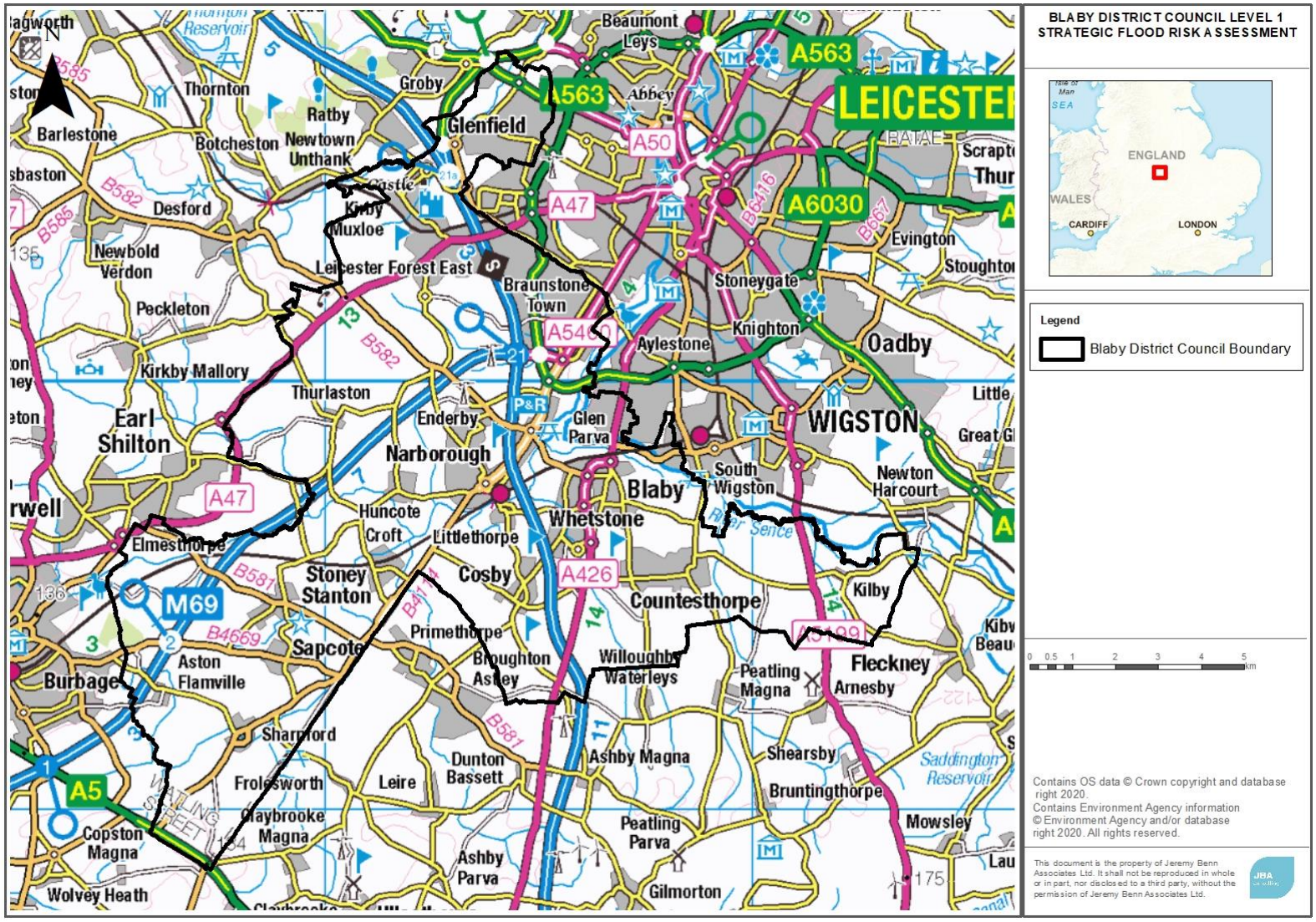

Figure 1-1: Blaby District Council study area

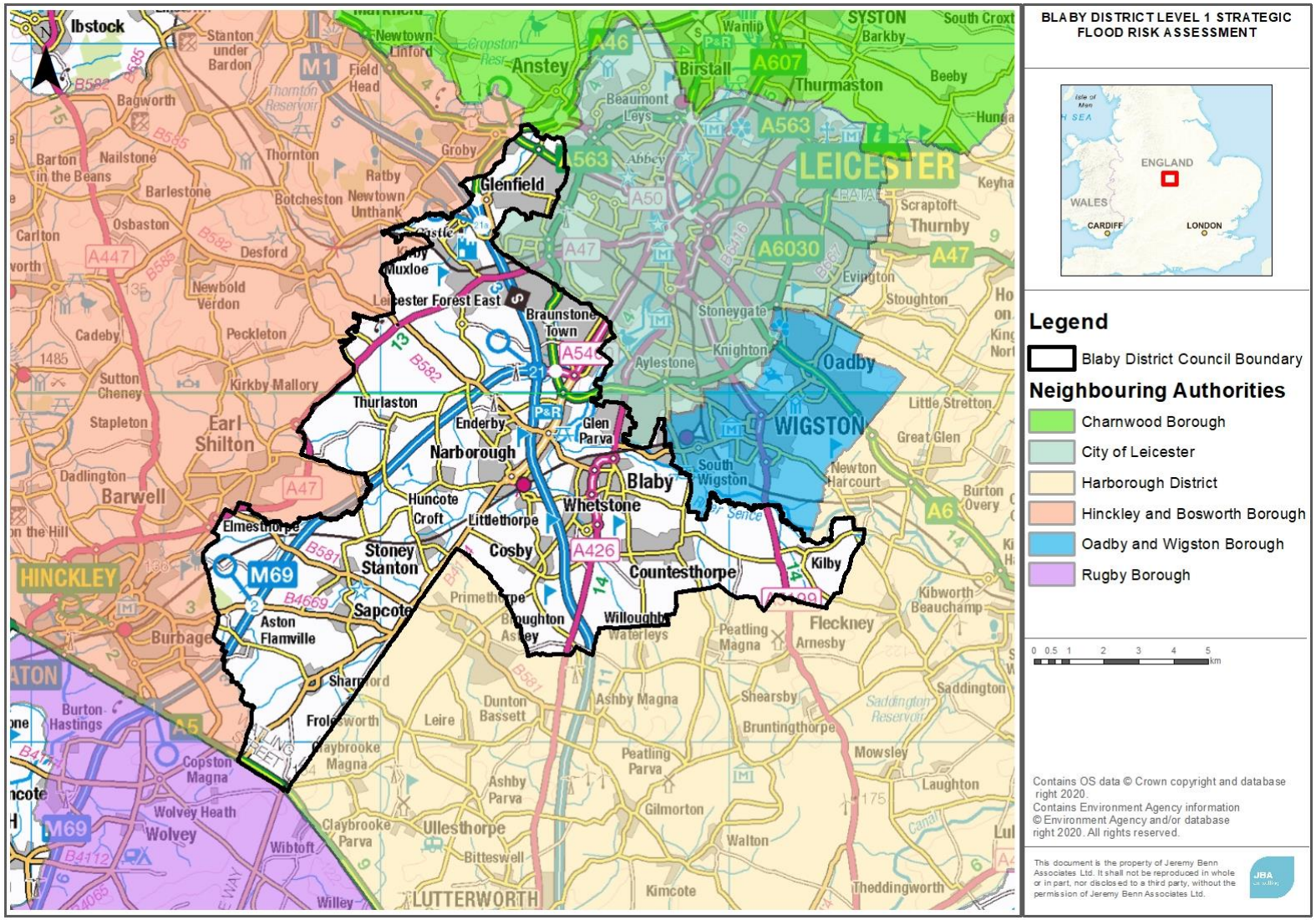

Figure 1-2: Neighbouring local authorities

The main rivers that fall within Blaby District are:

- River Soar
- River Sence

The River Soar enters the district in the south after flowing past Sharnford and Sapcote. It flows north-east past Narborough and Whetstone, with several tributaries joining it, including the River Sence, before flowing out of the district through Leicester and continuing north. The River Sence flows into the district in the south-east, past Kilby and flows along the eastern boundary, passing north of Blaby village before joining the River Soar at Enderby.

There are several notable minor rivers and brooks within Blaby District. Firstly, the Whetstone Brook begins at a confluence north of Willoughby Waterleys, flowing north west through Whetstone before joining the River Soar near Cosby. Thurlaston Brook rises south-west of Thurlaston flowing west under the M69 and past Huncote where it converges with the River Soar. The Lubbesthorpe Brook rises west of Braunstone Town, flowing south past Fosse Park before turning east to join the River Soar on the eastern boundary of Blaby District. The Rothly Brook enters the district west of Kirby Muxloe, flowing north-east along the north-western Blaby District boundary before passing Glenfield and out of Blaby District at the northern boundary.

Figure 1-3 shows a map of the key watercourses within Blaby District.

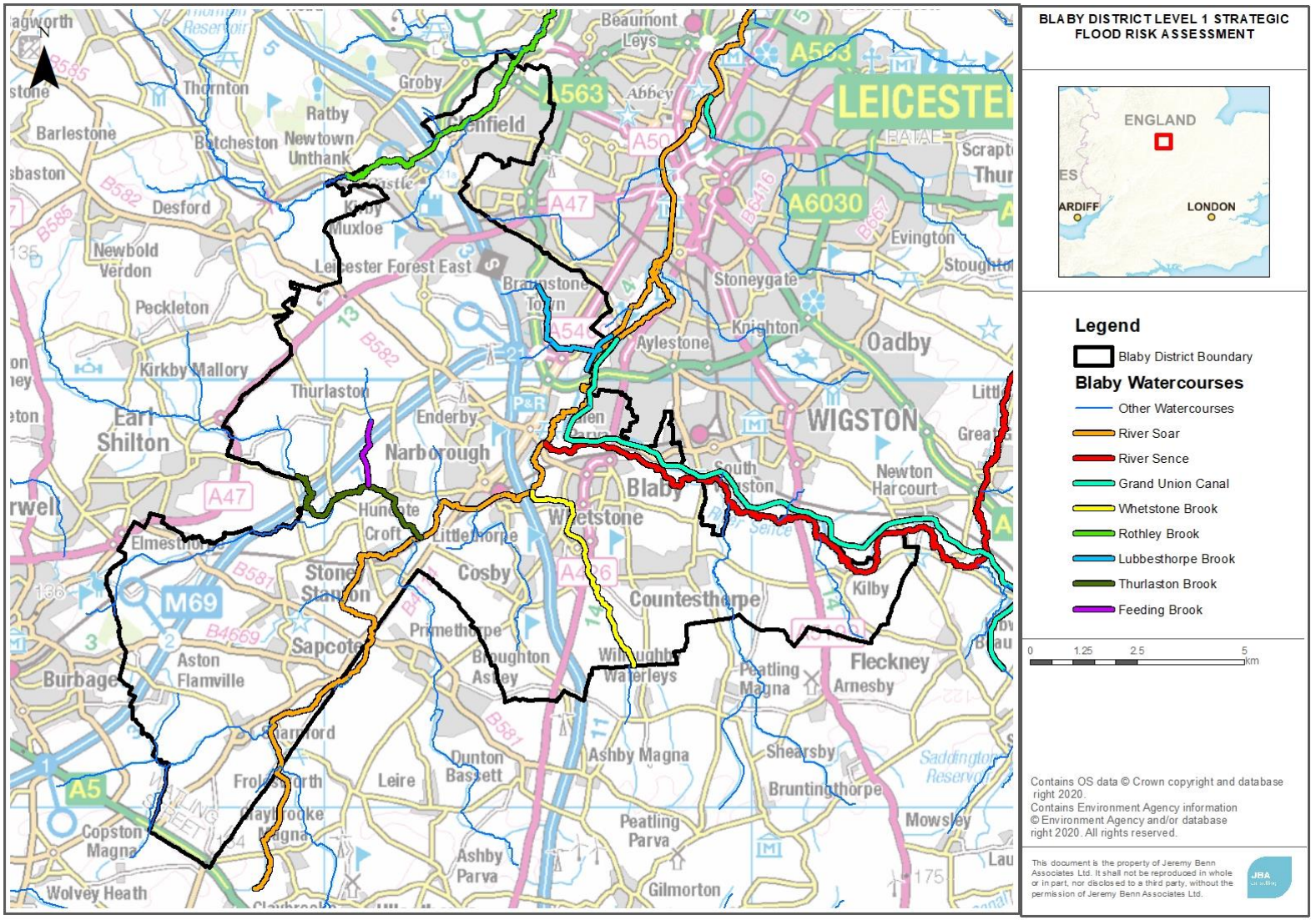

Figure 1-3: Map of the principal rivers and other watercourses within and around Blaby District

1.6 Consultation

The following parties (external to Blaby District Council) were consulted to inform the SFRA:

- Leicestershire County Council
- Environment Agency
- Severn Trent Water
- Leicestershire Fire and Rescue Service
- Canal and Rivers Trust
- Neighbouring authorities:
    - Leicester City
    - Oadby and Wigston
    - Harborough
    - Rugby
    - Hinckley and Bosworth
    - Charnwood

1.7 Use of SFRA data

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. The primary purpose is to provide an evidence base to inform the Local Plan and any future flood risk policies.

Developers will still be required to undertake site-specific Flood Risk Assessments to support Planning Applications. Developers will be able to use the information in the SFRA to scope out the sources of flood risk that will need to be explored in more detail at site level.

Appendix C presents a SFRA User Guide, further explaining how SFRA data should be used, including reference to relevant sections of the SFRA, how to consider different sources of flood risk and recommendations and advice for Sequential and Exception Tests.

Key reference material such as external guidance documents/ websites are provided in **purple** throughout the SFRA, with the weblink in brackets afterwards.

Advice to users has been highlighted in **amber boxes** throughout the document.

On the date of publication, the SFRA contains the latest flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), flood event information, new defence schemes and updates to policy and legislation. Developers should check the online **Flood Map for Planning** (https://flood-map-for-planning.service.gov.uk/) in the first instance to identify any major changes to the Flood Zones.

1.8 Structure of this report

Section	Contents	How to use
Executive Summary	Focuses on how the SFRA can be used by planners, developers and neighbourhood planners	Summarises the Level 1 findings and recommendations.
1. Introduction	Provides a background to the study, the Local Plan stage the SFRA informs, the study area, the roles and responsibilities for the organisations involved in flood management and how they were involved in the SFRA Provides a short introduction to how flood risk is assessed and the importance of considering all sources Includes this table of the contents of the SFRA	For general information and context.
2. Flood risk policy and strategy	Sets out the relevant legislation, policy and strategy for flood risk management at a national, regional and local level.	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.
3. Planning policy for flood risk management	Provides an overview of both national and existing Local Plan policy on flood risk management This includes the Flood Zones, application of the Sequential Approach and Sequential/Exception Test process. Provides guidance for the Council and Developers on the application of the Sequential and Exception Test for both allocations and windfall sites, at allocation and planning application stages.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
4. Impact of climate change	Outlines the latest climate change guidance published by the Environment Agency and how this was applied to the SFRA Sets out how developers should apply the guidance to inform site specific Flood Risk Assessments	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
5. Understanding flood risk in Blaby District	Provides an overview of the characteristics of flooding affecting the study area and key risks including historical flooding incidents, flood risk from all sources and flood warning arrangements.	This section should be used to understand all sources of flood risk in the borough, including where has flooded historically. This section may also help identify any data gaps, in conjunction with Appendix B.
6. Flood	Provides a summary of current flood	This section should be used

alleviation schemes and assets	defences and asset management and future planned schemes. Introduces actual and residual flood risk.	to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site-specific stage.
7. Cumulative impact of development and strategic solutions	This section provides a summary of the catchments with the highest flood risk and development pressures, considers opportunities for strategic flood risk solutions and makes recommendations for local planning policy based on these.	Planners should use this section to help develop policy recommendations for the cumulative impact of development.
8. Flood risk management for developers	Guidance for developers on Flood Risk Assessments, considering flood risk from all sources	Developers should use this section to understand requirements for FRAs and what conditions/ guidance documents should be followed, as well as mitigation options.
9. Surface water management and Sustainable Drainage Systems	An overview of Sustainable Drainage Systems, Guidance for developers on Surface Water Drainage Strategies, considering any specific local standards and guidance for Sustainable Drainage Systems (SuDS) from the Lead Local Flood Authority.	Developers should use this section to understand what national, regional and local SuDS standards are applicable. Hyperlinks are provided.
10. Summary and recommendations	Summarises sources of flood risk in the study area and outlines planning policy recommendations	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.
Appendices	• Appendix A: Interactive flood risk maps • Appendix B: Data sources used in the SFRA • Appendix C: SFRA User Guide • Appendix D: Flood Alert and Flood Warning Areas • Appendix E: Summary of flood risk across the district • Appendix F: Cumulative Impact Assessment methodology	Planners should use these appendices to understand what data has been used in the SFRA, to inform the application of the Sequential and Exception Tests, as relevant, and to use these maps and tabulated summaries of flood risk to understand the nature and location of flood risk.

1.9 Understanding flood risk

This section provides useful background information on how flooding arises and how flood risk is determined.

1.9.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways, as illustrated in Figure 1-4. Major sources of flooding include:

- Fluvial (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- Surface water - surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc.)
- Groundwater - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- Infrastructure failure - reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

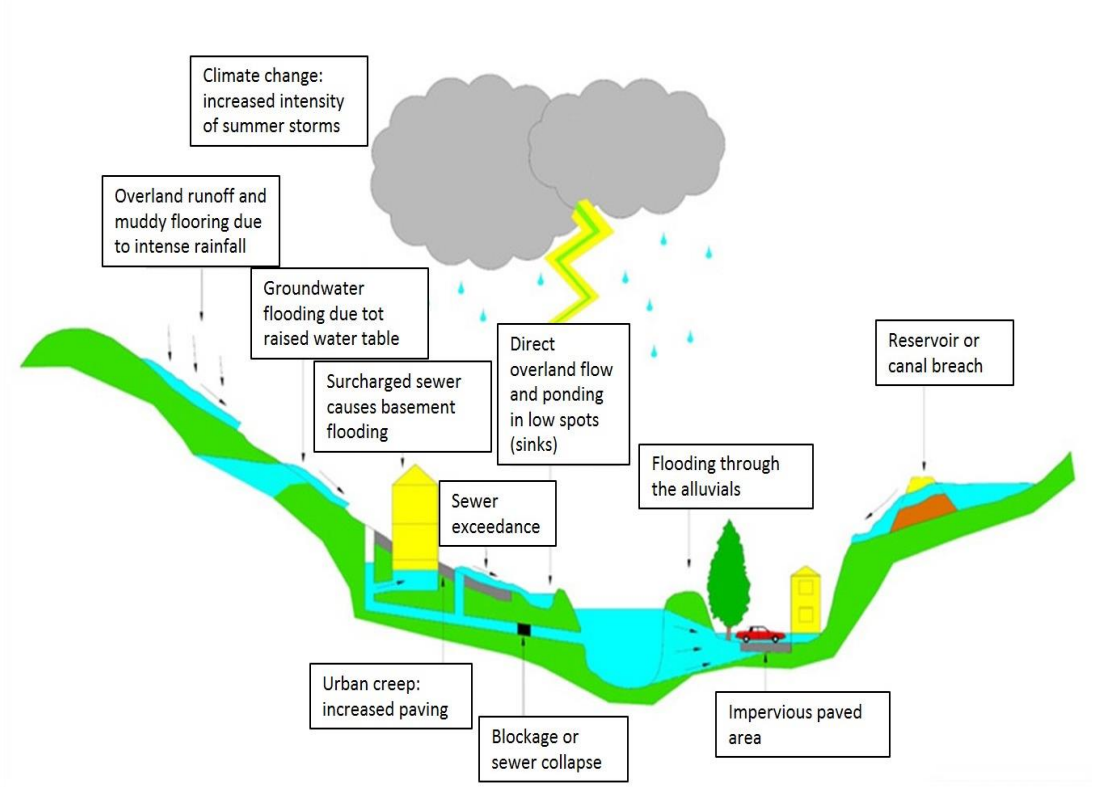

Figure 1-4: Flooding from all sources

1.10 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 1-5 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

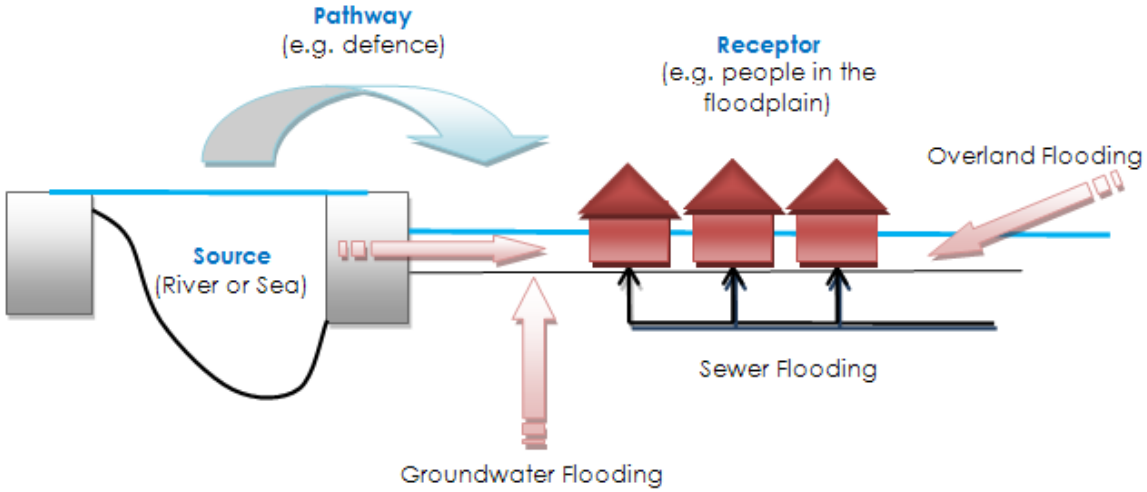

Figure 1-5: Source-Pathway-Receptor Model

The principal sources are rainfall and rivers; the most common pathways are rivers themselves, drains, sewers, overland flows, floodplains and defence assets (for example through overtopping or breach). Receptors can include people, their property and the environment. All these elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding, but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a consistent manner.

1.11 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years.

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example:

- A 1% flood has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage
- And a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime

1.12 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

1.13 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

2 Flood risk policy and strategy

This section sets out the flood risk management roles and responsibilities for different organisations and relevant legislation, policy and strategy.

2.1 Roles and responsibilities for Flood Risk Management in Blaby District

There are different organisations that cover Blaby District that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are shown on Table 2-1, with a summary of their responsibilities.

It is important to note that land and property owners are responsible for the maintenance of watercourses either on or next to their properties. Property owners are also responsible for the protection of their properties from flooding as well as other management activities, for example by maintaining riverbeds/ banks, controlling invasive species and allowing the flow of water to pass without obstruction. More information can be found in the Environment Agency publication **'Owning a Watercourse' (2018)** (https://www.gov.uk/guidance/owning-a-watercourse).

When it comes to undertaking works to reduce flood risk, the Environment Agency and Leicestershire County Council as LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect. Permissive powers mean that Risk Management Authorities are permitted to undertake works on watercourses but are not obliged.

Table 2-1: Roles and responsibilities for Risk Management Authorities

Risk Management Authority	Strategic Level	Operational Level	Planning role
Environment Agency	• Strategic overview for all sources of flooding • National Strategy • Reporting and general supervision	• Main rivers (e.g. River Soar) • Reservoirs	• Statutory consultee for development in Flood Zones 2 and 3
Leicestershire County Council as Lead Local Flood Authority (LLFA)	• Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy	• Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement) • Ordinary watercourses (works)	• Statutory consultee for major developments
Blaby District Council as Local Planning Authority	• Local Plans as Local Planning Authorities	• Determination of Planning Applications as Local Planning Authorities • Managing open spaces under Borough Council ownership	• As left
Severn Trent Water	• Asset Management Plans, supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans	• Public sewers	• Non-statutory consultee
Highways Authorities *Highways England (motorways and trunk roads)* *Blaby District Council (for non-trunk roads)*	• Highway drainage policy and planning	• Highway drainage	• Internal planning consultee regarding highways design standards and adoptions

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in Blaby District:

- **Flood Risk Regulations (2009)**

  (http://www.legislation.gov.uk/uksi/2009/3042/pdfs/uksi_20093042_en.pdf) - these transpose the European Floods Directive (2000) into law and require the Environment Agency and LLFAs to produce Preliminary Flood Risk Assessments and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk Management Plan is produced; this is done in a six-year cycle.

- **Town and Country Planning Act (1990)** (https://www.legislation.gov.uk/ukpga/1990/8/contents), **Water Industry Act (1991)** (https://www.legislation.gov.uk/ukpga/1991/56/contents)**, Land Drainage Act (1991)** (https://www.legislation.gov.uk/ukpga/1991/59/contents), **Environment Act (1995)** (http://www.legislation.gov.uk/ukpga/1995/25/contents), **Flood and Water Management Act (2010)** (https://www.legislation.gov.uk/ukpga/2010/29/contents) – as amended and implanted via secondary legislation. These set out the roles and responsibilities for organisations that have a role in FRM.

- The **Land Drainage Act (1991, as amended)** (https://www.legislation.gov.uk/ukpga/1991/59/contents) and **Environmental Permitting Regulations (2018)** (http://www.legislation.gov.uk/uksi/2018/110/contents/made) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an Ordinary Watercourse or Main River.

- The **Water Environment Regulations (2017)** (http://www.legislation.gov.uk/uksi/2017/407/contents/made) – these transpose the European Water Framework Directive (2000) into law and require the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.

- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

Table 2-2 summarises relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. Hyperlinks are provided to external documents. These documents may

- Provide useful and specific local information to inform Flood Risk Assessments within the local area.

- Set the strategic policy and direction for Flood Risk Management (FRM) and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for FRM and drainage in the district.

- Provide guidance and/or standards that informs how a developer should assess flood risk and/or design flood mitigation and SuDS.

Table 2-2: National, regional and local flood risk policy and strategy documents

Scale	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
National	**Flood and Coastal Management Strategy** (see section 2.5.1) (Environment Agency) 2020	No	Yes	No	Due to be reviewed in 2026
National	**National Planning Policy Framework and Guidance** (MHCLG) 2018/2015) (see section 3.1)	No	No	Yes	2019 updates to PPG
National	**Building Regulations Part H** (MHCLG) 2010 (see section 2.5.8)	No	No	Yes	-
Regional	**Humber River Basin Catchment Flood Management Plan** (Environment Agency) 2016 (see section 2.5.5)	Yes	Yes	No	-
Regional	**Humber River Basin Management Plan** (Environment Agency) 2015 (see section 2.5.3)	No	Yes	No	2021
Regional	**Drainage and Wastewater Management Plan** (Severn Trent Water) due 2022/23	Yes	Yes	Yes	2022/23
Regional	**Climate Change guidance for development and flood risk** (see section 4.1) (Environment Agency) 2019	No	No	Yes	2020 for fluvial and rainfall allowances
Local	**Supplementary Planning Document for Sustainable Drainage Systems** (see section 9.3.6) (LCC)	No	No	Yes	-
Local	**Leicestershire Local Flood Risk Management Strategy** (LCC) 2015 (see section 2.5.6)	Yes	Yes	No	2021
Local	**Leicester City and Leicestershire Strategic Water Cycle Study** (2017) (see section 2.5.7)	Yes	No	Yes	-

2.4 Key legislation for flood and water management

2.4.1 Flood Risk Regulations (2009)

The **Flood Risk Regulations 2009** translate the EU Floods Directive into UK law. The EU requires Member States to complete an assessment of flood risk (known as a Preliminary Flood Risk Assessment (PFRA)) and then use this information to identify areas where there is a significant risk of flooding. For these Flood Risk Areas, States must then undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans.

The Flood Risk Regulations direct the Environment Agency to do this work for river, sea and reservoir flooding. LLFAs must do this work for surface water, Ordinary Watercourse and Groundwater flooding. This is a six-year cycle of work and the second cycle started in 2017.

The **Leicestershire County Council PFRA** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698267/PFRA_Leicestershire_County_Council_2017.pdf) was published in 2011 with an addendum in 2017 with updated flood risk data and information. This greater understanding of flood risk from the LLFA has drawn attention to new areas of risk not previously considered. Such as ground water flooding not being restricted to those areas indicated in the 2011 report, and other areas experiencing significant flood events. Several areas within the Blaby District have been identified as Flood Risk Areas, such as parts of Enderby, Braunstone Town, Leicester Forest East, Kirby Muxloe and Glenfield.

Key outputs of the 2011 PFRA include:

Three past flooding events in Leicestershire were noted as having nationally significant harmful consequences; however, none of these fall within the Blaby District.

After a review of the Indicative Flood Risk Area, in collaboration with Leicester City Council, it was proposed that the Indicative Flood Risk Area was extended in the south west to include parts of Blaby.

The **English PFRA (2018)** (https://www.gov.uk/government/publications/preliminary-flood-risk-assessment-for-england) provides information on significant past and future flood risk from river and sea flooding across all of England, including Blaby District. No nationally significant Flood Risk Areas for river flooding have been identified in the Blaby District.

2.4.2 Flood and Water Management Act (FWMA) 2010

The Flood and Water Management Act (FWMA) was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

2.4.3 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP), which were last published in 2015 and are currently being updated.

Blaby District lies within the Humber River Basin District.

2.5 Key national, regional and local policy documents and strategies

2.5.1 The National Flood and Coastal Erosion Risk Management Strategy for England (2020)

The **National Flood and Coastal Erosion Risk Management Strategy** (FCERM) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/899498/National_FCERM_strategy_for_England.pdf) for England provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England. The new Strategy has been in preparation since 2018. The Environment Agency brought together a wide range of stakeholders to develop the strategy collaboratively. The Strategy is much more ambitious than the previous one from 2011 and looks ahead to 2100 and the action needed to address the challenge of climate change.

The Strategy has been split into 3 high level ambitions: climate resilient places, today's growth and infrastructure resilient in tomorrow's climate and a nation ready to respond and adapt to flooding and coastal change. Measures include updating the national river, coastal and surface water flood risk mapping and the understanding of long term investment needs for flood and coastal infrastructure, trialling new and innovative funding models, flood resilience pilot studies, developing an adaptive approach to the impacts of climate change, seeking nature based solutions towards flooding and erosion issues, integrating natural flood management into the new Environmental Land Management scheme, considering long term adaptive approaches in Local Plans, maximising the opportunities for flood and coastal resilience as part of contributing to environmental net gain for development proposals, investing in flood risk infrastructure that supports sustainable growth, aligning long term strategic planning cycles for flood and coastal work between stakeholders, mainstreaming property flood resilience measures and 'building back better' after flooding, consistent approaches to asset management and record keeping, updating guidance on managing high risk reservoirs in light of climate change, critical infrastructure resilience, education, skills and capacity building, research, innovation and sharing of best practise, supporting communities to plan for flood events, develop world leading ways of reducing the carbon and environmental impact from the construction and operation of flood and coastal defences, development of digital tools to communicate flood risk and transforming the flood warning service and increasing flood response and recovery support.

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a New **National Policy Statement for Flood and Coastal Erosion Risk Management** (https://www.gov.uk/government/publications/flood-and-coastal-erosion-risk-management-policy-statement). The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

1. Upgrading and expanding flood defences and infrastructure across the country,
2. Managing the flow of water to both reduce flood risk and manage drought,
3. Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. Better preparing communities for when flooding and erosion does occur, and
5. Ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

2.5.2 Updated Strategic Flood Risk Assessment guidance

There was an update to the **'How to prepare a Strategic Flood Risk Assessment guidance'** in August 2019 (https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment), which had some key additions to both Level 1 and Level 2 assessments. The Level 1 assessment is undertaken in accordance with this guidance.

2.5.3 River Basin Management Plans

The **Humber River Basin District River Basin Management Plan** (RBMP) (https://www.gov.uk/government/publications/humber-river-basin-district-river-basin-management-plan), managed by the EA, has been updated since the first cycle in 2009. The latest version was published in December 2015. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The Humber RBMP includes such examples whereby land management techniques have been designed to reduce flood risk whilst also reducing sediment loss and improving water quality. The plans include an assessment of river basin characteristics, a review of the impact on human activity, statuses of water bodies, and an economic analysis of water use and progress since the first plan in 2009.

2.5.4 Flood Risk Management Plans

Flood Risk Management Plans (FRMPs) are part of the six-year cycle of assessment, mapping and planning required under the Flood Risk Regulations. The Environment Agency led the development of the **Humber FRMPs** (https://www.gov.uk/government/publications/humber-river-basin-district-flood-risk-management-plan), which were published in 2015. The FRMPs summarise the flooding affecting the area and describes the measures to be taken to address the risk in accordance with the Flood Risk Regulations.

2.5.5 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are a high-level strategic plan providing an overview of flood risk across each river catchment. The Environment Agency use CFMPs to work with other key-decision makers to identify and agree long-term policies for sustainable flood risk management.

Blaby District sits within the **River Trent Catchment Flood Management Plan** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289105/River_Trent_Catchment_Management_Plan.pdf) and is part of the following sub-area:

- **Sub-area 9 (Upper Soar and Upper Anker)** – The sub-area is characterised by the River Soar valley which sees high amounts of surface water run-off, due to soil characteristics. Flooding can therefore result from lack of capacity in the river channel and floodplains becoming inundated. Overall, there is a medium risk of flooding in this area, although parts of Leicester are considered to be high risk. The preferred policy is option 4, applied where areas of low, moderate or high flood risk where flood risk is generally managed effectively.

2.5.6 Leicestershire Local Flood Risk Management Strategy

The **Leicestershire Local Flood Risk Management Strategy** (LFRMS) (https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2015/12/8/flooding_strategy_plan.pdf) was published in 2015. The Strategy sets out how Leicestershire County Council will manage flood risk from surface water runoff, groundwater and ordinary watercourses for which they have a responsibility as LLFA and the work that other Risk Management Authorities are doing to manage flood risk in the borough. Once the new National Strategy has been published in 2020, LLFAs will need to update their Local Strategies so that they reflect how national objectives for flood risk management will be delivered locally.

The Strategy notes that the council will seek to deliver sustainable drainage systems (SuDS) as part of new development in its roles as statutory consultee for major planning applications and non-statutory consultee for non-major planning applications.

The Strategy has seven objectives, which are to:

- **Work Collaboratively** – Adopt a collaborative approach to managingflood risk by working with local partners and stakeholders to identify, secure and optimise resources, expertise and opportunities for reducing flood risk and increasing resilience to flooding.
- **Improve Understanding and Awareness –** Develop a greater understanding of local flood risk by improving local knowledge and the understanding of local flood risk.
- **Enhance the Natural and Historic Environment** – Adopt a sustainable approach to reducing local flood risk, seeking to lessen the risk of localised flooding using mechanisms that are economically viable, deliver wider environmental benefits and promote the wellbeing of local people.
- **Improve Resilience** - Reduce the harmful consequences of local flooding to communities and human health through proactive actions, activities and education programmes that enhance preparedness and resilience to local flood risk, and contribute to minimising community disruption.
- **Encourage Sustainable Development** – Aim to mitigate and manage flood risk relating to development through the promotion of sustainable drainage systems and supporting the development of local policies and guidance.

- **Use Resources Effectively** – Ensure the financial viability of flood related schemes through the development of appropriate policies and assessment tools to ensure that flood risk management measures provide value for money whilst minimising the long-term revenue costs. Seeking to use natural processes where possible or source the costs of any maintenance from the financial beneficiaries of the development.
- **Promote Riparian Responsibilities** - Encourage flood management activities by working with riparian owners of ordinary watercourses.

The strategy sets out actions for meeting these objectives.

2.5.7 Water Cycle Studies

Water Cycle Studies (WCS) assist councils to select and develop sustainable development allocations in locations where there is minimal impact on the environment, water quality, water resources, infrastructure, and flood risk. WCS provide the required evidence, and an agreed strategy, to ensure that planned growth occurs within environmental constraints (and, where possible, contributes to environmental improvements), with the appropriate infrastructure in place in a timely manner so that planned allocations are deliverable. This is undertaken by identifying areas where there may be conflict between any proposed development, the requirements of the environment and by recommending potential solutions to these conflicts.

The latest WCS covering Blaby District was **Leicester City and Leicestershire Strategic detailed Water Cycle Study** (https://www.llstrategicgrowthplan.org.uk/download/pdf_document/2017s5956-Leicester-City-and-Leicestershire-Water-Cycle-Study-Final-v5.0.pdf), published in November 2017. This will assist the Council in selecting and developing sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk.

2.5.8 LLFAs, surface water and SuDS

The 2019 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165). When considering planning applications, local planning authorities should consult the LLFA on the management of surface water in order to satisfy that:

- The proposed minimum standards of operation are appropriate
- Through the use of planning conditions or planning obligations there are clear arrangements for on-going maintenance over the development's lifetime

Leicestershire Council's requirements for new developers on SuDS are set out on their website, alongside supporting documents. At the time of writing this SFRA, documents and policies relevant to SuDS and surface water in Blaby District are:

- **Local Flood Risk Management Strategy** (https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2015/12/8/flooding_strategy_plan.pdf)
- **Leicestershire County Council – Guidance Notes: Surface Water** (https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2018/11/15/Surface-Water.pdf)
- The SuDS Manual (C753), published in 2007, updated in 2015I

- **DEFRA Non-statutory technical standards for sustainable drainage systems, 2015** (https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards)
- **DEFRA National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011** (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82421/suds-consult-annexa-national-standards-111221.pdf)
- **Building Regulations Part H (MHCLG) 2010** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/738407/National_FCERM_strategy_Strategic_Environmental_Assessment_scoping_report.pdf)

The 2019 NPPF states that flood risk should be managed "using opportunities provided by new development to reduce causes and impacts of flooding." As such, Blaby District Council expects SuDS to be incorporated on minor development as well as major development.

2.5.9 Surface Water Management Plans

A Surface Water Management Plan (SWMP) is a study to understand the flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from risk from surface runoff, groundwater, and ordinary watercourses. SWMPs are led by a partnership of flood risk management authorities who have responsibilities for aspects of local flooding, including the LLFA, Local Authority, Sewerage Undertaker and other relevant authorities. The purpose of a SWMP is to identify what the local flood risk issues are, what options there may be to prevent them or the damage they cause and who should take these options forward. This is then presented in an Action Plan that the stakeholders and partners agree. There are currently no surface water management plans for the Blaby District however, there is one for Leicester City, which Blaby District drains into, so collaboration between the two councils is recommended for future surface water management.

3 Planning policy for flood risk management

This section summaries national planning policy for development and flood risk.

3.1 National Planning Policy Framework and Guidance

The revised **National Planning Policy Framework (NPPF)** (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/733637/National_Planning_Policy_Framework_web_accessible_version.pdf) was published in July 2019, replacing the 2012 version. The NPPF sets out Government's planning policies for England. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF states that:

"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"

Planning Practice Guidance (https://www.gov.uk/government/collections/planning-practice-guidance) on flood risk was published in March 2014 and sets out how the policy should be implemented. **Diagram 1 in the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-risk-in-local-plans) sets out how flood risk should be considered in the preparation of Local Plans.

3.2 The risk-based approach

The NPPF takes a risk-based approach to development in flood risk areas.

3.2.1 The Flood Zones

The definition of the Flood Zones is provided below. The Flood Zones do not take into account defences. This is important for planning long-term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

The Flood Zones do not take into account surface water, sewer or groundwater flooding or the impacts of canal or reservoir failure. They do not consider climate change. Hence there could still be a risk of flooding from other sources and that the level of flood risk will change over time during the lifetime of a development.

The Flood Zones are:

- **Flood Zone 1 – Low probability:** less than a 0.1% chance of river and sea flooding in any given year.
- **Flood Zone 2 – Medium probability:** between a 1% and 0.1% chance of river flooding in any given year or 0.5% and 0.1% chance of sea flooding in any given year.
- **Flood Zone 3a – High probability:** greater or equal to a 1% chance of river flooding in any given year or greater than a 0.5% chance of sea flooding in any given year. Excludes Flood Zone 3b.

- **Flood Zone 3b – Functional Floodplain:** land where water has to flow or be stored in times of flood. SFRAs identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. It may be required to consider climate change on the functional floodplain; this would need hydraulic modelling to confirm extents and therefore it is recommended that this is considered in a Flood Risk Assessment and a suitable approach is agreed with the EA.

Important note on Flood Zone information in this SFRA

The Flood Zones (Flood Zone 2 and 3a) in the Appendix A Geo-PDFs are the same as those shown on the Environment Agency's **'Flood Map for Planning'** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) (which incorporates latest modelled data), where available, except for the Lubbesthorpe Brook and tributaries where the modelled data was not all fully incorporated into the EA Flood Zones. This has been replaced with the modelled outputs. The approach for the Lubbesthorpe Brook in the SFRA mapping is outlined in Section 4.1 of Appendix B.

The Environment Agency Flood Zones do not cover all catchments or ordinary watercourses with areas <3km^2. As a result, whilst the Environment Agency Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from smaller watercourse not shown in the Flood Zones.

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 1 in 20 years, where detailed hydraulic modelling exists. The 1 in 20-year defended modelled flood extents have been used to represent Flood Zone 3b, where available from the Environment Agency. For areas outside of the detailed model coverage, or where no outputs were available, Flood Zone 3a can be used as a conservative indication. Further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b where no detailed modelling exists.

3.2.2 The Sequential Test

Firstly, land at the lowest risk of flooding and from all sources should be considered for development. A test is applied called the 'Sequential Test' to do this. Figure 3-1 summarises the Sequential Test. The LPA will apply the Sequential Test to strategic allocations. For all other developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test.

The LPA should work with the Environment Agency to define a suitable area of search for the consideration of alternative sides in the Sequential Test. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land or Employment Land Availability Assessments.

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for. **Table 2 of the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification) defines the vulnerability of different development types to flooding. **Table 3 of the NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-3-Flood-risk-vulnerability) shows whether, having applied the Sequential Test first, that vulnerability of development is suitable for that Flood Zone and where further work is needed.

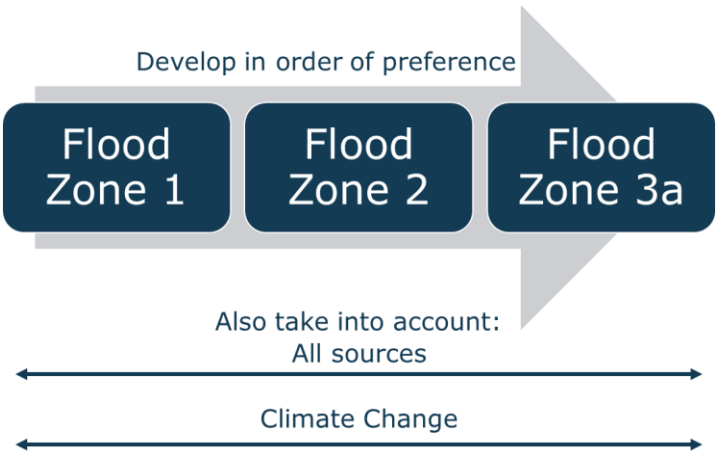

Figure 3-1: The Sequential Test

Figure 3-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against the EA's Flood Map for Planning flood zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded. In addition, the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate. The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

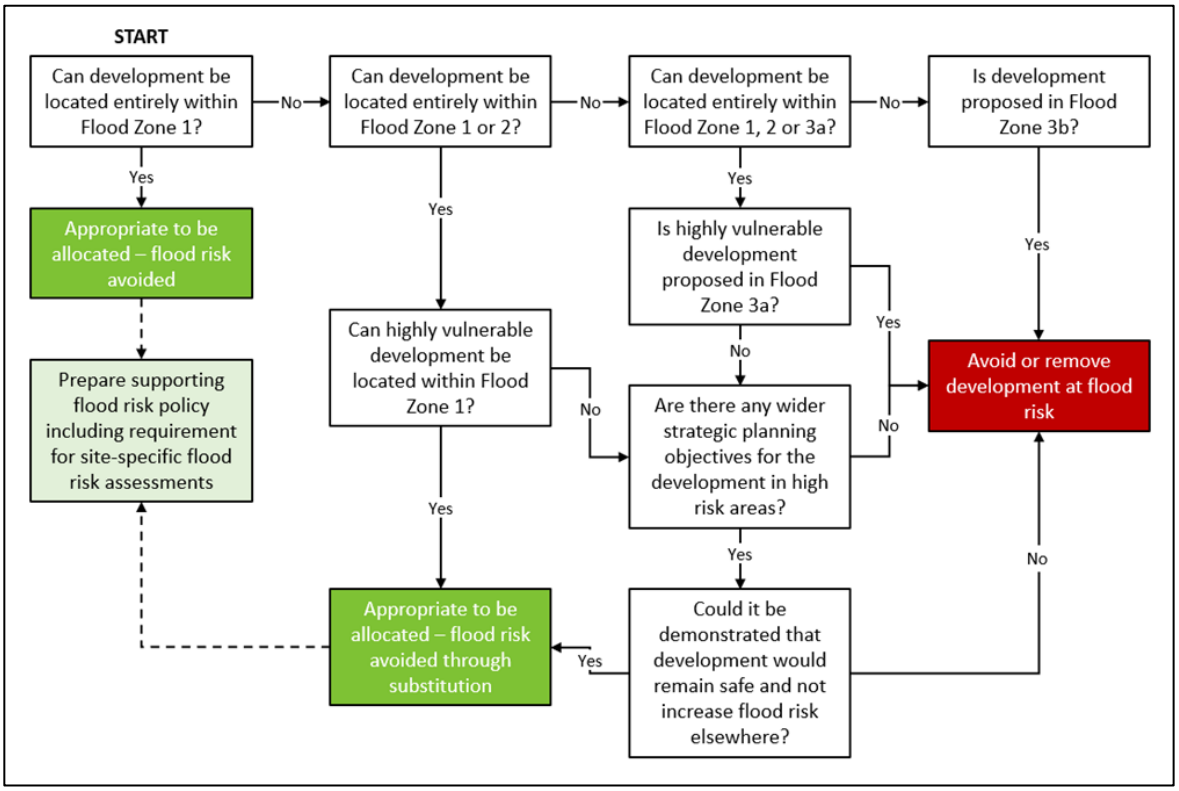

Figure 3-2: Local Plan sequential approach to site allocation

3.2.3 The Exception Test

It will not always be possible for new development to be allocated on land that is not at risk from flooding. To further inform whether land should be allocated, or Planning Permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required.

The Exception Test should only be applied following the application of the Sequential Test. It applies in the following instances:

- More vulnerable in Flood Zone 3a
- Essential infrastructure in Flood Zone 3a or 3b
- Highly vulnerable in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b)

Figure 3-3 summarises the Exception Test.

For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that is appropriate flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

For developments that have not been allocated in the Local Plan, developers must undertake the Exception Test and present this information to the Local Planning Authority for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

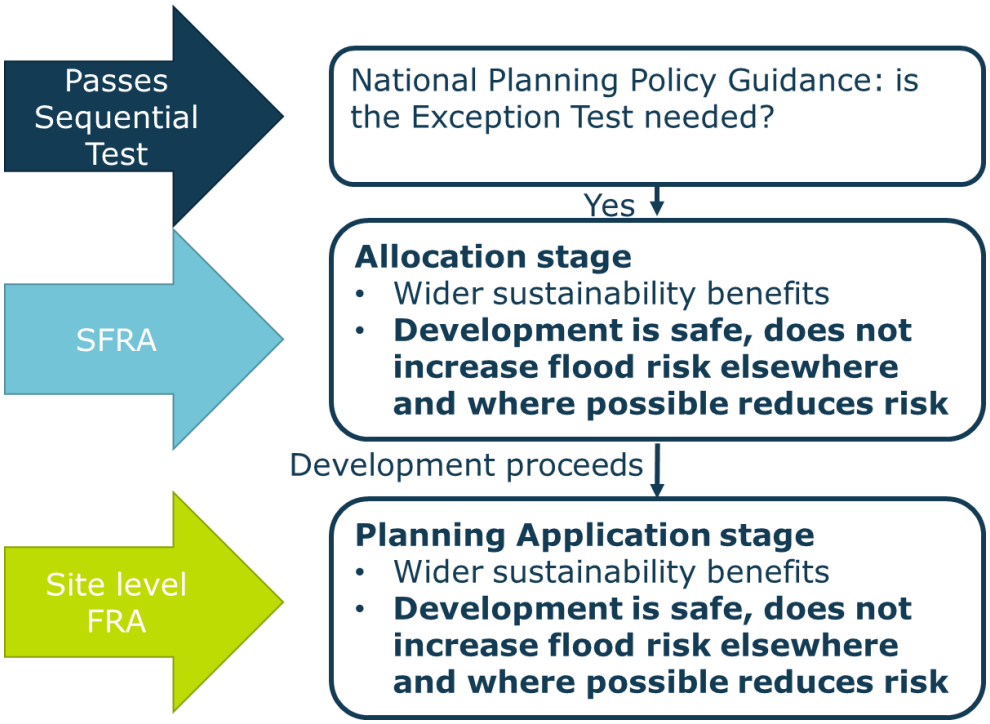

Figure 3-3: The Exception Test

There are two parts to demonstrating a development passes the Exception Test:

1. *Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk*

   Local planning authorities will need to consider what criteria they will use to assess whether this part of the Exception Test has been satisfied and give advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the Local Planning Authority should consider whether the use of planning conditions and / or planning obligations could allow it to pass. If this is not possible, this part of the Exception Test has not been passed and planning permission should be refused.

   At the stage of allocating development sites, Local Planning Authorities should consider wider sustainability objectives, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

   The Local Planning Authority should consider the sustainability issues the development will address and how doing so will outweigh the flood risk concerns for the site, e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

2. *Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

   A Level 2 SFRA is likely to be needed to inform the Exception Test in these circumstances for strategic allocations. At Planning Application stage, a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.2.4 Making a site safe from flood risk over its lifetime

Local Planning Authorities will need to consider the actual and residual risk of flooding and how this will be managed over the lifetime of the development:

- The actual risk is the risk to the site considering existing flood mitigation measures. The fluvial 1% chance flood in any year event is a key event to consider because the National Planning Policy Guidance refers to this as the 'design flood' against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.
- Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.
- Residual risk is the risk that remains after the effects of flood defences have been taken into account and/ or from a more severe flood event than the design event. The residual risk can be:
  - The effects of an extreme 0.1% chance flood in any year event. Where there are defences this could cause them to overtop, which may lead to failure if this causes them to erode; and/or
  - Structural failure of any flood defences, such as breaches in embankments or walls.

Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage it does, should water enter a property. Emergency plans should also account for residual risk, e.g. through the provision of flood warnings and a flood evacuation plan where appropriate.

In line with the NPPF, the impacts of climate change over the lifetime of the development should be taken into account when considering actual and residual flood risk.

3.3 Applying the Sequential Test and Exception Test to individual planning applications

3.3.1 Sequential Test

Blaby District Council, with advice from the Environment Agency, are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers are required to apply the Sequential Test to all development sites, unless the site is either:

- A strategic allocation and the test has already been carried out by the LPA;
- A change of use (except to a more vulnerable use);
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m^2); or
- A development in Flood Zone 1, unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

The SFRA contains information on all sources of flooding and taking into account the impact of climate change. This should be considered when a developer undertakes the Sequential Test, including the consideration of reasonably available sites at lower flood risk.

Local circumstances must be used to define the area of application of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). The criteria used to determine the appropriate search area relate to the catchment area for the type of development being proposed. For some sites this may be clear e.g. school catchments, in other cases it may be identified by other Local Plan policies. For some sites e.g. regional distribution sites, it may be suitable to widen the search area beyond LPA administrative boundaries.

The sources of information on reasonably available sites may include:

- Site allocations in Local Plans
- Site with Planning Permission but not yet built out
- Strategic Housing and Economic Land Availability Assessments (SHELAAs)/ five-year land supply/ annual monitoring reports
- Locally listed sites for sale

It may be that a number of smaller sites or part of a larger site at lower flood risk form a suitable alternative to a development site at high flood.

Ownership or landowner agreement in itself is not acceptable as a reason not to consider alternatives.

The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what development might be appropriate in what situations.

3.3.2 The Exception Test

If, following application of the Sequential Test it is not possible for the development to be located in areas with a lower probability of flooding the Exception Test must then be applied if required (as set out in Table 3 of the NPPG). Developers are required to apply the Exception Test to all applicable sites (including strategic allocations).

The applicant will need to provide information that the application can pass both parts of the Exception Test:

- Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk

  Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

  Applicants should detail the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

- Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

  The site-specific Flood Risk Assessment should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:

  - The design of any flood defence infrastructure

- Access and egress
- Operation and maintenance
- Design of the development to manage and reduce flood risk wherever possible
- Resident awareness
- Flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
- Any funding arrangements required for implementing measures.

4 Impact of climate change

Climate change projections show an increased chance of warmer, wetter winters and hotter, drier summers with a higher likelihood of more frequent and intense rainfall. This is likely to make severe flooding happen more often.

The NPPF sets out that flood risk should be managed over the lifetime of a development, taking climate change into account. This section sets out how the impact of climate change should be considered.

4.1 Revised Climate Change Guidance

The Climate Change Act 2008 creates a legal requirement for the UK to put in place measures to adapt to climate change and to reduce carbon emissions by at least 80% below 1990 levels by 2050.

The Environment Agency published **updated climate change guidance** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances) in 2019 on how allowances for climate change should be included in both strategic and site specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development. Whilst the guidance was updated in 2019, fluvial allowances are still to be updated from those in the original 2016 guidance.

In 2018, the government published new UK Climate Projections (UKCP18). The Environment Agency are currently using these to update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances. Developers should check on the government website for the latest guidance before undertaking a detailed Flood Risk Assessment. At the time of writing this report, this was reported to be due in late 2020, but is not yet released.

4.2 Applying the climate change guidance

To apply the climate change guidance, the following information needs to be known:

- The vulnerability of the development – see the **NPPG** (https://www.gov.uk/guidance/flood-risk-and-coastal-change#making-development-safe-from-flood-risk)
- The likely lifetime of the development – in general 60 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA
- The River Basin that the site is in – Blaby District is situated in the Humber River Basin District
- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s)
- The 'built in' resilience measures used, for example, raised floor levels
- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach

4.3 Relevant allowances for Blaby District

Table 4-1 shows the peak river flow allowances that apply in Blaby District for fluvial flood risk. Table 4-2 shows the peak rainfall intensity allowances that apply in Blaby District for small catchments (less than 5km^2) and urban catchments for surface water flood risk. Catchment which are larger than 5km^2 or are rural should use Table 4-1 for peak rainfall intensity. Both the central and upper end allowances should be considered to understand the range of impact.

Table 4-1: Peak river flow allowances for the Humber river basin district

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
H++	20%	35%	65%
Upper end	20%	30%	50%
Higher central	15%	20%	30%
Central	10%	15%	20%

Table 4-2: Peak rainfall intensity allowances for small and urban catchments

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

4.4 Representing climate change in the Level 1 SFRA

Climate change modelling for the watercourses in the study area was undertaken based on the EA's climate change guidance.

Existing EA hydraulic models were obtained, and where these had not already been run with the latest climate change allowances, these were run for the 2080s period for all three 2080s allowance categories (relevant to the Humber river basin district, so 100-year +20%, +30% and +50%). This includes the Lubbesthorpe Brook and its tributaries. The River Soar and Tributaries (Broughton, Cosby and Whetstone), Leicester City Model (Soar at the northern Blaby boundary) and existing 2D generalised modelling from 2017 already had the latest climate change allowances mapped. Appendix B shows the models used in this assessment.

For any sites not covered by the EA's detailed modelling, Flood Zone 2 was used as an indicative climate change extent. This is appropriate given the 100-year +50% flows are often similar to the Flood Zone 2 extents; therefore, the impacts of climate change would be minimal.

The 1,000-year surface water extent can also be used as an indication of surface water risk, and risk to smaller watercourses, which are too small to be covered by the EA's Flood Zones.

Developers will need to undertake a more detailed assessment of climate change as part of the planning application process when preparing Flood Risk Assessments, using the percentage increases which relate to the proposed lifetime and the vulnerability classification of the development. In areas where no modelling is present, this may require development of a 'detailed' hydraulic model, using channel topographic survey. The EA should be consulted to provide further advice for developers on how best to apply the new climate change guidance.

Climate change mapping has been provided in Appendix A: GeoPDFs.

In summary, the climate change outputs on the GeoPDF maps for the SFRA may be from:

- 'Indicative Climate Change (FZ2)': Flood Zone 2, which is used outside of the areas covered by specific flood models and should be considered to be indicative.

'Climate Change Central, Higher Central and Upper End': Existing hydraulic model 100-year events upscaled by the 2080s climate change allowances.

It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity and hazard may increase compared to the 100-year current-day event.

When undertaking a site-specific Flood Risk Assessment, developers should:

- Confirm which national guidance on climate change and new development applies by visiting **GOV.uk** (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances).
- Apply this guidance when deciding the allowances to be made for climate change, having considered the potential sources of flood risk to the site (using this SFRA), the vulnerability of the development to flooding and the proposed lifetime of the development. If the site is just outside the indicative climate change extents in this SFRA, the impact of climate change should still be considered because these may get affected should the more extreme climate change scenarios materialise.
- Refer to Chapter 8 which provides further details on climate change for developers, as part of the FRA guidance, and the SFRA User Guide in Appendix C.

4.5 Impact of climate change on flood risk

This section explores which areas of the district are most sensitive to increases in flood risk due to climate change. It should be noted that areas that are already at high risk will also become at increasing risk in future and the frequency of flooding will increase in such areas.

It is recommended that the Council works with other Risk Management Authorities to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the district.

4.5.1 Impact of climate change on fluvial flood risk

Climate change modelled flood extents (or Flood Zone 2 where no modelling exists) can be compared to the 100-year flood extent (Flood Zone 3a) for an indication of areas most sensitive to climate change.

Areas in the district most sensitive to fluvial impacts of climate change are:

- Northern area of Blaby around A426
- Whetstone Brook through Whetstone
- Northern areas of Croft
- South-west of Littlethorpe due to low-lying topography

4.5.2 Impact of climate change on surface water flood risk

In the absence of modelling surface water risk with climate change uplifts, the 1,000-year surface water flood extent can be used as an indication of climate change (as well as for smaller watercourses; some of which are not included in the Flood Zones).

Areas in the district most sensitive to changes between the 1,00-year and 1,000-year surface water extents are all in the Blaby area:

- Area west of Glen Parva and area west of Whetstone due to large areas of low-lying flat topography.
- Area south-west of Little Thorpe.
- South of Thurlaston.

4.5.3 Impact of climate change on groundwater flood risk

There is no technical modelling data available to assess climate change impacts on groundwater. It would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

A high likelihood of groundwater flooding may mean infiltration SuDS are not appropriate and groundwater monitoring may be recommended.

4.6 Adapting to climate change

The **NPPG Climate Change guidance** (https://www.gov.uk/guidance/climate-change) contains information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses; and

- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. The Council and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option, such as at the defence locations mentioned in Chapter 6.

It is recommended that the differences in flood extents from climate change are compared by the Council when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/ egress and how much land could still be developable overall. Recommendations for development are made for the levels of risk in the SFRA User Guide in Appendix C.

5 Understanding flood risk in Blaby District

This chapter explores the key sources of flooding in the district and the factors that affect flooding including topography, soils and geology. The main sources of flooding are from watercourses, surface water and sewers.

This is a strategic summary of the risk in Blaby District. Developers should use this chapter to scope out the flood risk issues they need to consider in greater detail in a site-specific Flood Risk Assessment to support a Planning Application.

Appendix B contains a list of the sources of data used in the SFRA and the approach to using hydraulic model data to inform the mapping.

5.1 Historical flooding

Leicestershire County Council's (LLFA) Historic Flooding Incidents and Asset Register includes recorded historical flood events within Blaby District. There is a history of documented flood events, with the main sources being fluvial and surface water. Table 5-1 highlights the most significant historic flood events.

Table 5-1: Historic flooding incidents held by Leicestershire County Council

Location	Date	Additional information recorded
Bignal Drive, Leicester Forest East	28/06/2012	Culverted watercourse and surface-water flooded garden
Hardie Crescent, Braunstone	25/07/2012	Highway flooding due to ground topography and drainage capacity issues.
Coventry Road, Sharnford	25/11/2012	Internal property flooding from Main River during intense rainfall event
Hinckley Road, Leicester Forest East	27/07/2013	Internal property flooding due to capacity issues within the highway drainage systems
Desford Road, Thurlaston	04/01/2014	Highway flooded due to collapsed pipe in adjoining field.
Station Road, Narborough	10/08/2014	Internal property flooding during heavy rainfall due to low level of the property (Commercial)
Gynsill Lane, Glenfield	20/01/2015	Highway flooding due to surface water runoff
Smithy Lane, Aston Flamville	27/02/2015	Highway flooding for surface water flows from adjacent land.
Holmfield Avenue West, Leicester Forest East	17/09/2015	Flooding from ground water source / unknown source
Glenfield, Kirby Road	09/03/2016	Highway flooding
Ratby Lane, Kirby Muxloe	09/03/2016	Highway flooding
Desford Road, Moat Close and Earl Shilton Road in Thurlaston	09/03/2016	Highway flooding
Aston Road, Sharnford	09/03/2016	Highway flooding

Location	Date	Additional information recorded
Coventry Road, Stoney Stanton	09/03/2016	Highway flooding
Leicester Lane, Enderby	09/03/2016	Highway flooding
Little Glen Road, Glen Parva	09/03/2016	Highway flooding
Heybrook Avenue, Blaby	09/03/2016	Highway flooding
Lutterworth Road, Blaby	09/03/2016	Highway and close to property flooding.
Mill Lane, Blaby	09/03/2016	Minor highway flooded, concern over condition of ditches.
Countesthorpe Road, Blaby / Wigston	09/03/2016	Highway flooded due to river overtopping.
Kirby Muxloe	09/03/2016	Gardens flooded from watercourse.
Park Road, Cosby	09/03/2016	Highway flooded.
Walnut Leys, Cosby	09/03/2016	Garden flooded.
West View Avenue, Glen Parva	16/06/2016	Near property flooding.
Park Drive, Leicester Forest East	01/01/2016	Internal property flooding from groundwater.
Hinckley Road, Leicester Forest East	12/08/2016	Driveway flooded from highway drainage
Little Glen Road, Glen Parva	27/08/2016	Flooding under railway bridge.
Rosebank Road, Countesthorpe	27/08/2016	Drains blocked.
Main Street, Kilby	2016	Property flooded from highway runoff.
Pennant Close, Glenfield	01/04/2017	Internal flooding, some external flooding.
The Fleet, Stoney Stanton	22/01/2018	External property flooding from groundwater. May be from land drainage pipe burst.
Frolesworth Road, Sharnford	27/02/2018	Water running across road Sharnford to Frolesworth
Clovely Road, Glenfield	27/02/2018	Garden flooding believed to be issue from ditch infilled.
Hospital Road, Countesthorpe	06/04/2018	Highway flooding preventing access, one recorded road traffic collision and numerous close calls.
Desford Road, Thurlaston	27/04/2018	Highway flooded – possible blocked culvert beneath.
Leicester Road, Sharnford	27/06/2018	Internal flooding. Possible source is highway.

Location	Date	Additional information recorded
Manorfield Primary School, Stoney Stanton	01/10/19	Flooded to a depth of approximately 200mm. Flows from the school field flooded the temporary school building. Flows from the field may have conveyed from off site.
Godfrey Close, Stoney Stanton	01/10/19	Internal flooding. Flood water from station road ponded at the low point in the development.

In addition to the Historic Flooding Incidents and Assets Register, Leicestershire Fire and Rescue Service provided their recorded flooding data, which contains the responses of the Fire and Rescue Service to incidents involving flooding or rescue from water within Blaby District; the incidents are shown in Figure 5-1.

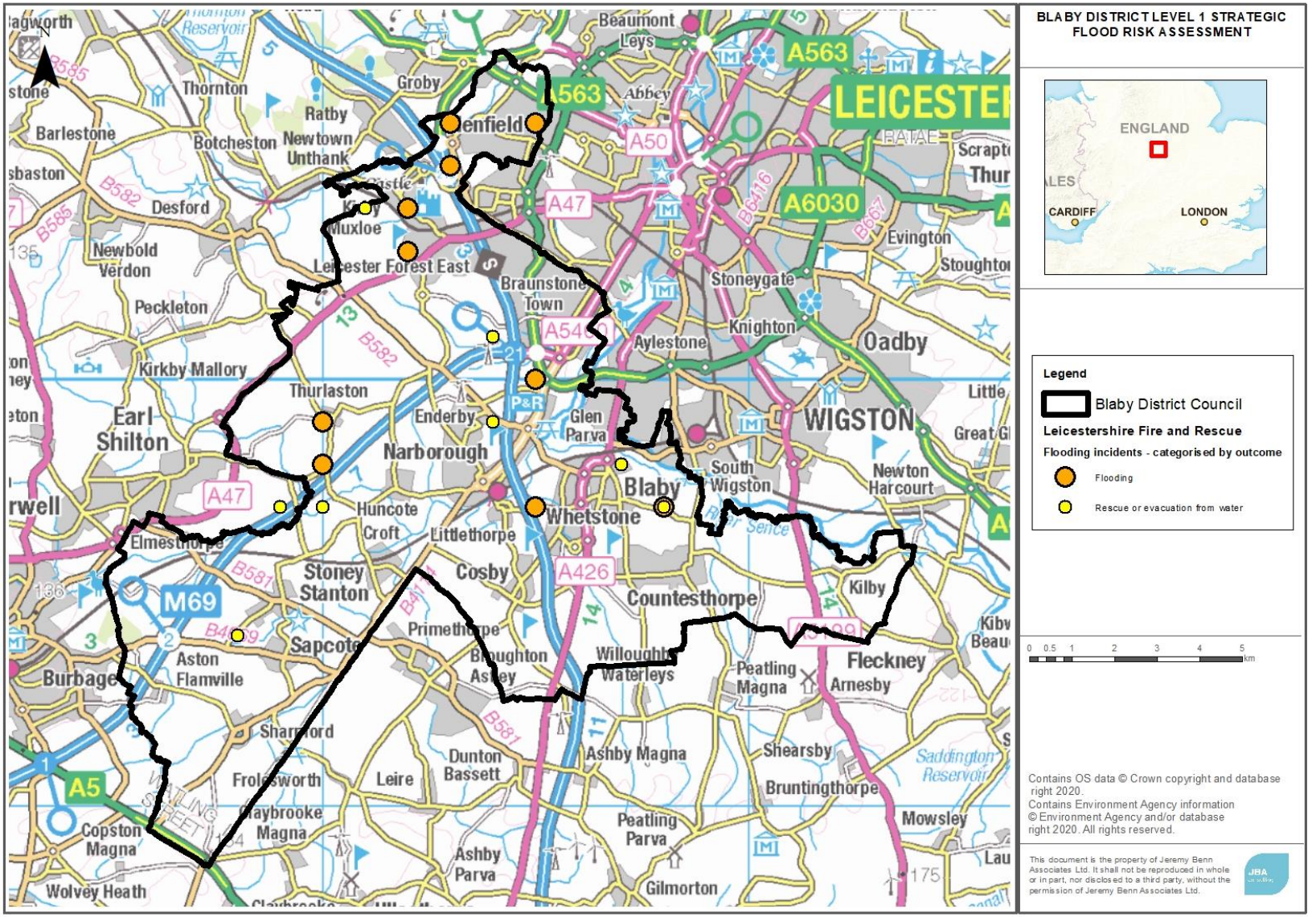

Figure 5-1: Blaby District Fire and Rescue Incidents since 2010 relating to flooding and grouped by incident outcome

5.2 Topography, geology, soils and hydrology

The topography, geology and soil are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows water to percolate through it, the permeability, affects the extent of overland flow and therefore the amount of run-off reaching the watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone may result in a more subdued response.

5.2.1 Topography

The topography of Blaby District is characterised by the highest elevations being along the southern and western boundaries. These fall towards the lower-lying River Soar valley in the centre of the district, which flows north-east out of the district into Leicester City. Elevations range from 120m-80m AOD along the southern and western district boundaries, to 58m AOD in the north-east where the River Soar flows out of the district. The topography of the borough is shown in Figure 5-2.

5.2.2 Geology

The underlying geology of Blaby District is predominantly divided between undifferentiated Triassic mudstone, siltstone and sandstone in the west of the district and Lias group mudstone, siltstone, limestone and sandstone in the south east. Mafic igneous rock is also seen near Croft, an igneous intrusion formed in the Neoproterozoic period. The bedrock geology is shown in Figure 5-3.

The superficial geology in the district is predominantly till (diamicton) and on courses main watercourses is alluvium (clay, sand and silt) formed 2-3 million years ago during the Quaternary period. River Terrace Deposits (Sand and Gravel) are also seen in some areas formed up to 3 million years ago in the Quaternary Period. The superficial geology is shown in Figure 5-4.

5.2.3 Soils

The District is mostly covered in loamy and clayey soils with impeded drainage and the flood plain of the River Soar and Sence are naturally wet loamy and clayey soil. Loamy soils are also seen west of Whetstone and some freely draining slightly acidic loamy soils are seen around Croft and Huncote.

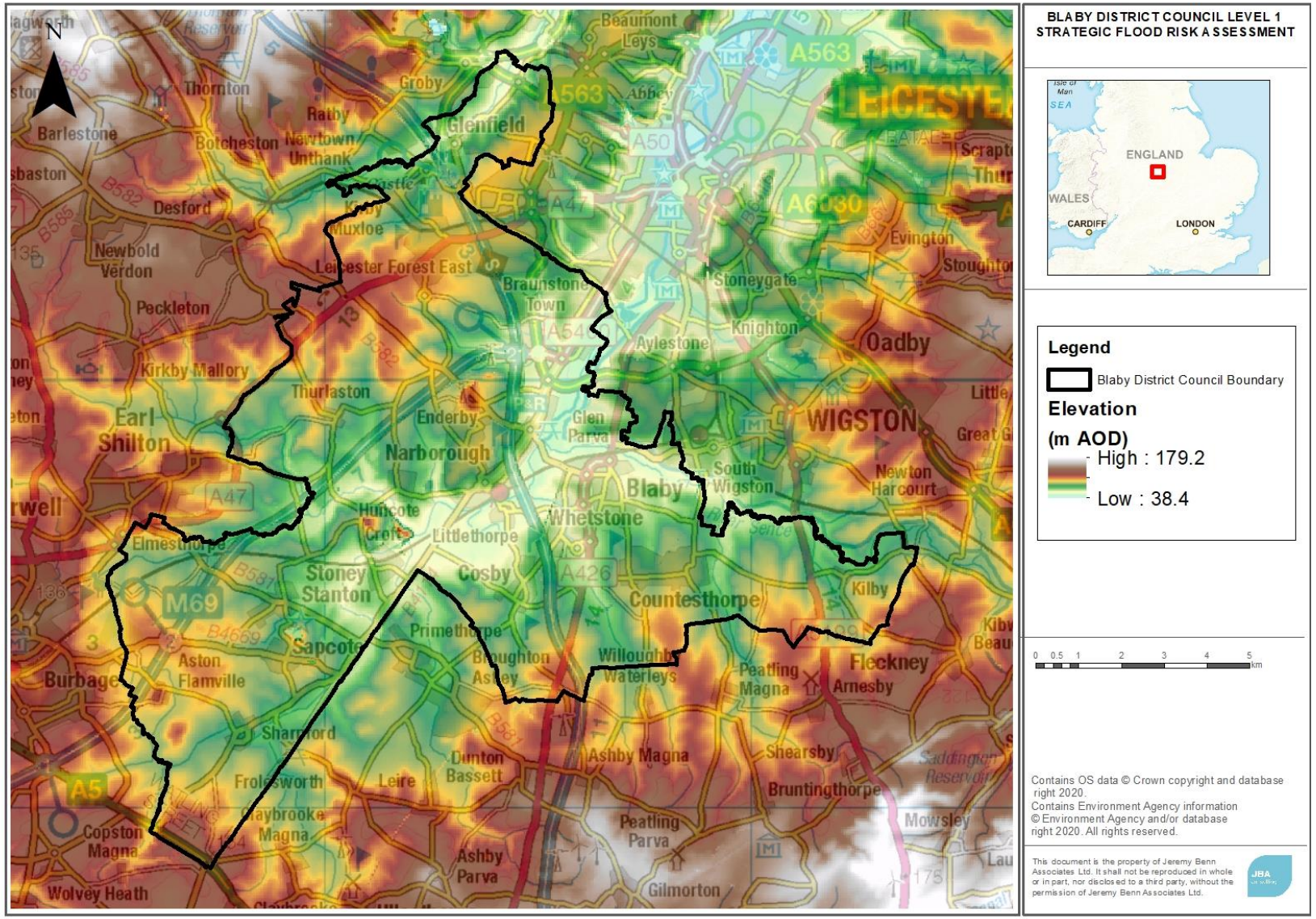

Figure 5-2: Topography of the district

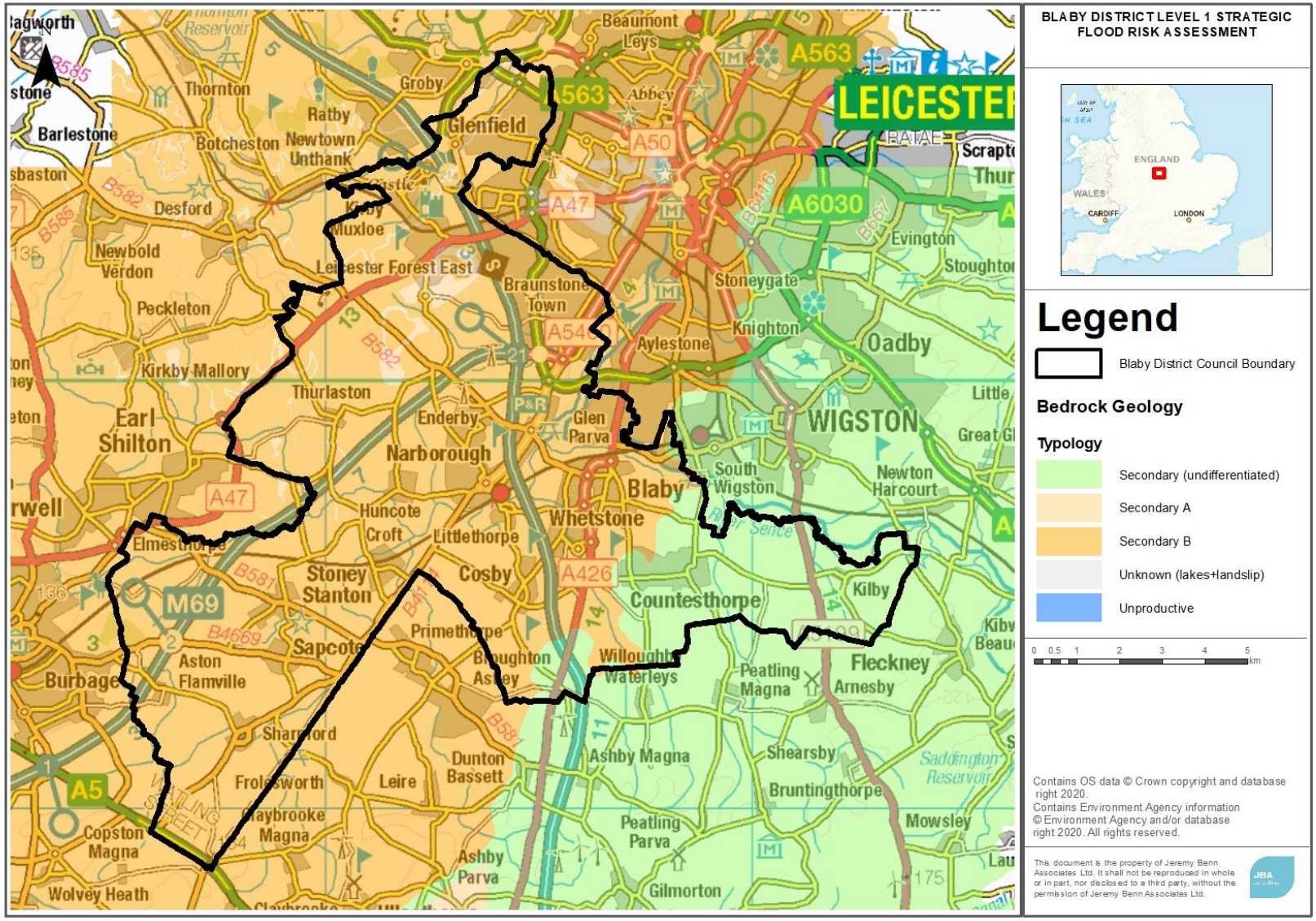

Figure 5-3: Bedrock geology of the district

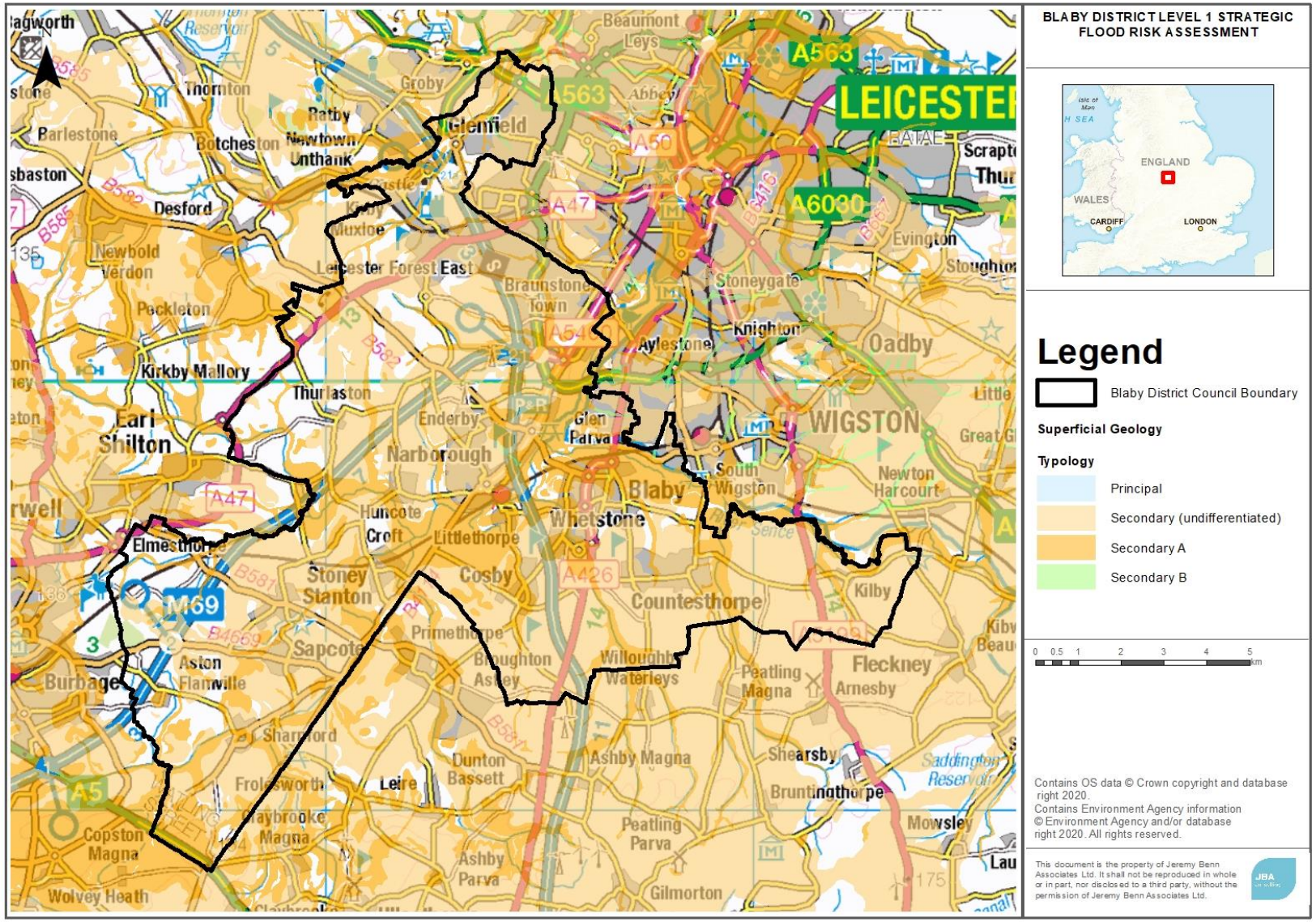

Figure 5-4: Superficial geology of the district

5.3 Hydrology

The principal watercourses flowing through the SFRA area are:

- River Soar
- River Sence

There are a number of smaller watercourses and tributaries, including the Whetstone Brook, Thurlaston Brook, Rothley Brook and the Lubbesthorpe Brook that flow through the area. There are also a number of ponds and lakes within the study area. A map of the key watercourses is included in Figure 1-3 and Geo-PDF mapping in and Appendix A.

5.4 Fluvial flood risk

The primary fluvial flood risk in the Blaby District is along the River Sence, the River Soar and the tributaries of both of these rivers, such as the unnamed watercourse flowing through Cosby and the Thurlaston Brook. Where these two watercourses join the Soar, there is an area of increased risk at the confluences. The area north of the Sence-Soar confluence is also an area with a higher flood risk. Risk is also posed by the Rothley Brook along the north-west of Glenfield. These watercourses present a fluvial flood risk to larger towns and settlements such as Blaby, Glenfield, Enderby, Cosby and Braunstone Town, as well as some small villages along the River Soar, Thurlaston Brook and Whetstone Brook.

There are many smaller tributaries and brooks throughout the district that pose a smaller flood risk, the majority of which are unnamed watercourses. The areas that these smaller watercourses affect are predominantly rural.

In addition to flood risk shown by the flood risk mapping, there are a number of small watercourses and field drains which may pose a risk to development. Flood Zone mapping (where more detailed modelling investigations are not available) has only been prepared for watercourses with a catchment greater than 3km^2. Therefore, whilst these smaller watercourses may not be shown as having flood risk on the flood risk mapping, it does not necessarily mean that there is no flood risk. As part of a site-specific Flood Risk Assessment, the potential flood risk and extent of Flood Zones should be refined for these smaller watercourses and this information used as appropriate to perform the Sequential and Exception Tests. The Risk of Flooding from Surface Water (RoFSW) mapping can be used to indicate where this is likely to be an issue.

5.5 Surface water flooding

Surface water runoff (or 'pluvial' flooding) is most likely to be caused by intense downpours e.g. thunderstorms. At times the amount of water falling can completely overwhelm the drainage network, which is not designed to cope with extreme storms. The flooding can also be complicated by blockages to drainage networks, sewers being at capacity and/ or high-water levels in watercourses that cause local drainage networks to back up.

The Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) shows that a number of communities are at risk of surface water flooding. The mapping shows that surface water predominantly follows topographical flow paths of existing watercourses or dry valleys and can pond in low-lying areas. Whilst in the majority of cases the risk is confined to roads, there are notable prominent run-off flow routes around properties, e.g. properties situated at the foot of surrounding hills. The RoFSW mapping for Blaby District can be found on the Geo-PDF mapping in Appendix A.

5.6 Sewer flooding

Sewer flooding occurs when intense rainfall/river flooding overloads sewer capacity (surface water, foul or combined), and/or when sewers cannot discharge to watercourses due to high water levels.

Sewer flooding can also be caused by blockages, collapses, equipment failure or groundwater leaking into sewer pipes.

Since 1980, the Sewers for Adoption guidelines mean that new surface water sewers have been designed to have capacity for a rainfall event with a 1 in 30 chance of occurring in any given year, although until recently this did not apply to smaller private systems. This means that sewers will be overwhelmed in larger rainfall and flood events. Existing sewers can also become overloaded as new development adds to the surface water discharge to their catchment, or due to incremental increases in roofed and paved surfaces at the individual property scale (urban creep). Sewer flooding is therefore a problem that could occur in many locations across the study area.

Historical incidents of flooding are detailed by Severn Trent Water through their Hydraulic Flood Risk Register (HFRR). This database records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding. For confidentiality, this data has been supplied on a 4-digit postcode basis. Data covers all reported incidences as of October 2020. The HFRR register is shown in Table 5-2.

These outputs indicate areas that may be affected from surface water and sewer flooding, should sewers exceed their capacity and discharge (particularly if this happens due to intense rainfall overwhelming the system). It will also help to identify flooding hotspots, where there is limited capacity, and help inform future schemes and mitigation.

Table 5-2: HFRR recorded incidents

Postcode	Recorded Flood Incidents	Postcode	Recorded Flood Incidents
LE2 4	1	LE9 3	1
LE2 9	30	LE9 4	32
LE3 2	37	LE10 3	11
LE3 3	28	LE19 1	1
LE3 6	1	LE19 2	20
LE3 8	40	LE19 3	2
LE8 4	5	LE19 4	3
LE8 5	7		
LE8 6	6		
LE9 2	1		
LE8 6	6		
LE9 2	1		
Total: 233			
Note: Based on information exported October 2020			

The HFRR indicates a total of 233 recorded flood incidents in Blaby District. The more frequently flooded postcodes are LE2 9, LE3 2, LE3 3, LE3 8, LE9 4 and LE19 2. It is important to recognise the HFRR does not contain information about properties and areas at risk of sewer flooding caused by operational issues such as blockages. Also, the register represents a snapshot in time and will get outdated with properties being added to the register following rainfall events, whilst risk will be reduced in some locations by capital investment in increasing the capacity of the network. As such the summary of the HFRR in this report is not a comprehensive 'at risk register'.

5.7 Groundwater flooding

In general, less is known about groundwater flooding than other sources. Groundwater flooding can be caused by:

- High water tables, influenced by the type of bedrock and superficial geology
- Seasonal flows in dry valleys, which are particularly common in areas of chalk geology
- Rebounding groundwater levels, where these have been historically lowered for industrial or mining purposes
- Where there are long culverts that prevent water easily getting into watercourses

Groundwater flooding is different to other types of flooding. It can last for days, weeks or even months and is much harder to predict and warn for. Monitoring does occur in certain areas, for example where there are major aquifers or when mining stops.

Areas Susceptible to Groundwater Flooding (AStGWF) mapping for Blaby District has been provided in the Geo-PDFs in Appendix A. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding.

The **British Geological Survey** (https://www.bgs.ac.uk/research/groundwater/flooding/home.html) provides further information on groundwater flooding on their website.

5.8 Flooding from canals

Canals are regulated waterbodies and are unlikely to flood, unless there is a sudden failure of an embankment or a sudden ingress of water from a river in areas where they interact closely. Embankment failure can be caused by:

- Culvert collapse
- Overtopping
- Animal burrowing
- Subsidence/ sudden failure e.g. collapse of former mine workings
- Utility or development works close or encroaching onto the footings of a canal embankment.

Flooding from a breach of a canal embankment is largely dictated by canal and ground levels, canal embankment construction, breach characteristics and the volume of water within the canal that can discharge into the lower lying areas behind the embankment. The volume of water released during a breach is dependent on the pound length (i.e. the distance between locks) and how quickly the operating authorities can react to prevent further water loss, for example by the fitting of stop boards to restrict the length of the canal that can empty through the breach, or repair of the breach. The Canal and River Trust monitor embankments at the highest risk of failure.

The only canal located in Blaby District is the Grand Union Canal, which enters the district to the east of Blaby village and flows in a western direction before turning north next to the River Soar north of Blaby and exits the district west of Glen Parva. There is one recorded incident of canal overtopping along the Grand Union Canal within the study area, located in a sub-urban area where the Grand Union Canal passes Glen Parva.

Figure 5-6 shows the location of this canal overtopping, as well as the course of the Grand Union Canal in the study area.

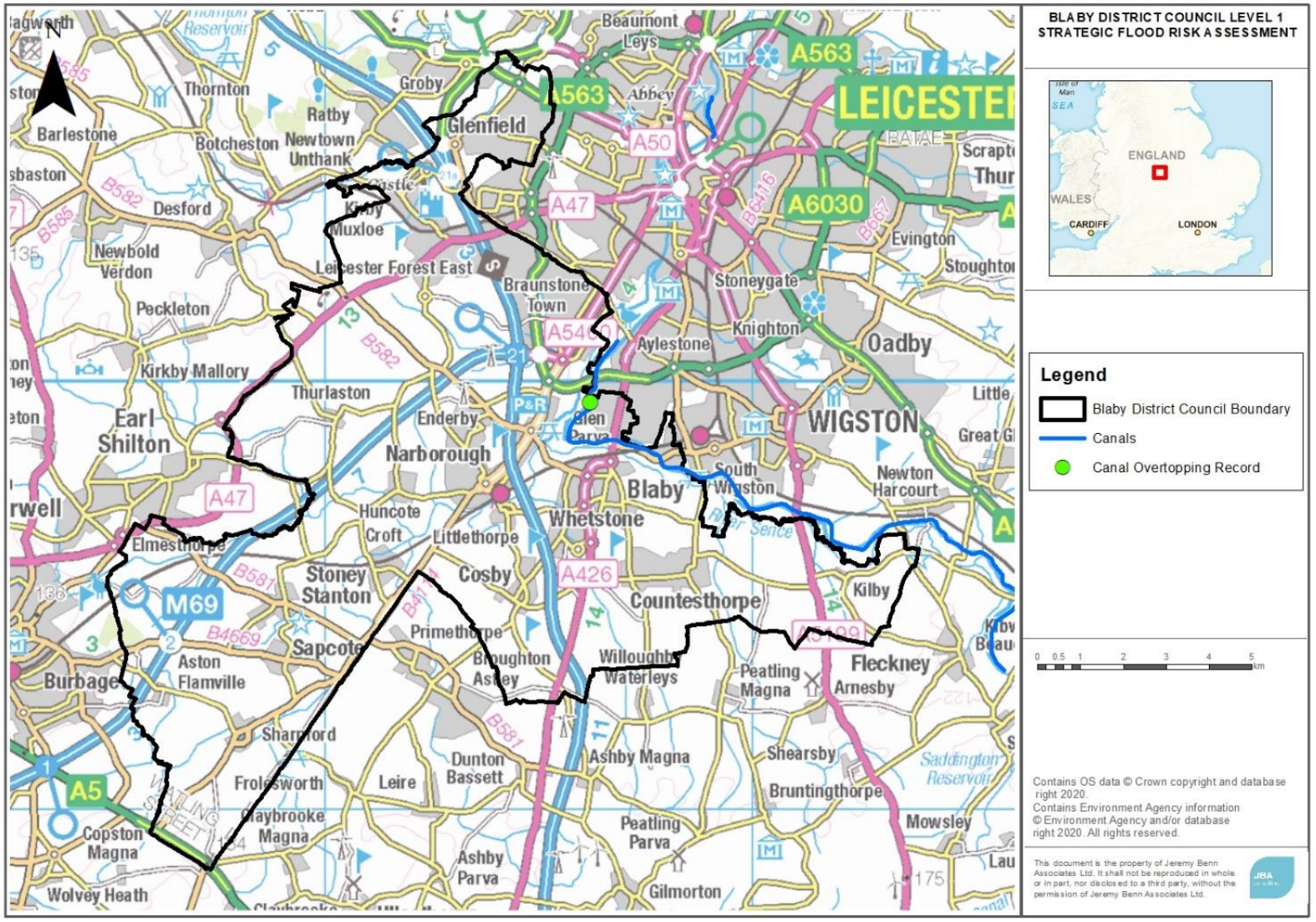

Figure 5-5: Location of all recorded incidents of canal overtopping in the study area.

5.9 Flooding from reservoirs

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the **Reservoir Act 1975** (https://www.legislation.gov.uk/ukpga/1975/23) and are on a register held by the Environment Agency. The level and standard of inspection and maintenance required by a Supervising Panel of Engineers under the Act means that the risk of flooding from reservoirs is very low.

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is very different from other forms of flooding; it may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure.

The Environment Agency hold mapping showing what might happen if reservoirs fail. Developers and planners should check the **Long-Term Risk of Flooding website** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?easting=504825&northing=249317&address=100081210838&map=RiversOrSea) before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping. Existing or new hydraulic models in locations where there are reservoirs should represent the effect of reservoirs, for example the attenuation effect on flood response, which will either be represented in the hydrology or as part of the model itself.

The current **flood warning information service** (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) mapping shows that there are no reservoirs located within Blaby District but there are two outside the district that could cause flooding within the district. Section 8.7.3 provides further considerations for developing in the vicinity of reservoirs.

Table 5-3: Reservoirs with potential risk to Blaby District

Reservoir	Northings and eastings	Reservoir owner	Local Authority Area	Is the reservoir within the study area?
Thornton Reservoir	447327, 307474	Severn Trent Water	Hinckley and Bosworth Borough	No
Mallory Park Large Lake Reservoir	444861, 300039	Hanson Plc	Hinckley and Bosworth Borough	No

5.10 Flood Alert and Flood Warnings

The Environment Agency is the lead organisation for providing warnings of river flooding. Flood Warnings are supplied via the Flood Warning System (FWS) service, to homes and business within Flood Zones 2 and 3.

There are currently three Flood Alert Areas (FAA) and nine Flood Warning Areas (FWAs) covering Blaby District. Flood Alerts are issued when there is water out of bank for the first time anywhere in the catchment, signalling that 'flooding is possible', and therefore Flood Alert Areas usually cover the majority of Main River reaches. Flood Warnings are issued to designated Flood Warning Areas (i.e. properties within the extreme flood extent which are at risk of flooding), when the river level hits a certain threshold; this is correlated between the FWA and the gauge, with a lead time to warn that 'flooding is expected'.

A list of the Flood Alert and Flood Warning Areas is available in Appendix D. A map of the Flood Alert Areas and Flood Warning Areas is included in the Geo-PDF mapping in Appendix A and D.

5.11 Summary of flood risk in Blaby District

A table summarising all sources of flood risk to key settlements in Blaby District can be found in Appendix E.

6 Flood alleviation schemes and assets

This section provides a summary of existing flood alleviation schemes and assets in the Blaby District. Planners should note the areas that are protected by defences where further work to understand the actual and residual flood risk through a Level 2 SFRA may be beneficial. Developers should consider the benefit they provide over the lifetime of a development in a site-specific Flood Risk Assessment.

6.1 Asset management

Risk Management Authorities hold databases of flood risk management and drainage assets:

- The Environment Agency holds a national database that is updated by local teams
- The LLFA holds a database of significant local flood risk assets, required under Section 21 of the Flood and Water Management Act (2010)
- Highways Authorities hold databases of highways drainage assets, such as gullies and connecting pipes
- Water Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.

The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.

Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific Flood Risk Assessment.

6.2 Standards of Protection

Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 100-year SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.

Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.

It should be noted that the Environment Agency's on-going hydraulic modelling programme may revise flood risk datasets and, as a consequence, the standard of protection offered by flood defences in the area may differ from those discussed in this report.

Developers should consider the standard of protection provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

The Environment Agency and local authorities have permissive powers to maintain and improve Main Rivers and Ordinary Watercourses, respectively. There is no legal duty to maintain watercourses, defences or assets and maintenance and improvements are prioritised based on flood risk. The ultimate responsibility for maintaining watercourses rests with the landowner.

Highways authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g. where there is frequent highway or sewer flooding. Leicestershire County Council as LLFA have permissive powers and limited resources are prioritised and targeted to where they can have the greatest effect.

There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defences has degraded over time. Drainage networks in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.

Developers should not assume that any defence, asset or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact the relevant RMA about current and likely future maintenance arrangements and ensure future users of the development are aware of their obligations to maintain watercourses.

Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-1.

Table 6-1: Grading system used by the Environment Agency to assess flood defence condition

Grade	Rating	Description
1	Very good	Cosmetic defects that will have no effect on performance
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce the performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation required.
5	Very Poor	Severe defects resulting in complete performance failure.

Source: Condition Assessment Manual – Environment Agency 2006

6.4 Major flood risk management assets in the district

The Flood Map for Planning contains information on 'Areas Benefiting from Defences' (ABD). This shows areas that benefit from the defences that provide a SoP of at least a 100-year river flood event. It does not show areas that benefit from protection for more frequent events. There are no areas in Blaby District shown to be benefiting from defences in the EA's 'ABD' mapping.

However, the Environment Agency 'AIMS' flood defence dataset gives information on all flood defence assets within the district. The following locations benefit from flood defences at a lower (or unknown) standard of protection in the Blaby District.

Table 6-2: Locations shown in the 'EA AIMS' data set

Watercourse	Location	Type	Design SOP	Condition Rating
River Sence	Croft. Properties benefitting on Dovecote Road and The Green	Embankment	Unknown	Unknown
Unnamed watercourse flowing through Cosby.	Cosby. Property benefitting on Chapel Lane	Wall	Unknown	Unknown
Whetstone Brook	Whetstone. Properties benefitting on Wright Close	Embankment	25-year	Unknown
Whetstone Brook	Whetstone. Limetree Pub, Cambridge Road	Embankment and Wall	Embankment: 25-year Wall: Unknown	
Whetstone Brook	Whetstone. Brook Street	Embankment	Unknown	Unknown

6.5 Existing and future flood alleviation schemes

6.5.1 Stoney Stanton Flood Alleviation Scheme

At the time of this SFRA, there was technical work underway for Leicestershire County Council on the Stoney Stanton Flood Alleviation Scheme. This is a result of the flooding which occurred on 1st October 2019 and the subsequent Section 19 report by the County Council. The Section 19 report investigated the local ditches, culverts, maintenance responsibilities, highway drainage connections, areas which flooded and their flooding mechanisms, any trash screen blockages or damaged pipes and so on.

This Flood Alleviation Scheme study involved Integrated Flood Modelling of the watercourse, to understand both fluvial and surface water risk. River channel and culvert CCTV survey was undertaken, followed by modelling a range of return period flood events, verification against historic rainfall extents and the 1st October 2019 flood event, feasibility optioneering to remove or reduce the extent of flooding, shortlisting of alleviation options and generating a Business Case for flood alleviation. The results of the study at this stage are unknown. It is recommended that developers contact the LLFA for further updated information.

6.5.2 Lubbesthorpe Brook Flood Alleviation Scheme

Following the flooding of properties along the Lubbesthorpe Road in August 2005 and 8th July 2007, work on the Lubbesthorpe Brook Flood Alleviation Scheme (FAS) was completed in September 2013 by the Environment Agency. The scheme re-aligned and widened approximately 500m of the watercourse channel, integrating it with the adjacent nature reserve. A bypass culvert has also been constructed at Watergate Lane Bridge.

Additionally, £200,000 of sewer improvements was undertaken by Severn Trent Water to help prevent the sewer flooding seen on Lubbesthorpe Road and Watergate Lane. New sewers have been constructed to help manage the storage and flow of storm water as well as new water pipes that will help prevent burst pipes.

This scheme is represented in the SFRA Flood Zones and climate change extents. Section 4.1 of Appendix B provides more details on the hydraulic model and SFRA mapping approach.

6.6 Actual and residual flood risk

A Level 2 SFRA (for strategic allocations) or developer site-specific Flood Risk Assessment will need to consider the actual and residual flood risk due to the presence of flood and drainage assets in greater detail.

6.6.1 Actual flood risk

This is the risk to the site considering existing flood mitigation measures and any planned to be provided through new development. Note that it is not likely to be acceptable to allocate developments in existing undefended areas on the basis that they will be protected by developer works, unless there is a wider community benefit that can be demonstrated.

The assessment of the actual risk should take into account that:

- The level of protection afforded by existing defences might be less than the appropriate standards and hence may need to be improved if further growth is contemplated.
- The flood risk management policy for the defences will provide information on the level of future commitment to maintain existing standards of protection. If there is a conflict between the proposed level of commitment and the future needs to support growth, then it will be a priority for this to be reviewed.
- The standard of safety must be maintained for the intended lifetime of the development. Over time the effects of climate change will erode the present-day standard of protection afforded by defences and so commitment is needed to invest in the maintenance and upgrade of defences if the present-day levels of protection are to be maintained and where necessary, land secured and safe-guarded that is required for affordable future flood risk management measures.
- By understanding the depth, velocity, speed of onset and rate of rise of floodwater it is possible to assess the level of hazard posed by flood events from the respective sources.

6.6.2 Residual risk

Residual risk is the risk that remains after the effects of flood risk infrastructure have been taken into account. It is important that these risks are quantified to confirm that the consequences can be safely managed. The residual risk can be:

- The effects of a larger flood than defences were designed to alleviate (the 'design flood'). This can cause overtopping of flood banks, failure of flood gates to cope with the level of flow or failure of pumping systems to cope with the incoming amount of water.
- Failure of the defences or flood risk management measures, such as breaches in embankments or walls, failure of flood gates to open or close or failure of pumping stations.

It is the responsibility of the developer to fully assess flood risk, propose measures to mitigate it and demonstrate that any residual risks can be safely managed.

This SFRA does not assess the probability of failure other than noting that such events are very rare. However, in accordance with NPPF, all sources of flooding need to be considered. If a breach or overtopping event were to occur, then the consequences to people and property could be high. Developers should be aware that any site that is at or below defence level, may be subject to flooding if an event occurs that exceeds the design capacity of the defences, or the defences fail, and this should be considered in a detailed Flood Risk Assessment.

The assessment of residual risk should take into account:

- The flood hazard, depth and velocity that would result from overtopping or breach of defences. Flood gate or pumping station failure and/ or culvert blockage (as appropriate). The Environment Agency can provide advice at site-specific development level for advice on breach/ overtopping parameters for flood models.
- The design of the development to take account of the highest risk parts of the site e.g. allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g. sleeping accommodation above the flood level.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.

6.6.3 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and Environment Agency **Flood Risks to People** (http://sciencesearch.defra.gov.uk/Document.aspx?Document=FD2321_3437_TRP.pdf) guidance document provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

Any sites located next to defences or perched ponds/ reservoirs, may need overtopping modelling or assessments at the site-specific FRA stage.

6.6.4 Defence breach

A breach of a defence occurs when there is a failure in the structure and a subsequent ingress of flood water.

Where defences are present, risk of breach events should be considered as part of the site-specific flood risk assessment. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach location and so FRAs must include assessment of the hazards that might be present so that the safety of people and structural stability of properties and infrastructure can be appropriately taken into account. Whilst the area in the immediate vicinity of a breach can be subject to high flows, the whole flood risk area associated with a breach must also be considered as there may be areas remote from the breach that might, due to topography, involve increased depth hazards.

Considerations include the location of a breach, when it would occur and for how long, the depth of the breach (toe level), the loadings on the defence and the potential for multiple breaches. There are currently no national standards for breach assessments and there are various ways of assessing breaches using hydraulic modelling. Work is currently being undertaken by the Environment Agency to collate and standardise these methodologies. It is recommended that the Environment Agency are consulted if a development site is located near to a flood defence, to understand the level of assessment required and to agree the approach for the breach assessment.

7 Cumulative impact of development and strategic solutions

This section provides a summary of the catchments with the highest flood risk and development pressures and then makes recommendations for local planning policy based on these.

7.1 Introduction

Under the NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.156), rather than just to or from individual development sites.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

All developments are required to comply with the 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, in theory they should not increase flood risk downstream.

Catchments within the study area that have the potential to influence existing flood risk issues in neighbouring Local Authorities were identified, as well as catchments in the study area that may be influenced by development in catchments in neighbouring Local Authorities. Historic flood incidents, the current and predicted increase in surface water flood risk to properties and cross boundary issues in each catchment were assessed to identify the catchments at greatest risk.

Local planning policies can also be used to identify areas where the potential for development to increase flood risk is highest and identify opportunities for such new development to positively contribute to decreases in flood risk downstream.

7.2 Strategic flood risk solutions

Blaby District Council have a vision for the future management of flood risk and drainage in the district. This concerns flood risk management, alongside wider environmental and water quality enhancements. Strategic solutions may include upstream flood storage, integrated major infrastructure/ FRM schemes, new defences and watercourse improvements as part of regeneration and enhancing green infrastructure, with opportunities for natural flood management and retrofitting sustainable drainage systems. The Blaby District Local Plan sets out specific actions for the district.

Chapter 2 sets out the strategic plans that exist for the district. The list below summarises the key outcomes these are seeking to achieve. This vision needs to be delivered by new development alongside retrofitting and enhancing green infrastructure and flood defence schemes in the existing developed area.

The strategic policy vision from the CFMP and RBMP focuses on re-naturalising watercourses, safeguarding the floodplains and the encouraging collaboration and creating new partnerships to reduce the risk of flooding and to enhance the natural environment. Within Blaby District, strategic solutions encourage development to:

- Use sustainable flood storage and mitigation schemes to store water and manage surface water runoff in locations that provide overall flood risk reduction as well as environmental benefits.

- In areas where flood risk is being managed effectively, there will be a need in the future to keep pace with increasing flood risk as a result of climate change.
- Promote partnership working with all relevant stakeholders in the Humber River Basin. This includes working with land managers and farmers to reduce soil erosion from intensively farmed land.
- Assess long-term opportunities to move development away from the floodplain and create green river corridors through Blaby District.
- Identify opportunities to use areas of the floodplain to store water during high flows, to reduce long term dependence on engineered flood defences located both within and outside of the district.
- Safeguard the natural floodplain from inappropriate development.
- Where possible, land management change should be used to reduce run-off rates from the development whilst maintaining or enhancing the capacity of the natural floodplain to retain water. Land management and uses that reduce runoff rates in upland areas should be supported.
- Development should maintain conveyance of watercourses through hamlets and villages, to help reduce the impact of the more frequently experienced floods and to improve the natural environment.
- Use SFRAs to inform future development and minimise flood risk from all sources.
- Implement upstream catchment management e.g. slow the flow and flood storage schemes could be implemented in upper catchments to reduce flooding downstream and across neighbouring authority boundaries; and
- Promote and consider SUDS at the earliest stage of the development of a site.

7.3 Assessment of cross-boundary issues

Figure 7-1 shows the catchments in Blaby District mapped against the topography and the direction that they drain into or out of neighbouring authorities. Growth in neighbouring authorities was considered in the cumulative impact assessment outlined below.

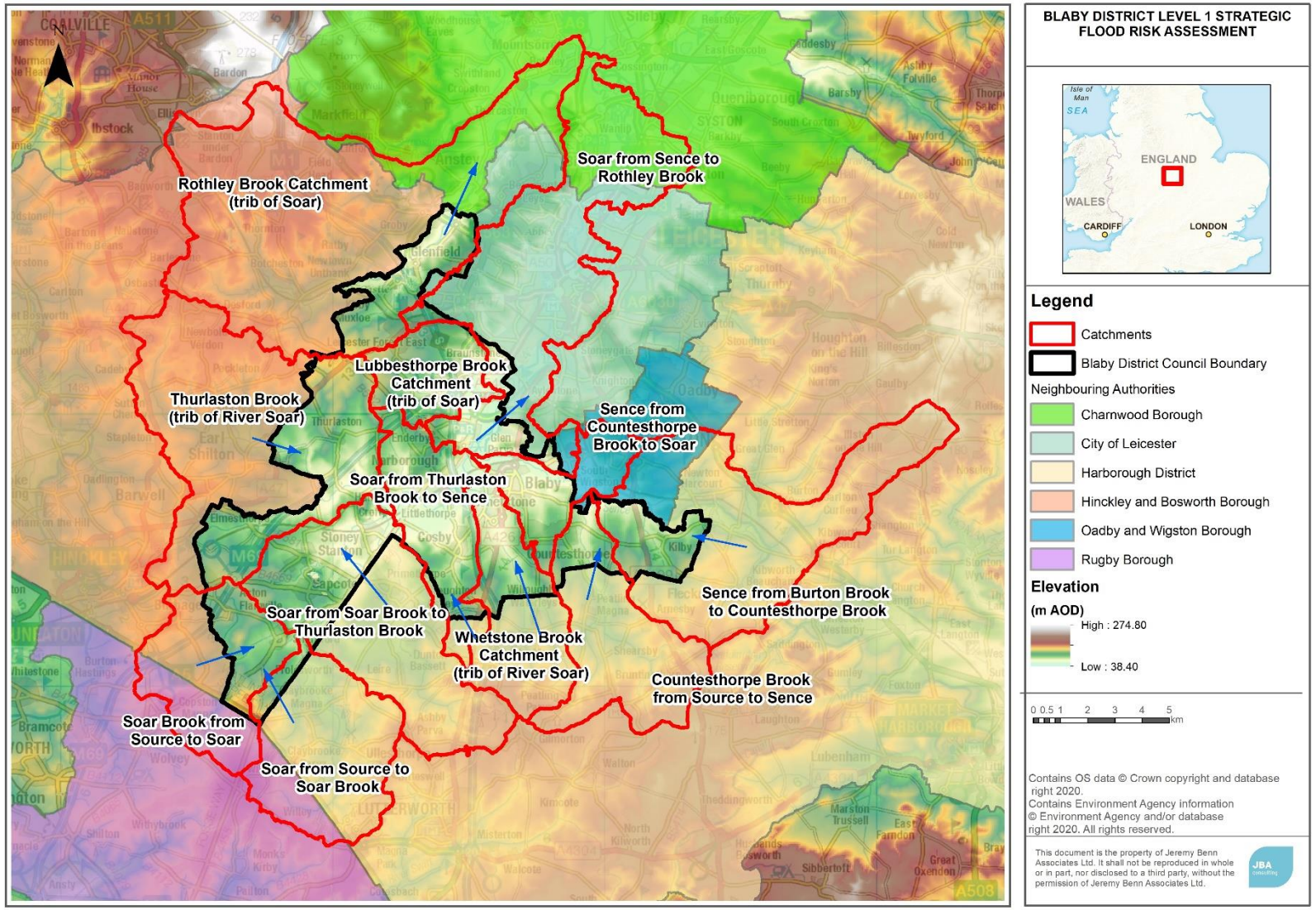

Figure 7-1: Cross boundary catchments and the direction they drain in or out of district

Consequently, there are a number of catchments within Blaby District where future development may impact flood risk in the neighbouring local authorities outlined above, particularly where there are existing flood risk issues. Figure 7-1 summarises which catchments drain out of Blaby District, where the impact of flood risk downstream should be assessed when considering development. The sources of data used to inform the existing flood risk issues to properties in neighbouring local authorities can be found in Appendix F.

The following Local Plans have been adopted by neighbouring Local Authorities and include policies relevant to flood risk and drainage:

- Charnwood Borough's Local Plan 2011 – 2028 (currently being updated)
- The City of Leicester's Development Framework 2006-2026 (currently being updated)
- Harborough District's Local Plan 2011 – 2031
- Hinckley & Bosworth Borough's Local Plan 2006 – 2026
  - Hinckley & Bosworth District's Local Plan is currently being updated alongside the evidence base and a revised Local Development Scheme has been adopted in July 2020. The existing full plan is to be superseded by October 2022.
- Oadby & Wigston Borough's Local Plan 2011-2031
- Rugby Borough's Local Plan 2011-2031

Table 7-1: Summary of catchments that drain into the neighbouring Local Authorities from Blaby District

Catchment	Neighbouring downstream Local Authority
River Soar from River Sence to Rothley Brook	City of Leicester
Rothley Brook Catchment	Charnwood Borough

Policy recommendations with regards to managing the cumulative impact of development have been made in Chapter 10. This will help to ensure there is no incremental increase in flood risk both within and downstream of Blaby District.

7.4 Cumulative Impact Assessment

To assess the cumulative impact of development across the study area, the surface water flood risk in each catchment was assessed along with evidence of historic flooding incidents. Potential change in developed areas within each catchment from neighbouring authorities was also considered, but no development sites within Blaby District were included in the assessment. Analysis of this data facilitated the identification of catchments at the greatest risk of cumulative impacts of an increase in impermeable area within the catchment.

Figure 7-2 shows the methodology used and Table 7-2 summarises the datasets used within the Blaby District cumulative development scenario. More detailed information on the methodology, assumptions and considerations of the cumulative impact assessment can be found in Appendix F.

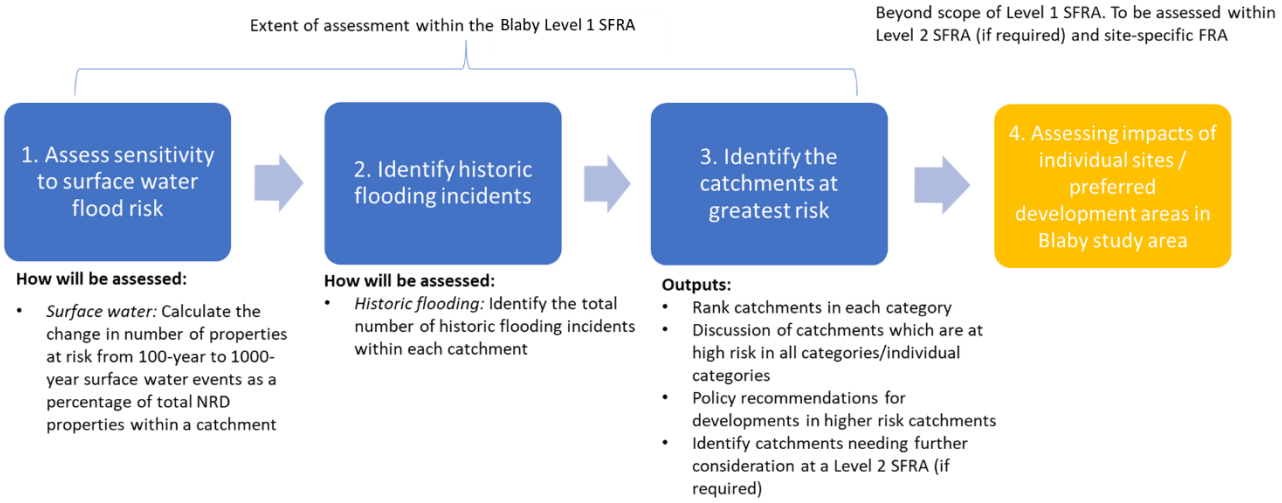

Figure 7-2: Overview of the method used within the Cumulative Impact Assessment

Table 7-2: Summary of datasets used within the Cumulative Impact Assessment

Dataset	Coverage	Source of data	Use of data
Catchment Boundaries	Blaby study area	Water Framework Directive Catchments	Surface Water and Development Flood Risk
National Receptor Database (2014)	Blaby study area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment
Risk of Surface Water Flooding Mapping	Blaby Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment
Future development areas	Blaby study area and neighbouring authorities.	Blaby District Council, Leicester City Council, Harborough District Council	Assessing the impact of proposed future development on risk of flooding.
Historic Flooding Incidents	Blaby study area	Leicestershire County Council, Leicestershire Fire & Rescue Service, Canals & Rivers Trust	Assessing incidences of historic flooding within the Blaby study area.

7.4.1 Assessing sensitivity to surface water flood risk

To understand the sensitivity of a catchment to an increased risk in surface water flooding, a potential result of increased development, the number of additional properties at risk in the 1,000-year event compared to the 100-year event was calculated. This approach utilised National Receptor Database (NRD) dataset to indicate the location of properties alongside the Environment Agency's Risk of Flooding from Surface Water mapping datasets. Water Framework Directive (WFD) catchment data was used to determine the number of properties at risk in each river catchment.

7.4.2 Assessing historic flooding incidents

Historic flooding data was supplied by Leicestershire Fire and Rescue (data from 20-2020) and Leicestershire County Council as LLFA (data from 2012-2018), detailing 'X, Y' coordinate data of historic flooding incidents within the Blaby District study area. The total number of historic flooding incidents within each catchment was recorded.

7.4.3 Assessment assumptions and limitations

The study has been undertaken using the best available data. The assumptions made in assessing and ranking the impacts of cumulative development on catchments within Blaby District are summarised in Appendix F.

7.5 Cumulative Impact Assessment Outcomes

The assessment was conducted on the Water Framework Directive (WFD) River Catchments.

The results of the cumulative impact assessment can be summarised to give a rating of low, medium or high risk for each catchment. The rating of each catchment in each of these assessments was combined to give an overall ranking.

Table 7-3 shows the catchments identified as high risk due to the increased risk of surface water flooding, Table 7-4 shows the percentage of the catchments covered by future planned development and Table 7-5 shows the highest risk catchments based on the number of historic flooding incidents recorded.

Table 7-3: Percentage of properties in a catchment sensitive to increased surface water flood risk

Catchment	Properties sensitive to increased surface water flood risk (%)
Soar: Sence to Rothley Brook	5
Sence: Countesthorpe Brook to Soar	4
Soar: Thurlaston Brook to Sence	4
Sence: Burton Brook to Countesthorpe Brook	4

Table 7-4: Percentage of catchment covered by future planned development

Catchment	Area of catchment for development (%)
Whetstone Brook: A tributary of the River Soar	22
Sence: Countesthorpe Brook to Soar	16
Soar: Source to Soar Brook	13
Soar: Soar Brook to Thurlaston Brook	10

Table 7-5: Number of recorded historic flooding incidents within a catchment

Catchment	No. of historic incidents
Lubbesthorpe Brook: A tributary of the river Soar	15
Rothley Brook: a tributary of the River Soar	14

As can be seen from the above tables, there are catchments that are at high risk in both categories.

Figure 7-3 shows a map of catchments within Blaby District and identifies the highest risk catchments which are the most sensitive to the impacts of cumulative impacts of development.

Four catchments are identified as highest risk (red), these are:

- Sence from Countesthorpe Brook to Soar
- Soar from Sence to Rothley Brook
- Soar from Soar Brook to Thurlaston Brook
- Soar from Thurlaston Brook to Sence

These are predominantly rural catchments that drain into the urbanised centre of Leicester.

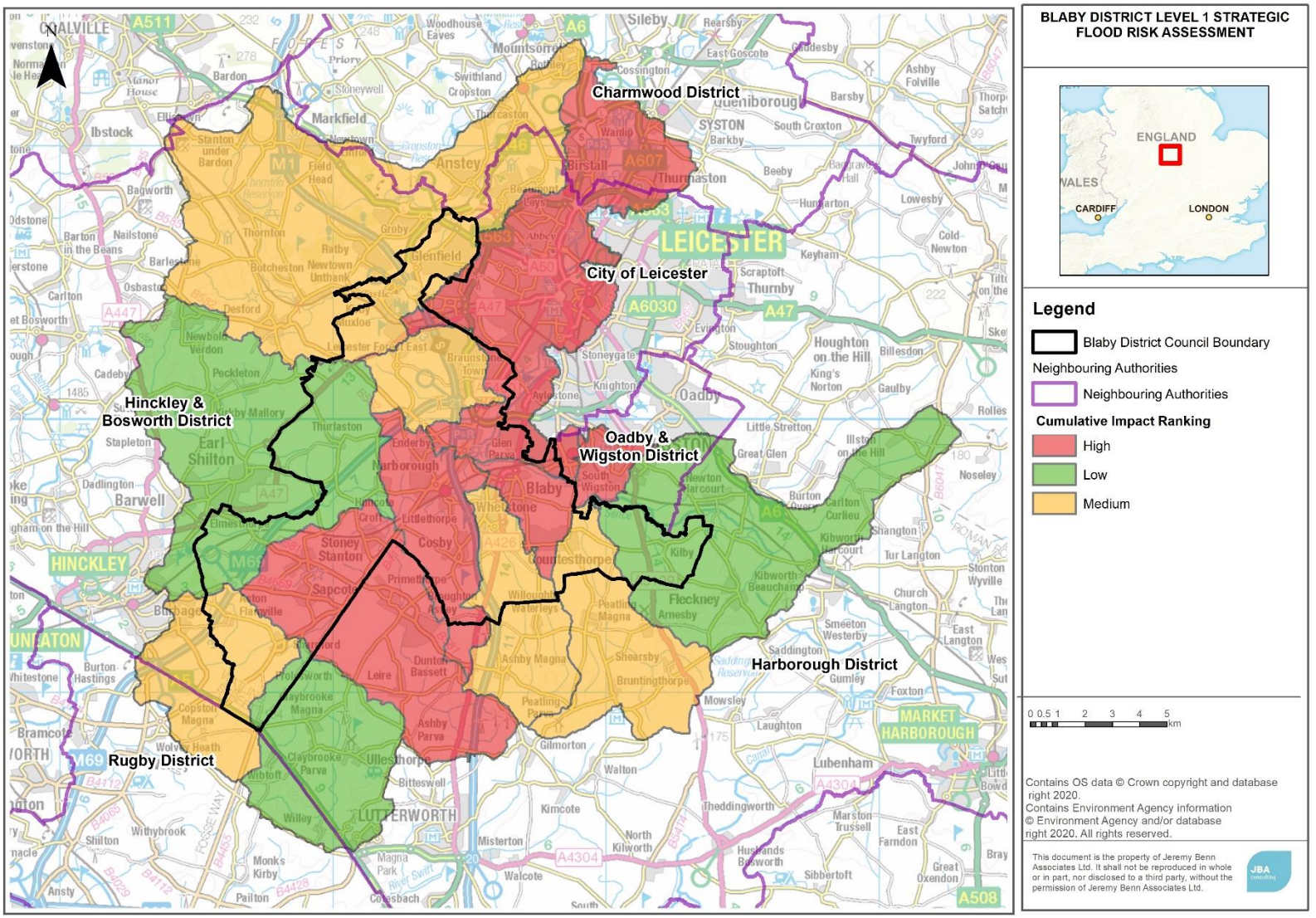

Figure 7-3: Map showing the results of the cumulative impact assessment for each catchment within Blaby District

A further five catchments that fall within or partially within Blaby District have been identified as at medium risk (amber) which include:

- Lubbesthorpe Brook Catchment (tributary of River Soar)
- Whetstone Brook Catchment (tributary of River Soar)
- Soar Brook from Source to Soar
- Rothley Brook Catchment (tributary of River Soar)
- Countesthorpe Brook from Source to Sence

The remaining catchments (green) within Blaby District are identified as at a low risk of the impacts of cumulative development.

7.6 Planning Policy Recommendations

The following Planning Policy recommendations have been made for the Soar (catchments from the confluence with Soar Brook to the confluence with Rothley Brook) and the River Sence (from the confluence with Countesthorpe Brook to the confluence with the River Soar) which have been identified as high-risk catchments (red). These catchments all flow into the centre of Leicester from predominantly rural upper catchments within Blaby District. Therefore, policy recommendations are:

1. That a Level 2 SFRA or detailed local area Strategic Drainage Study considers further how the cumulative effects of potential peak rates and volumes of water from development sites would impact on peak flows, duration of flooding and timing of flood peaks on receiving watercourses. Such studies could be used to justify greater restrictions/ enforce through Local Planning Policy development site runoff rates and volumes specific to each catchment that are over and above those required by National and Local SuDS Standards. They could also identify where there are opportunities with allocated sites to provide off-site betterment e.g. online/ offline flood storage and where land should be safeguarded within proposed site allocations to fulfil this purpose.
2. Where appropriate, that the opportunity for Natural Flood Management in rural areas, SuDS retrofit in urban areas and river restoration should be maximised in these catchments. In support of Objective 7 in the Local FRM Strategy (2015), culverting should be opposed, and day-lighting existing culverts promoted through new developments.
3. Developers should explore, through site-specific FRAs, opportunities to provide wider community flood risk benefit 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 be by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes. Consultation on the site-specific requirements should be undertaken with Leicestershire County Council as LLFA and the Environment Agency at the earliest opportunity.
4. Developers should contribute to community flood defences outside of their red line boundary in these catchments to provide wider benefit and help offset the cumulative impact of development.
5. That the LLFA and other RMAs should use this information to inform a long-term pipeline of flood alleviation studies and schemes to help inform points 2. to 5. above.

6. That the Environment Agency, in consultation with Blaby District Council, should consider whether to formally designate these catchments as Critical Drainage Areas. This would mean that a detailed Flood Risk Assessment would be required for all developments that are proposed, regardless of their size.
7. A Surface Water Drainage Strategy will be required for all developments within these catchments, regardless of development size.

The River Soar from the confluence with the River Sence to Rothley Brook is identified as a high-risk catchment; however, it lies mostly outside of Blaby District, draining from Blaby into Leicester. Due to cross-boundary considerations, policy recommendations in this catchment include:

1. Blaby District Council should work closely with Leicester City Council to ensure that runoff is attenuated through the upper catchment through SuDS implementation to minimise and mitigate flood risk downstream. This could include opportunities for Natural Flood Management techniques in the upper Blaby District catchment and the installation of storage areas to hold water back and therefore slow flows downstream.

The upper part of the River Soar catchment from Soar Brook to the confluence with Thurlaston Brook is also identified as high-risk, but outside the Blaby District. Similar to above, policy recommendations in this catchment include:

1. Blaby District Council should work closely with Harborough District Council to ensure that runoff is attenuated through the upper catchment through SuDS implementation and may again include opportunities for Natural Flood Management techniques and the installation of storage areas to hold water back and therefore slow flows downstream.

The following policies are applicable to catchments across the district that have received a medium-risk or low-risk rating in the Cumulative Impact Assessment in order to minimise cumulative impacts:

1. Blaby District Council should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of Blaby District to other local authorities in order to minimise cross boundary issues of cumulative impacts of development.
2. 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 in the borough where practicable.
3. 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 take into account all sources of flooding to ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.

7.7 Water quality considerations

In addition to cross-boundary issues regarding flood risk, there are also cross-boundary issues relating to water quality. Development or changes to land management practises in the upper catchments of watercourses that flow across boundaries into Blaby District can potentially impact on the quality of watercourses within the study area. Development should consider the quality of the water that is released from sites and the impact it may have on the water quality on any receiving waterbodies. Future development should ensure there is no adverse impact on the quality of watercourses within the Council administrative area. Any impacts identified should then be considered in relation to the WFD Ecological, Hydromorphological and Chemical Status of the waterbody and the status objectives. Opportunities to improve the status of watercourses should also be considered. This is particularly important for Blaby District as there are several watercourses within the area which have not achieved a good status, primarily due to diffuse pollution and phosphate levels.

8 Flood risk management requirements for developers

This section provides guidance on site-specific Flood Risk Assessments (FRAs). These are carried out by (or on behalf of) developers to assess flood risk to and from a site. They are submitted with Planning Applications and should demonstrate how flood risk will be managed over the development's lifetime, considering climate change and vulnerability of users.

The report provides a strategic assessment of flood risk within the district of Blaby. Prior to any construction or development, site-specific assessments will need to be undertaken so all forms of flood risk and any defences at a site are considered in more detail. Developers should, where required, undertake more detailed hydrological and hydraulic assessments of watercourses to verify flood extents (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed Flood Risk Assessment (FRA) may show that a site, windfall[1] or other, is not appropriate for development of a particular vulnerability or even at all. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not been seen as an alternative to proving these tests have been met.

8.1 Principles for new developments

8.1.1 Apply the Sequential and Exception Tests

Developers should refer to Section 3 for more information on how to consider the Sequential and Exception Tests. For allocated sites, Blaby District Council should use the information in this SFRA to apply the Sequential Test. For windfall sites a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the Sequential Test should the Exception Test then be applied if required. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

Developers should also apply the sequential approach to locating development within the site. The following questions should be considered:

- can risk be avoided through substituting less vulnerable uses or by amending the site layout?
- can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and
- can the site layout be varied to reduce the number of people, the flood risk vulnerability or the building units located in higher risk parts of the site?

8.1.2 Consult with statutory consultees at an early stage to understand their requirements

Developers should consult with the Environment Agency, Blaby District Council, Leicestershire County Council as LLFA and Severn Trent Water at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.

[1] 'Windfall sites' is used to refer to those sites which become available for development unexpectedly and are therefore not included as allocated land in a planning authority's development plan.

8.1.3 Consider the risk from all sources of flooding and that they are using the most up to date flood risk data and guidance

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific Flood Risk Assessment. At a site level, developers will need to check before commencing on a more detailed Flood Risk Assessment that they are using the latest available datasets. Developers should apply the 2020 Environment Agency climate change guidance and ensure the development has taken into account climate change adaptation measures.

8.1.4 Ensure that the development does not increase flood risk elsewhere

Chapter 9 sets out these requirements for taking a sustainable approach to surface water management. Developers should also ensure mitigation measures do not increase flood risk elsewhere and that floodplain compensation is provided where necessary.

8.1.5 Ensure the development is safe for future users

Consideration should first be given to minimising risk by planning sequentially across a site. Once risk has been minimised as far as possible, only then should mitigation measures be considered. Developers should consider both the actual and residual risk of flooding to the site, as discussed in section 3.

Further flood mitigation measures may be needed for any developments in an area protected by flood defences, where the condition of those defences is 'fair' or 'poor', and where the standard of protection is not of the required standard.

8.1.6 Enhance the natural river corridor and floodplain environment through new development

Developments should demonstrate opportunities to create, enhance and link green assets. This can provide multiple benefits across several disciplines including flood risk and biodiversity/ ecology and may provide opportunities to use the land for an amenity and recreational purposes. Development that may adversely affect green infrastructure assets should not be permitted. Where possible, developers should identify and work with partners to explore all avenues for improving the wider river corridor environment. Developers should open up existing culverts and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

8.1.7 Consider and contribute to wider flood mitigation strategy and measures in the district and apply the relevant local planning policy

Wherever possible, developments should seek to help reduce flood risk in the wider area e.g. by contributing to a wider community scheme or strategy for strategic measures, such as defences or natural flood management or by contributing in kind by mitigating wider flood risk on a development site. More information on the contribution developers are expected to make towards achieving the wider vision for FRM and sustainable drainage in the district can be found in Chapter 7.3. Developers must demonstrate in an FRA how they are contributing towards this vision.

8.2 Requirements for site-specific Flood Risk Assessments

8.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals of 1 hectare or greater in Flood Zone 1.

- Proposals for new development (including minor development such as non-residential extensions, alterations which do not increase the size of the building or householder developments and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)
- Where evidence of historical or recent flood events have been passed to the LPA
- In an area of significant surface water flood risk.

8.2.2 Objectives of a site-specific FRA

Site-specific FRAs should be proportionate to the degree of flood risk and the scale, nature and location of the development. Site-specific FRAs should establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source.
- Whether a proposed development will increase flood risk elsewhere.
- Whether the measures proposed to deal with the effects and risks are appropriate.
- The evidence, if necessary, for the local planning authority to apply the Sequential Test; and
- Whether, if applicable, the development will be safe and pass the Exception Test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency and Blaby District Council. Guidance and advice for developers on the preparation of site-specific FRAs include:

- **Standing Advice on Flood Risk** (Environment Agency) (https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities)
- **Flood Risk Assessment for Planning Applications** (Environment Agency) (https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applicationshttps:/www.gov.uk/guidance/flood-risk-assessment-for-planning-applications); and
- **Site-specific Flood Risk Assessment: CHECKLIST** (NPPF PPG, Defra) (https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section)

Guidance for local planning authorities for reviewing Flood Risk Assessments submitted as part of planning applications has been published by Defra in 2015 – **Flood Risk Assessment: Local Planning Authorities** (https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities).

8.3 Local requirements for mitigation measures

8.3.1 Site layout and design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development.

The NPPF states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use away from flood zones, to higher ground, while more flood-compatible development (e.g. vehicular parking, recreational space) can be located in higher risk areas. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning.

Waterside areas, or areas along known flow routes, can act as green infrastructure, being used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

8.3.2 Modification of ground levels

Any proposal for modification of ground levels will need to be assessed as part of a detailed flood risk assessment.

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to a particular site in circumstances where the land does not act as conveyance for flood waters. However, care must be taken as raising land above the floodplain could reduce conveyance or flood storage in the floodplain and could adversely impact flood risk downstream or on neighbouring land. Raising ground levels can also deflect flood flows, so analyses should be performed to demonstrate that there are no adverse effects on third party land or property.

Compensatory flood storage should be provided, and would normally be on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain (in order for it to fill and drain). It should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated). Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624.

Where proposed development results in a change in building footprint, the developer should ensure that it does not impact upon the ability of the floodplain to store or convey water and seek opportunities to provide floodplain betterment.

Raising levels can also create areas where surface water might pond during significant rainfall events. Any proposals to raise ground levels should be tested to ensure that it would not cause increased ponding or build-up of surface runoff on third party land.

8.3.3 Raised floor levels

If raised floor levels are proposed, these should be agreed with Blaby District Council and the Environment Agency. The minimum Finished Floor Level (FFL) may change dependent upon the vulnerability and flood risk to the development.

The Environment Agency advises that minimum finished floor levels should be set 600mm above the 100-year plus climate change peak flood level, where the new climate change allowances have been used (see Chapter 4 for the climate change allowances). An additional allowance may be required because of risks relating to

blockages to the channel, culvert or bridge and should be considered as part of an FRA.

Allocating the ground floor of a building for less vulnerable, non-residential, use is an effective way of raising living space above flood levels. Single storey buildings such as ground floor flats or bungalows are especially vulnerable to rapid rise of water (such as that experienced during a breach). This risk can be reduced by use of multiple storey construction and raised areas that provide an escape route.

Similarly, the use of basements should be avoided. Habitable uses of basements within Flood Zone 3 should not be permitted, whilst basement dwellings in Flood Zone 2 will be required to pass the Exception Test. Access should be situated 300mm above the design flood level and waterproof construction techniques used.

8.3.4 Development and raised defences

Construction of localised raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain.

Where development is located behind, or in an area benefitting from defences, the residual risk of flooding must be considered.

8.3.5 Developer contributions

In some cases, and following the application of the Sequential Test, it may be appropriate for the developer to contribute to the improvement of flood defence provision that would benefit both proposed new development and the existing local community. Developer contributions can also be made to maintenance and provision of flood risk management assets, flood warning and the reduction of surface water flooding (i.e. SuDS).

8.3.6 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and ensure access to the watercourse, structures and defences is maintained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection.

Building adjacent to riverbanks can cause problems to the structural integrity of the riverbanks and the building itself, making future maintenance of the river much more difficult.

8.3.7 Making space for water

The **PPG** (https://www.gov.uk/government/collections/planning-practice-guidance) sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing

flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

8.4 Resistance and resilience measures

The consideration of resistance and resilience measures should not be used to justify development in inappropriate locations.

Having applied planning policy, there will be instances where developments, such as those that are water compatible and essential infrastructure are permitted in high flood risk areas. The above measures should be considered before resistance and resilience measures are replied on. The effectiveness of these forms of measures are often dependant on the availability of a reliable forecasting and warning system and the use of back up pumping to evacuate water from a property as quickly as possible. The proposals must include details of how the temporary measures will be erected and decommissioned, responsibility for maintenance and the cost of replacement when they deteriorate. Available resistance and resilience measures are shown in Table 8-1.

Table 8-1: Available temporary measures

Measures	Description
Permanent barriers	Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers
Temporary barriers	Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.
Community resistance measures	These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.
Flood resilience measures	These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level and water-resistant materials for floors, walls and fixtures.

8.5 Reducing flood risk from other sources

8.5.1 Groundwater

Groundwater flooding has a very different flood mechanism to any other and so many conventional flood mitigation methods are not suitable. The only way to fully reduce flood risk would be through building design (development form), ensuring floor levels are raised above the water levels caused by a 1 in 100-year plus climate change event. Site design would also need to preserve any flow routes followed by the groundwater overland to ensure flood risk is not increased downstream.

Infiltration SuDS can cause increased groundwater levels and subsequently may increase flood risk on or off a site. Developers should provide evidence and ensure that this will not be a significant risk.

8.5.2 Surface water and sewer flooding

Developers should discuss public sewerage capacity with the water utility company at the earliest possible stage. It is important that a Surface Water Drainage Strategy (often done as part of a Flood Risk Assessment) shows that this will not increase flood risk elsewhere, and that the drainage requirements regarding runoff rates and SuDS for new development are met.

If residual surface water flood risk remains, the likely flow routes and depths across the site should be modelled. The site should be designed so that these flow routes are preserved and building design should provide resilience against this residual risk.

When redeveloping existing buildings, the installation of some permanent or temporary floodproofing and resilience measures could protect against both surface water and sewer flooding. Non-return valves prevent water entering the property from drains and sewers. Non-return valves can be installed within gravity sewers or drains within a property's private sewer upstream of the public sewerage system. These need to be carefully installed and must be regularly maintained.

Consideration must also be given to attenuation and flow ensuring that flows during the 100-year plus climate change storm event are retained within the site if any flap valves shut. This should be demonstrated with suitable modelling techniques.

8.5.3 Reservoirs

As discussed in Section 5.9, the risk of reservoir flooding is extremely low. However, there remains a residual risk to development from reservoirs which developers should consider during the planning stage:

- Developers should contact the reservoir owner for information on:
  - the Reservoir Risk Designation
  - reservoir characteristics: type, dam height at outlet, area/volume, overflow location
  - operation: discharge rates / maximum discharge
  - discharge during emergency drawdown; and
  - inspection / maintenance regime.
- The EA online Reservoir Flood Maps contain information on the extents, depths and velocities following a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extent, depths and velocities shown in these online maps.
- The GOV.UK website on **Reservoirs: owner and operator requirements** (https://www.gov.uk/guidance/reservoirs-owner-and-operator-requirements) provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.
- In addition, developers should consult the **'Leicester, Leicestershire and Rutland Prepared'** (LLR Prepared) (www.llrprepared.org.uk) about emergency plans.

Developers should use the above information to:

- Apply the sequential approach to locating development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific Emergency Plans and/ or Off-site Plans if necessary and ensure the future users of the development are aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand, similar to the response to the Toddbrook Reservoir incident in Whaley Bridge, Derbyshire, 2019.

8.6 Emergency planning

Emergency planning covers three phases: before, during and after a flood. Measures involve developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. National Planning Policy takes this into account by seeking to avoid inappropriate development in areas of flood risk and considering the vulnerability of new developments to flooding.

The 2019 NPPF requires site level Flood Risk Assessments to demonstrate that

> *"d) any residual risk can be safely managed; and*
>
> *e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan."*

Certain sites will need emergency plans:

- Sites with vulnerable users, such as hospitals and care homes
- Camping and caravan sites
- Sites with transient occupants e.g. hostels and hotels
- Developments at a high residual risk of flooding from any source e.g. immediately downstream of a reservoir or behind raised flood defences
- Situations where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. at risk of a breach).

Emergency Plans will need to consider:

- The characteristics of the flooding e.g. onset, depth, velocity, hazard, flood borne debris
- The vulnerability of site occupants.
- Structural safety
- The impact of the flooding on essential services e.g. electricity, drinking water
- Flood warning systems and how users will be encouraged to sign up for them
- Safe access and egress for users and emergency services

- How to manage the consequences of events that are un-foreseen or for which no warnings can be provided e.g. managing the residual risk of a breach.
- A safe place of refuge where safe access and egress and advance warning may not be possible, having discussed and agreed this first with emergency planners. Proposed new development that places an additional burden on the existing response capacity of the Councils will not normally be appropriate.

The LLR Prepared provides Emergency Planning relevant information that is both general and flood specific. This includes practical advice before, during and after flooding has occurred including, preparation, understanding warnings, actions to limit exposure to risk and recovery.

Further information is available from:

- **The National Planning Policy Guidance** (https://www.gov.uk/government/publications/national-planning-policy-framework--2)
- **2004 Civil Contingencies Act** (http://www.legislation.gov.uk/ukpga/2004/36/contents)
- **DEFRA (2014) National Flood Emergency Framework for England** (https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england)
- **FloodRe** (http://www.floodre.co.uk/)
- The Environment Agency and DEFRA's **Standing Advice for FRAs** (https://www.gov.uk/guidance/flood-risk-assessment-standing-advice)
- Leicestershire County Council's **"Emergency Flood Advice"** (https://www.leicestershire.gov.uk/environment-and-planning/flooding-and-drainage/emergency-flood-advice)
- Environment Agency's **"How to plan ahead for flooding"** (https://flood-warning-information.service.gov.uk/plan-ahead-for-flooding)
- Sign up for **Flood Warnings** with the Environment Agency (https://www.gov.uk/sign-up-for-flood-warnings)
- The **National Flood Forum** (https://nationalfloodforum.org.uk/)
- **GOV.UK** - Make a Flood Plan guidance and templates (https://www.gov.uk/prepare-for-flooding/future-flooding)

9 Surface water management and SuDS

This chapter provides guidance and advice on managing surface water runoff and flooding.

9.1 Role of the LLFA and Local Planning Authority in surface water management

In April 2015, Leicestershire County Council as LLFA was made a statutory planning consultee on the management of surface water. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to ensure that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, Leicestershire County Council will provide advice to the Planning Department on the management of surface water. As LPA, Blaby District Council should satisfy themselves that the development's proposed minimum standards of operation are appropriate and ensure through the use of planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the lifetime of the development.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by Blaby District Council. This will assist with the delivery of well designed, appropriate and effective SuDS.

9.2 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are designed to maximise the opportunities and benefits that can be secured from surface water management practices.

SuDS provide a means of dealing with the quantity and quality of surface water and can also provide amenity and biodiversity benefits. Given the flexible nature of SuDS they can be used in most situations within new developments as well as being retrofitted into existing developments. SuDS can also be designed to fit into most spaces. For example, permeable paving could be used in parking spaces or rainwater gardens as part of traffic calming measures.

It is a requirement for all new major development proposals to ensure that sustainable drainage systems for management of runoff are put in place. Likewise, minor developments should also ensure sustainable systems for runoff management are provided. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and current drainage arrangements is essential.

9.3 Sources of SuDS guidance

9.3.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015)

(https://ciria.sharefile.com/share/getinfo/s7227335a22e40b6a) provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

9.3.2 Non-Statutory Technical Guidance, Defra (March 2015)

Non-Statutory Technical guidance

(https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards) provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations.

9.3.3 Non-statutory Technical Guidance for Sustainable Drainage Practice Guidance, LASOO (2016)

The Local Authority SuDS Officer Organisation produced their **practice guidance** (https://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf) in 2016 to give further detail to the Non-statutory technical guidance.

9.3.4 Leicestershire County Council Flood Risk and Drainage Standing Advice

Leicestershire County Council's Flood risk and Drainage Standing Advice gives advice on SuDS and flood risk for new developments. Developers should contact the LLFA for more information.

9.3.5 Leicestershire County Council Consultation Checklist

The **Consultation Checklist** (https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2018/10/11/LLFA-checklist.pdf) document provides a checklist of all the required documents and information for all major planning applications. There is also a supporting Guidance Document that should be used in conjunction with the checklist, which explains the items contained in the checklist.

9.3.6 Leicestershire County Council SuDS Guidance

Leicestershire County Council have not yet published a comprehensive SuDS Handbook which includes county-specific guidance for the design and implementation of SuDS in new developments. However, there is limited SuDS guidance pertaining to Leicestershire itself within the Environmental Best Practice document. This document uses a number of examples from various sources including the River Restoration Centre and Susdrain to illustrate a number of techniques that can be incorporated into SuDS designs. Additional information can be found environment and planning section of Leicestershire County Council's website (https://www.leicestershire.gov.uk/environment-and-planning/flooding-and-drainage/surface-water-drainage-for-developments)

9.4 Other surface water considerations

9.4.1 Groundwater Vulnerability Zones

The Environment Agency published new groundwater vulnerability maps in 2015. These maps provide a separate assessment of the vulnerability of groundwater in overlying superficial rocks and those that comprise of the underlying bedrock. The map shows the vulnerability of groundwater at a location based on the hydrological, hydro-ecological and soil propertied within a one-kilometre grid square.

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to

certain areas. Groundwater vulnerability maps can be found **on Defra's interactive mapping** (https://magic.defra.gov.uk/MagicMap.aspx).

9.4.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination. GSPZs can be viewed on **DEFRA's Magic Map** (https://magic.defra.gov.uk/MagicMap.aspx).

Blaby District is located outside of a Groundwater Source Protection Zone.

9.4.3 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

Blaby District comprises a Surface Water NVZ. The whole district is covered by the River Soar Surface Water NVZ. NVZs can be viewed on the **Environment Agency's website** (https://environment.data.gov.uk/farmers/).

10 Summary and Recommendations

- Historic flooding incident records from Leicestershire County Council and Leicestershire Fire and Rescue service show the most affected areas are the northern areas of the District, particularly Leicester Forest East,Glenfield and Kirby Muxloe. Incidents are distributed across the south-east, seeing clusters in the Glen Parva and Blaby areas. Rural villages in the west and south-west, notably Thurlaston and Sharnford are commonly affected in these records.
- The main rivers associated with fluvial flooding are the River Soar, which poses a flood risk to some rural settlements and areas along the banks as it flows through Croft and Littlethorpe, The River Sence as it flows past Blaby, the Rothley Brook as it flows past Glenfield, an unnamed watercourse flowing through Cosby, and the Thurlaston Brook, the Whetstone Brook which pose a flood risk to more remote rural settlements.
- The largest surface water flow paths exist in the south-west rural areas of the district e.g. a large flow path through Sharnford and in the north of Blaby. Other flow paths exist across the district, e.g. that affecting Glenfield.
- The post codes most frequently flooded from sewer flooding, as recorded in Severn Trent Water's Historic Flooding Risk Register (HFRR) are LE2 9, LE3 2, LE3 3, LE3 8, LE9 4 and LE19 2.
- Areas at risk of flooding are likely to become at increasing risk in the future and the frequency of flooding will increase in such areas as a result of climate change. Flood extents will increase; in some locations, this may not be by very much, but flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that the Council works with other Risk Management Authorities to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the District.
- The Areas Susceptible to Groundwater Flooding map shows that, in general, the majority of Blaby District is between the >=25% to 50% and >=50% to <75% susceptible classifications, therefore it is at medium risk of groundwater flooding. Parts of the district, particularly around Littlethorpe, Stoney Stanton and east of Countesthorpe fall within higher susceptibility classifications (>=75%) and are therefore at higher risk from groundwater flooding.
- There is one canal located within Blaby District, the Grand Union Canal. This has the potential to interact with other watercourses and become flow paths during flood events or in a breach scenario. There has been one recorded incident of canal overtopping in the district. The canal overtopping incidents occurred west of Glen Parva.
- There is a potential risk of flooding from 2 reservoirs, both outside the district boundary. There are no records of flooding from reservoirs in the study area. The level and standard of inspection and maintenance required under the Reservoirs Act 1975 means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

10.1 Recommendations

Reduction of flood risk through site allocations and appropriate site design

- To locate new development in areas of lowest risk, in line with the Sequential Test, by steering sites to Flood Zone 1. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the Exception Test shall be undertaken.
- After application of the Exception Test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk which provide other wider sustainability benefits will provide flood risk betterment and made resilient to flooding.
- Identification of long-term opportunities to remove development from the floodplain and to make space for water.
- Ordinary watercourses not currently afforded flood maps should be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.
- Ensure development is 'safe', dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then as assessment should be made to detail the flood duration, depth, velocity and flood hazard rating in the 1 in 100-year plus climate change flood event, in line with FD2320.
- Raise residential and commercial finished floor levels 600mm above the 1 in 100-year plus climate change flood level. Protect and promote areas for future flood alleviation schemes.
- Safeguard functional floodplain from future development.
- Identify opportunities for brownfield sites in functional floodplain to reduce risk and provide flood risk betterment.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.

Promote SuDS to mimic natural drainage routes to improve water quality

- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.
- Use of the SuDS management train to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.
- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

Reduce Surface Water Runoff from New Developments and Agricultural Land

- Space should be provided for the inclusion of SuDS on all allocated sites and outline proposals
- Promote biodiversity, habitat improvements and **Countryside Stewardship schemes** (https://www.gov.uk/government/publications/countryside-stewardship-runoff-and-soil-erosion-risk-assessment) to help prevent soil loss and to reduce runoff from agricultural land.

Enhance and Restore River Corridors and Habitat

- Assess condition of existing assets and upgrade, if required, to ensure that the infrastructure can accommodate pressures/flows for the lifetime of the development.
- Natural drainage features should be maintained and enhanced.
- Identify opportunities for river restoration/enhancement to make space for water.
- A presumption against culverting of open watercourses except where essential to allow highways and/or other infrastructure to cross, in line with CIRIA's Culvert design and operation guide, (C689) and to restrict development over culverts.
- There should be no built development within 8m from the top of a watercourse or Main River for the preservation of the watercourse corridor, wildlife habitat, flood flow conveyance and future watercourse maintenance or improvement.

Mitigate Against Risk, Improved Emergency Planning and Flood Awareness

- Work with emergency planning colleagues and stakeholders to identify areas at highest risk and locate most vulnerable receptors.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.
- For a partial or completely pumped drainage system, an assessment should be undertaken to assess the risk of flooding due to any failure of the pumps to be assessed. The design flood level should be determined if the pumps were to fail; if the attenuation storage was full, and if a design storm occurred.
- An emergency overflow should be provided for piped and storage features above the predicted water level arising from a 100-year rainfall event, inclusive of climate change and urban creep.
- Consideration and incorporation of flood resilience measures up to the 1 in 1,000-year event.
- Ensure robust emergency (evacuation) plans are produced and implemented for major developments.
- Increase awareness and promote sign-up to the Environment Agency Flood Warnings Direct (FWD) within Blaby District.

10.1.1 Recommendations from the cumulative impact analysis

The following planning policy recommendations have been made for the catchments where cumulative development is likely to have the greatest impact on flood risk:

1. That a Level 2 SFRA or detailed local area Strategic Drainage Study considers further how the cumulative effects of potential peak rates and volumes of water from development sites would impact on peak flows, duration of flooding and timing of flood peaks on receiving watercourses. Such studies could be used to justify greater restrictions/ enforce through Local Planning Policy development site runoff rates and volumes specific to each catchment that are over and above those required by National and Local SuDS Standards. They could also identify where there are opportunities with allocated sites to provide off-site betterment e.g. online/ offline flood storage and where land should be safeguarded within proposed site allocations to fulfil this purpose.
2. Where appropriate, that the opportunity for Natural Flood Management in rural areas, SuDS retrofit in urban areas and river restoration should be maximised in these catchments. In support of Objective 7 in the Local FRM Strategy (2015), culverting should be opposed, and day-lighting existing culverts promoted through new developments.
3. Developers should explore, through site-specific FRAs, opportunities to provide wider community flood risk benefit 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 be by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes. Consultation on the site-specific requirements should be undertaken with Leicestershire County Council as LLFA and the Environment Agency at the earliest opportunity.
4. Developers should contribute to community flood defences outside of their red line boundary in these catchments to provide wider benefit and help offset the cumulative impact of development.
5. That the LLFA and other RMAs should use this information to inform a long-term pipeline of flood alleviation studies and schemes to help inform points 2. to 4. above.
6. That the Environment Agency, in consultation with Blaby District Council, should consider whether to formally designate these catchments as Critical Drainage Areas. This would mean that a detailed Flood Risk Assessment would be required for all developments that are proposed, regardless of their size.
7. A Surface Water Drainage Strategy will be required for all developments within these catchments, regardless of development size.

Appendices

A Interactive Flood Risk Mapping

B Data sources used in the SFRA

C SFRA User Guide

D Flood Alerts and Flood Warnings

E Summary of flood risk across the district

F Cumulative Impact Assessment methodology

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