Derby City Council Level 1 Strategic Flood Risk Assessment

Final Report

December 2025

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Derby City Council

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This report describes work commissioned by Derby City Council by an instruction dated 5th May 2025. The Client's representative for the contract was David Brown of Derby City Council. Lucy Briscoe of JBA Consulting carried out this work.

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Acknowledgements

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Abbreviations

ACDP	Areas with Critical Drainage Problems
ADEPT	Association of Directors of Environment, Economy, Planning & Transport
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
AStGWF	Areas Susceptible to Groundwater Flooding
BNG	Biodiversity Net Gain
CaBA	Catchment Based Approach
CC	Climate Change
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIA	Cumulative Impact Assessment
CIL	Community Infrastructure Levy
CIRIA	Construction Industry Research and Information Association
DCG	Design and Construction Guidance
Defra	Department for Environment, Food and Rural Affairs
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EU	European Union
FAA	Flood Alert Area
FCERM	Flood and Coastal Erosion Risk Management
FFL	Finished Floor Level
FFR	Flood Risk Regulation
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
FRAP	Flood Risk Activity Permit
FRMP	Flood Risk Management Plan
FWA	Flood Warning Area
FWMA	Flood and Water Management Act
FWS	Flood Warning System
GI	Green Infrastructure
GSPZ	Groundwater Source Protection Zone
IDB	Internal Drainage Board
JBA	Jeremy Benn Associates
LASOO	Local Authority SuDS Officer Organisation

LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LNRS	Local Nature Recovery Strategies
LPA	Local Planning Authority
LPU	Local Plan Update
mAOD	metres Above Ordnance Datum
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NRD	National Receptor Database
NVZ	Nitrate Vulnerable Zone
OCOR	Our City Our River
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RAG	Red-Amber-Green
RBD	River Basin District
RBMP	River Basin Management Plan
REUL	Retained EU Law
RFCC	Regional Flood and Coastal Committee
RMAs	Risk Management Authorities
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SHELAAs	Strategic Housing and Economic Land Availability Assessments
SoP	Standard of Protection
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WCS	Water Cycle Study
WFD	Water Framework Directive
WRMP	Water Resources Management Plan

Definitions

1D model: One-dimensional hydraulic model.

2D model: Two-dimensional hydraulic model.

Annual Exceedance Probability: The probability (expressed as a percentage) of a flood event occurring in any given year.

Brownfield: A previously developed parcel of land.

Climate change: Long term variations in global temperature and weather patterns caused by natural and human actions.

Design flood: 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), or surface water flooding likely to occur with a 1% annual probability (a 1 in 100 change each year), plus an appropriate allowance for climate change, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

Flood defence: Infrastructure used to protect an area against floods such as floodwalls and embankments; they are designed to a specific Standard of Protection (SoP) (design standard).

Green infrastructure: A network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity.

Greenfield: An undeveloped parcel of land.

Lead Local Flood Authority: The unitary authority for the area or if there is no unitary authority, the County Council for the area.

Main river: A watercourse shown as such on the statutory main river map held by the Environment Agency (EA). They are usually the larger rivers and streams. The EA has permissive powers (not duties) to carry out maintenance and improvement works on main rivers).

Major development: Defined in the National Planning Policy Framework (NPPF) as a housing development where 10 or more homes will be provided, or the site has an area of 0.5 hectares or more, or as a non-residential development with additional floorspace of 1,000m² or more, or a site of 1 hectare or more, or as otherwise provided in the Town and Country Planning (Development Management Procedure) (England) Order 2015 (gov.uk).

Natural Flood Management (NFM): Techniques that work with nature to reduce the risk of flooding for communities.

Ordinary watercourse: Any river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows but which does not form part of a

main river. The local authority or Internal Drainage Board (IDB) has permissive powers (not duties) on ordinary watercourses.

Permissive powers: Authorities have the power to undertake flood risk management activities, but not a duty to do so. This will depend on priorities in flood risk management.

Return period: 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 Management Authority (RMA): The EA; a Lead Local Flood Authority; a District Council in an area where there is no unitary authority; an internal drainage board; a water company and a highway authority.

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.

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.

Sustainable Drainage Systems (SuDS): Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques, such as grates, gullies, and channels.

Windfall site: A site which becomes available for development unexpectedly and therefore not included as allocated land in a planning authority's Local Plan.

Executive Summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the planning policies for Derby City Council. The review process is known as the Local Plan Update (LPU). This report uses the best available information, including input from key stakeholders. The SFRA applies the latest national planning policy and guidance, including:

- National Planning Policy Framework (NPPF) (gov.uk), last updated in December 2024.
- Planning Practice Guidance (PPG): Flood risk and coastal change (gov.uk) updated in September 2025.
- The latest Environment Agency climate change guidance (gov.uk) (updated in July 2021 and May 2022).
- The Environment Agency 'How to prepare a strategic flood risk assessment' (gov.uk) guidance
- The Association of Directors of Environment, Economy, Planning & Transport (ADEPT) 'Strategic flood risk assessment good practice guidance' (adeptnet.org.uk)

Introduction

To support the review and LPU for Derby City Council (referred to hereafter as the Council), the key objectives of the assessment are:

- 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 risks may be mitigated against.
- To inform decisions in the emerging LPU, including informing the sustainability appraisal, 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 in the preparation of the LPU.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the LPU.
- To help decide when a Flood Risk Assessment (FRA) will be required for individual planning applications.
- To provide advice for applicants carrying out site-specific FRAs, including those at risk from sources other than river flooding, or at risk of flooding in the future due to climate change, and outline specific measures or objectives that are required to manage flood risk.
- To provide the basis for applying the sequential test on planning applications, including by identifying sources of flooding other than those in ‘Flood Zones’ and those at risk of flooding in the future.

- To identify opportunities to reduce the causes and impacts of flooding and gather information on the land that is likely to be required for flood risk management structures.

Summary of the city and flood risk

The Local Plan Area covers the city of Derby, an approximate area of 78.1km^2 with major settlements of Allestree, Alvaston, the city centre, Chaddesden, Chellaston, Littleover, Mickleover, Normanton, and Spondon. Derby is located in the northern area of England and located within the county of Derbyshire. Derby itself is heavily urbanised with some protected greenspaces.

Flood risk from all sources has been assessed in this SFRA. Parts of the city area are shown to be at risk of flooding from the following sources:

- fluvial,
- surface water,
- groundwater
- sewers, and
- reservoirs.

This study has shown that the most significant sources of flood risk across the city are fluvial and surface water. The points below summarise the findings:

Fluvial: The River Derwent flows from the north of the city to the east, with the majority of smaller named watercourses and ordinary watercourses forming tributaries to the River Derwent. These smaller watercourses include the Markeaton Brook, Mackworth Brook, Cuttle Brook, and Main Drain. Areas predominantly at risk are the city centre, Alvaston, Chaddesden, Markeaton, Spondon, Boulton, Darley Abbey and Normanton. Fluvial flood risk is discussed in Section 4.4 and the flood extents are shown in the static mapping in Appendix D.

Surface Water: Surface water flood extents predominantly affect the urbanised areas of the city. Areas most affected are Derby City Centre, Avaston, Allestree, Chellaston, Darley Abbey, Normanton, Littleover, Markeaton, Spondon, and Mickleover. Surface water flood risk is discussed in Section 4.5 and Appendix C and the flood extents are shown in the static mapping in Appendix D.

Climate Change: 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, due to climate change. Flood extents will increase; in some locations this may be minimal, but flood depth, velocity and hazard may have more of an impact due to climate change. This SFRA provides an assessment of the impacts of climate change on fluvial and surface water flood risk. The approach to climate change is discussed in Section 5, and the flood extents are shown in the static mapping in Appendix D.

Sewer: Severn Trent Water provide water and sewerage services across the city and have provided details of historic sewer flooding across the city. Severn Trent Water have

provided sewer flood records from 1999 to the start of 2025. The records show that throughout the time frame, areas that have experienced the most incidents of sewer flooding are within DE21, DE22, and DE24. Sewer flood risk is discussed in Section 4.6.

Groundwater: From the JBA Groundwater Emergence Mapping, areas most at risk include: Markeaton and New Zealand associated with the Markeaton Brook, Alvaston, Boulton, Crewton, and Wilmorton. The city centre has varied groundwater risk, withs small areas identified to be at high risk
There is no national groundwater flood dataset to inform the areas at risk from groundwater flooding; however, emergence mapping when considered in conjunction with topography and surface water flow paths can indicate areas where groundwater is likely to emerge, and the flow paths it may take once above the ground. Groundwater flood risk is discussed in Section 4.7 and JBA emergence map are shown in the static mapping in Appendix D.

Reservoirs: There are two reservoirs located within the city, and thirteen located outside the city, which present a potential risk of flooding within the city. The level and standard of inspection and maintenance required under the Reservoirs Act 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 FRAs (where relevant) in accordance with the updated PPG: Flood risk and coastal change. Reservoir flood risk is discussed in Section 4.8.1. The 'Dry Day', 'Wet Day', and 'Fluvial Contribution' flood extents are shown in the Static Mapping in Appendix D.

Defences

The EA Asset Information Management System (AIMS) dataset provides information on flood defence assets across the city. The River Derwent is defended by walls, embankments, and bridge abutments. Markeaton Brook is defended by spillways and walls, with Glenmoy Close Balancing Pond defended by embankments. These protect the areas of Little Chester, Darley Abbey, Mackworth, Markeaton, New Zealand, Glenmoy Close. Further information on defences across the city is available in Section 6.4 and shown in the Static Mapping in Appendix D.

How to use this report

The SFRA provides recommendations regarding all sources of flood risk across the city, which can be used to inform policy on flood risk within the emerging LPU. 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, for both allocations and individual planning applications (Appendix B) and provides guidance on how to apply the exception test.

This SFRA is a strategic assessment of flood risk and does not replace the need for site-specific FRAs, where required. The SFRA provides guidance for the development industry and development management officers to establish when an FRA is required and to assess whether site-specific FRAs meet the required quality standard (Section 7). This should be

used alongside the EA's FRA Guidance (gov.uk). The SFRA can be used to help identify which locations and development may require emergency planning provision.

The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas. Similarly, all known available recorded historical flood events across the city are listed in Section 0. This can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned within the city are outlined in Section 5 and Section 8.5 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Table 1-1 sets out the contents of the SFRA and how users should use the information provided through the document and appendices.

Mapping

The SFRA mapping highlights on a strategic scale flood risk from fluvial, surface water and reservoirs sources, and where groundwater emergence may occur; as well as where the effects of climate change are most likely. The 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 depict small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this mapping.

The mapping data should always be supplemented by direct consultation with the relevant wastewater company to ascertain if there is any site-specific risk from a public sewer. This is because sewer flood risk information is not publicly available and would need to be considered on a site-specific basis.

1 Introduction

1.1 Purpose of a Strategic Flood Risk Assessment (SFRA)

Derby City Council as the Local Planning Authority (LPA) are responsible for producing a Local Plan, determining planning applications, enforcement in response to breaches of planning control, and supporting neighbourhood planning.

The Council are currently compiling the evidence base to support the development of its new Local Plan. The current Adopted Local Plan was adopted in 2017 and concludes in 2028

As set out in the NPPF (Paragraph 171) “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.”

1.2 Relevance of the SFRA

The ‘How to prepare a Strategic Flood Risk Assessment guidance’ (gov.uk) (last updated August 2025), sets out the requirements that the LPA must address within their SFRA and has been used to undertake this Level 1 SFRA.

This SFRA has been developed using the best available information, supplied at the time of preparation. Appendix A details the information supplied for the preparation of this SFRA. Over time new information will become available to inform planning decisions:

- The EA regularly reviews its hydrology, hydraulic modelling, and flood risk mapping.
- The EA have recently produced new national flood risk mapping (NaFRA 2) which was released in March 2025, with velocity and hazard data released in September 2025, and further updates are expected in the future. New national flood and coastal erosion risk information (gov.uk) provides details on the latest information and expected updates.
- Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by Risk Management Authorities (RMAs).

Links have been provided for relevant guidance documents and policies published by other Risk Management Authorities (RMAs) such as the Lead Local Flood Authority (LLFA) and the Environment Agency (EA). When using the SFRA to prepare FRAs it is important to check that the most up to date information is used.

As the data available for SFRAs and the relevant legislation is continually changing, an SFRA should be updated to reflect changes where applicable and reasonably practicable.

Under any changes in guidance or legislation, the implications on the SFRA should be considered and a review undertaken where this is deemed reasonably necessary.

1.3 Levels of SFRA

The PPG: Flood risk and coastal change (gov.uk) identifies two levels of SFRA.

Level 1 SFRAs are high-level strategic documents and do not go into detail on an individual site-specific basis. Where potential site allocations are not at major flood risk and where development pressures are low, a Level 1 assessment is likely to be sufficient, without the LPA progressing to a Level 2 assessment. The Level 1 assessment should be of sufficient detail to enable application of the sequential test, to inform the allocation of development to areas of lower flood risk.

A Level 2 assessment is required where land outside flood risk areas cannot appropriately accommodate all necessary development, creating the need to apply the NPPF's exception test if relevant, or if an LPA believe they may receive high numbers of applications in flood risk areas on sites not identified in the Local Plan. In these circumstances the assessment should consider the detailed nature of the flood characteristics from all sources, both now and in the future.

This report fulfils the requirements of a Level 1 SFRA.

1.4 Local Plan Area

Derby City Council is located in the midlands and covers an area of approximately 78.1km^2, servicing a population of approximately 261,400 people[1]. The Council is predominantly urbanised city with some green spaces, with the district centres consisting of Allestree, Alvaston, the city centre, Chaddesden, Chellaston, Littleover, Mickleover, Normanton, and Spondon. Derby City Council shares boundaries with Amber Valley Borough Council, Erewash Borough Council, and South Derbyshire District Council, as shown in Figure 1-1.

Derby is serviced by Severn Trent Water for potable water, wastewater treatment and sewerage, and there are no Internal Drainage Boards within the city area. Derby City Council is both the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA) for the Derby City area. Derby City Council as LLFA is nestled within the wider Derbyshire County Council LLFA area, as shown in Figure 1-2. As LLFA, Derby City Council prepares guidance and strategies for flood risk management, conduct work to manage local flood risk, maintain an asset register, regulate and manage ordinary watercourses, and undertakes Section 19 investigations.

Within the city area, there are eleven named watercourses that flow through the city area, as shown in Figure 1-3, with no canals present. The watercourses are as follows:

- Amber BRook
- Bramble Brook
- Burley Brook

1 2021 Census

- Chaddesden Brook
- Cotton Brook
- Cuttle Brook
- Dam Brook
- Eggington Brook
- Folly Brook
- Hell Brook
- Littleover Brook
- Lees Brook
- Mackworth Brook
- Main Drain
- Markeaton Brook
- Meadow Draom
- River Derwent
- Thulston Brook
- Wood Brook

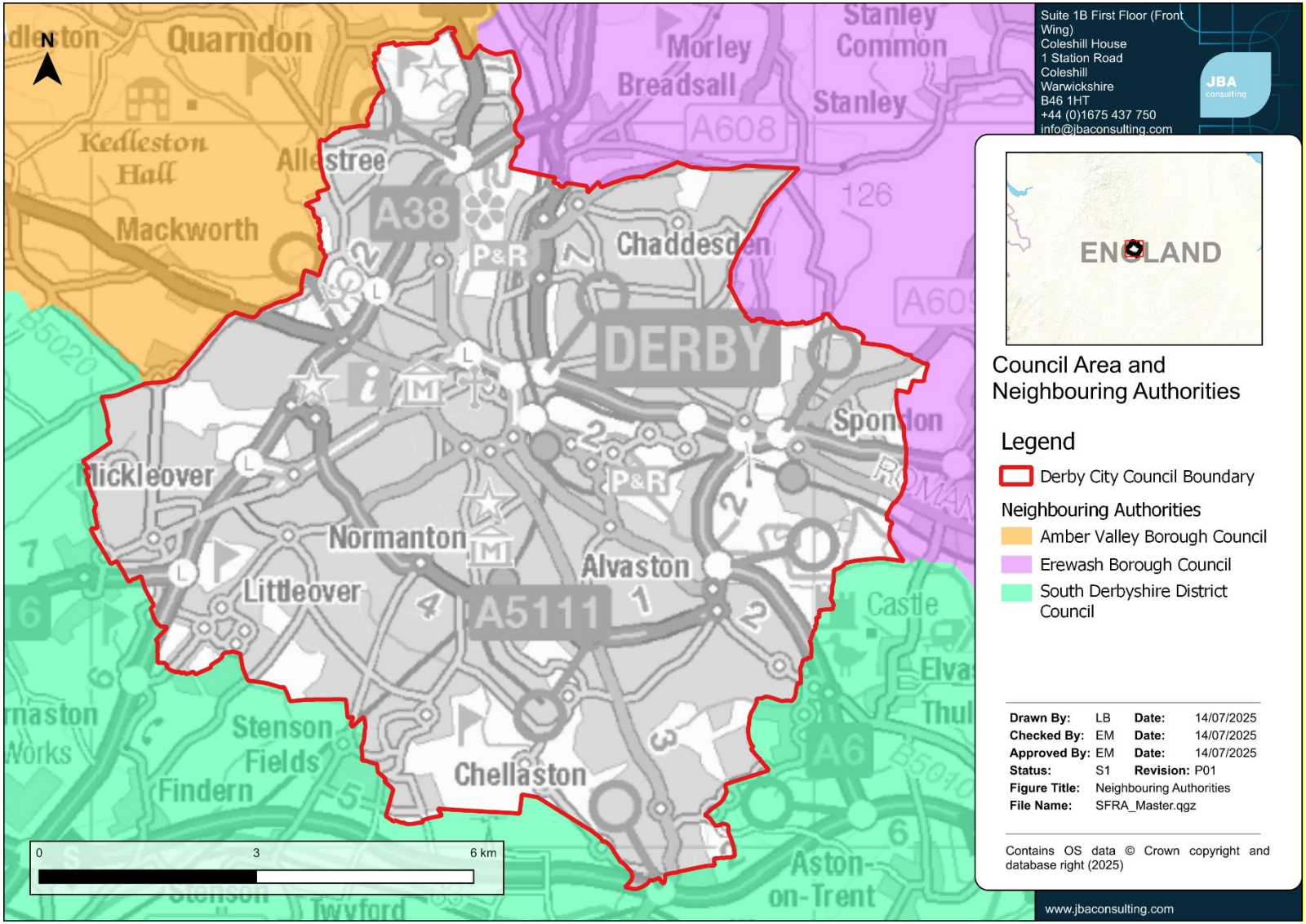


Figure 1-1: Derby City Council and its neighbouring authorities.

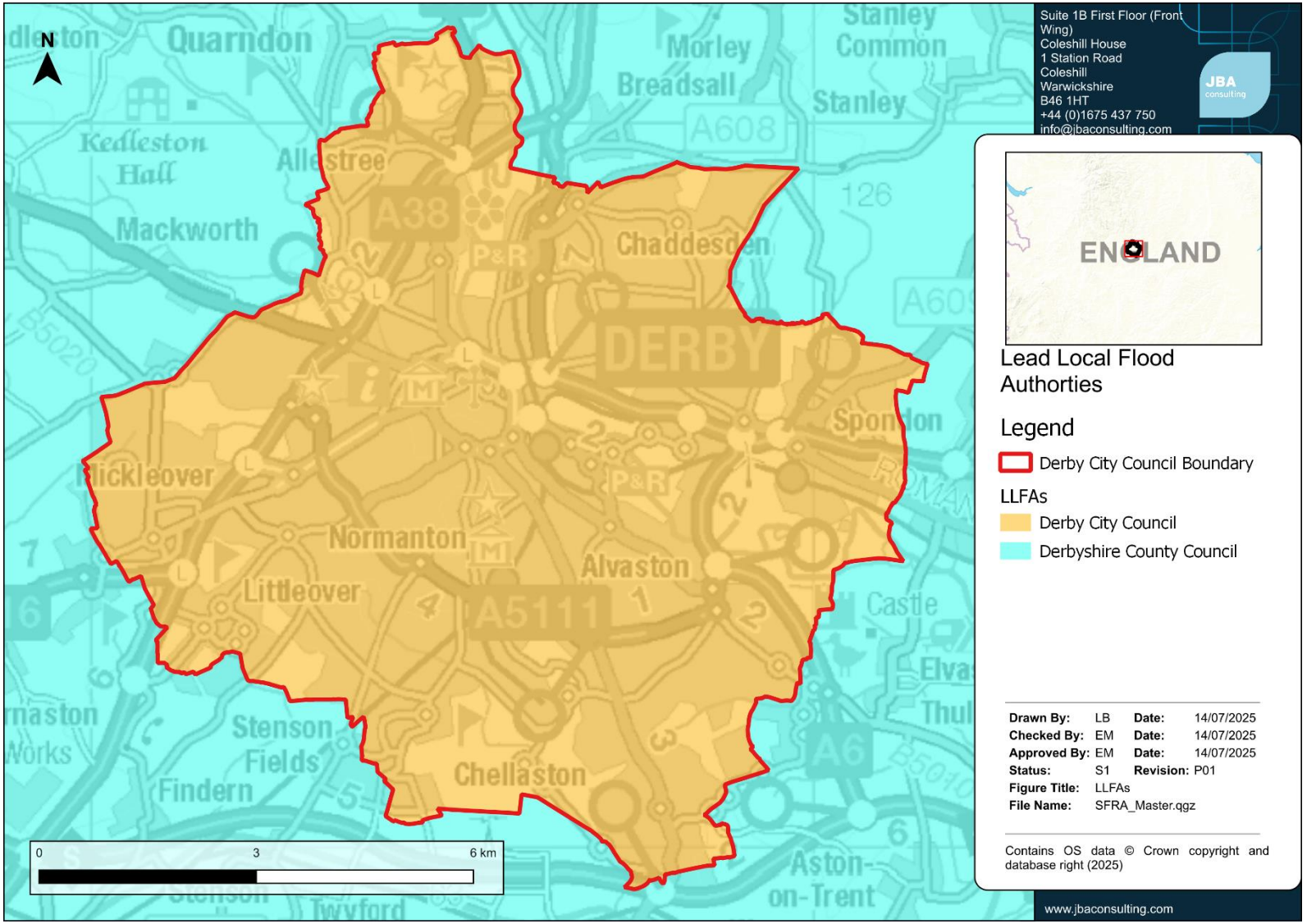


Figure 1-2: LLFA coverage across the city area.

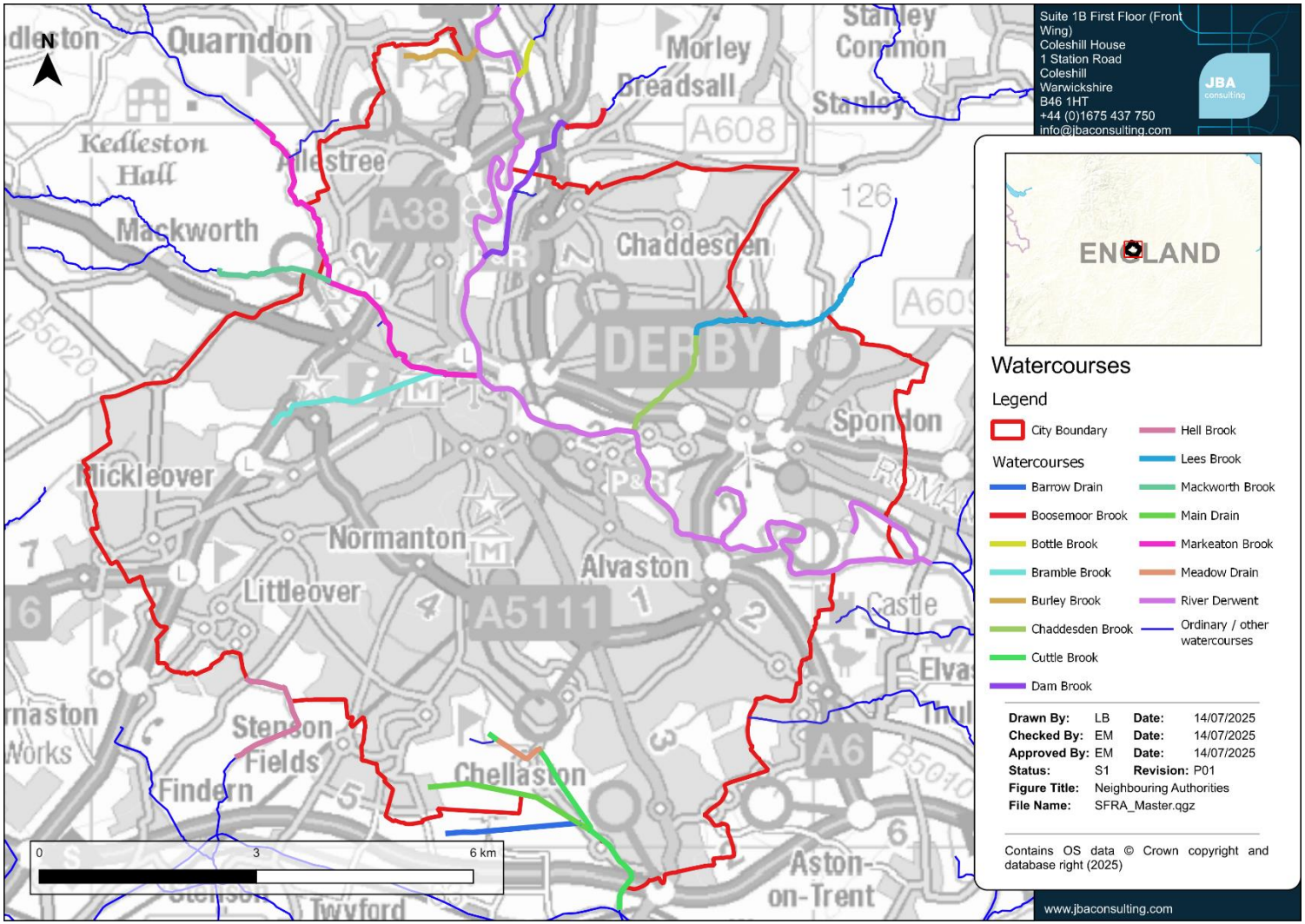


Figure 1-3: Main rivers and other watercourses across the city area.

1.5 Consultation

SFRAs should be prepared in consultation with other RMAs. In addition to the LPA the following parties have been consulted during the preparation of this version of the SFRA through data requests and draft report reviews:

- Environment Agency

In addition, the following parties were consulted through data requests during the preparation of this SFRA:

- Environment Agency
- Severn Trent Water
- Amber Valley Borough Council
- Erewash Borough Council
- South Derbyshire District Council

1.6 Structure of this report

Table 1-1 sets out the contents of this Level 1 SFRA report and appendices, and how to use each section.

Table 1-1: Sets out the contents of the report and how to use each section.

Section	Contents	How to use
Executive summary	This section focuses on how the SFRA can be used by planners, developers, and neighbourhood planners.	Users should refer to this section for a summary of the Level 1 findings and recommendations.
1. Introduction	This section provides a background to the study, the Local Plan stage the SFRA informs, and the Local Plan Area. It also details the organisations involved in the SFRA.	Users should refer to this section for general information and context.
2. Policy and strategy for flood risk management	This section 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. Sequential and exception tests	This section provides an overview of national planning policy, application of the sequential approach, and the sequential/exception test process. It provides guidance for the Councils 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. Understanding flood risk	This section introduces the concept of flood risk and provides an overview of the characteristics of flooding affecting the city and key risks including historical flooding incidents and flood risk from all sources, as well as characteristics that influence flood risk including topography, geology and soils.	This section should be used to understand all sources of flood risk across the city including where has flooded historically.

Section	Contents	How to use
5. Impact of climate change	This section outlines the latest climate change guidance published by the EA and how this was applied to the SFRA. It also sets out how developers should apply the guidance to inform site-specific FRAs.	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.
6. Flood risk infrastructure	This section provides a summary of current flood defences and asset management and future planned schemes.	This section should be used to understand if there are any defences or flood schemes in a particular area, for further detailed assessment at site specific stage.
7. Flood risk management requirements for developers	This section contains guidance for developers on FRAs, considering flood risk from all sources, and principles of managing flood risk in developments.	Developers should use this section to understand requirements for FRAs and what conditions/guidance documents should be followed, as well as mitigation options.
8. Principles for site design and master planning	This section details measures and principles that are to be included in the design of developments to be minimise flooding and flood related issues within the city in line with national and local guidance.	Developers should use this section to understand requirements for the design of developments as part of the design process and for FRAs. This includes any defences planned or that may be present.
9. Surface water management and SuDS	This section provides an overview of SuDS, including signposting to relevant guidance, as well as guidance for developers on surface water drainage strategies, considering any specific local standards and guidance for SuDS from the LLFA.	Developers should use this section to understand what national, regional, and local SuDS standards are applicable. Hyperlinks are provided.
10. Flood warning and emergency planning	This section provides an overview of the requirements for emergency plans, include any local emergency planning arrangements, and an overview of the available flood alerts and warnings.	Developers should use this section to understand requirements for emergency planning.

Section	Contents	How to use
11. Cumulative Impact Assessment	This section details the cumulative impact assessment, which identifies which catchments are most likely to be sensitive to increased flood risk as a result of future development.	Planners should use this section to help develop policy recommendations for the cumulative impact of development
12. Strategic flood risk solutions	This section sets out wider strategic solutions that may offer potential to reduce flood risk across the city, including natural flood management. It also details current partnership working opportunities within the city.	Planners should use this section to help develop policy recommendations for strategic flood risk solutions to reduce flood risk across the city. Developers should use this section to consider options for strategic solutions and natural flood management techniques.
13. Recommendations	This section summarises sources of flood risk in the city and outlines planning policy recommendations. It also sets out the next steps.	Developers and planners should use this as a summary of the SFRA. Developers should refer to the Level 1 SFRA recommendations when considering site specific assessments.
Appendix A - Data Sources used in this SFRA	Details the data used to inform the SFRA, including when the data was provided, any associated licensing, and where the data can be obtained from.	Planners and developers should use this appendix to understand what data has been used in the SFRA, whether it has since been updated, and where to access the latest data from.
Appendix B - Sequential Test Guide	Sets out the methodology for the sequential test, including how each source of flood risk should be considered.	Planners should use this appendix to inform the application of the sequential test.
Appendix C - Cumulative Impact Assessment	This section details the methodology for the cumulative impact assessment.	Planners should use this appendix, in conjunction with Section 12, to help develop policy recommendations for the cumulative impact of development.

Section	Contents	How to use
Appendix D - Static Mapping	Provides the flood risk mapping for the SFRA with an accompanying user guide detailing the information shown within the mapping.	Planners and developers should use these maps to identify key areas of flood risk from different sources.

2 Policy and strategy for flood risk management

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

There are different organisations in and around the city area that have responsibilities for flood risk management, known as RMAs. These are listed in Table 2-1 with a summary of their responsibilities.

Further information on the roles and responsibilities of the RMAs is available in Annex A of the National Flood and Coastal Erosion Risk Management Strategy (FCERM) (gov.uk) for England. The Local Government Association (gov.uk) also provide further information on the roles and responsibilities for managing flood risk.

The National flood risk standing advice for local planning authorities (gov.uk) provides advice on when to consult the EA.

Table 2-1: Roles and responsibilities for RMAs.

Risk Management Authority	Strategic Level	Operational Level	Planning role
EA	Strategic overview for all sources of flooding, National Strategy, and general supervision	Main River (e.g., River Derwent) and reservoirs (Flood Risk Activity Permits (FRAPs), enforcement, and works)	Statutory consultee for certain development in Flood Zones 2 and 3 and all works within 20 metres of a main river.
Derby City Council as LLFA	Coordination of Local Flood Risk Management and maintaining a Local Flood Risk Management Strategy (LFRMS)	Surface water, groundwater, and ordinary watercourses (consenting, enforcement, and works)	Statutory consultee for major developments
Severn Trent Water	Asset Management Plans, supported by Periodic Reviews (business cases), develop drainage and wastewater	Public sewers and some reservoirs	Non-statutory consultee

Risk Management Authority	Strategic Level	Operational Level	Planning role
	management plans (DWMPs)		
Highways Authorities - National Highways for motorways and trunk roads and Derby City Council for non-trunk roads	Highway drainage policy and planning	Highway drainage	Statutory consultee regarding highways design standards and adoptions

2.1.1 Riparian ownership

Land and property owners are responsible for the maintenance of watercourses either on or next to their properties, called Riparian Owners. Riparian 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 on the Government website in the EA publication 'Owning a watercourse' (gov.uk).

When it comes to undertaking works to reduce flood risk, the EA, and Derby City Council as LLFA do have permissive powers, but limited resources must be prioritised and targeted to where they can have the greatest effect. Permissive powers mean that RMAs are permitted to undertake works on watercourses but are not obliged.

2.2 Key legislation for flood and water management in the city area

2.2.1 Flood Risk Regulations (2009)

The Flood Risk Regulations (FRRs) 2009 translated the European Union (EU) Floods Directive into UK law setting the requirement for Member States to complete an assessment of flood risk, known in England as a Preliminary Flood Risk Assessment (PFRA). This information was then used to identify areas where there is a significant risk of flooding (Flood Risk Areas), where States had to undertake Flood Risk and Hazard Mapping and produce Flood Risk Management Plans (FRMPs). This cycle was repeated on a six-yearly basis.

As of 1 January 2024, the Retained EU Law (Reform and Revocation) Bill automatically repealed any Retained EU Law (REUL) not otherwise preserved or replaced in UK law before the end of 2023, including the FRRs 2009 which transposed the EU Floods Directive into legislation. This is because much of the FRRs duplicated existing domestic legislation, namely the Flood and Water Management Act 2010.

The Government expects to see continued implementation of the Flood Risk Management Plans 2021-2027, with funding for this still in place over the six-year period. No indicative Flood Risk Areas were identified within the Derby CIty Council's Preliminary Flood Risk Assessment.

2.2.2 Flood and Water Management Act (2010)

The Flood and Water Management Act (2010) (gov.uk) was passed in April 2010 following the recommendations made within the Pitt Review (2009) following the flooding in 2007. It aims to create a simpler and more effective means of managing both flood risk and coastal erosion, establishing the lead role for Local Authorities, 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.

2.2.3 Water Framework Directive (2000)

The European Water Framework Directive (WFD) (2000) was transposed into English Law by the Water Environment Regulations (2017) (gov.uk). The WFD aims to deliver improvements across Europe in the management of water quality and water resources. This is enforced through a series of plans called River Basin Management Plans (RBMPs). The city area falls within the Humber RBMP.

2.2.4 Environmental permitting

The Environmental Permitting Regulations (2018) (gov.uk) 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. This includes flood risk activities, for example:

- On or within 8 metres of a main river.
- On or within 8 metres of a non-tidal flood defence structure or culvert.
- Involving quarrying or excavation within 16 metres of any main river, flood defence (including a remote defence) or culvert; and
- In a floodplain more than 8 metres from the riverbank, culvert or flood defence structure and you don’t already have Planning Permission.

Environmental permits may also be required from the EA to discharge runoff, trade effluent or sewage into a main river. They may also be required in relation to groundwater activities, where there may be a risk of groundwater contamination.

2.2.5 Byelaws

Land Drainage Byelaws outline legal obligations and responsibilities when undertaking works on or close to a watercourse, for the purpose of preventing flooding, or mitigating any damage caused by flooding.

The city area is covered by the Midlands and Severn Trent region flood defence and land drainage byelaws enforced by the EA. These byelaws apply to activities around main rivers, flood defences and floodplains.

2.2.6 Additional legislation

Additional legislation relevant to development and flood risk in the city area include:

- Town and Country Planning Act (1990) (gov.uk), Water Industry Act (1991) (gov.uk), Land Drainage Act (1991) (gov.uk), Environment Act (1995) (gov.uk), which set out the regulations for development on land in England and Wales.
- The Environment Act 2021 (gov.uk) requires developers to provide Biodiversity Net Gain (BNG) and for LPAs to develop Local Nature Recovery Strategies (LNRS). Strategic site allocations in Local Plans which present opportunities for BNG or areas for habitat improvement/creation identified by the LNRS could have parallel opportunities to contribute to reduced flood risk from a range of sources.
- Other environmental legislation such as the Habitats Directive (1992) (gov.uk), Environmental Impact Assessment Directive (2014) (gov.uk), and The Environmental Assessment of Plans and Programmes (Amendment) Regulations 2020 (gov.uk) which apply as appropriate to strategic and site-specific developments to guard against environmental damage.
- The Planning and Compulsory Purchase Act (2004) (gov.uk) Section 19(1A) which requires LPAs to include in their Local Plans 'policies designed to secure that the development and use of land in the local planning authority's area contribute to the mitigation of, and adaptation to, climate change.'

2.3 Key national, regional, and local policy documents and strategies

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 FRAs within the local area.
- Set the strategic policy and direction for flood risk management 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 flood risk management and drainage in the city area.
- Provide guidance and/or standards that inform how a developer should assess flood risk and/or design flood mitigation and SuDS.

The following sections provide further details on some of these documents and strategies.

Please note that the links to these documents may change over time and any requests for these documents should be directed toward the author.

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

Policy level	Document, lead author and date	Contextual information	Policy and measures	Development design requirements	Next update due
National	Flood and Coastal Management Strategy (EA) 2020 (gov.uk)	Yes	Yes	No	2026
National	National Planning Policy Framework updated in December 2024 (gov.uk)	Yes	Yes	Yes	-
National	Planning Practice Guidance (PPG): Flood risk and coastal change (gov.uk) updated in August 2022	Yes	Yes	Yes	-
National	Building Regulations Part H (MHCLG) 2010 (gov.uk)	Yes	No	Yes	-
Regional	Humber Catchment Flood Management Plan (EA) 2010 (gov.uk)	Yes	Yes	No	-
Regional	River Derwent Basin District River Management Plan (EA) 2022 (gov.uk)	Yes	Yes	No	2028
Regional	Humber River Basin District Flood Risk Management Plan (EA) 2022 (gov.uk)	Yes	Yes	No	-
Regional	Severn Trent Water Water Resources Management Plan (Severn Trent Water), 2024	Yes	No	No	-
Regional	Severn Trent Water Drainage and Wastewater management plan (Severn Trent Water) 2022.	Yes	No	No	-
Regional	Climate change guidance for development and flood risk (EA) last updated May 2022 (gov.uk)	Yes	No	Yes	-
Local	Derbyshire County Council Preliminary Flood Risk Assessment (2011)	Yes	No	No	-
Local	Derby City Council Preliminary Flood Risk Assessment Addendum (2017) (gov.uk)	Yes	No	No	-
Local	Derby City Council Local Flood Risk Management	Yes	Yes	No	-

Policy level	Document, lead author and date	Contextual information	Policy and measures	Development design requirements	Next update due
	Strategy, (Derby City Council) 2017				

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

The National Flood and Coastal Erosion Risk Management Strategy for England (gov.uk) provides the overarching framework for future action by all RMAs to tackle flooding and coastal erosion in England. The Strategy looks ahead to 2100 and the actions needed to address the challenge of climate change.

The Strategy has been split into three high level ambitions:

- Climate resilient places.
- Today's growth and infrastructure resilient in tomorrow's climate.
- A nation ready to respond and adapt to flooding and coastal change.

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a Policy Statement for Flood and Coastal Erosion Risk Management (gov.uk).

It can be expected that the implementation of the National Strategy will lead to the publication of new guidance and practice that is focused on resilience and adaptation over the coming years. It will be important to adjust the content of the SFRA so that changes in approach are captured in the delivery of the Local Plan.

2.3.2 Catchment Flood Management Plans

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

There are six pre-defined national policies provided in the CFMP guidance and these are applied to specific locations through the identification of 'Policy Units'. These policies are intended to cover the full range of long-term flood risk management options that can be applied to different locations in the catchment.

The Local Plan area is covered by the River Trent CFMP. The primary policy units for the area are:

- Monitoring and advising areas of little to no flood risk.
- Reduce existing flood risk management action in areas of low to moderate flood risk.
- Areas of low to moderate flood risk will be managed appropriately and consistently reviewed.
- In areas of low, moderate, and high flood risk, further action to keep pace with climate change.
- Further action to reduce flood risk in areas of moderate to high flood risk.
- Actions taken to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits in areas of low to moderate flood risk.

2.3.3 Local Flood Risk Management Strategy

Local Flood Risk Management Strategies (LFRMS) set out how the LLFA will manage local flood risk i.e. surface water runoff, groundwater, and ordinary watercourses, for which they have a responsibility as LLFA and the work that other Risk Management Authorities (RMAs) are doing to manage flood risk across the city area. Derby City Council as LLFA have a published LFRMS, completed in 2017.

2.3.4 Local policy and guidance for SuDS

The 2024 NPPF states that: 'Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal.' (Paragraph 182) and 'development should only be allowed in areas at risk of flooding where… it can be demonstrated that… c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate' (Paragraph 181).

At the time of writing this SFRA, the following documents and policies are relevant to SuDS and surface water in the city area. Hyperlinks are provided to external documents:

- SuDS Manual (C753) (ciria.org), published in 2007 and updated in 2015.
- Defra Non-statutory technical standards for sustainable drainage systems (gov.uk), 2015.
- Defra National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating, and maintaining drainage for surface runoff (gov.uk), 2011.
- Building Regulations Part H (MHCLG) (gov.uk), 2010.

Further information on SuDS requirements and design considerations can be found in Section 9.

2.3.5 Water Cycle Studies

Water Cycle Studies (WCSs) assist local authorities to select and develop growth proposals that minimise impacts on the environment, water quality, water resources, infrastructure, and flood risk and help to identify ways of mitigating such impacts.

A WCS was conducted for the Derby Housing Market Area in 2010 and published in two parts. The WCS was written as a joint study with Amber Valley City and South Derbyshire District Council, and identifies the following:

- Derby is supplied by Severn Trent Water's East Midlands Water Resource Zone which is significantly constrained.
- There is likely to be capacity issues within the wastewater treatment works within the growth period, and capacity issues of the sewerage has also been highlighted as a constraint.
- Water quality has been highlighted as a potential issue due to increased nutrient levels.

- The main sources of flood risk are from the River Derwent and its tributaries, and surface water runoff. As part of the Lower Derwent Strategy, a Blue Corridor vision is recommended to help control flooding through Derby. Additionally surface water flooding from heavy rainfall events is likely affected by urbanisation and limited drainage capacity.

2.3.6 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water in a particular area. They are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning, and future developments. Derby City Council does not have a SWMP.

2.3.7 Water Resources Management Plans (WRMPs)

Under the duties set out in sections 37A to 37D of the Water Industry Act 1991, all water companies across England and Wales must prepare and maintain a WRMP. This must be prepared at least every five years and reviewed annually.

WRMPs should set out how a water company intends to achieve a secure supply of water for their customers and a protected and enhanced environment. Severn Trent Water published their WRMP in April 2025.

2.3.8 Drainage and Wastewater Management Plans (DWMPs)

Water and sewage companies must produce a Drainage and Wastewater Management Plan (DWMP), covering a minimum of 25 years, which looks at current and future capacity, pressures, and risks to their networks such as climate change and population growth. They detail how a company plans to work with RMAs and drainage asset owners to manage future pressures. The water and sewage company for the city area is Severn Trent Water, with their DWMP published in 2022.

2.3.9 Neighbourhood plans

A neighbourhood plan is a document produced by a local community that sets out planning policies for their area and can be used to:

- Protect local green spaces;
- Encourage better designed places;
- Bring forward housing that meets local needs.

Neighbourhood planning groups can use the information in this SFRA to assess the risk of flooding to sites within their community.

Information on neighbourhood planning is available on Derby City Council's website. Within Derby City area, only Chellaston is designated as a neighbourhood for the purposes of preparing a Neighbourhood Plan, although the Chellaston Neighbourhood Planning Forum voted to dissolve in 2020.

3 Sequential and Exception Tests

This section summaries national planning policy for development and flood risk and the application of the sequential and exceptions tests for both planners and developers.

3.1 National Planning Policy Framework and Guidance

The NPPF (December 2024) (gov.uk) sets out the Government's planning policies for England. It must be considered in the preparation of Local Plans and is a material consideration in planning decisions. The NPPF advises on how flood risk should be considered to guide the location of future development and FRA 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” (Paragraph 171).

The Flood Risk and Coastal Change PPG (gov.uk), last updated September 2025, sets out how the policy should be implemented. Diagram 1 in the PPG (Paragraph: 007 Reference ID: 7-007-20220825) sets out how flood risk should be considered in the preparation of Local Plans.

3.2 The Sequential Test

Firstly, land at the lowest risk of flooding 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. As set out in the FRA Standing Advice (gov.uk,) for all other developments, evidence must be supplied to the LPA, with a planning application, that the development has passed the test if any proposed building, access and escape route, land-raising or other vulnerable element will be:

- In Flood Zone 2 or 3;
- In Flood Zone 1 and the SFRA shows it will be at increased risk of flooding during its lifetime; or
- At risk of surface water flooding, unless a site-specific FRA demonstrates that the site can be developed in a manner that ensures residents are safe in the design event without adversely impacting flood risk off site,
- Subject to sources of flooding other than rivers or sea,

The LPA should define a suitable search area for the consideration of alternative sites 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/Employment Land Availability Assessments.

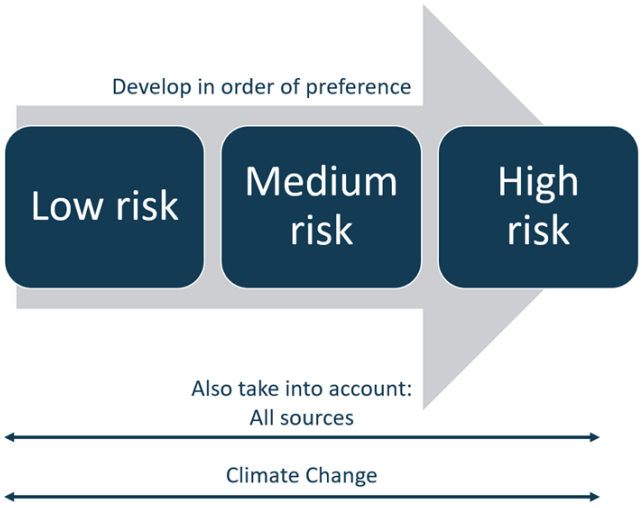
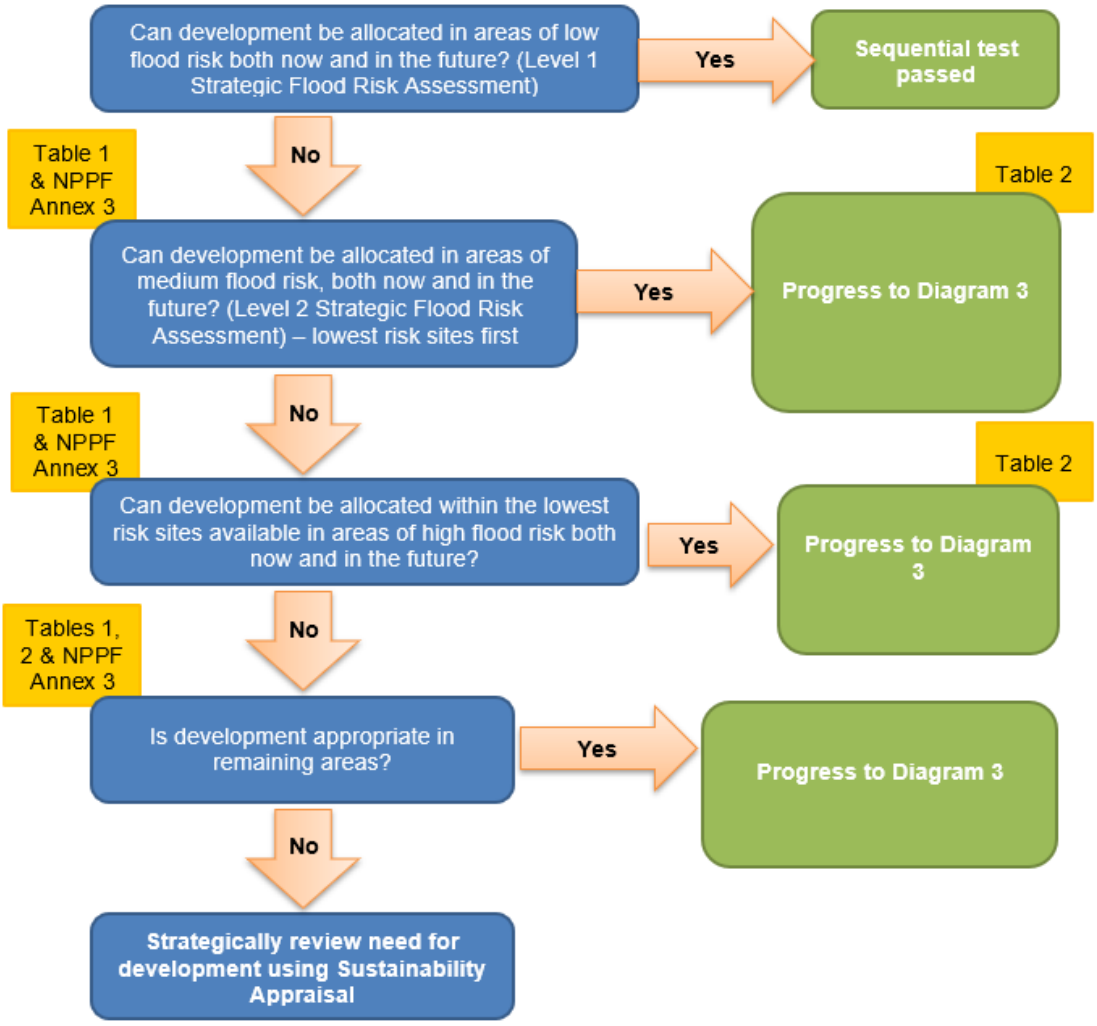


Figure 3-1: The Sequential Test.

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 PPG (gov.uk) (Paragraph: 079 Reference ID: 7-079-20220825) shows whether, having applied the Sequential Test first, the vulnerability of development is not compatible with a particular Flood Zone and where the Exception Test is required to determine the suitability of that vulnerability of development to the Flood Zone.

Figure 3-2 illustrates the Sequential Test as a process flow diagram using the information contained in this SFRA to assess potential development sites against areas of flood risk and development vulnerability compatibilities. This is a stepwise process, but a complex one, as several 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. Appendix B addresses the use of flood risk information in the performance of the Sequential Test.



† Diagram 2 of PPG: Flood Risk and Coastal Change (paragraph 026, Reference ID 7-026-20220825) Revised August 2022.

Figure 3-2: Application of the Sequential Test for plan preparation.

3.2.1 The risk-based approach

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

Since July 2021, the approach has adjusted the requirement for the Sequential Test (as defined in Paragraph 172 of the NPPF) so that all sources of flood risk are to be included in the consideration.

The updated PPG further states in Paragraph 23 of the Flood risk and coastal change guidance: "Other forms of flooding need to be treated consistently with river and tidal flooding in mapping probability and assessing vulnerability, so that the sequential approach can be applied across all areas of flood risk".

The general implications of these are summarised as follows:

- The Sequential Test must be based on mapping that enables decision making according to a prioritisation based on a risk-based sequence (for river and sea flooding national mapping is available that describes low, medium and high-risk Flood Zones but comparable mapping of this specific type and quality is not available for other sources; for river and sea flooding the risk zones are based on the assumption that no flood risk management features are present).
- The other sources of flood risk that can potentially be included in the Sequential Test are surface water, groundwater, sewer flooding and reservoir flooding (or other water impounding features such as canals).
- It follows that proposed new development placed in locations at high or medium risk from flooding from other sources now and in the future (note that the explicit requirement to include climate change in the test, as set out in the August 2022 PPG will require the preparation of additional modelling and mapping or use of proxies) should be accompanied by evidence that the Exception Test can be satisfied (in a Level 2 SFRA).

A basic requirement for the Sequential Test to be performed is that appropriate, competent mapping can be prepared to enable logical comparison of the flood risk from different sources at alternative locations, both now and in the future, as this is fundamental to establishing a logical “risk sequence”.

Appendix B describes the implications of including different sources of flooding both now and in the future in the Sequential Test. It also highlights matters to be considered and identifies a preferred approach.

3.3 The Exception Test

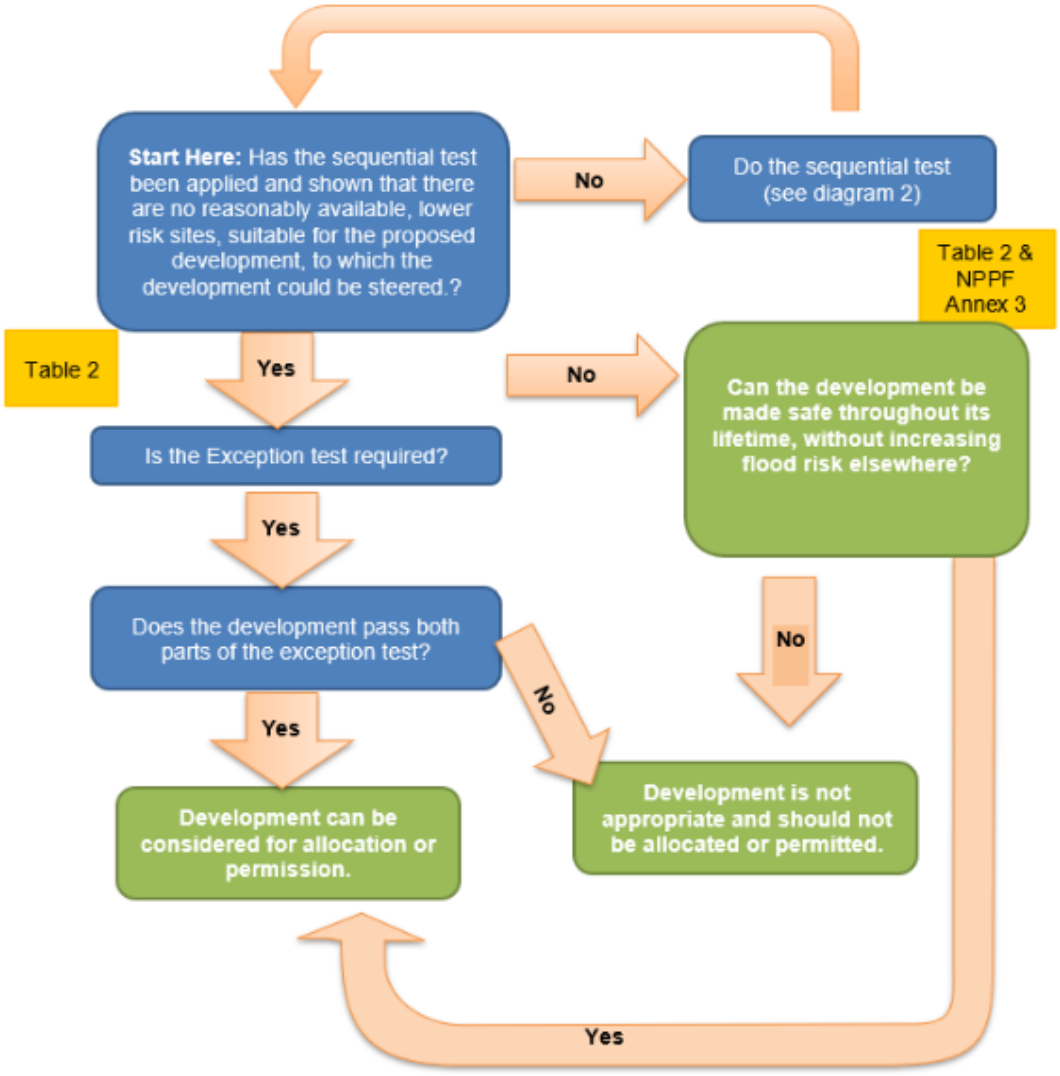
It will not always be possible for all new development to be located on land that is not at risk from flooding. To further inform whether land should be allocated, or planning permission granted, a greater understanding of the scale and nature of the flood risks is required. In these instances, the Exception Test will be required. Diagram 3 of the PPG (gov.uk) (Paragraph: 033 Reference ID: 7-033-20220825) summarises the Exception Test (Figure 3-3).

Table 2 of the PPG (gov.uk) sets out the requirements for the Exception Test but does not reflect the need to avoid flood risk from sources other than rivers and the sea. There is no guidance on how to consider other sources of flood risk. The Exception Test should only be applied, following the application of the Sequential Test, in the following instances:

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

While the Exception Test is not explicitly required for sites at risk from other sources of flooding, the LPA should follow a similar principle where sites are proposed that are at risk from other sources of flooding, carefully weighing up the wider benefits of development against the risk, ensuring that site users can be kept safe through the lifetime of the development and ensuring residual risk can be safely managed.

For sites proposed for allocation within the Local Plan, the LPA should use the information in this SFRA to inform the Exception Test. At the planning application stage, the developer must design the site such that it is appropriately 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.



† Diagram 3 of PPG: Flood Risk and Coastal Change (paragraph 033, Reference ID 7-033-20220825) Revised August 2022.

Figure 3-3: Application of the Exception Test to plan preparation.

There are two parts to demonstrating a development passes the Exception Test that should be considered by the LPA when allocating development sites, and developers when required (see Section 3.4.2 for Exception Test requirements for individual planning applications).

Part A: Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.

The LPA will need to set out the criteria used to assess the Exception Test and provide clear advice to enable applicants to provide evidence to demonstrate that it has been passed. If the application fails to prove this, the LPA should consider whether the use of planning conditions and/or planning obligations could allow it to pass the Exception Test. If this is not possible, this part of the Exception Test has failed, and planning permission should be refused.

Wider sustainability objectives should be considered, such as those set out in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, housing, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.

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

Part B: 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.

In circumstances where the potential effects of proposed development are material a Level 2 SFRA is likely to be needed to inform the Exception Test for strategic allocations to provide evidence that the principle of development can be supported. At the planning application stage, a site-specific FRA will be needed. Both will need to consider the undefended and residual risk and how this will be managed over the lifetime of the development.

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

3.4.1 Applying the Sequential Test

The LPA are responsible for considering the extent to which Sequential Test considerations have been satisfied.

Developers should consult with the LPA in the first instance before commencing on a site-specific FRA to determine the Sequential Test requirements for their site. Developers are required to apply the Sequential Test to all development sites, unless the site is:

- A strategic allocation and the test has already been carried out by the LPA as part of preparing the Local Plan, or
- A change of use (except to a caravan, camping or chalet site, or to a mobile home or park home site), or
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m²), or
- A development in fluvial Flood Zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, groundwater, reservoir, sewer flooding).

It should also be noted that residential sub-divisions are exempted from the definition of minor development and therefore, by default, should also be subject to the Sequential Test.

The SFRA contains information on all sources of flooding and takes 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 geographical scope of the Sequential Test (within which it is appropriate to identify reasonably available alternatives). To determine the appropriate search area criteria, include 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 but is not restricted to:

- Site allocations in Local Plans.
- Sites 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 risk.

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

3.4.2 Applying the Exception Test

Where a development proposal is in accordance with an allocation made in a Local Plan following the application of the sequential and Exception Tests, the Exception Test will only be required to be repeated if:

- Elements of the development that were key to it satisfying the Exception Test at the plan-making stage (such as wider sustainability benefits to the community or measures to reduce flood risk overall) have changed or are not included in the proposed development; or
- The understanding of current or future flood risk has changed significantly.

For developments that have not been allocated in the Local Plan or where the Sequential Test was not applied at the development plan stage and new information becomes available that identifies a flood risk, developers must undertake the sequential and Exception Tests and present this information to the LPA for approval. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should investigate in more detail to inform the Exception Test for windfall sites.

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

4 Understanding flood risk

This section explores what flood risk is, key sources of flooding in the city area, and the factors that affect flooding including topography, soils, and geology.

This is a strategic summary of the risk in the city area to inform the application of the sequential and exceptions tests. Developers should use this section to scope out the flood risk issues they need to consider in greater detail in a site-specific FRA to support a planning application. Information in this section should not be used to inform flood risk at a property-level.

4.1 Defining flood risk

Section 3 (subsection 1) of the Flood and Water Management Act 2010 (FWMA) (gov.uk) defines the risk of a potentially harmful event (such as flooding) as 'a risk in respect of an occurrence is assessed and expressed (as for insurance and scientific purposes) as a combination of the probability of the occurrence with its potential consequences.'
Figure 4-1 sets out this definition of risk.

Figure 4-1: Conceptual model depicting how risk can be defined.

4.1.1 Probability

The probability of flooding is expressed as a percentage based on the average frequency measured or extrapolated from records over many years. A 1% AEP 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 at least once every hundred years.

4.1.2 Consequences

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), the receptors that are present and the vulnerability of these receptors (type of development, nature, e.g., age-structure, of the population, presence, and reliability of mitigation measures etc).

4.1.3 Source-Pathway-Receptor model

Flood risk can be assessed using the Source-Pathway-Receptor model (Figure 4-2) where:

- The source is the origin of the floodwater, principally rainfall.
- A pathway is a route or means by which a receptor can be affected by flooding, which includes rivers, drains, sewers, and overland flow.
- A receptor is something that can be adversely affected by flooding, which includes people, their property, and the environment.

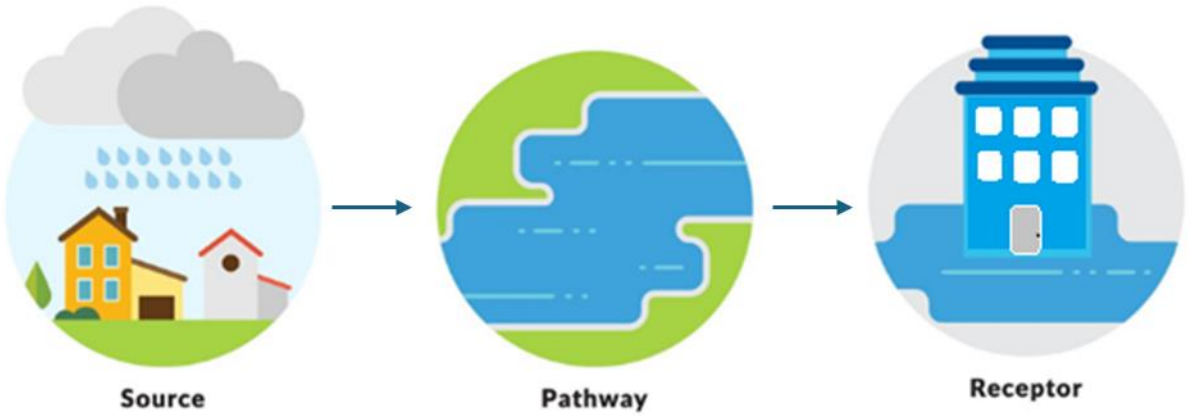


Figure 4-2: Source-Pathway-Receptor model.

This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. All these elements must be present for flood risk to arise. Having applied the Source-Pathway-Receptor model it is possible to mitigate the flood risk by addressing the source (often very difficult), blocking, or altering the pathway, or removing the receptor, e.g., steer development away.

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 to apply this guidance in a consistent manner.

4.2 Topography, geology, and soils

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.

4.2.1 Topography

The National LIDAR Programme (gov.uk) provides elevation data at 1m spatial resolution for all of England. The city area generally slopes to the south-east, with the topography in the northern and north-western areas sloping to follow the watercourse catchments. Maximum elevations are 137.6m AOD in the northern section of the city area, and a minimum elevation of 36.7m AOD in the eastern section of the city area.

Lower lying areas tend to follow flow routes of watercourses that predominantly form tributaries to the River Derwent, with main rivers such as the River Derwent, shown within the LiDAR. The topography of the district is shown within Figure 4-3.

4.2.2 Geology

The geology of the catchment can be an important influencing factor as to how water runs off the grounds surface due to variations within the permeability of the rock and the bedrock stratigraphy. The underlying bedrock is predominantly mudstone with areas of sandstone and is formed of the following formations:

- Arden Sandstone Formation
- Branscombe Mudstone Formation
- Chester Formation
- Cotgrave Sandstone Member
- Edwalton Member - mudstone and siltstone
- Gunthorpe Member
- Morridge Formation - mudstone, siltstone, and sandstone
- Tarporley Siltstone Formation - mudstone, siltstone, and sandstone

Superficial deposits across the city are varied and consists of:

- Sand and gravel from the Allenton terrace deposits, Barrowash sand and gravel, and glaciofluvial deposits
- Diamicton from head, till, the Oadby member, and the Thrussington member
- Clay, silt, sand and gravel combinations from alluvium, lacustrine deposits, glaciolacustrine deposits, Findern clay, and the Hemington member.

The majority of the bedrock is mudstone with varied superficial deposits that are predominantly sand and gravel, and while there is likely some variability in the localised permeability, the overall city area can be considered to be less permeable.

A map detailing the extents of this bedrock and further superficial geology across the city area can be viewed online in the British Geology Society Geology Viewer (bgs.ac.uk), and the bedrock and superficial geologies are shown within Figure 4-4 and Figure 4-5 respectively at a 625k scale.

The EA also provides mapping of different types of aquifers, the underground layers of water-bearing permeable rock from which groundwater can be extracted. Aquifers are designated as either principal or secondary aquifers. Principal aquifers are designated by the EA as strategically important rock units that have high permeability and water storage capacity.

Using the Magic Map online service, the city area is covered by Secondary A and B, and undifferentiated Secondary bedrock aquifers, and Secondary A and B, and undifferentiated Secondary superficial aquifers.

4.2.3 Soils

Using the Cranfield LandIS Soilscapes, the district is predominantly underlain by slightly acidic loamy and clayey soils with impeded drainage. Other soils present are:

- freely draining slightly acidic loamy soils,
- loamy and clayey floodplain soils with naturally high groundwater,
- freely draining floodplain soils,
- freely draining slightly acidic sandy soils,
- slowly permeable seasonally wet slightly acidic but base rich loamy and clayey soils, and
- slowly permeable seasonally wet acidic loamy and clayey soils.

As there is variability in the drainage of the soils, infiltration testing should be conducted to determine the suitability of infiltration techniques and options.

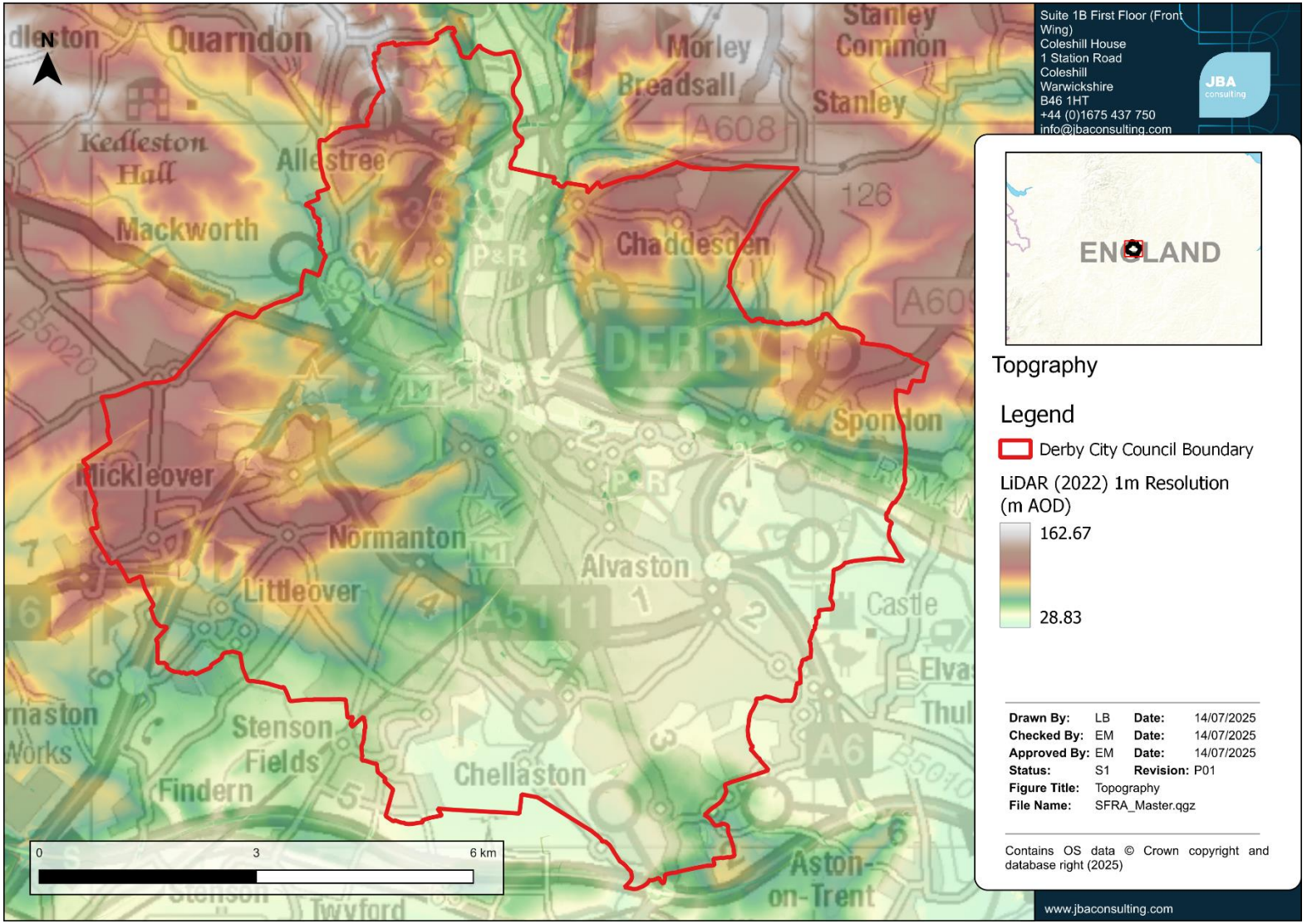


Figure 4-3: EA 1m LiDAR data showing the topography across the city area.

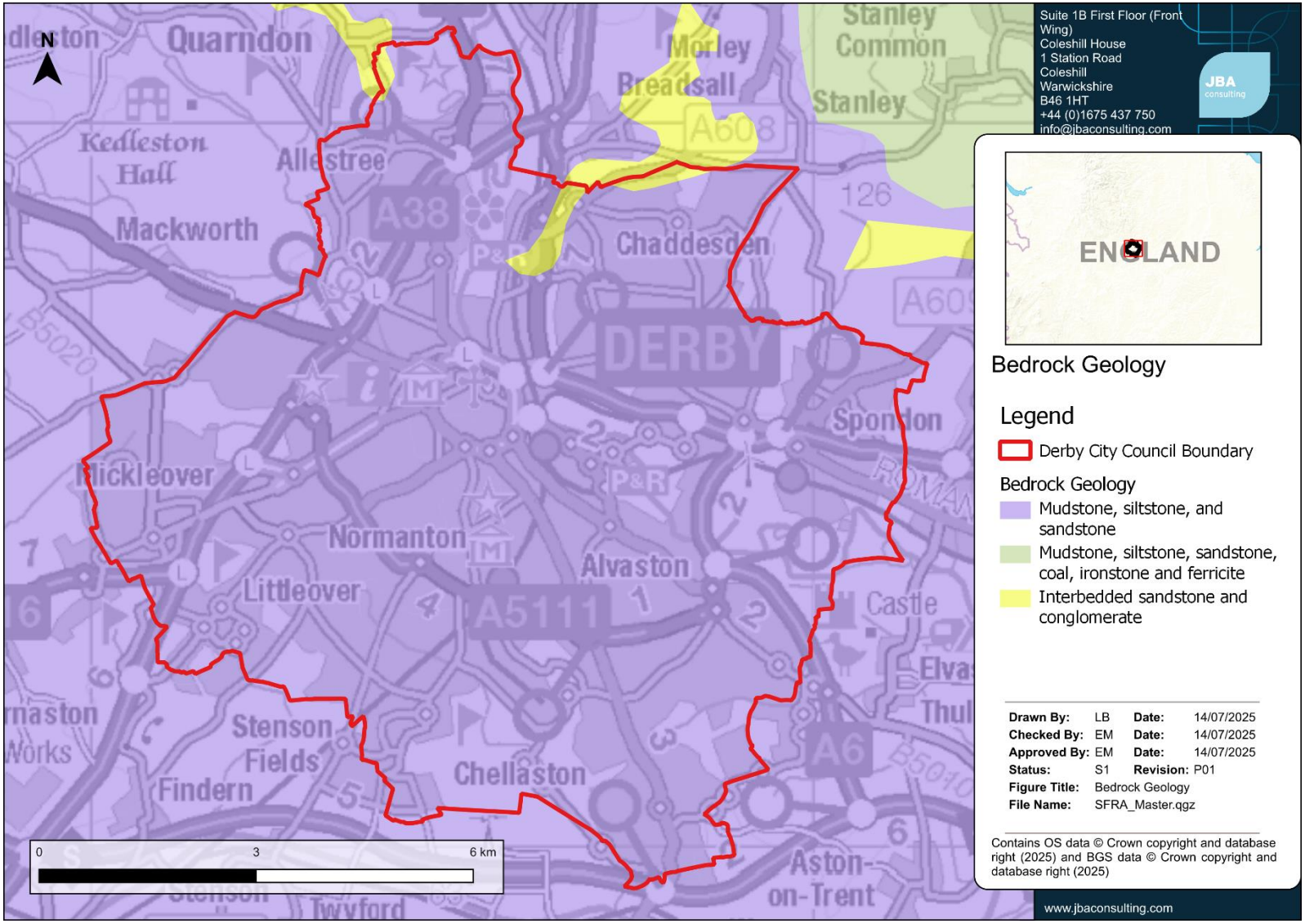


Figure 4-4: Bedrock geology across the city area.

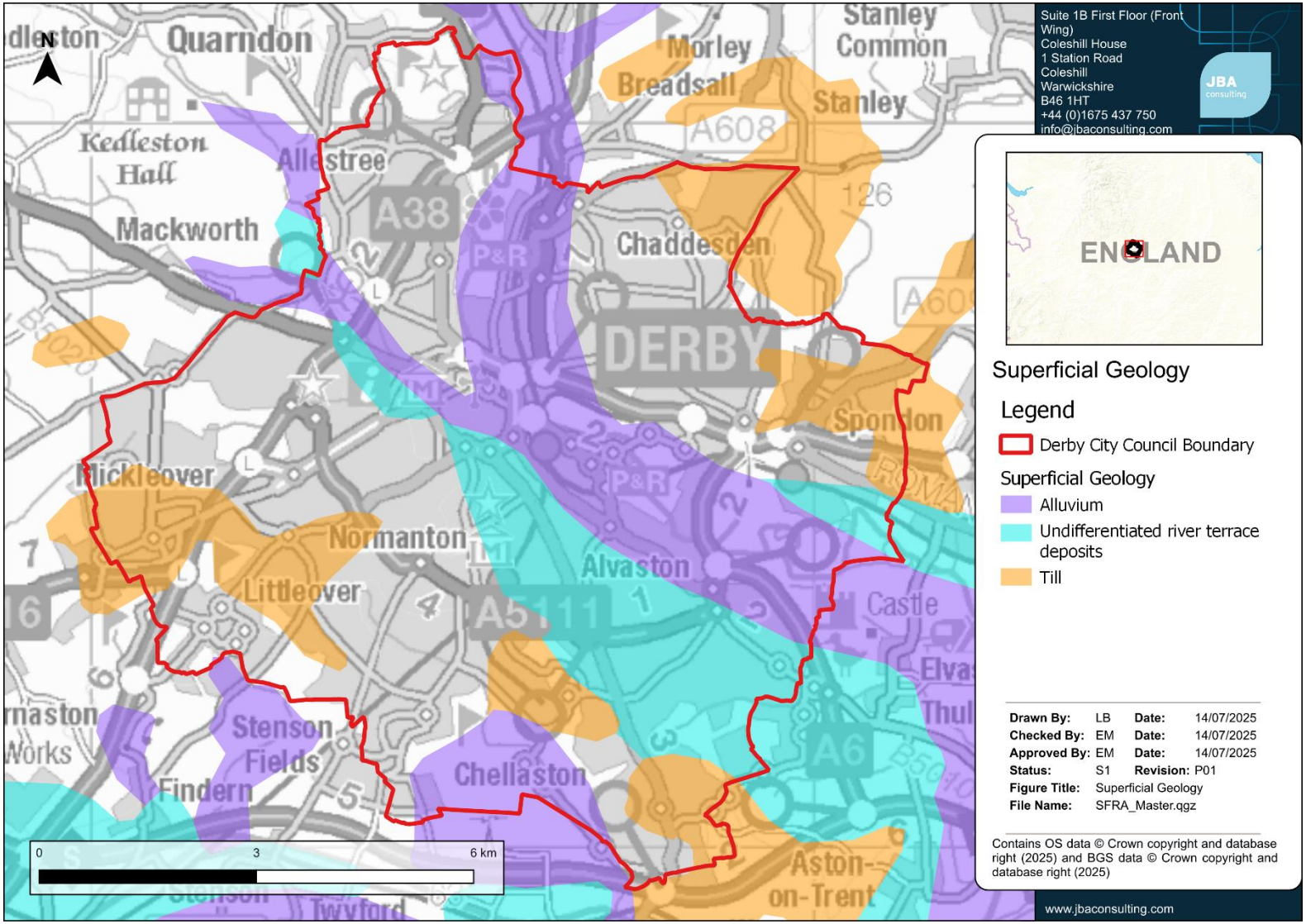


Figure 4-5: Superficial geologic across the city area.

4.3 Historical flooding

Derby City Council is the LPA and LLFA for Derby City, and as such hold reports relating to Section 19 flood investigations carried out through the city area. It should be noted that not all flood events are reported, and records may not indicate the comparative severity of events.

There is a long history of flooding along the River Derwent through Derby, with several notable events in recent years (November 2019, January 2021, February 2022, and October 2023, with these being the third, seventh, second, and first highest river level readings on record at the St Mary's gauge in the city centre.

There are five Section 19 reports that cover events that occurred on 6th July 2012, three reports for the same event on 19th July 2014, and on 8th November 2019. The 2012 report states that prolonged rainfall events saturated the ground and led to an increase in surface runoff as well as elevated water levels within the Mackworth and Markeaton Brooks. Both of these exacerbated high groundwater levels in the area, as such surface water and fluvial flooding occurred, affecting Markeaton. Additionally, there is a Section 19 report by Derbyshire County Council for the Storm Babet event in 2023 that covers the River Derwent catchment that includes the city of Derby.

The three events from 2014 affect Spondon and Oakwood, within the two reports related to areas in Spondon, surface water flooding caused internal flooding of properties and highway damage after intense rainfall, with a gauge at Drayton recording 54.2mm of rainfall with 17.2mm falling in 15 minutes. In Oakwood, for the same event, there was internal flooding of properties and highway damage from surface water flooding.

The report for the 2019 event, there was prolonged rainfall which saturated the ground and elevated watercourse levels. After an intense rainfall event (100-125mm), fluvial flooding of the River Derwent and surface water flooding within various areas of Derby caused internal flooding, damage to highways and caused the failure of vital infrastructure.

The EA's recorded flood outlines show that the following flood events occurred within the city area:

- 2000 - River Derwent
- 1977 - Cuttle Brook, Hell Brook, Lower Trent, Bottle Brook
- 1965 - River Derwent, Lower Trent
- 1960 - River Derwent
- 1947 - River Derwent
- 1932 - River Derwent, Markeaton Brook
- 1931 - River Derwent

The Chronology of British Hydrology Events hold historical records of flooding within Derby spanning from 1610 to 1932, most often noting flooding from the River Derwent and Markeaton Brook.

It is also noted that Storm Babet caused widespread fluvial and surface water flooding across the city area in October 2023, with record river levels, failed drainage, failure of flood defences, and buildings were flooded.

4.4 Fluvial flood risk

4.4.1 Flood Zones

Fluvial flood risk across the city area is assessed based on Flood Zones. The definition of the Flood Zones is provided below. The Flood Zones do not consider defences, except when considering the functional floodplain. 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 are:

- Flood Zone 1: Low risk: less than a 0.1% chance of river flooding in any given year.
- Flood Zone 2: Medium risk: between a 1% and 0.1% chance of river flooding in any given year.
- Flood Zone 3a: High risk: between a 3.3% and 1% chance of river flooding in any given year.
- Flood Zone 3b: Functional Floodplain: land where water has to flow or be stored in times of flood (greater than a 3.3% chance of river flooding in any given year). 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. Annex 3 of the NPPF (gov.uk) provides information on flood risk vulnerability.

Important note on Flood Zone information in this SFRA

The Flood Zone maps for the city area are provided in Appendix D: Static mapping.

These have been derived from the EA's Flood Map for Planning (FMfP) (gov.uk) and detailed hydraulic modelling received from the EA. The models provided are as follows:

- Bottle Brook ISIS-TUFLOW (Black and Veatch 2012 and EA CC update 2021)
- Chaddesden Brook Derby Tributaries ESTRY-TUFLOW (JBA Consulting 2013 and EA CC update 2020)
- Cuttle Brook ISIS (JBA Consulting 2006)
- Derby Our City Our River Flood Modeller-TUFLOW (Binnies 2023)
- Derbyshire Trent Flood Modeller-TUFLOW (EA 2021)
- Ecclesbourne and Derwent ISIS-TUFLOW (JBA Consulting 2014 and EA CC update 2017)
- Hell Brook HEC-RAS (JBA Consulting 2006)

- Markeaton Brook ESTRY-TUFLOW (JBA Consulting 2013 and EA CC update 2020)

It should also be noted that the EA have commissioned an update to the River Derwent model which is likely to be published in the winter of 2025. Additionally, both 2006 models are likely to be outdated, and have been updated, and climate change scenarios have since been updated in 2022. Models where climate change updates have occurred have been run for the are C120, C130 and C150, while C120 and C130 are close to current values (29% and 39% respectively), C150 is not with a current allowance of 62% and the higher climate change allowance is likely needed to be adjusted for.

Flood Zones 2 and 3a within this SFRA show the same extent as the online EA's Flood Map for Planning (FMfP) (which incorporates latest modelled data).

The EA Flood Zones do not cover all catchments or ordinary watercourses with areas <3km². As a result, whilst the EA Flood Zones may show an area is in Flood Zone 1, there may be a flood risk from a smaller watercourse(s) not shown in the Flood Zones.

Flood defences should be considered when delineating the functional floodplain.

Flood Zone 3b is defined as the 3.3% AEP event and as such mapped extents of that event should be used to inform the location and extents of Flood Zone 3b. 3.3% AEP extents are available within the Derby OCOR and Derbyshire Trent models.

For areas outside of the detailed model coverage, Flood Zone 3a has been used as a conservative proxy for Flood Zone 3b. Further work should be undertaken as part of a detailed site-specific FRA to define and refine the extent of Flood Zone 3b where no detailed modelling exists. Caution should also be applied where the conservative Flood Zone 3b extent encompasses existing urban areas which would not otherwise be "designed to flood".

4.4.2 Fluvial flood risk across the city area

The River Derwent poses the largest fluvial flood risk to the city, predominantly affecting the city centre, Alvaston, Chaddesden, and Spondon. Darley Abbey Mills is located close to the River Derwent and is at significant risk, and its main access route (Haslams Lane) is cut off during low return period flooding.

There are smaller watercourses that form tributaries to the River Derwent that also pose fluvial flood risk, these are:

- Markeaton Brook affecting Markeaton,
- Lees Brook in Chaddesden,
- Main Drain and Cuttle Brook in Sinfin,
- and other unnamed ordinary watercourses in Alvaston, Boulton, Littleover, and Normanton.

Other areas indicated to be at risk include Chellaston, Boulton, and New Zealand. The impacts of climate change on fluvial flooding are discussed in Section 5.2.

4.5 Surface water flood risk

Surface water runoff 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 EA's Risk of Flooding from Surface Water mapping (RoFSW) (gov.uk) has been used to assess surface water risk within this SFRA. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the EA, and any potential developers to focus their management of surface water flood risk.

The RoFSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water. The RoFSW should not be used to understand flood risk for individual properties but is suitable for high level assessments such as SFRAs for local authorities.

4.5.1 Surface water flood risk across the city area

The EA RoFSW highlights several communities in the city area at risk from surface water flooding particularly in the highly urbanised areas of the city. Areas most affected are Derby City Centre, Alvaston, Allestree, Chellaston, Darley Abbey, Normanton, Oakwood, Littleover, Markeaton, Spondon, and Mickleover. Surface water flow paths generally follow the topography of existing watercourses, although there are some areas at risk from isolated ponding. Additionally, surface water flow routes are also established on roads in the more urban areas within the city area highlighting risk to transport networks while posing a risk to buildings which water can be routed to.

The RoFSW mapping for the city area can be found in Appendix D: Static mapping.

The impacts of climate change on surface water flooding are discussed in Section 5.3.

4.6 Sewer flood risk

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 3.3% AEP rainfall event, although until recently this did not apply to smaller private systems. This means that sewers can be overwhelmed in larger rainfall and flood events.

New developments should not cause additional pressures on existing sewers due to the requirements to maintain greenfield runoff rates. However, increases in rainfall as a result of climate change can lead to existing sewers becoming overloaded, although this can be reduced through the use of well-designed SuDS to reduce surface water runoff.

Severn Trent Water is the water company responsible for the management of the sewerage networks across the city area, and provided sewer records from 1999 to the start of 2025. The records show that throughout the time frame, there have been 197 recorded events with flooding affecting highways, curtilage and internal properties. Locations that have experienced the most incidents of sewer flooding are within:

- DE21 - with 75 recorded incidents;
- DE22 - with 100 recorded incidents; and
- DE24 - with 42 recorded incidents.

4.7 Groundwater flood risk

In general, less is known about groundwater flooding than other sources of flooding and availability of data is limited. 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.
- Perched aquifers underlain by impermeable geology, particularly in low lying areas.

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.

The JBA Groundwater Emergence map shows the likelihood of groundwater emergence posing a risk to both surface and subsurface assets, based on predicted groundwater levels during a 1% AEP event. This divides groundwater emergence into five categories (Table 4-1).

Table 4-1: JBA Groundwater Emergence Map category descriptions.

Category	Potential risk
Groundwater levels are either at or very near (within 0.025m of) the ground surface.	Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.

Category	Potential risk
Groundwater levels are between 0.025m and 0.5m below the ground surface.	Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
Groundwater levels are between 0.5m and 5m below the ground surface.	There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
Groundwater levels are at least 5m below the ground surface.	Flooding from groundwater is not likely.
No risk.	This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

It should be noted that this dataset only identifies areas likely to be at risk of groundwater emergence and does not allow prediction of the likelihood of groundwater flooding or quantification of the volumes of groundwater that might be expected to emerge in a given area.

This JBA Groundwater Emergence map is shown in Appendix D: Static mapping.

Areas most at risk include: Markeaton and New Zealand associated with the Markeaton Brook, Alvaston, Boulton, Crewton, and Wilmorton. The city centre has varied groundwater risk, withs small areas identified to be at high risk. In high-risk areas, a site-specific risk assessment for groundwater flooding, including ground investigations, may be required to fully inform the likelihood of flooding.

4.8 Residual risk

Residual risk comes in two main forms (PPG: Flood Risk and Coastal Change Paragraph: 041):

- Residual risk from flood risk management infrastructure.
- Residual risk to a development once any site-specific flood mitigation measures are taken into account.

Examples of residual flood risk from flood risk management infrastructure include:

- A breach of a raised flood defence, blockage of a surface water conveyance system or failure of a pumped drainage system;
- Failure of a reservoir; and
- A flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot accommodate.

This SFRA does not assess the probability of failure. However, in accordance with the 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. 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.

Examples of residual flood risk to a development include:

- The depth of internal flooding predicted after any raising of land or floor levels;
- The flood hazard to which people would be exposed on access or escape routes after they have been raised; and
- A failure of flood forecasting or flood warning and the risks associated with people not receiving warnings or acting upon them.

4.8.1 Reservoir flood risk

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975 (gov.uk) and are on a register held by the EA. 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.

Reservoirs have a designated "risk category" set by the potential damage and loss of life in circumstances where there is a breach or an extreme flood event. Reservoirs designated as high risk are subject to increased inspection and maintenance requirements. However, this designation does not mean they are at a high risk of flooding. Allocation of new development downstream of an existing reservoir could potentially change the risk category and result in a legal requirement to improve the structural and hydraulic capacity of the dam. As the cost of implementing such works can be substantial, consideration should be given to whether it would be more appropriate to place development in alternative locations not associated with such risk.

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 EA hold mapping showing what might happen if reservoirs fail. Developers and planners should check the Long-Term Risk of Flooding (gov.uk) before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping.

The EA provide two flooding scenarios for the reservoir flood maps: a ‘dry-day’ and a ‘wet-day’. The ‘dry day’ scenario shows the predicted flooding which would occur if the dam or reservoir fails when rivers are at normal levels. The ‘wet day’ scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood. It should be noted that these datasets give no indication of the likelihood or probability of reservoir flooding. The EA maps represent a credible worst-case scenario. In these circumstances it is the time to inundation, the depth of inundation, the duration of flooding and the velocity of flood flows that will be most influential.

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

The current mapping shows that there are two reservoirs located within the city area. Markeaton Reservoir (Mill Pond) and Allestree Park Lake, and a further 12 reservoirs located outside the city area which could pose a risk within the city area (detailed in Table 4-2). The reservoir locations are shown in Figure 4-6. The reservoir flood mapping is shown in Appendix D: Static mapping.

In addition to the risk of inundation, those considering development in areas affected by breach events should also assess the potential hydraulic forces imposed by the rapid flood event and check that that the proposed infrastructure fabric can withstand the loads imposed on the structures by a breach event.

Table 4-2: Reservoirs with flood extents that impact the city area.

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact city area in 'dry day' scenario?
Allestree Park Lake	SK3400040300	Derby City Council	High	Derbyshire	Yes
Carsington	SK2480051400	Severn Trent Water	High	Derbyshire	No
Drum Hill Reservoir	SK3732042020	Severn Trent Water	High	Derbyshire	Yes
Derwent (in cascade with the Howden reservoir)	SK1717590736	Severn Trent Water	High	Derbyshire	No
Howden	SK1703592952	Severn Trent Water	High	Derbyshire	No
Kedleston Park Lake No.1	SK3210040200	The National Trust	High	Derbyshire	Yes
Kedleston Park Lake No.2	SK3160040400	The National Trust	High	Derbyshire	Yes
Ladybower	SK2000085500	Severn Trent Water	High	Derbyshire	Yes
Locko Park Lake	SK4066238035	Locko Park Estates	High	Derbyshire	Yes
Markeaton Reservoir (Mill Pond)	SK3395226973	Derby City Council	High	Derbyshire	Yes
Ogston	SK3780059900	Severn Trent Water	High	Derbyshire	Yes

Reservoir	Easting and Northing	Reservoir owner	Risk Category	Local Authority	Does reservoir impact city area in 'dry day' scenario?
Tittesworth	SJ9930058700	Severn Trent Water	High	Derbyshire	No

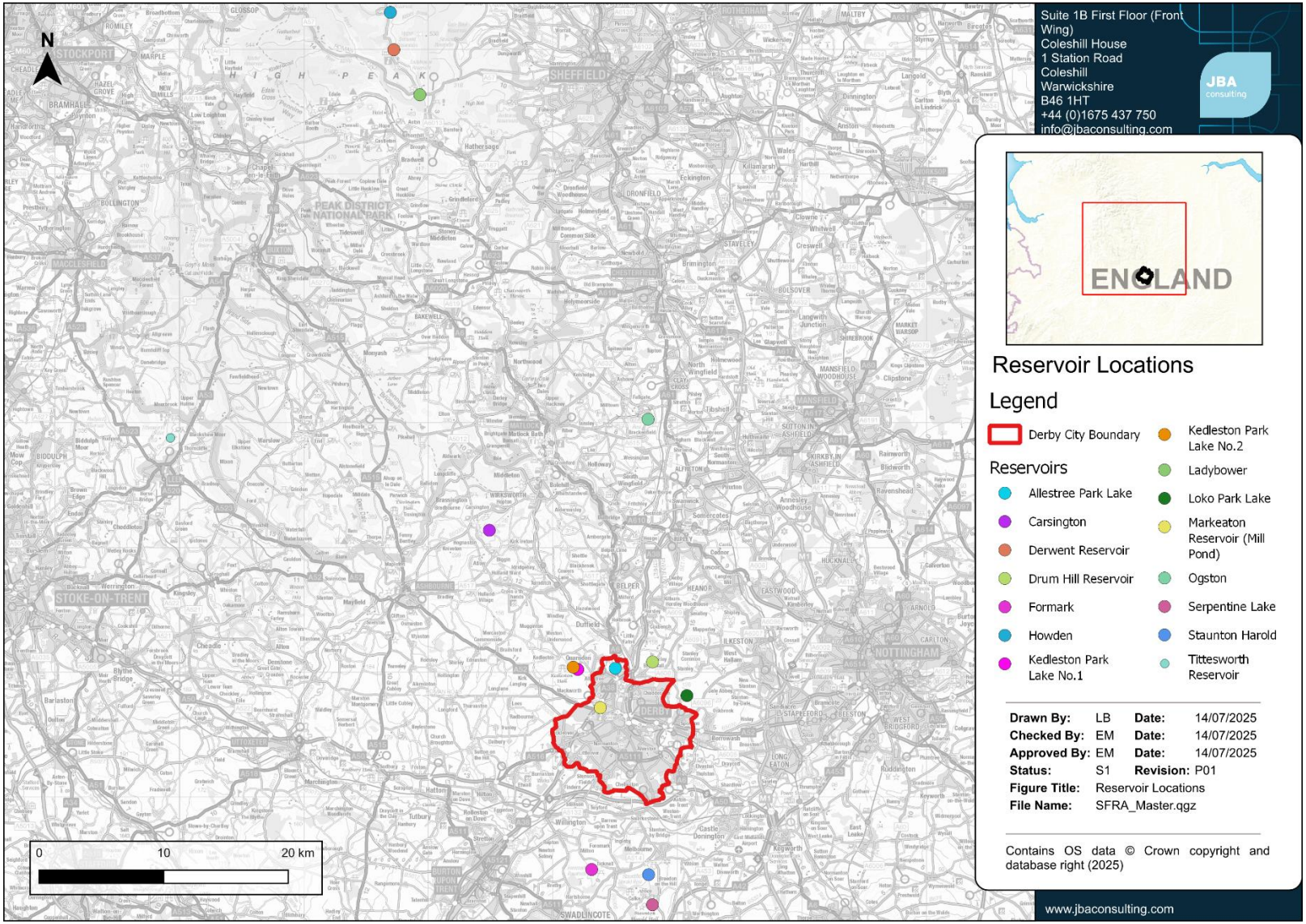


Figure 4-6: Reservoirs with flood extents that impact the city area.

4.9 Combined sources of flood risk

Within Derby City, there are areas which are sensitive to the combined flood risk from fluvial and surface water sources, increasing the overall flood risk to the area. Areas that are noted to be at residual risk from reservoir inundation in the 'Dry' and 'Wet' day scenarios have been included. Areas that are most likely to encounter combined flood risk are:

- Alvaston - is at combined flood risk from fluvial flooding from the River Derwent and surface water flooding, with fluvial flood events being the more severe. It is also at risk of inundation from reservoir breaches during the 'Dry' and 'Wet' day scenarios;
- Chaddesden - is at combined flood risk from fluvial flooding from the River Derwent and surface water flooding. It is also at risk of inundation from reservoir breaches during the 'Dry' and 'Wet' day scenarios;
- Chellaston - is at combined flood risk from fluvial flooding from the Main Drain and Cuttle Brook and surface water flooding, with surface water events being more severe. It is also at risk of inundation from reservoir breaches during the 'Wet' day scenarios;
- Derby City Centre - is at combined flood risk from fluvial flooding from the River Derwent and surface water flooding, with fluvial flood events being the more severe. It is also at risk of inundation from reservoir breaches during the 'Dry' and 'Wet' day scenarios;
- Little Chester - is at combined flood risk from fluvial flooding from the River Derwent and surface water flooding, with fluvial flood events being the more severe;
- Markeaton - is at combined flood risk from fluvial flooding from the Markeaton and Mackworth Brook and surface water flooding, with surface water events being more severe. It is also at risk of inundation from reservoir breaches during the 'Dry' and 'Wet' day scenarios;
- Sinfin - is at combined flood risk from fluvial flooding from the Main Drain and Cuttle Brook and surface water flooding, with fluvial flood events being the more severe. It is also at risk of inundation from reservoir breaches during the 'Wet' day scenarios;
- Spondon - is at combined flood risk from fluvial flooding from the River Derwent and surface water flooding, with surface water events being more severe. It is also at risk of inundation from reservoir breaches during the 'Wet' day scenarios.

As the city area is urbanised, there is an increased impermeable surface area, and as such there is likely to be increased surface run off and risk of surface water. There is also the potential surcharging of sewers with the increased surface water flood risk.

5 Impact of climate change

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.

5.1 Climate change guidance

The Climate Change Act 2008 (legislation.gov.uk) 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. This was updated in June 2019 under the Climate Change Act 2008 (2050 Target Amendment) Order (legislation.gov.uk) to a 100% reduction (or net zero) by 2050.

In 2018, the Met Office published new UK Climate Projections (UKCP18) (gov.uk). The EA used these projections to update their guidance on climate change allowances for new developments for river flow (July 2021) and rainfall intensity (May 2022). This includes information on how these allowances should be included in both SFRAs and FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The management catchments for the city area are shown in Figure 5-1

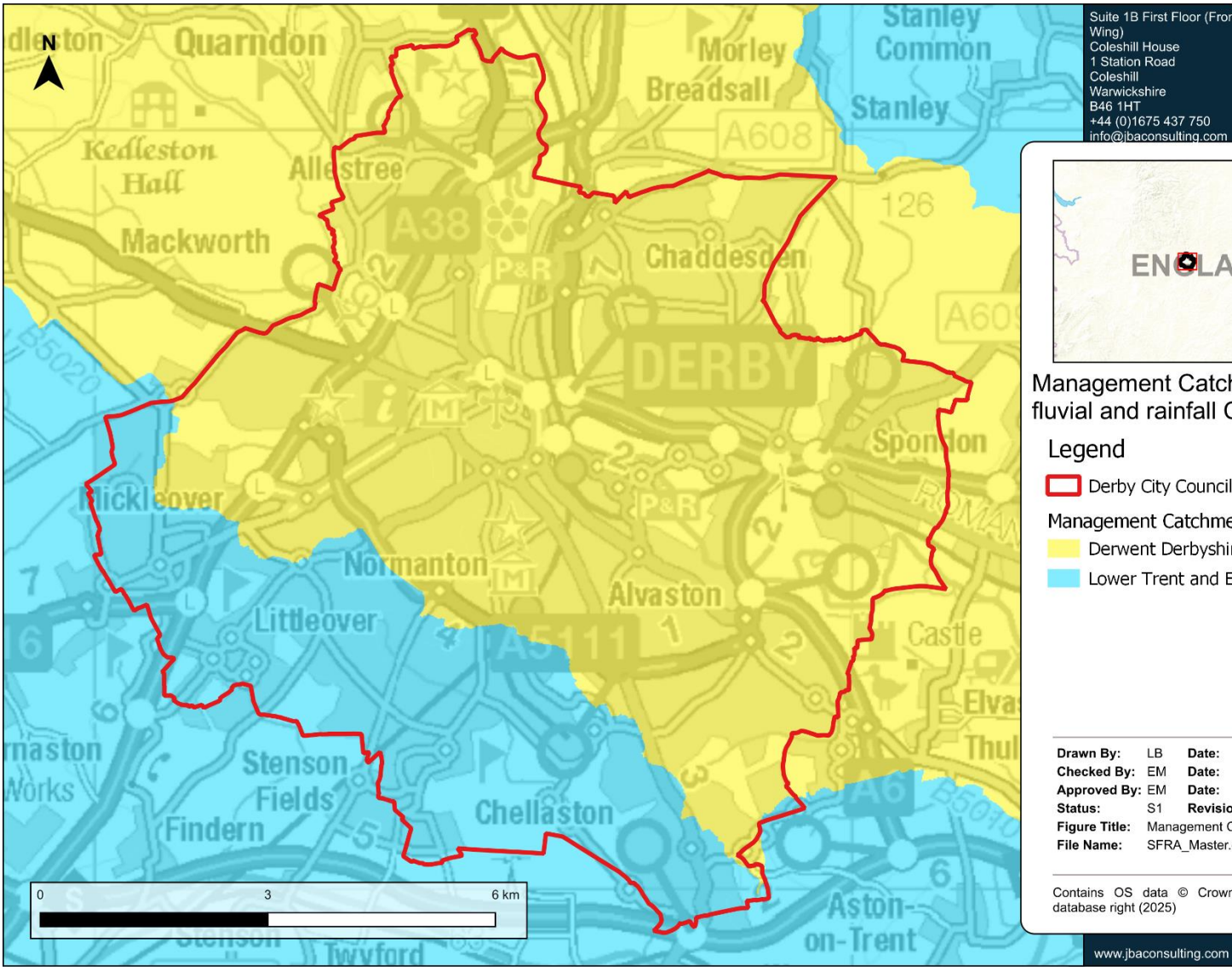


Figure 5-1.

Developers should check Flood risk assessments: climate change allowances (gov.uk) for the most recent guidance before undertaking a detailed FRA.

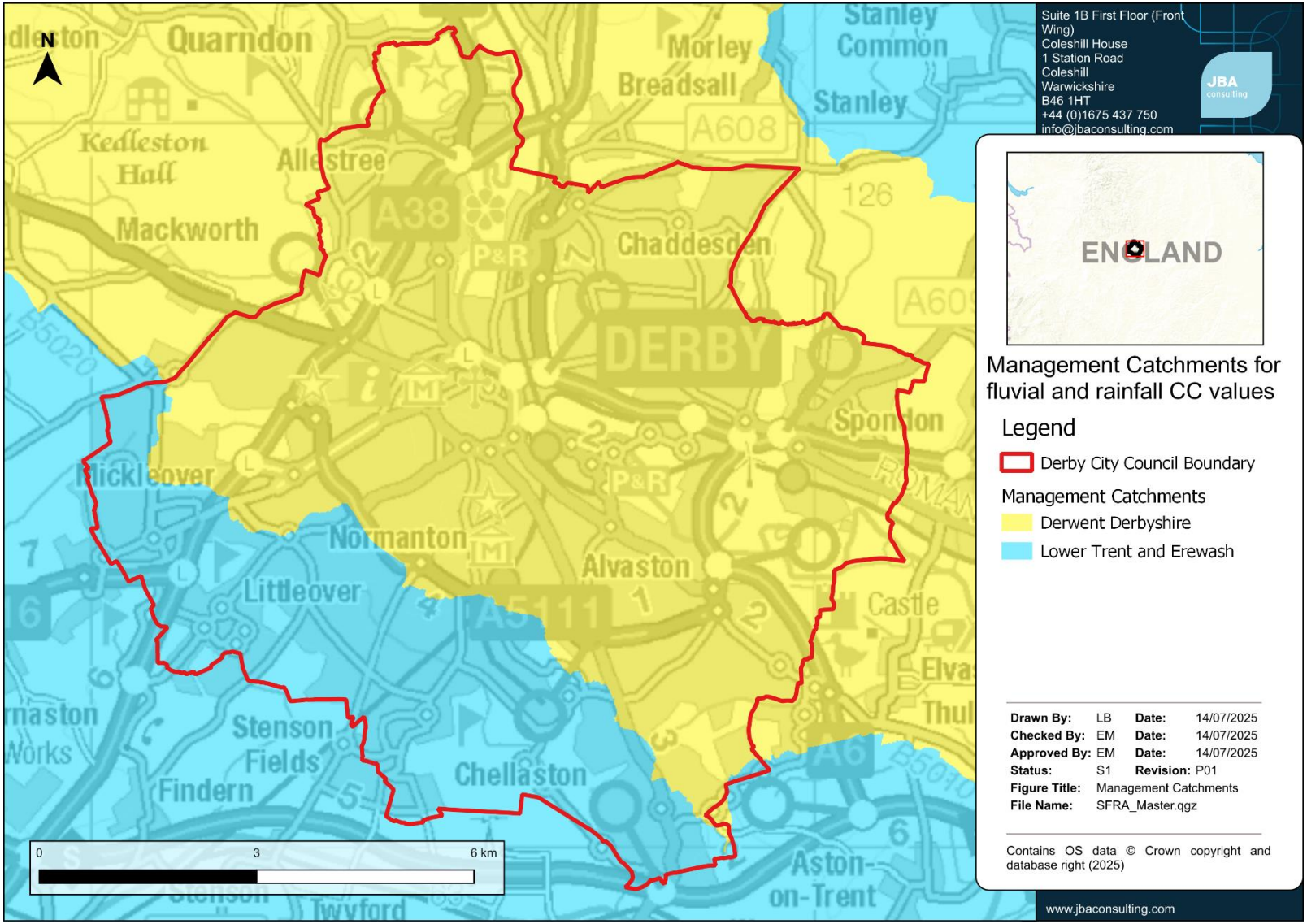


Figure 5-1: Management Catchments (assigned by the EA) across the city area.

5.2 Peak river flows

Climate change is expected to increase the frequency, extent and impact of flooding, reflected in peak river flows. Wetter winters and more intense rainfall may increase fluvial flooding and surface water runoff and there may be increased storm intensity in summer. Rising river levels may also increase flood risk.

The peak river flow allowances (gov.uk) provided in the guidance show the anticipated changes to peak flow for the management catchment within which the subject watercourse is located. The range of allowances are based on percentiles which describe the proportion of possible scenarios that fall below an allowance level:

- The central allowance is based on the 50th percentile (exceeded by 50% of the projections in the range).
- The higher central allowance is based on the 70th percentile (exceeded by 30% of the projections in the range).
- The upper end allowance is based on the 95th percentile (exceeded by 5% of the projections in the range).

These allowances (increases) are provided in the form of figures for the total potential change anticipated, for three climate change periods:

- The '2020s' (2015 to 2039).
- The '2050s' (2040 to 2069).
- The '2080s' (2070 to 2125).

The time period used in the assessment depends upon the expected lifetime of the proposed development. Residential development should be considered for a minimum of 100 years, whilst the lifetime of a non-residential development depends upon the characteristics of that development but a period of at least 75 years is likely to form a starting point for assessment. Further information on what is considered to be the lifetime of development is provided in the PPG (gov.uk).

5.2.1 Peak river flow allowances

The majority of the city area is within the Derwent Derbyshire Management Catchment for peak river flow allowances, with the south-eastern area of the city located in the Lower Trent and Erewash Management Catchment. Table 5-1 displays the peak river flow allowances that apply to the city area.

Table 5-1: Peak river flow allowances for the Derwent Derbyshire Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	29%	38%	63%
Higher Central	18%	23%	39%

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Central	13%	17%	29%

Table 5-2: Peak river flow allowances for the Lower Trent and Erewash Management Catchment.

Allowance category	Total potential change (%) anticipated for '2020s' (2015 to 2039)	Total potential change (%) anticipated for '2050s' (2040 to 2069)	Total potential change (%) anticipated for '2080s' (2070 to 2125)
Upper end	29%	38%	62%
Higher Central	18%	23%	39%
Central	13%	39%	29%

Which peak river flow allowance to use?

The EA guidance states that both the central and higher central allowances should be assessed in SFRAs.

The Flood Zone and flood risk vulnerability classification (gov.uk) should be considered when deciding which allowances apply to the development or the plan. Specific guidance for which climate change allowance estimates should be applied can be found in the EA climate change guidance (gov.uk).

5.2.2 Representation of fluvial climate change within the Level 1 SFRA

Fluvial climate change has been included in the Bottle Brook, Chaddesden Brook, Derby Our City Our River (OCOR), Derbyshire Trent, Ecclesbourne and Derwent, and Markeaton Brook modelling. At the time of writing, the Environment Agency is undertaking new modelling for the River Derwent which is expected to be available in Spring 2026. Developers should contact the Environment Agency to ensure the latest modelling is considered in their assessments. Where climate change uplifts have not been modelled it is recommended to use the 0.1% AEP event (Flood Zone 2) as a proxy for climate change events. Site-specific FRA's may need to undertake their own climate change modelling where the latest allowances are not available.

5.3 Peak rainfall intensities

Climate change is predicted to result in wetter winters and increased summer storm intensity in the future. This increased rainfall intensity will affect land and urban drainage systems, resulting in surface water flooding, due to the increased volume of water entering

the systems. The EA have developed a peak rainfall allowances map (gov.uk) which shows anticipated changes in peak rainfall intensity which can be used for site-scale applications (like urban drainage design) and surface water flood mapping in small catchments (<5km^2).

The guidance suggests that direct rainfall modelling may not be suited to larger (>5km^2) catchments with rural land use. In these instances, the guidance states that the fluvial flood risk affected by climate change should be assessed using uplifts from peak river flow allowances (Section 5.2).

5.3.1 Peak rainfall intensity allowances for the city area

The majority of the city area is located within the Derwent Derbyshire Management Catchment for peak rainfall allowances, with the south-eastern area of the city located in the Lower Trent and Erewash Management Catchment. Table 5-3 shows the peak rainfall allowances that apply to the city area.

Table 5-3: Peak rainfall intensity allowances for small and urban catchments for Management Catchment.

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35%	40%	35%	40%
Central	20%	20%	25%	30%

Table 5-4: Peak rainfall intensity allowances for small and urban catchments for the Lower Trent and Erewash Management Catchment.

Allowance category	Total potential change (%) anticipated for '2050s' (2022 to 2060) 3.3% AEP	Total potential change (%) anticipated for '2050s' (2022 to 2060) 1% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 3.3% AEP	Total potential change (%) anticipated for '2070s' (2061 to 2125) 1% AEP
Upper end	35%	40%	35%	40%
Central	20%	20%	25%	25%

Which peak rainfall intensity allowance to use?

Rainfall intensity climate change uplifts should be applied to both the 3.3% and 1% AEP events. The recommended epoch and use of either the central or upper end allowances should be based on the design lifetime of the proposed development. Further details are provided within the EA climate change guidance (gov.uk). For FRAs and SFRAs the upper end allowance should be used. The EA guidance recommends that the upper end allowance is considered for both the 3.3% and 1% AEPs for the 2070's epoch (2061 to

2125), unless the allowance for the 2050's epoch (2022 to 2060) is higher, in which case this should be used. This is appropriate for development with a lifetime beyond 2100. For development with a shorter lifetime the central allowance can be used.

5.3.2 Representation of surface water climate change within the Level 1 SFRA

There are no surface water models available for the city area, as such the 0.1% AEP surface water extents are to be used as a proxy for climate change extents.

5.4 Groundwater

The effect of climate change on groundwater flooding problems, and those watercourses where groundwater has a large influence on winter flood flows, is much more uncertain than other types of flooding. Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months. The effect of climate change on groundwater levels for sites in areas where groundwater is known to be an issue should be considered at the planning application stage.

5.5 Adapting to climate change

PPG: Climate Change (gov.uk) Paragraph 003 (Reference ID: 6-003-20140612) contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Paragraph 005 (Reference ID: 6-005-20140306) also provides considerations for the LPA on dealing with the uncertainty of climate risks and accounting for climate change in a realistic way within developments.

6 Flood risk infrastructure

This section provides a summary of existing flood alleviation schemes and assets in the city area. Planners should note the areas that are protected by defences where further work to understand the undefended 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 FRA.

6.1 Asset management

RMAs hold databases of flood risk management and drainage assets according to their jurisdiction as follows:

- The EA 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 FWMA (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.

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 1% AEP 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 EA's on-going hydraulic modelling programme may revise flood risk datasets and, therefore, the SoP offered by flood defences in the area may differ from those discussed in this report.

6.3 Maintenance

Different authorities have responsibilities relating to maintenance of flood risk assets, set out in Table 6-1. It is important that the authorities work in partnership to maintain flood risk assets and manage flood risk across the city area.

Table 6-1: Flood risk asset maintenance responsibilities based on the FWMA (2010).

Authority	Asset maintenance responsibilities
EA	Permissive powers to maintain and improve main rivers, ultimate responsibility for maintaining watercourses rests with the landowner.
Local Authorities	Permissive powers to maintain and improve ordinary watercourses, ultimate responsibility for maintaining watercourses rests with the landowner.
LLFA	Permissive powers, limited resources are prioritised and targeted to where they can have the greatest effect
Highways Authorities	Duty to maintain public roads, making sure they are safe, passable, and the impacts of severe weather have been considered. Responsible for maintaining sections of watercourses where they are crossed by highways.
Water Companies	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 sewer flooding.
Riparian Owners	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.

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 defence 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 make future users of the development 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 EA for condition is provided in Table 6-2.

Table 6-2: Grading system used by the EA 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 – EA 2006

6.4 Major flood risk management assets in the city area

The EA retired the Flood Map for Planning 'Areas Benefiting from Defences' (ABD) dataset in December 2022. This dataset will no longer be available on online mapping. Instead, a developer can enter an address into the EA Flood Map for Planning (gov.uk) to get information about their specific site and request FRA data for planning (also known as Product 4).

The EA 'AIMS' (Asset Information Management System) flood defence dataset gives further information on flood defence assets within the city area. Table 6-3 details the locations which benefit from formal flood defences within the 'AIMS' dataset. Developers should refer to the AIMS Spatial Flood Defences dataset (gov.uk) for further information on specific flood defences. The EA 'AIMS' dataset is shown in Appendix D.

Table 6-3 below details the assets present within the city area included in the Environment Agency's AIMS database. The River Derwent has flood walls present within Little Chester, Darley Abbey and the city centre, as well as embankments and bridge abutments in Darley Abbey. Along the Markeaton Brook, there are spill ways at the Bowling green and Mackworth Road, and flood walls in Markeaton and New Zealand. Additionally, there are embankments at Glenmoy Close and Sunny hill for the Glenmoy Close Balancing Pond.

Additionally, the Northern Flood Relief Culvert, also known as the Markeaton Interceptor, begins near Markeaton Park and takes the Markeaton and Mackworth Brooks, out falling into the Derwent near Darley Park. The Culvert was constructed in 1938, following several significant floods from Markeaton Brook.

Table 6-3: Locations shown in the EA 'AIMS' data set.

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
River Derwent	Little Chester	Walls	50	NULL	NULL	NULL	Local Authority
River Derwent	Little Chester, Darley Abbey	Walls	25 75	NULL NULL	NULL 3	NULL 3	Private individual, Company or Charity
River Derwent	Vicinity of Derwent Street, Stewart Street and Meadow Road	Walls	50	25	NULL	NULL	Private individual, Company or Charity
River Derwent	Darley Abbey	Embankment	75	NULL	3	3	Private individual, Company or Charity
River Derwent	Darley Abbey	Bridge Abutment	NULL	NULL	NULL	NULL	Private individual, Company or Charity

Watercourse	Location	Type	Design SoP (AEP)	Actual SoP (AEP)	Target Condition Rating (1-5)	Actual Condition Rating (1-5)	Ownership
Markeaton Brook	Bowling Green, Mackworth Road	Spillway	NULL	NULL	3	3	Private individual, Company or Charity
Markeaton Brook	Markeaton and New Zealand	Walls	10	NULL	NULL	NULL	Private individual, Company or Charity
Glenmoy Close Balancing Pond	Glenmoy Close, Sunny Hill	Embankment	1%	NULL	3	2	Private individual, Company or Charity

6.5 Existing and future flood alleviation schemes

6.5.1 Our City Our River (OCOR)

The Our City Our River project is led by Derby City Council in partnership with the EA and has been developed to reduce flood risk , particularly in the city centre and areas at high risk from fluvial flooding from the River Derwent. The project includes providing greater levels of protection from defences up to the 1% AEP event and is being delivered through three packages, the first of which was completed in 2015 with packages 2 and 3 ongoing with continued funding at time of publishing. The Environment Agency' River Derwent Model is currently being updated and it is anticipated the model will include runs simulating the impacts of the completed OCOR Scheme. At present however, potential future impacts of the scheme are not considered in the flood extents shown in this SFRA. The Munio Projects form part of the three packages, and the packages are as follows:

- Package 1: Alfreton Road Industrial Estate to Sowter Road, and was carried out from 2015 to 2019.
- Package 2: North Riverside and Meadow Lane, Derby Junction Railway Bridge, Pride Park, Ambaston and Shardlow
- Package 3: Chaddesden Sidings and Triangle (delivered in 2023 as part of development) and Raynesway north of the river, Alvaston Park south of the river.

6.5.2 Other Initiatives

The Friends of Littleover Parks have conducted natural flood management measures in 2021, creating meadows and wetlands, as well as cross track drainage and land reformation to slow water flow and redirect water into storage ponds already present in the park. The Derwent Connections Project includes natural flood management schemes, that while schemes may not be within the city area, provides attenuation of flood water that could affect the city.

The Cuttle Brook flood Alleviation Scheme was completed in 2021, providing flood storage for the Cuttle Brook in Sunnydale park. It also delivered wetlands and habitat/biodiversity enhancements in the park. The scheme was funded from Grant in Aid and EU European Regional Development Funds.

Grant in Aid is allocated to complete the Cotton Brook Refurbishment scheme in Normanton and Osmaston, expected to be completed between 2026-2028.

7 Flood risk management requirements for developers

This section provides guidance on site-specific FRAs and other principles for managing flood risk in new development.

7.1 Early consultation with statutory and non-statutory consultees

Developers should consult with the EA, the LLFA and the relevant sewerage undertaker at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and foul and surface water drainage assessment and design. It should be noted that some of these consultees may need to charge for data and/or advice requested by developers or landowners.

7.2 Site-specific FRAs

7.2.1 What is a site-specific FRA?

A site-specific FRA is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site and should accompany a planning application where required (see Section 7.2.2). It is recommended that the assessment is undertaken by a suitably qualified person. The assessment should demonstrate how flood risk will be managed now and over the development's lifetime, taking both climate change and the vulnerability of users into account.

The developer should check whether they are required to apply the sequential test prior to commencing with a site-specific FRA.

The objectives of a site-specific FRA are to 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 these effects and risks are adequate and appropriate.
- The nature of residual risk and whether this can be safely managed.
- The evidence, if necessary, for the LPA to apply the sequential test.
- The evidence, if applicable, to show whether the development will be safe and pass the exception test.

7.2.2 When is an FRA required?

As set out in Flood risk assessments: applying for planning permission (gov.uk), a site-specific FRA is required for all development (including minor development and changes of use) proposed:

- In Flood Zones 2, 3, or 3b.
- Within Flood Zone 1 with a site are of 1 hectare or more.
- In areas with critical drainage problems.
- Within Flood Zone 1 where the LPA's SFRA shows it will be at increased risk of flooding during its lifetime.
- That increases the vulnerability classification and may be subject to sources of flooding other than rivers or sea.

7.2.3 What level of detail is needed in 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. The SFRA can be used by developers as a starting point to identify the initial flood risk to a site however a pre-application consultation is key to define the scope of the FRA and identify data requirements, making sure that latest available datasets are used.

7.2.4 Guidance for FRAs

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the EA and the LLFA. Guidance and advice for developers on the preparation of site-specific FRAs is available from the following websites with hyperlinks provided:

- Standing Advice on Flood Risk (gov.uk)
- Flood Risk Assessment for Planning Applications (gov.uk); and
- Site-specific Flood Risk Assessment: Checklist (gov.uk)

Guidance should be sought from the EA and the Council at the earliest possible stage, and opportunities should be taken to incorporate environmental enhancements and reduce flooding from all sources both to and from the site through development proposals. Developers should seek to go beyond managing the flood risk and support opportunities to reduce the causes and impacts of flooding, whilst enhancing and conserving the natural environment. PPG: Flood risk and coastal change (gov.uk) Paragraphs 062 - 067 provide further information. Potential strategic solutions to consider are detailed in Section 0.

7.3 Emergency planning

Safe access and escape routes from the site should be provided. The developer should seek to incorporate an emergency plan and a safe refuge point if the development site has been identified to be at risk of flooding. The local authority and Emergency Services should be consulted when designing an emergency plan. For further details on emergency planning, see Section 10.

8 Principles for site design and master planning

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 uses away from high-risk areas to higher ground and lower flood risk areas, while more flood-compatible development (e.g., vehicular parking, recreational space) can be located in higher risk areas. Higher risk areas can also be retained and enhanced as natural green space. Whether parking in floodplains is appropriate will be based on the likely flood depths and hazard, evacuation procedures and availability of flood warning. The nature of risk to water quality also needs to be considered and mitigated to ensure that accumulated hydrocarbons and other vehicle related pollutants are not released to the aquatic environment.

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 provide safe access to higher ground from these areas and avoid the creation of isolated islands as water levels rise.

8.1 Modification of ground levels

Modifying ground levels to raise the land above the design 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 flood level 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 analysis 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 (for it to fill and drain by gravity). 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). Appendix A3 of the CIRIA Publication C624 (ciria.org) provides guidance on how to address floodplain compensation.

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 check that it would not cause increased ponding or build-up of surface runoff on third party land.

Any proposal for modification of ground levels within areas of flood risk will need to be discussed at an early stage with the EA and its impacts assessed as part of a detailed FRA.

8.2 Raised floor levels

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

Developers should refer to the Preparing a flood risk assessment: standing advice (gov.uk) for the latest guidance on FFLs but generally the EA advises the minimum finished floor levels should be set 600mm above the 1% AEP fluvial plus climate change peak flood level, where the appropriate climate change allowances have been used. 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. Lowering existing FFLs below the existing levels within the 1% AEP plus climate change floodplain would not be acceptable and should be discouraged. New development offers opportunities to improve the resilience of buildings.

Building design and raised floor levels is the only way to fully reduce groundwater flood risk, through ensuring FFLs are raised above predicted groundwater levels considering known groundwater issues.

Allocating the ground floor of a building for less vulnerable, non-residential, or non-habitable 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 of flood defences). This risk can be reduced by use of multiple storey construction and raised areas that provide an point of refuge. However, access and escape routes may still be an issue, particularly when flood duration covers many days.

Similarly, the use of basements should be avoided in areas of flood risk. Habitable uses of basements within Flood Zone 3 and areas at high risk of surface water flooding should not be permitted, whilst basement dwellings (classed as 'highly vulnerable') in Flood Zone 2 will be required to pass the exception test.

Where the ground level of a site is below the ground level at the point where the drainage connects to the public sewer, care must be taken to ensure that the proposed development is not at an increased risk of sewer surcharge. It is good practice for the finished floor levels and manhole cover levels (including those that serve private drainage runs) to be higher than the manhole cover level at the point of connection to the receiving sewer. Alternatively, mitigation measures may need to be incorporated into the proposals to protect against sewer surcharge.

8.3 Development and raised defences

8.3.1 Undefended and residual risk

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, both the undefended risk and residual risk of flooding must be considered by the developer and demonstrated that they can be safely managed. The assessment of the risk should consider:

- Improvements required to the level of protection afforded by existing defences for future development.
- The future commitment to maintain the current standard of protection of any existing defences.
- Any disparities between the proposed level of commitment to maintain the current standard of protection and the level of protection required to support future development.
- The effects of climate change on the future SoP afforded by the defences and the associated maintenance and upgrade commitments required.
- Any land required to be safeguarded for affordable future flood risk management measures.

8.3.2 Breach assessment

The assessment of the residual risk from a breach event should consider an assessment of the hazards that might be present from flood flows from a breach event, considering depth and flow velocities, so that the safety of people and structural stability of properties and infrastructure can be appropriately considered.

Considerations should 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 various ways of assessing breaches using hydraulic modelling. EA LIT56413 Breach of Defences Guidance (2021) provides some guidance for breach assessment. It is recommended that the EA is 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.

8.3.3 Overtopping assessment

The assessment of the residual risk from overtopping of defences should consider the risk which 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 EA Flood Risks to People guidance document (gov.uk) provides standard flood hazard ratings based on the distance from the defence and the level of overtopping. Overtopping modelling or assessments should be undertaken for any sites located next to defences or perched ponds/reservoirs, accounting for climate change.

8.3.4 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).

8.4 Buffer strips

The provision of a buffer strip allows additional capacity to accommodate climate change and means 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. A buffer strip of 8m is required from any main river. Where flood defences are present, these distances should be taken from the landward toe of the defence.

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. Flood Risk Activity Permits (gov.uk) from the EA are likely to be required for development in these areas alongside any planning permission. There should be no built development within these distances from main rivers/flood defences (where present).

8.5 Property Flood Resilience (PFR)

PFR includes a range of measures that can be installed around the perimeter of a building to reduce the risk of internal flooding. PFR can also be used within a building, to minimise the damage done if internal flooding stills occurs. PFR aims to help households and businesses reduce the damage caused by flooding, helping to speed up recovery and reoccupation.

PFR encompasses two main elements:

- Resistance - Resistance measures are installed around the perimeter of a building. These measures aim to reduce the amount of water entering the building, reducing the damage caused internally. Examples include flood doors/barriers, automatic airbricks, and non-return valves.
- Resilient Adaptation (Recoverability) - Adaptions made within a property, which aim to reduce the damage caused if internal flooding still occurs.

The consideration of resistance measures and resilient adaptation should not be used to justify development in inappropriate locations. However, having applied planning policy there may be some instances where development is permitted in high flood risk areas where application of resistance and resilience measures may be required.

There may also be opportunities for 'change of use' developments to be used to improve the flood resistance and resilience of existing development, which may not have been informed by a site-specific FRA when it was first constructed.

Further information and guidance on best practice can be found in the following locations:

- Department for Communities and Local Government Improving the Flood Performance of New Buildings: Flood Resilient Construction (gov.uk)
- CIRIA Property Flood Resilience Code of Practice (ciria.org)
- EA Flood resilience construction of new buildings (gov.uk)

9 Surface water management and SuDS

9.1 Sustainable Drainage Systems (SuDS)

Sustainable Drainage Systems (SuDS) are management practices which enable surface water to be drained in a more sustainable manner and to mimic the local natural drainage. The inclusion of SuDS within developments is an opportunity to enhance ecological and amenity value, and promote green infrastructure, incorporating above ground features into the development landscape strategy.

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the pre-application or master-planning stage. To further inform development proposals at the master-planning stage, pre-application submissions are accepted by the Council. This will assist with the delivery of well designed, appropriate, and effective SuDS. Applicants are also encouraged to engage with Severn Trent Water to discuss their surface water proposals, especially where adoption is proposed.

9.2 Sources of SuDS guidance

The C753 CIRIA SuDS Manual (2015) (ciria.sharefile.com) 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.

The Defra National Standards for SuDS (gov.uk) 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. The Local Authority SuDS Officer Organisation (LASOO) produced their Practice Guidance (susdrain.org) in 2016 to give further detail to the Non-Statutory technical guidance.

The Design and Construction Guidance (DCG) (water.org.uk), part of a new Codes for Adoption covering the adoption of new water and wastewater infrastructure by water companies, contains details of the water sector's approach to the adoption of SuDS.

Derby City Council holds guidance on SuDS on its website.

9.3 Roles of the LLFA and LPA

Derby City Council as the LLFA are a statutory planning consultee. They provide technical advice on surface water drainage strategies and designs put forward for major development proposals, to confirm that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications, the drainage/flood risk engineering team will provide advice to the Planning Department on the management of surface water. The LPA should satisfy themselves that the development's proposed minimum standards of

operation are appropriate and, using planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the lifetime of the development.

In their respective roles as LLFA and LPA, Derby City Council should:

- Promote the use of SuDS for the management of run off;
- Ensure their policies and decisions on applications support and compliment the building regulations on sustainable rainwater drainage, giving priority to infiltration over watercourses and then sewer conveyance;
- Incorporate favourable policies within development plans;
- Adopt policies for incorporating SuDS requirements into the Local Plan; and
- Encourage developers to utilise SuDS whenever practical, if necessary, through the use of appropriate planning conditions.

9.3.1 Schedule 3 of the Flood and Water Management Act (2010)

Currently the implementation of SuDS is driven through planning policy. Schedule 3 of the FWMA 2010 will provide a framework for the approval and adoption of drainage systems, a SuDS Approving Body (SAB) within Unitary and County Councils, and national standards on the design, construction, operation, and maintenance of SuDS for the lifetime of the development. Timescales for enactment of Schedule 3 by the Government are unknown, however as of September 2025, these additional changes and affects have yet to be applied.

9.4 Considerations for SuDS design

9.4.1 Four pillars of SuDS design

SuDS are designed to maximise the opportunities and benefits that can be secured from surface water management practices. SuDS design should consider the four pillars of SuDS (Figure 9-1): water quantity, water quality, amenity, and biodiversity.

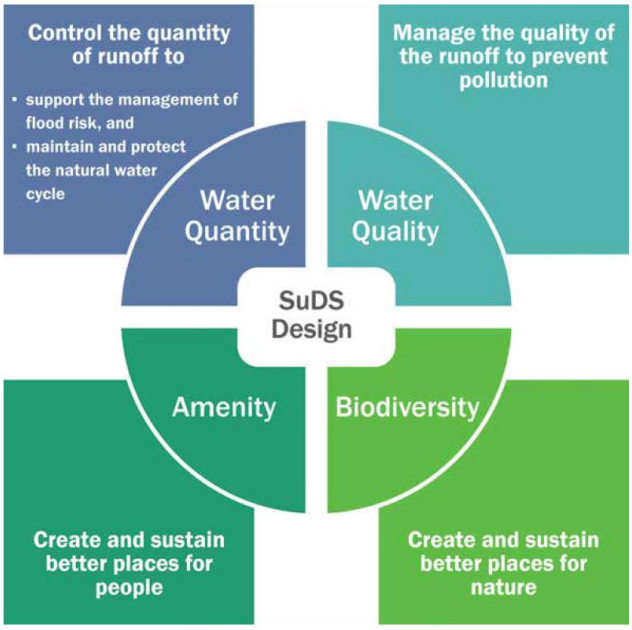


Figure 9-1: Four pillars of SuDS design (The SuDS Manual C753, 2015).

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 that 'applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity' (NPPF Paragraph 182).

It is important that SuDS are maintained for the lifetime for the development so that features can function as designed. Consideration should be given to enhancing SuDS to achieve biodiversity net gain.

9.4.2 Types of SuDS System

There are many different SuDS techniques that can be implemented in attempts to mimic pre-development drainage. Techniques can include soakaways, infiltration trenches, permeable pavements, grassed swales, green roofs, ponds and wetlands. Many of which do not necessarily need to take up a lot of space. The suitability of the techniques will be dictated in part by the development proposal and site conditions. Advice on best practice is available from the EA and the Construction Industry Research and Information Association (CIRIA) e.g. the CIRIA SuDS Manual C753 (2015).

9.4.3 SuDS management train

SuDS should not be used individually but as a series of features in an interconnected system designed to capture water at the source and convey it to a discharge location. Collectively this concept is described as a SuDS Management Train (see Figure 9-2).

The number of treatment stages required within the Management Train depends primarily on the source of the runoff and the sensitivity of the receiving waterbody or groundwater.

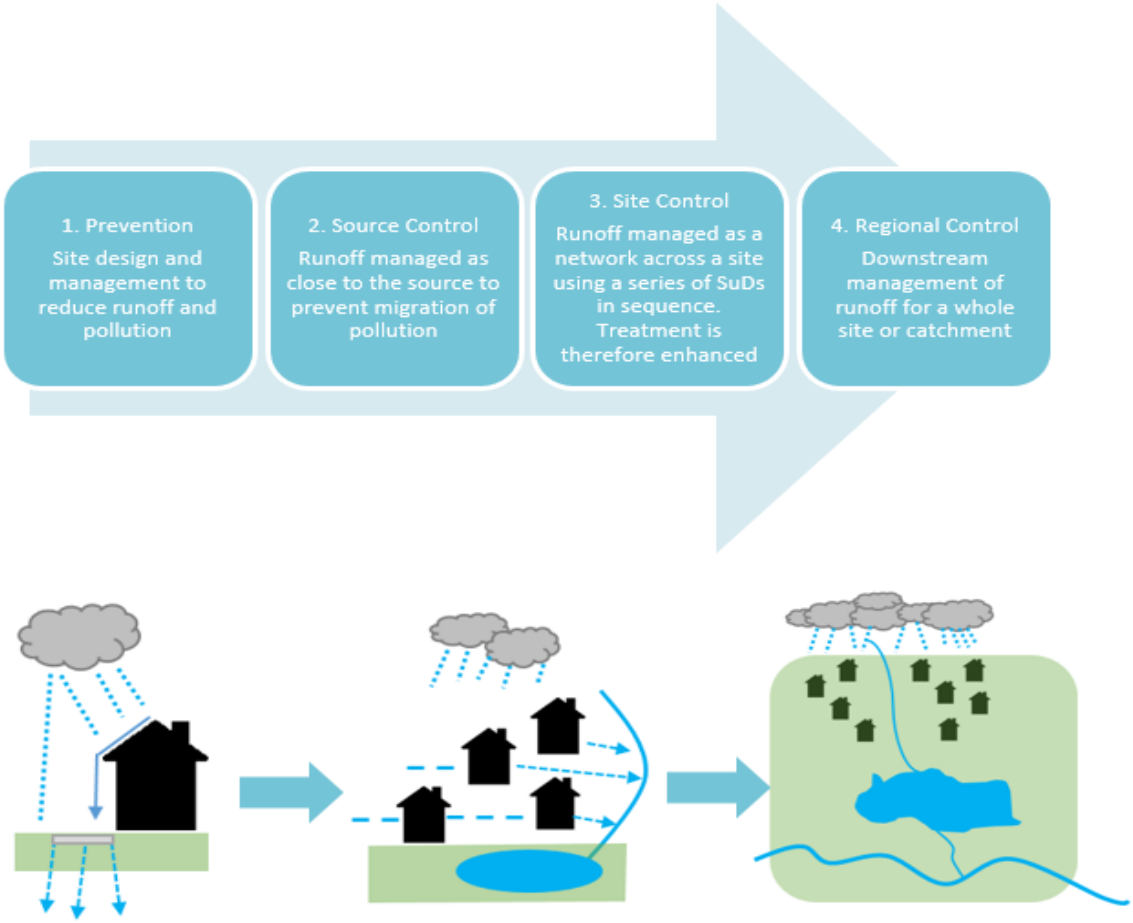


Figure 9-2: SuDS Management Train.

9.4.4 SuDS considerations

The design of a SuDS system will be influenced by a number of physical and policy constraints. These should be taken into account and reflected upon during the conceptual, outline and detailed stages of SuDS design. Table 9-1 details some possible constraints and how they may be overcome.

Drainage from new development sites or redeveloped sites should be designed in line with the drainage hierarchy (PPG: Flood Risk and Coastal Change Paragraph: 056 Reference ID: 7-056-20220825) which initially promotes the use of infiltration prior to considering alternative drainage. For SuDS techniques that are designed to encourage infiltration, it is imperative that the water table is low enough to receive surface run-off waters. Most types of SuDS will be suitable in areas with permeable bedrock including features such as

soakaways and infiltration basins. In areas with more impermeable geology, off-site discharge in accordance with the drainage hierarchy may be required to discharge surface water runoff from the site. In some cases, above-ground features such as attenuation ponds may be practical with a managed outlet or discharge point. Infiltration should be considered with caution within areas of possible subsidence or sinkholes.

A site-specific infiltration test will need to be conducted early on as part of the design of the development in order to determine the impact of groundwater levels on the effectiveness of the drainage system. Groundwater monitoring is also encouraged and may be required in some locations.

Where sites lie within or close to Groundwater Source Protection Zones (GSPZs) (Section 9.5.2) or aquifers (Section 4.2.2), further restrictions may be applicable, and guidance should be sought from the LLFA and the EA.

Table 9-1: Example SuDS design constraints and possible solutions

Constraints	Solution
Land availability	SuDS can be designed to fit into small areas by utilising different systems. For example, features such as permeable paving and green roofs can be used in urban areas where space may be limited.
Contaminated soil or groundwater below site	SuDS can be placed and designed to overcome issues with contaminated groundwater or soil. Shallow surface SuDS can be used to minimise disturbance to the underlying soil. The use of infiltration should also be investigated as it may be possible in some locations within the site. If infiltration is not possible linings can be used with features to prevent infiltration.
High groundwater levels	Non-infiltrating features can be used. Features can be lined with an impermeable line or clay to prevent the egress of water into the feature. Additional, shallow features can be utilised which are above the groundwater table.
Steep slopes	Check dams can be used to slow flows. Additionally, features can form a terraced system with additional SuDS components such as ponds used to slow flows.
Shallow slopes	Use of shallow surface features to allow a sufficient gradient. If the gradient is still too shallow pumped systems can be considered as a last resort.
Ground instability	Geotechnical site investigation should be done to determine the extent of unstable soil and dictate whether infiltration would be suitable or not.
Sites with deep backfill	Infiltration should be avoided unless the soil can be demonstrated to be sufficiently compacted. Some features such as swales are more adaptable to potential surface settlement.

Constraints	Solution
Open space in floodplain zones	Design decisions should be done to take into consideration the likely high groundwater table and possible high flows and water levels. Features should also seek to not reduce the capacity of the floodplain and take into consideration the influence that a watercourse may have on a system. Facts such as siltation after a flood event should also be taken into account during the design phase.
Future adoption and maintenance	The LPA should ensure development proposals, through the use of planning conditions or planning obligations, have clear arrangements for on-going maintenance over the development's lifetime.

9.5 Other surface water considerations

9.5.1 Groundwater Vulnerability Zones

The 2015 EA published groundwater vulnerability 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 properties 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 (defra.gov.uk).

9.5.2 Groundwater Source Protection Zones (GSPZ)

The EA 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 interactive mapping (defra.gov.uk). Three main zones are defined as follows:

- Inner protection zone (Zone 1) - areas from where pollution can travel to the groundwater source within 50 days or is at least a 50m radius.
- Outer protection zone (Zone 2) - areas from where pollution can travel to the groundwater source within 400 days or lies within the nearest 25% of the total catchment area (whichever is largest).
- Total catchment (Zone 3) - the total area needed to support removal/discharge of water from the groundwater source.

The online EA Magic Map shows that there are two GSPZs within the city, the smaller of the two is located in Derby City Centre, while the second is part of a larger GSPZ that is

present in the northern area of the city, encroaching from the northern boundary. Both GSPZs include zones 1, 2 and 3 within the city area. Where a site is located in a GSPZ used for public water supply, applicants should engage with Derby City Council and Severn Trent Water to understand any concerns and any necessary mitigating measures to manage the risk of development to public water supply.

9.5.3 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.

NVZs can be viewed on the EA's interactive mapping (data.gov.uk), and shows that there are two NVS within the city area. The first is the Breadsall NVZ located in the northern area of the city, and the second is the Mackworth Brook NVZ which encroaches into the area along the western boundary of the city.

Currently, information on the 2021 to 2024 NVZs post-appeal is unavailable. Landowners can appeal an NVZ designation once notified if their land (or part of it):

- Does not drain into water that has been identified as polluted.
- Drains into water that should not be identified as polluted.

9.5.4 Critical Drainage Areas

Local Authorities can also choose to designate Critical Drainage Areas (CDAs) within their authority area; however, there are no CDAs currently designated within the city area.

10 Flood warning and emergency planning

10.1 NPPF requirements

The NPPF Flood Risk Vulnerability and Flood Zone "incompatibility" table seek to avoid inappropriate development in areas at risk from all sources of flooding. It is essential that any development which will be required to remain operational during a flood event is located in the lowest flood risk zones to ensure that, in an emergency, operations are not impacted upon by flood water, or that such infrastructure is resistant to the effects of flooding such that it remains serviceable/operational during 'upper end' events, as defined in the Environment Agency's Climate Change allowances.

The outputs of this SFRA should be compared and reviewed against any emergency plans and continuity arrangements. This includes the nominated rest and reception centres (and prospective ones), so that evacuees are outside of the high-risk Flood Zones and will be safe during a flood event.

10.2 Emergency planning

The Civil Contingencies Act 2004 lists Local Authorities, the EA and emergency services as Category 1 responders, responsible for reducing, controlling, and mitigating the effects of emergencies in both response and recovery phases.

The 2024 NPPF (Paragraph 181) requires site-level FRAs to demonstrate that "any residual risk can be safely managed; and safe access and escape routes are included where appropriate, as part of an agreed emergency plan."

In accordance with the NPPF, SFRAs, PFRAs and SWMPs can be used in the preparation and execution of a flood emergency plan as they can indicate areas that may be at risk of flooding. These can be provided as part of an FRA or as a separate document. Decisions regarding whether an Emergency Plan is required sits with the LPA, with advice from their Emergency Planning Teams, the EA and LLFA.

According to the PPG flood risk and coastal change guidance, an emergency plan is needed wherever emergency flood response is an important component of making a development safe; this includes the free movement of people during a 'design flood' and potential evacuation during an extreme flood.

Emergency plans are essential for any site with transient occupancy in areas at risk of flooding, such as holiday accommodation, hotels, caravan, and camping sites (PPG: Flood risk and coastal change paragraph 043).

Emergency Plans should consider:

- The type of flood risk present, and the extent to which advance warning can be given in a flood event.
- The number of people that would require evacuation from the area potentially at risk.

- The vulnerability of site occupants.
- The impact of the flooding on essential services e.g., electricity, gas, telecommunications, water supply and sewerage.
- Safe access and escape routes for users and emergency services (Section 10.2.1).

Further information is available from the following documents/websites with hyperlinks provided:

- The National Planning Policy Guidance (gov.uk)
- 2004 Civil Contingencies Act (legislation.gov.uk)
- Defra (2014) National Flood Emergency Framework for England (gov.uk)
- FloodRe (floodre.co.uk)
- The EA and Defra's Standing Advice for FRAs (gov.uk)
- EA's 'How to plan ahead for flooding' (gov.uk)
- Sign up for Flood Warnings with the EA (gov.uk)
- The National Flood Forum (nationalfloodforum.org.uk)
- 'Prepare for flooding' (gov.uk)
- ADEPT Flood Risk Plans for new development (adeptnet.org.uk)
- Environment Agency (2012) Flooding – minimising the risk, flood plan guidance for communities and groups
- Environment Agency Personal flood plans (2017)

10.2.1 Safe access and escape routes

Safe access and escape routes will need to be demonstrated during the design flood event. Access requirements are set out in the PPG: Flood Risk and Coastal Change (gov.uk) Paragraph: 047 Reference ID: 7-047-20220825.

As part of an FRA, the developer should review the acceptability of the proposed access in consultation with the LLFA and the EA. Site and plot specific velocity and depth of flows should be assessed against standard hazard criteria to ensure safe access and escape routes can be achieved.

10.3 Local arrangements for managing flood risk

The Local Flood Resilience Forum that covers Derby City Council is the Derbyshire Resilience Partnership, which provides information on how to prepare for, stay safe during, and recover from flood events. Derbyshire Resilience Partnership has also prepared a Multi-Agency Flood Plan which outlines:

- The flood risk within Derbyshire and Derby City
- How to activate the flood response
- Mutual/military aid, evacuation, shelter, and recovery arrangements
- Command and co-ordination arrangements
- Specialist resources and how they are acquired/used, which include sandbags, boats and other specialised vehicles, pumps and other resources

- Health and safety advice and information, particularly for working around water.
- Environmental considerations
- Action sheets for the emergency services.

10.4 Flood alerts and flood warnings

The EA 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. The EA Sign up for Flood Warnings (gov.uk) page provides information on how to sign up for these warnings.

There are currently three Flood Alert Areas (FAA) and 13 Flood Warning Areas (FWAs) covering the city area.

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 FAAs usually cover the majority of main river reaches.

Flood Warnings are issued to designated FWAs (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'.

The FAAs and FWAs are included in Appendix D.

11 Cumulative Impact Assessment

11.1 Introduction

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume from any source, 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. Similarly, the effect of the loss of surface water flow paths/exceedance paths from sewers, surface water ponding and infiltration can also give rise to cumulative effects and potentially exacerbate flood risk. There are also risks of development causing modified flow regimes from sites creating an alignment in peak flows in downstream watercourses and resulting in greater flood risk as a result of the development.

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, and appropriate consideration is given to flow paths and storage proposals should normally not increase flood risk downstream.

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.

There is currently no national guidance available for assessing the cumulative impacts of development. The CIA provide a relative assessment of the catchments within Derby City and are not comparable across other city areas/districts.

11.2 Results

The CIA has identified the following catchments as highly sensitive to cumulative impacts:

- 9 Derwent (Derby City East)
- 10 - Derwent (Derby City South)
- 11 - Derwent (Derby City North)

The catchment specific results are ranked using a RAG assessment within the catchment specific results shown in Figure 11-1. Specific recommendations for catchments identified as high risk, alongside broadscale recommendations applicable across the whole city area, are set out in Section 13.1.6.

The full CIA methodology can be found in Appendix C.

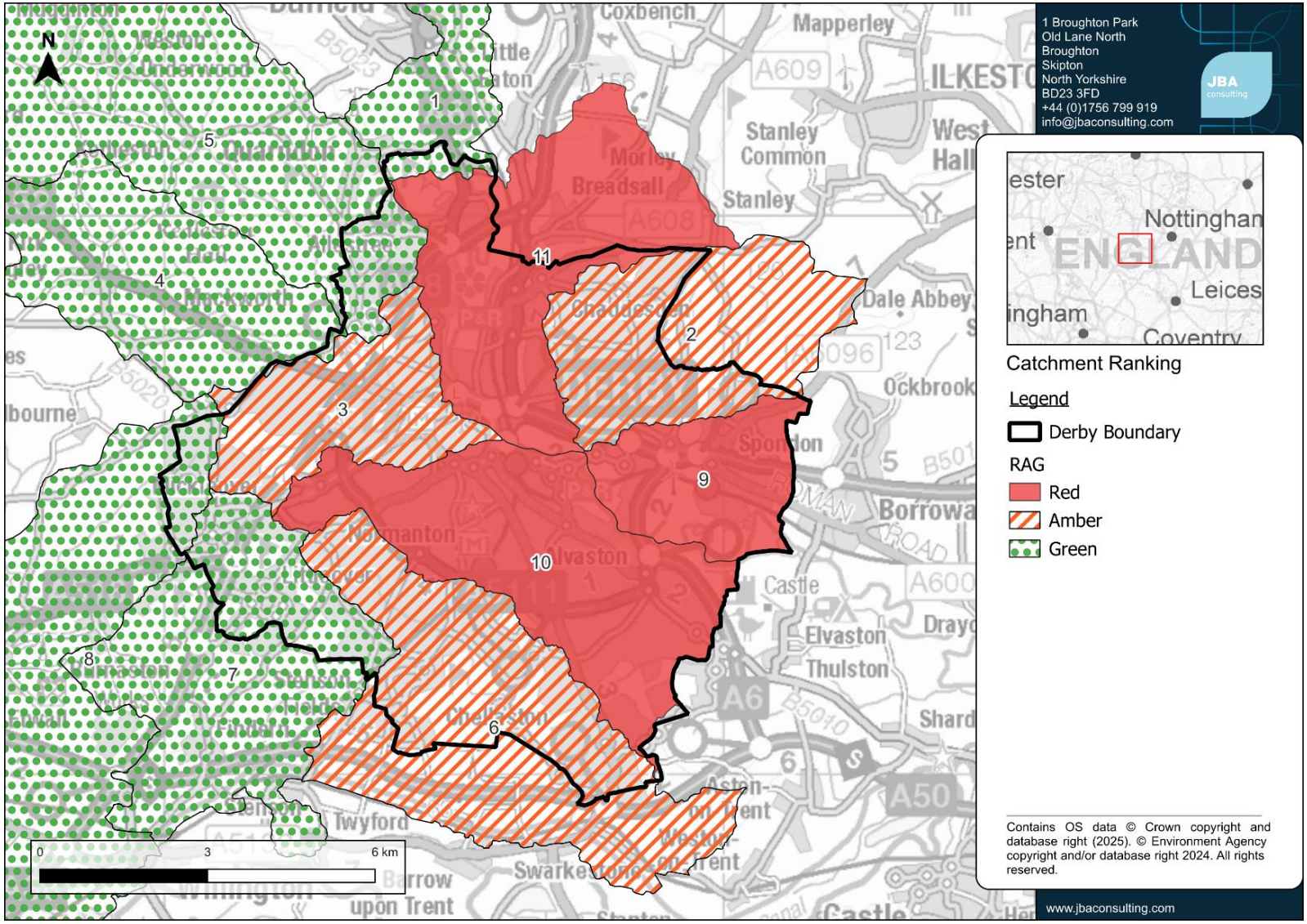


Figure 11-1: Results of the CIA RAG assessment for Derby City.

12 Strategic flood risk solutions

Strategic flood risk solutions may offer a potential opportunity to reduce flood risk in the city area. Section 11 considers the cumulative impacts of development across the city area and the catchments which are most sensitive to these impacts, and as such where strategic flood risk solutions may be most beneficial.

Where possible developments should seek to help reduce flood risk in the wider area. The following sections outline different options which could be considered for strategic flood risk solutions. Any strategic solutions should ensure they are consistent with wider catchment policy and the local policies.

It is important that the ability to deliver strategic solutions in the future is not compromised by the location of proposed development. When assessing the extent and location of proposed development, consideration should be given to the requirement to secure land for flood risk management measures that provide wider benefits.

12.1 Partnership working

Flood risk to an area or development can often be attributed to multiple different sources, including fluvial, surface water and/or groundwater, which can become intertwined. Where complex flood risk issues are highlighted, it is important that all stakeholders are actively encouraged to work together to identify issues and provide suitable solutions.

12.1.1 Catchment Based Approach

The Catchment Based Approach (CaBA) (catchmentbasedapproach.org) was introduced by the Government to establish catchment partnerships throughout England to jointly deliver improved water quality and reduce flood risk, directly supporting achievement of many of the targets set out within the Government's 25-year Environment Plan. CaBA partnerships are actively working in all 100+ river catchments across England and cross-border with Wales.

The Derbyshire Derwent Catchment Partnership includes Derby City and hosted on the Derbyshire Wildlife Trust's website. Derby City Council is one of the 58 partners involved in the partnership, and predominantly looks at the Water Framework Directive and restoration of the River Ecclesbourne. It also disseminates overview leaflets and a 'Water Friendly Farming Good Practice Guide.'

The Derbyshire Derwent Partnership have also produced the Derbyshire Derwent Catchment Management Plan, which details the high level catchment issues, the delivery priorities and the action plan devised by the partnership.

12.2 Biodiversity Net Gain

Biodiversity Net Gain (BNG) is a strategy to develop land and contribute to the recovery of nature. It is making sure the habitat for wildlife is in a better state than it was before development. BNG has been applicable since November 2023 for developments in the Town and Country Planning Act 1990, unless exempt, and has been applicable to small sites since April 2024. Further information is available on the Government BNG webpage (gov.uk). Strategic flood risk solutions can help developments achieve BNG requirements.

Derbyshire adopted their Local Nature Recovery Strategy in September 2025 following a period of public consultation. The strategy outline opportunities and priorities for nature recovery within Derbyshire, and identifies Boulton Moor, and Allestree park, as well as several smaller areas including parkland and riverside areas as key sites for nature within the city. Its recommendations focus on the protection and enhancement of existing sites within the city, enhancement of the Derwent corridor for wildlife, connection of existing habitat areas through green corridors and protection of existing/planting of street trees.

12.3 Natural Flood Management

12.3.1 Introduction to NFM

Development can provide opportunities to work with natural processes to help reduce flood and erosion risk, benefit the natural environment and reduce costs of schemes. This is known as Natural Flood Management (NFM), a process whereby action is taken to mitigate flood risk by protecting, restoring and emulating natural processes. This approach aims to reduce flow volumes and delay the arrival of peak flood flow downstream.

Techniques and measures, which could be applied in the city area include:

- Creation of offline storage areas.
- Re-meandering streams (creation of new meandering courses or reconnecting cut-off meanders to slow the flow of the river).
- Targeted woodland planting.
- Reconnection and restoration of functional floodplains (Section 12.4).
- Restoration of rivers and removal of redundant structures, i.e. weirs and sluices no longer used or needed (Section 12.5).
- Installation or retainment of large woody material in river channels.
- Improvements in management of soil and land use.
- Creation of rural and urban SuDS.

To maximise the benefits of NFM, it is important that land which is likely to be needed for NFM is protected by safeguarding land for future flood risk management infrastructure. This is particularly important for infrastructure that reduces the risk of flooding to large amounts of existing development, or where options for managing risk in other ways are limited to achieve multiple benefits for flood risk and the environment.

It is important to recognise the value of maintenance or restoration of natural riparian zones, such as grasslands, which protect the soils from erosion and ‘natural’ meadows

which can tolerate flood inundation. The use of green infrastructure throughout river corridors can also play a vital role in enhancing the river environment as well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

12.3.2 Working with natural processes

The EA published an evidence base (gov.uk) for working with natural processes to reduce flood risk to support the implementation of NFM, with maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them.

The mapping from the evidence base shows that there is:

- Pockets of flood plain reconnection potential areas along the River Derwent, Markeaton Brook, Hell Brook, Cuttle Brook and the Main Drain.
- Areas of floodplain woodland potential along and around the River Derwent, Markeaton Brook, Hell Brook, Cuttle Brook and the Main Drain.
- Areas of riparian woodland potential along the River Derwent, Markeaton Brook, Hell Brook, Cuttle Brook and the Main Drain.
- Areas of runoff attenuation potential north of Allestree, Mickleover, Sunny Hill/Littleover and the Hell Brook, Sinfin, Alvaston, and Boulton.
- Areas of wider catchment potential in Darley Abbey, Breadsall/Oakwood, Spondon, Shelton Lock, Littleover, and Mickleover.
- the main constraints to NFM measures are urban areas and infrastructure.

12.3.3 Ongoing NFM schemes

There are currently no ongoing NFM projects within the city area, however previous projects were included within the Our River Our City project and that within Sunnydale Park. Websites that provide further information about ongoing NFM schemes and community works include The Flood Hub (thefloodhub.co.uk) and the Rivers Trust NFM National Map (theriverstrust.hub.arcgis.com).

12.4 Catchment and floodplain restoration

Floodplain restoration represents the most sustainable form of strategic flood risk solution, by allowing watercourses to return to a more naturalised state, and by creating space for naturally functioning floodplains working with natural processes.

Although the restoration of floodplain is difficult in previously developed areas where development cannot be rolled back, the following measures should be adopted:

- Promoting existing and future brownfield sites that are adjacent to watercourses to naturalise banks as much as possible. Buffering areas around watercourses to provide an opportunity to restore parts of the floodplain.
- Removing redundant structures to reconnect the river and the floodplain.

- Applying the sequential approach to avoid new development within the floodplain.

12.5 Structure removal and/or modification (e.g. weirs)

Structures, both within watercourses and adjacent to them can have significant impacts upon rivers including alterations to the geomorphology and hydraulics of the channel through water impoundment and altering sediment transfer regime, which over time can significantly impact the channel profile including bed and bank levels, alterations to flow regime and interruption of biological connectivity, including the passage of fish and invertebrates.

Many artificial in-channel structures (examples include weirs and culverts) are often redundant and/or serve little purpose and opportunities exist to remove them where feasible. The need to do this is heightened by climate change, for which restoring natural river processes, habitats and connectivity are vital adaptation measures. However, it also must be recognised that some artificial structures may have important functions or historical/cultural associations, which need to be considered carefully when planning and designing restoration work.

In the case of weirs, whilst weir removal should be investigated in the first instance, in some cases it may be necessary to modify a weir rather than remove it. For example, by lowering the weir crest level or adding a fish pass. This will allow more natural water level variations upstream of the weir and remove a barrier to fish migration.

Developers should open up existing culverts where possible and should not construct new culverts on site except for short lengths to allow essential infrastructure crossings.

12.6 Bank stabilisation

Bank erosion should be avoided, and landowners are encouraged to avoid using machinery and vehicles close to or within the watercourse unless in the circumstances where machinery and vehicles are required for watercourse maintenance such as desilting. Care should be taken not to destabilise the banks.

There are several techniques that can be employed to restrict the erosion of the banks of a watercourse. In an area where bankside erosion is particularly bad and/or vegetation is unable to properly establish, ecologically sensitive bank stabilisation techniques, such as willow spiling, can be particularly effective. Live willow stakes thrive in the moist environment and protect the soils from further erosion allowing other vegetation to establish and protect the soils. Other approaches include the planting of brash or small trees, large wood, large trees and root wads.

12.7 Green infrastructure

Green infrastructure (GI) is a planned and managed network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and rural fringe and consist of:

- Open spaces – parks, woodland, nature reserves, lakes.
- Linkages – river corridors and canals, and pathways, cycle routes and greenways.
- Networks of “urban green” – private gardens, street trees, verges and green roofs.

The identification and planning of GI is critical to achieving sustainable growth. It merits forward planning and investment as much as other socio-economic priorities such as health, transport, education and economic development. GI is also central to climate change action and is a recurring theme in planning policy. With regards to flood risk, green spaces can be used to manage storm flows and free up water storage capacity in existing infrastructure to reduce risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. GI can also improve accessibility to waterways and improve water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

Derby City Council published their open space assessment in 2018, and identifies 61 natural and semi-natural green spaces, 11 of which are designated as Local Nature Reserves, and covers a total area of 214.5 ha. It also includes a further 372 sites that cover parks, amenity greenspace, provisions for children and young people, and allotments which covers a total area of 659 ha.

13 Recommendations and next steps

13.1 Recommendations from SFRA findings

13.1.1 Drainage strategies and SuDS

Planners should be aware of the conditions set by the LLFA for surface water management. The future enactment of Schedule 3 of the FWMA means that there will be mandatory standards for delivery and adoption of SuDS in new developments, however, this has not yet been enacted.

Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications. 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.

SuDS must be designed appropriately for the area. Large parts of the city area are underlain predominantly by mudstone geology with some sandstone; therefore, infiltration SuDS may not be appropriate in these areas, and testing should be conducted as part of a site-specific risk assessment. Infiltration testing must be undertaken to determine whether infiltration rates are suitable for the use of infiltration SuDS. Where sites lie within or close to GSPZs or aquifers, there may be restrictions on infiltration SuDS and guidance should be sought from the LLFA and the EA.

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. Applicants will need to demonstrate a holistic and co-ordinated approach to both foul and surface water drainage and the management of flood risk.

SuDS should be designed based on the SuDS management train to prevent and control pollutants to prevent the ‘first flush’ polluting the receiving waterbody.

SuDS should 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.

13.1.2 Residual risk

Residual risk is the risk that remains after mitigation measures are considered. All residual risks to a site should be considered during the planning stage as part of site-specific FRAs.

There are various fluvial flood defences throughout the district area, and any development in areas protected by these flood defences should consider the residual risk of overtopping or a breach of these defences.

Other residual risks that may be applicable to development sites within the city area include potential breaches or overtopping of the reservoirs and canal, and blockages or failure of infrastructure, such as culverts.

13.1.3 Safe access and escape routes

Safe access and escape routes will need to be demonstrated at all development sites.

If raised access routes are required, an assessment must be made to check this will not displace floodwater elsewhere.

Emergency vehicular access should be possible during times of flood. If at risk, then as assessment should be made to detail the flood duration, depth, velocity, and flood hazard rating in the 1% AEP plus climate change flood event, in line with FD2320.

Where development is located behind, or in an area benefitting from defences, consideration should be given to the potential safety of the development, FFLs and for safe access and escape routes in the event of rapid inundation of water due to a defence breach with little warning.

13.1.4 River restoration and habitat improvement

Developments should be used as an opportunity to enhance the existing river corridor. Natural drainage features should be maintained, and opportunities identified for river restoration/enhancement to make space for water.

Opportunities should be identified to maintain and enhance permeable surfaces and greenspaces to help reduce surface water runoff whilst promoting other benefits, including biodiversity and wellbeing.

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.

Culverting of open watercourses should be avoided 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.

Countryside Stewardship schemes (gov.uk) should be promoted to help prevent soil loss and reduce runoff from agricultural land whilst also providing biodiversity and habitat improvements.

13.1.5 Emergency planning and flood awareness

Improved emergency planning and flood awareness provide an opportunity to mitigate against flood risk. The following recommendations should be considered:

- The Council should continue to work closely with emergency planning colleagues through the Derbyshire Resilience Partnership to identify areas at highest risk and locate most vulnerable receptors. For major developments, robust emergency (evacuation) plans should be produced and implemented.
- Increased flood awareness and sign-up to the EA Flood Warnings (gov.uk) should be promoted across the city area.
- Exceedance flows, both within and outside of the site, should be appropriately designed to minimise risks to both people and property.

13.1.6 Recommendations from the CIA

Recommendations from the CIA should be considered as part of a site-specific assessment in conjunction with detailed modelling that includes storage potential and needs, in addition the potential cumulative effect of a proposed development.

For high and medium risk catchments:

- The LPA should work closely with the neighbouring LPAs of Erewash City and South Derbyshire District to manage any cross-boundary implications. Development upstream in Erewash may have implications for flood risk in Derby City, whilst Derby City may have implications for flood risk downstream in South Derbyshire District.
- Use of oversized SuDS should be considered, where viable, to provide betterment beyond the existing greenfield runoff rate.
- Opportunities for retrofitting of SuDS in existing developed areas should be sought to reduce runoff rates from existing developments. This is key with the urban centre of Derby City given the significant urbanisation and prevalence of historic surface water incidents.

13.2 Requirements for a Level 2 SFRA

Following the application of the sequential test, where sites cannot be appropriately accommodated in low-risk areas, the Council will apply the NPPF's exception test. In these circumstances, a Level 2 SFRA may be required, to assess in more detail the nature and implications of the flood characteristics.

As part of this Level 1 SFRA, an initial site screening exercise using site boundaries and flood risk data has been undertaken for the Council to help inform the application of the sequential test and subsequent potential requirement for a Level 2 SFRA.

13.3 SFRA report recommendations

13.3.1 Updates to SFRA

SFRAs are high-level strategic documents and, as such, do not go into detail on an individual site-specific basis. This SFRA has been developed using the best available information, supplied at the time of preparation.

Over time, new information will become available to inform planning decisions. When using the SFRA to prepare FRAs it is important to check that the most up to date information is used.

The EA regularly reviews its hydrology, hydraulic modelling, and flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a site-specific FRA.

The EA are currently producing new national flood risk mapping (NaFRA2). The Flood Map for Planning is due to be updated in March 2025. Developers should check the online Flood Map for Planning (gov.uk) in the first instance to identify any major changes to the Flood Zones and the long-term flood risk mapping portal for any changes to flood risk from surface water or inundation from reservoirs.

Other datasets used to inform this SFRA may also be updated periodically and following the publication of this SFRA, new information on flood risk may be provided by RMAs.

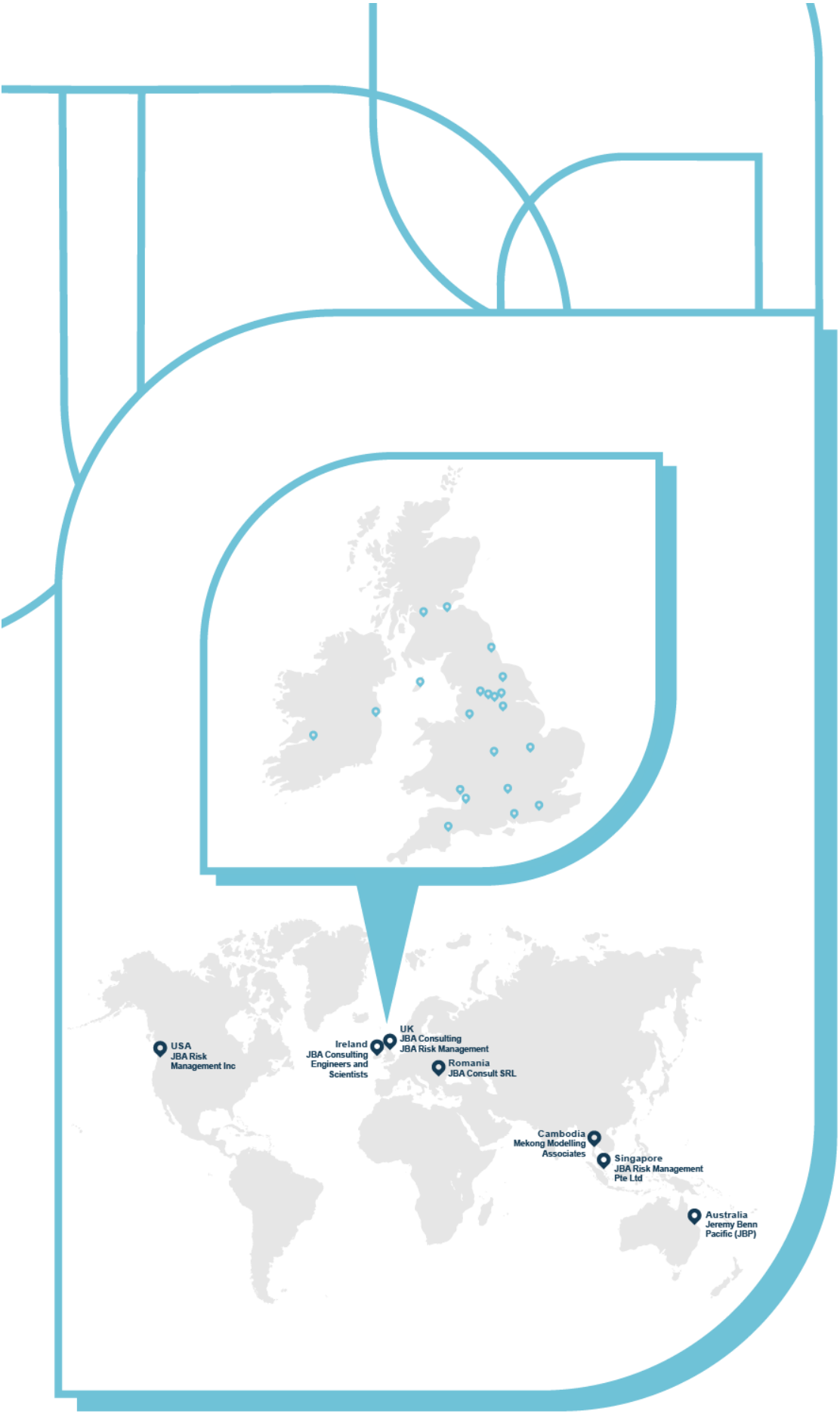
Appendices

A Data Sources used in this SFRA

B Sequential Test Guide

C Cumulative Impact Assessment

D Static Mapping



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