Coventry City Council Level 1 Strategic Flood Risk Assessment

Final Report

October 2022

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Coventry City Council

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Revision history

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Contract

This report describes work commissioned by Jacqueline Padbury on behalf of Coventry City Council. Helen Dawson, Louise Goode, Sarah Hambling, Alex Clark and Ed Mumford of JBA Consulting carried out this work.

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Purpose

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- Coventry City Council, including Highways
- Environment Agency
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- Severn Trent Water
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Carbon footprint

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Executive summary

This report provides a comprehensive and robust evidence base on flood risk issues to support the review and update of the Coventry and Warwickshire Authorities Local Plan sand associated Planning Policy documents using the best available information. This Level 1 Strategic Flood Risk Assessment (SFRA) for Coventry City was in preparation prior to the updates to the Planning Practice Guidance (PPG) as issued on 25 August 2022. The content has been revised to take account of the amended requirements under the updated PPG. This SFRA can be used to inform the Local Plan on the location of future development and the preparation of sustainable policies for the long-term management of flood risk, provided the implications of the changes to the PPG are understood by those developing the Local Plans.

Introduction

To support the preparation of a new Local Plan for the Coventry and Warwickshire Authorities which includes six local LPA's including Coventry City Council (CCC), Stratford-On-Avon District Council (SDC), Nuneaton and Bedworth Borough Council (NBBC), North Warwickshire Borough Council (NWBC), Rugby Borough Council (RBC) and Warwick District Council (WDC), the key objectives of the assessment are:

- To update the Coventry and Warwickshire Authorities Sub-region Local Plans, taking into account the most recent policy and legislation in the National Planning Policy Framework (2021).
- To collate and analyse the latest available information and data for current and future (i.e. climate change) flood risk from all sources, and how these may be mitigated.
- To inform decisions in the emerging Local Plans, including the selection of development sites and planning policies.
- To provide evidence to support the application of the Sequential Test for the allocation of new development sites, to support Coventry City Council's preparation of the Local Plan.
- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the emerging Local Plan.
- To provide advice for applicants carrying out site-specific Flood Risk Assessments and outline specific measures or objectives that are required to manage flood risk.

Summary of flood risk in Coventry City Council

- *Fluvial flooding*: The primary flood risk is along the River Sowe, the River Sherbourne and their main tributaries. These present fluvial flood risk to suburban communities of Coventry including, but not exclusively, Allesley, Spon End, Whitley, Wood End, Bell Green, Walsgrave and Binley. The fluvial flood extents are reasonably well confined in the majority of Coventry City, with wider extents along the River Sowe due to lower lying, flat topography. The River Sherbourne is culverted through Coventry city centre.
- *Surface* water: The Risk of Flooding from Surface Water map shows a number of prominent overland flow routes that largely follow the topography of the watercourses. There are some areas where there are additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments and in low-lying areas. There are also considerable flow routes following the roads throughout the main urban centre of Coventry City which alongside isolated areas of ponding affect a large number of properties across the area.
- *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 as a result of climate change. Flood extents may increase in some locations; although this may be minimal, however flood depth, velocity and hazard may have more of

an impact due to climate change. It is recommended that Coventry City Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the City.

- *Sewer*: The sewers in Coventry City are managed by Severn Trent Water. Up to 2015, a total of 61 properties have been recorded as experiencing sewer flooding within the borough. The highest risk localities include properties around Canley, Wyken Green, Coundon and Holbrooks.
- *Groundwater*: The Areas Susceptible to Groundwater Flooding map shows that in general, the majority of Coventry City is shown to be within the "< 25%" and ">= 25% <50%" classifications with a lower susceptibility to groundwater flooding or has no data available. There are however areas along the main rivers in the district, particularly along the River Sowe, where flooding from groundwater is more likely to occur.

  JBA's Groundwater Flood Risk map shows the areas with the predicted shallowest groundwater levels generally following the flow paths of the major watercourses in the City, particularly along the River Sherbourne and River Sowe. Across the majority of the City, the risk of groundwater flooding is considered to be negligible due to the nature of the local geological deposits.

  It is noted that the best available mapped data on groundwater flood risk only describes the potential for emergence of groundwater but does not provide any indication of the potential flood hazards (i.e. frequency, extent, depth, velocity, duration of flood risk).
- *Canals*: There are two canals in Coventry City including the Coventry Canal and the Oxford Canal which are both in the northern part of the City. These have the potential to interact with other watercourses in the study area, namely the River Sowe, and become flow paths during flood events or in a breach scenario. There is one record of breach on the Coventry Canal which happened at Bishopsgate Green as a result of excavation works. Any development proposed adjacent to a canal should include a detailed assessment of how a canal breach would impact the site, as part of a site-specific Flood Risk Assessment.
- *Reservoirs*: There is a potential risk of flooding from reservoirs outside Coventry 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 Flood Risk Assessments (where relevant). The best available mapping does not provide any indication of the risk of flooding from reservoirs as the probability of a reservoir breach is not included in the data used to generate the mapping.

Defences

Flood defences comprised of high ground are located along the River Sherbourne which runs through the centre of Coventry City and along the River Sowe to the east. The condition of the defences varies from poor to very good and the Standard of Protection for most of them is for an event with an annual probability of 1 in 5 in each and every year (the defences offer a minimal standard of protection).

Development and flood risk

The approach to using the information in the SFRA to support the Sequential and Exception Test procedures for both Local Plans and Flood Risk Assessments has been documented, along with guidance for planners and developers. Links have been provided for various

guidance documents and policies published by other Flood Risk Management Authorities such as the Lead Local Flood Authority and the Environment Agency.

When necessary, development and redevelopment within Coventry City will require a Flood Risk Assessment appropriate to the scale of the development and to the scope as agreed with the Lead Local Flood Authority and/or Environment Agency. Flood Risk Assessments should consider flood risk from all sources including residual risk, along with promotion of Sustainable Drainage Systems to create a conceptual drainage strategy and safe access/egress at the development in the event of a flood. Latest climate change guidance (last updated in May 2022) should also be taken into account, for the lifetime of developments. Planners and developers must ensure that modelling in line with the most up to date Environment Agency climate change guidance has been run.

How to use this report

Planners

The SFRA provides recommendations regarding all sources of flood risk in Coventry City, which can be used to inform policy on flood risk within the Coventry and Warwickshire Sub-region Local Plan. This includes how the cumulative impact of development should be considered.

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

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

Developers

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

- Highly vulnerable and in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable in Flood Zone 3a
- Proposed development in locations materially affected by surface water, groundwater, reservoir or sewer flood risk.

This is a strategic assessment and does not replace the need for site-specific Flood Risk Assessments where a development is either within Flood Zones 2 or 3 or greater than a hectare in Flood Zone 1, or is located in an area affected by surface water, groundwater, reservoir or sewer flood risk. In addition, a surface water drainage strategy will be needed for all major developments in any Flood Zone to satisfy Coventry City Council, the Lead Local Flood Authority (LLFA).

Developers can use the information in this SFRA, alongside site-specific research to help scope out what additional work will be needed in a detailed Flood Risk Assessment. To do this, they should refer to Section 5, Appendix A (Interactive PDF mapping) and Appendix B (Data sources used in the SFRA). At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood extent (including latest climate change allowances, last updated in May 2022), inform Master-planning and demonstrate, if required, that the Exception Test is satisfied. As part of the Environment Agency's updated guidance on climate change, which must be considered for all new developments and planning applications, developers will need to undertake a detailed assessment of climate change as part of the planning application process when preparing FRAs.

Developers need to ensure that new development does not increase surface water runoff from a site or contribute to cumulative effects at sensitive locations, see Section 7 and Appendix F: Cumulative Impact Assessment (CIA). Section 9 provides information on the surface water drainage requirements of the LLFA. Sustainable Drainage Systems should be considered at the earliest stages that a site is developed which will help to minimise costs and overcome any site-specific constraints.

Site-specific Flood Risk Assessments will need to identify how flood risk will be mitigated so development is safe from flooding and does not have an adverse effect on third parties. In high-risk areas the Flood Risk Assessment will also need to consider emergency arrangements, including how there will be safe access and egress from the site.

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

Neighbourhood plans

The SFRA provides:

- Information on the sources of flooding and the variation in the risk across Coventry City.
- Identifies the organisations that are involved in flood risk management and their latest strategic plans, current plans for major flood defences.
- The requirements for detailed Flood Risk Assessments and to inform the site selection process.

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

Mapping

The SFRA mapping highlights on a broad scale where flood risk from fluvial, surface water, groundwater and 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 model small scale changes in flood risk. Local knowledge of flood mechanisms will need to be included to complement this broadscale mapping. Similarly, all known available recorded historical flood events for Coventry City are listed in Section 5.1 and this can be used to supplement local knowledge regarding areas worst hit by flooding. Ongoing and proposed flood alleviation schemes planned by Coventry City Council are outlined in Section 6 and Section 8.4 discusses mitigations, resistance and resilience measures which can be applied to alleviate flood risk to an area.

Cumulative Impact Assessment

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

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Abbreviations and Glossary of Terms

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability – The probability (expressed as a percentage) of a flood event occurring in any given year.
AStGWf	Areas Susceptible to Groundwater flooding
Brownfield	Previously developed parcel of land
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CDA	Critical Drainage Area - A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, Main River and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure.
CFMP	Catchment Flood Management Plan- A high-level planning strategy through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
CIRIA	Construction Industry Research and Information Association
Cumecs	The cumec is a measure of flow rate. One cumec is shorthand for cubic metre per second; also m^3/s.
Defra	Department for Environment, Food and Rural Affairs
Design flood	This is a flood event of a given annual flood probability, which is generally taken as: fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or; tidal flooding with a 0.5% annual probability (1 in 200 chance each year), against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.
DTM	Digital Terrain Model
EA	Environment Agency
EU	European Union
Exception Test	Set out in the NPPF, the Exception Test is a method used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The Exception Test is applied following the Sequential Test.
FCERM	Flood and Coastal Erosion Risk Management
FEH	Flood Estimation Handbook
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Map for Planning	The Environment Agency Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.
Flood Risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).

Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Floods and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
FWA	Flood Warning Area
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a River
FRA	Flood Risk Assessment - A site-specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FSA	Flood Storage Area
FWMA	Flood and Water Management Act
FWS	Flood Warning System
GI	Green Infrastructure – a network of natural environmental components and green spaces that intersperse and connect the urban centres, suburbs and urban fringe
Greenfield	Undeveloped parcel of land
Ha	Hectare
IDB	Internal Drainage Board
Indicative Flood Risk Area	Nationally identified flood risk areas based on the definition of 'significant' flood risk described by Defra and WAG.
JBA	Jeremy Benn Associates
LFRMS	Local Food Risk Management Strategy
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management
LPA	Local Planning Authority
m AOD	metres Above Ordnance Datum
Main River	A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NRD	National Receptor Database
NRIM	National Reservoir Inundation Mapping
NVZs	Nitrate Vulnerability Zones
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility of maintenance.
PFRA	Preliminary Flood Risk Assessment

Pitt Review	Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity.
RBMP	River Basin Management Plan
Resilience Measures	Measures designed to reduce the impact of water that enters property and businesses; could include measures such as raising electrical appliances.
Resistance Measures	Measures designed to keep flood water out of properties and businesses; could include flood guards for example.
Return Period	Is an estimate of the interval of time between events of a certain intensity or size, in this instance it refers to flood events. It is a statistical measurement denoting the average recurrence interval over an extended period of time.
Riparian owner	A riparian landowner, in a water context, owns land or property, next to a river, stream or ditch.
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
Risk Management Authority (RMA)	Operating authorities who's remit and responsibilities concern flood and/or coastal risk management.
RoFfSW	Risk of Flooding from Surface Water (formerly known as the Updated Flood Map for Surface Water (uFMfSW)
Sequential Test	Set out in the NPPF, the Sequential Test is a method used to steer new development to areas with the lowest probability of flooding.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
SoP	Standard of Protection - Defences are provided to reduce the risk of flooding from a river and within the flood and defence field standards are usually described in terms of a flood event return period. For example, a flood embankment could be described as providing a 1 in 100-year standard of protection.
SPD	Supplementary Planning Document
SPZ	(Groundwater) Source Protection Zone
Stakeholder	A person or organisation affected by the problem or solution or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
SWMP	Surface Water Management Plan - The SWMP plan should outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of each partner. It is the principal output from the SWMP study.

WFD	Water Framework Directive – Under the WFD, all waterbodies have a target to achieve Good Ecological Status (GES) or Good Ecological Potential (GEP) by a set deadline. River Basin Management Plans (RBMPs) set out the ecological objectives for each water body and give deadlines by when objectives need to be met.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

> ***"Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.".***
>
> (National Planning Policy Framework, paragraph 160)

JBA Consulting were commissioned by Coventry and Warwickshire Authorities to prepare a Level 1 Strategic Flood Risk Assessment (SFRA) for Coventry City Council. This study provides a comprehensive evidence base to support the production of a new local plan for the Coventry and Warwickshire Sub-region local plans. This SFRA replaces the "Coventry City Council Level 1 and 2 Strategic Flood Risk Assessment" prepared by JBA Consulting in 2015.

This 2022 SFRA can be used to inform decisions on the location of future development and the preparation of sustainable policies for the long-term management of flood risk provided the implications of the changes to the PPG are understood by those developing the Local Plan. Annex 1 – Updates to the Planning Practice Guidance (25 August 2022) provides for more information on the August 2022 changes to the PPG.

1.2 Local Plan

The Coventry Local Plan was adopted in 2017 and supports the delivery of the Council's Corporate Plan and development through to 2031. The aim of the Local Plan is to establish a planning framework for future development, identifying how much land is available and where such land should be provided for new homes and employment, alongside associated infrastructure.

1.3 Levels of SFRA

The **Planning Practice Guidance (PPG)** identifies the following two levels of SFRA:

- **Level 1**: where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the Sequential Test. The Level 1 should be used to attempt to allocate sites in areas of lowest overall flood risk (including other sources of flood risk).
- **Level 2**: where allocations are proposed in flood risk areas (i.e. from any source now and in the future), or where future windfall pressures in flood risk areas are expected. The L2 SFRA should be detailed enough to identify which development sites have the least risk of flooding and the application of the Exception Test, if relevant. The above text suggests that the Level 2 SFRA will only be used to assess whether the Exception Test can be passed, and not the Sequential Test.

This Level 1 Strategic Flood Risk Assessment (SFRA) for Coventry City Council was in preparation prior to the updates to the Planning Practice Guidance (PPG) as issued on 25 August 2022. The content has been revised to take account of the amended requirements under the updated PPG in consultation with the Environment Agency, Warwickshire County Council and Nuneaton & Bedworth Borough Council. This SFRA can be used to inform the Local Plan on the location of future development and the preparation of sustainable policies for the long-term

management of flood risk, provided the implications of the changes to the PPG are understood by those developing the Local Plan. Annex 1 – Updates to the Planning Practice Guidance (25 August 2022) provides more information on the August 2022 changes to the PPG.

This is a Level 1 SFRA assessment. Should the Council be unable to place development outside of areas of Flood Risk, a Level 2 assessment may be required in the future.

1.4 SFRA outputs

- Identification of policy and technical updates.
- Identification of any strategic flooding issues or cumulative effects which may have cross boundary implications.
- Appraisal of all potential sources of flooding, including main river, ordinary watercourse, surface water, sewer, groundwater, reservoir and canal.
- Review of historic flooding incidents.
- Reporting on the standard of protection provided by existing flood risk management infrastructure.
- Available mapping showing distribution of flood risk across all Flood Zones from all sources of flooding including climate change allowances.
- Assessment of the potential increase in flood risk due to climate change.
- Flood Risk Assessment guidance for developers.
- Assessment of surface water management issues, how these can be addressed through development management policies and the application of Sustainable Drainage Systems.
- Recommendations of the criteria that should be used to assess future development proposals and the development of a Sequential Test and sequential approach to flood risk.
- Assessment of strategic flood risk solutions that can be implemented to reduce risks.

1.5 SFRA Study Area

Coventry City lies within the county of West Midlands and covers an area of approximately 98.64km^2 with a population of approximately 345,300 (2021 Census).

The City is bounded by five other authorities;

- North Warwickshire Borough Council
- Nuneaton and Bedworth Borough Council
- Rugby Borough Council
- Warwick District Council
- Solihull Metropolitan Borough Council

An overview of the study area showing the neighbouring authorities is shown in

Figure 1-1.

The main rivers in Coventry are the River Sherbourne which runs through the centre of Coventry and the River Sowe which drains the eastern side of the City.

The River Sherbourne has its source in Allesley in the west of the City and flows in a south-easterly direction until it reaches the ring road (A4053). The watercourse is then culverted through the city centre and re-emerges outside the ring road to the east. It then flows in a southerly direction until its confluence with the River Sowe at the boundary of the authority.

The River Sowe begins outside Coventry City in Bedworth to the north. It enters the City Council boundary at Longford and flows in a south easterly direction through the eastern suburbs of Coventry. Near the eastern boundary, the river turns in a south westerly direction and meanders through Coventry until it leaves the area to the south. The River Sowe is a tributary of the River Avon and joins the River Avon about five miles south of Coventry.

The Coventry Canal starts in the Coventry Canal Basin near the centre of the city and stretches five and half miles northwards to the authority boundary, where it continues out into the Midlands countryside. At the northern boundary of the City, the Oxford Canal begins at a junction with the Coventry Canal and flows for a short distance south-eastward before leaving Coventry City to the north-east. The main rivers and canals are shown in Figure 1-2. The water and sewerage company for the City is Severn Trent Water.

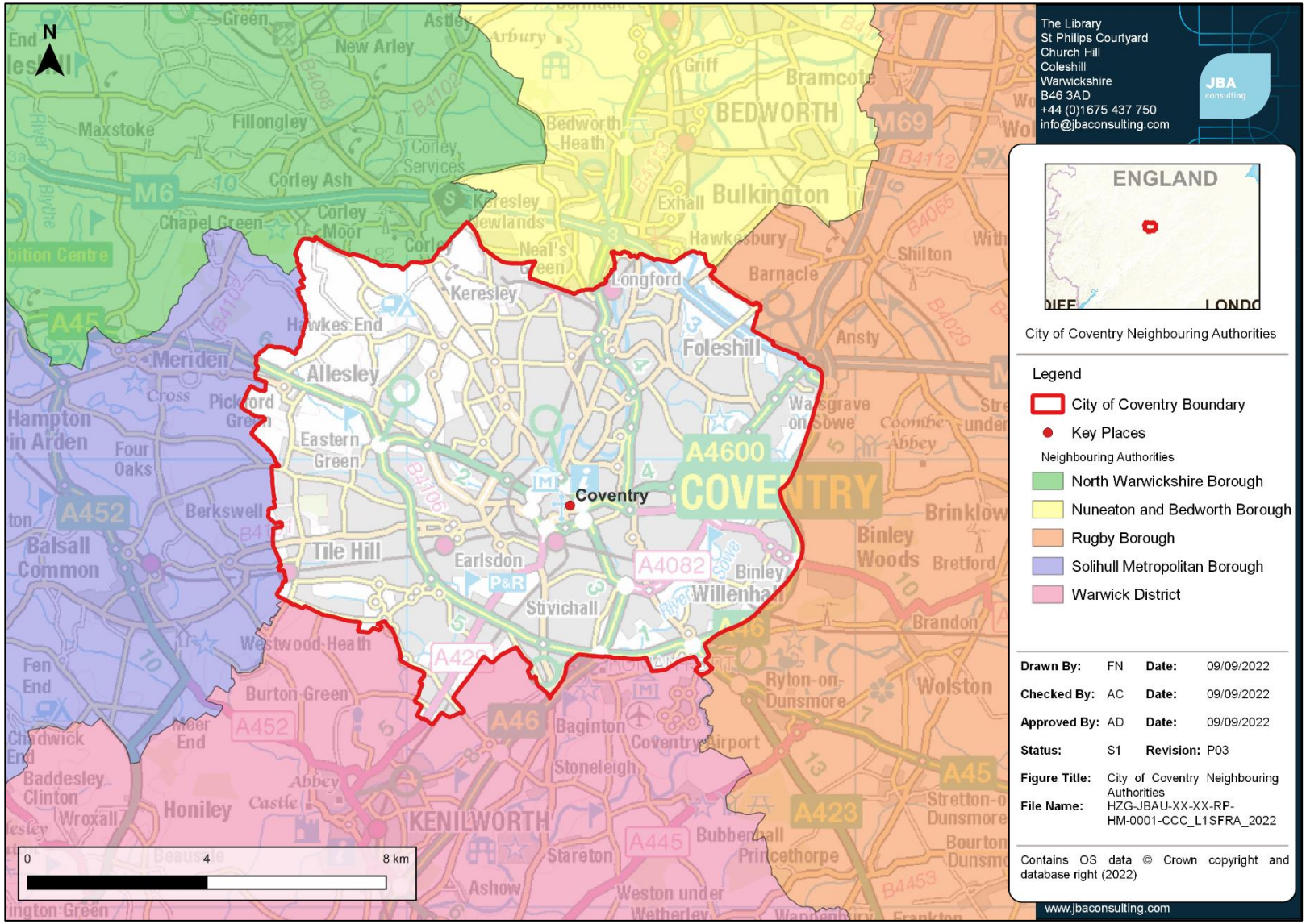

Figure 1-1: Coventry City Study Area and Neighbouring Authorities

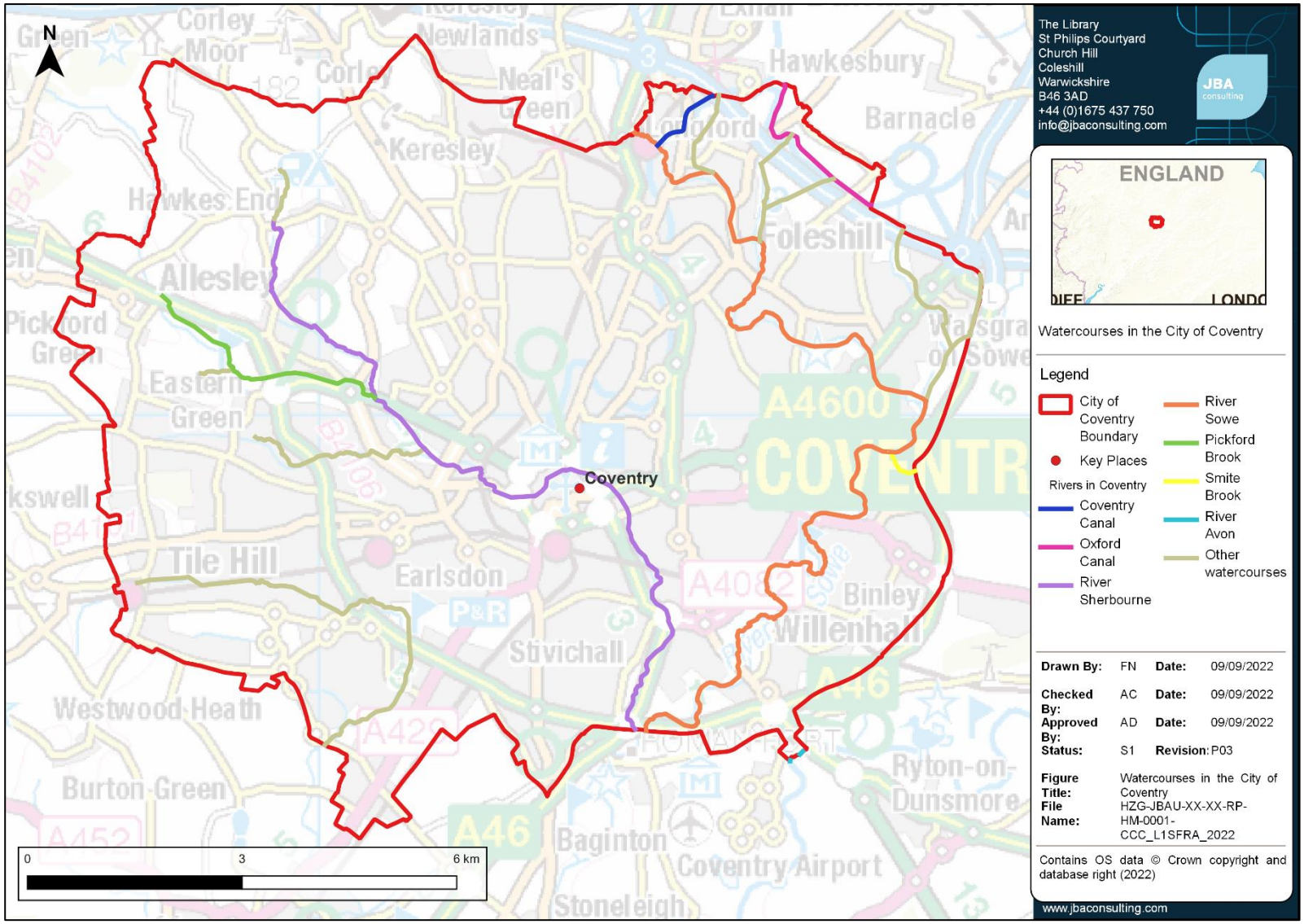

Figure 1-2: Main Rivers and Canals within Coventry City Study Area

1.6 Consultation

SFRAs should be prepared in consultation with other risk management authorities. The following parties (external to Coventry City Council) have been consulted during the preparation of this version of the SFRA:

- Environment Agency
- Canal and River Trust
- Severn Trent Water
- Neighbouring authorities including:
    - North Warwickshire Borough Council
    - Nuneaton and Bedworth Borough Council
    - Rugby Borough Council
    - Warwick District Council
    - Solihull Metropolitan Borough Council

1.7 Use of SFRA data

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

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

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

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

Key reference material such as external guidance documents/ websites are provided in **green** throughout the SFRA.

On the date of publication, the SFRA contains the latest available flood risk information. Over time, new information will become available to inform planning decisions, such as updated hydraulic models (which then update the Flood Map for Planning), updated information on other sources of flood risk or evidence showing future flood risks, new flood event information, new defence schemes and updates to policy, legislation and guidance. Developers should check the online **Flood Map for Planning** 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.

1.8 Structure of this report

The contents of the report are set out according to the following structure:

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

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

1.9 Understanding flood risk

The following content provides useful background information on how flooding arises and how flood risk is determined.

1.9.1 Sources of Flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways, as illustrated in Figure 1-3. Most likely sources of flooding include:

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

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

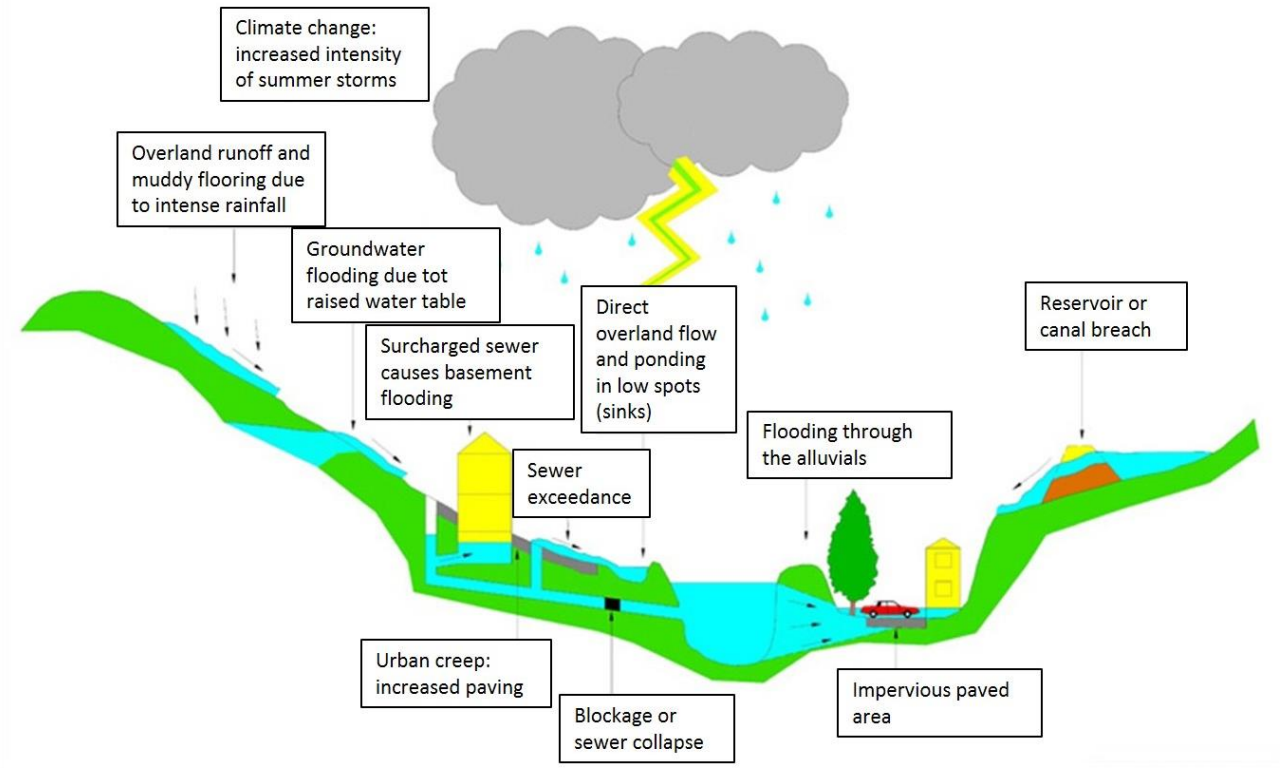

Figure 1-3: Flooding from all sources

1.10 Likelihood and Consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 1-4 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

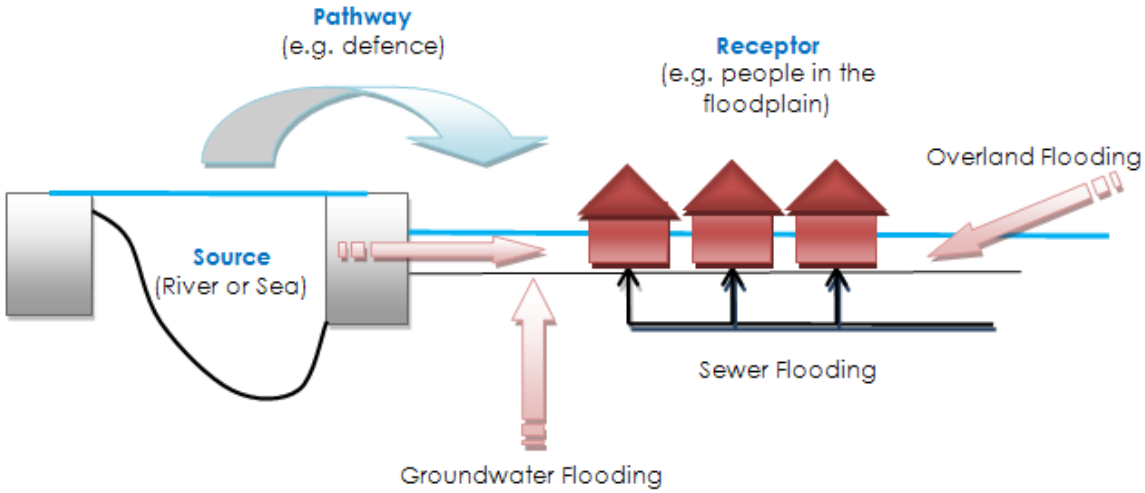

Figure 1-4: Source-Pathway-Receptor Model

The principal sources are rainfall; the most common pathways are rivers, drains, sewers, overland flow and river floodplains; their defence assets; and the receptors

can include people, their property and the environment. All these elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding, but they can block or impede pathways or remove receptors.

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

1.11 Likelihood

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

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

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

1.12 Consequence

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

Flood risk = Probability of flooding x Consequences of flooding

1.13 Risk

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

2 Flood Risk policy and strategy

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

2.1 Roles and responsibilities for Flood Risk Management in Coventry City

There are different organisations in and around Coventry City that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are shown on Table 2.1, with a summary of their responsibilities.

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

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

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

Risk Management Authority	Strategic Level	Operational Level	Planning role
Environment Agency	• Strategic overview for all sources of flooding • National Strategy • Reporting and general supervision	• Main rivers • Reservoirs	• Statutory consultee for development in Flood Zones 2 and 3
Coventry City Council as Lead Local Flood Authority (LLFA)	• Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy	• Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement) • Ordinary watercourses (works)	• Statutory consultee for major developments
Coventry City Council as Local Planning Authority	• Local Plans as Local Planning Authorities	• Determination of Planning Applications as Local Planning Authorities • Ordinary watercourses (works)	• As per operational level

Severn Trent Water	• Asset Management Plans, supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans	• Public sewers	• Non-statutory consultee
Highways Authorities *Highways England (motorways and trunk roads) Coventry City Council (for non-trunk roads)*	• Highway drainage policy and planning	• Highway drainage	• Statutory consultee regarding highways design standards and adoptions

2.2 Relevant legislation

The following legislation is relevant to development and flood risk in Coventry City:

- **Flood Risk Regulations (2009)** - these transpose the European Floods Directive (2000) into law and require the Environment Agency and LLFAs to produce Preliminary Flood Risk Assessments and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk Management Plan is produced; this is done in a six-year cycle.
- **Town and Country Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991), Environment Act (1995), Flood and Water Management Act (2010)** – as amended and implanted via secondary legislation. These set out the roles and responsibilities for organisations that have a role in FRM.
- The **Land Drainage Act (1991, as amended)** and **Environmental Permitting Regulations (2018)** also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an **Ordinary Watercourse** or **Main River**.
- The **Water Environment Regulations (2017)** – these transpose the European Water Framework Directive (2000) into law and require the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.
- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.

2.3 Relevant flood risk policy and strategy documents

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

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

- Set the strategic policy and direction for Flood Risk Management (FRM) and drainage – they may contain policies and action plans that set out what future flood mitigation and climate change adaptation plans may affect a development site. A developer should seek to contribute in all instances to the strategic vision for FRM and drainage in Coventry City.
- Provide guidance and/or standards that informs how a developer should assess flood risk and/or design flood mitigation and SuDS.

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

	Document, lead author and date	Information	Policy and measures	Development design requirements	Next update due
National	**Flood and Coastal Management Strategy** (Environment Agency) 2020	No	Yes	No	Due to be reviewed in 2026
	National Planning Policy Framework and Guidance (MHCLG) updated 2021	No	No	Yes	NPPF last updated 2021 PPG updated 2022
	Building Regulations Part H (MHCLG) 2010	No	No	Yes	-
Regional	**River Severn Catchment Flood Management Plan** (Environment Agency) 2009	Yes	Yes	No	-
	Severn River Basin Management Plan (Environment Agency) 2016	No	Yes	No	Autumn 2022
	Climate Change guidance for development and flood risk (Environment Agency) last updated May 2022	No	No	Yes	-
Local	**Policy EM5: Sustainable Drainage Systems (SuDS)** (CCC) 2017	No	Yes	Yes	-
	Local Flood Risk Management Strategy (CCC) 2014	Yes	Yes	No	2022
	Allesley and Upper Eastern Green Flood Risk Management (CCC)	Yes	No	No	-
	Coventry Local Plan (2011-2031) (CCC) 2017	Yes	Yes	Yes	2022
	Coventry City Council Flood Risk Management and Drainage Advice for Developers (CCC)	Yes	No	Yes	-
	Coventry Surface Water Management Plan (SWMP) (CCC) 2016	Yes	No	Yes	2022
	Coventry Strategic Flood Risk Assessment (CCC) 2015	Yes	Yes	Yes	2022
	Coventry City Council Water Cycle Study (Amec Foster Wheeler) 2015	Yes	No	Yes	2022

2.4 Key legislation for flood and water management

2.4.1 Flood Risk Regulations (2009)

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

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

The Coventry City Council **Preliminary Flood Risk Assessment (PFRA) (2011)** provides information on significant past and future flood risk from localised flooding, the sources of which include Ordinary Watercourses, surface water and groundwater. This was updated in 2017 and identified a large band of Coventry as a Flood Risk Area which included over 140,000 addresses within the City. The localised surface water flood risk varies significantly across this area. The Severn Flood Risk Management Plan is due to be published in Autumn 2022 which explores the surface water flood risk and how it is managed, and also the impact of climate change on future flood risk.

The Environment Agency PFRA (2018) for river, sea and reservoir flooding identifies nationally significant Flood Risk Areas for these sources across the whole of England including Coventry City. Five Flood Risk Areas were identified in the Severn River Basin District (RBD) within which Coventry City is located, which is a low number compared to other RBDs.

2.4.2 Flood and Water Management Act (2010)

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

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

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

Below is a summary of some of the work Coventry City Council has undertaken, or are in the process of undertaking, to date as a LLFA:

- Reviewing and cleansing highway gullies across Coventry City to improve surface water run-off and reduce localised flooding.
- Undertaking CCTV surveys underground to identify potential flooding problems.

2.4.3 The Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans (RBMP), which were last published in 2015 and are currently being updated. Draft updates were published in 2021, underwent public consultation and are now being finalised to be published in Autumn 2022.

Coventry City lies in the Severn River Basin District.

2.5 Key national, regional and local policy documents and strategies

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

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

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

The Strategy was laid before parliament in July 2020 for formal adoption and published alongside a New **National Policy Statement for Flood and Coastal Erosion Risk Management**. The statement sets out five key commitments which will accelerate progress to better protect and better prepare the country for the coming years:

1 Upgrading and expanding flood defences and infrastructure across the country,

2 Managing the flow of water to both reduce flood risk and manage drought,

3 Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,

4 Better preparing communities for when flooding and erosion does occur, and
5 Ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

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.

2.5.2 Updated Strategic Flood Risk Assessment guidance

There was an update to the **'How to prepare a Strategic Flood Risk Assessment guidance'** in March 2022, which requires further adjustment to the approaches to both Level 1 and Level 2 assessments. There have also been minor updates to the guidance in September 2020 and a substantive adjustment in August 2019. The Level 1 assessment is undertaken in accordance with the latest guidance.

2.5.3 Catchment Flood Management Plans

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

The **River Severn Catchment Flood Management Plan** is the one that is most relevant to Coventry City. The actions of this were brought forward into the 2015 Flood Risk Management Plan for the Severn, which will be superseded in Autumn 2022 by an updated version.

2.5.4 River Basin Management Plans

The WFD requires the production of Management Plans for each River Basin District. River Basin Management Plans (RBMPs) aim to ensure that all aquatic ecosystems, riparian ecosystems and wetlands reach 'good status'. To achieve 'good status', a waterbody must be observed to be at a level of ecological and chemical quality.

Coventry City Council falls within the Severn River Basin District. The River Basin Management Plan highlights actions to a number of issues raised either within the river basin district as a whole or in sub districts. Further information can be found in the RBMP and the **Catchment Based Approach (CaBA) website**.

2.5.5 Coventry City Council Local Flood Risk Management Strategy (LFRMS) 2014

Coventry City Council is responsible for developing, maintaining, applying and monitoring a LFRMS. Their **Strategy** was published in July 2014 and is used as a means by which the LLFA co-ordinates Flood Risk Management on a day-to-day basis. The seven high-level objectives proposed in the Strategy for managing flood risk include:

- Collaborative working
- Understand local flood risk
- Natural and historical environmental enhancements
- Support communities to become more resilient to flooding
- Engage with riparian owners
- Manage flood risk through sustainable development policies and practices

- Achieve an economically sustainable approach

The Action Plan in **Appendix D** of the Strategy sets out how the objectives will be delivered and by whom. The actions are monitored by a strategic Flood Risk Management Board.

2.5.6 LLFAs, surface water and SuDS

The 2021 NPPF states that: 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 169). When considering planning applications, local planning authorities should consult the relevant LLFA on the management of surface water in order to satisfy that:

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

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

- Coventry City Council's **Policy EM5: Sustainable Drainage Systems (SuDS)**
- **Flood Risk Management and Drainage – Planning Standing Advice**
- **Coventry Surface Water Management Plan**
- **SuDS Manual (C753)** published in 2007, updated in 2015
- **DEFRA Non-statutory technical standards for sustainable drainage systems, 2015**
- **DEFRA National Standards for sustainable drainage systems Designing, constructing (including LASOO best practice guidance), operating and maintaining drainage for surface runoff, 2011**
- **Building Regulations Part H (MHCLG) 2010**

The 2021 NPPF states that flood risk should be managed "using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding." As such, Coventry City Council expect SuDS to be incorporated on minor development in areas of risk as well as all major development.

2.6 Water Cycle Studies

Water Cycle Studies 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.

Coventry Water Cycle Study was completed in 2015 and highlighted the following:

- *Water supply*: It is important that the Council encourages new developments to conform to at least the basic levels of water efficiency. Alongside Severn Trent Water's programme of water mains renewal which improves the quality and reliability of supplies, this will help manage the demand for drinking water.

- *Wastewater and sewerage*: Public sewerage is mainly provided by Severn Trent Water and with developers and the planning authority, they will provide the required sewerage and Wastewater Treatment Works (WwTWs) for any development. The report identified that the existing infrastructure could accommodate growth but there are limitations phasing this with required capacity or WFD initiated upgrades.
- *Flood risk*: There is generally capacity to accommodate growth as fluvial flood risk at sites is low or can be mitigated against. Although surface water flood risk is more widespread across the City, development sites can be sequentially laid out to avoid areas of risk.

2.7 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in a particular area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments. The SWMP for Coventry City Council is available on their **website**. This provided assessment of the six areas within Coventry most susceptible to surface water flooding, as identified in Coventry's Preliminary Flood Risk Assessment. These areas include the city centre, Sherbourne Fields, Kingfield Road, Bennetts Road, Hen Lane and Duggins Lane.

3 Planning policy for flood risk management

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

3.1 National Planning Policy Framework and Guidance

The revised **National Planning Policy Framework (NPPF)** was published in July 2021, replacing the 2019 version. The NPPF sets out 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 defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF states that:

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

Planning Practice Guidance on flood risk was published in March 2014 and sets out how the policy should be implemented. **Diagram 1 in the NPPG** sets out how flood risk should be considered in the preparation of Local Plans. It was updated on the 25 August 2022, see Annex 1 – Updates to the Planning Practice Guidance (25 August 2022) for more information.

3.2 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 Para 162 of the NPPF) so that all sources of flood risk are included in the consideration. At the time of preparation of the 2022 SFRA the updated guidance (PPG) has been recently published, describing a revised approach to the Sequential Test should be modified. The requirement has been addressed by adopting the following approach:

- The test will cease to be based on the use of the Zones describing river and sea flood risk, and instead be based on whether development can be located in the lowest risk areas (high-medium-low) of flood risk both now and in the future (the test applied to all sources of flood risk – whereas previously the test was only performed for present day flood risk for the "Flood Zones" i.e. river and sea flood risk).
- Understanding flood risk to sites based on their vulnerability and incompatibility as opposed to whether development is appropriate
- As there is no available competent risk mapping for other sources of risk that is comparable with that for the sea, rivers and surface water it is not considered appropriate to use such mapping in a strict process that involves comparison of differing levels of flood risk. However, it is important that the potential implications of such risk is assessed in performing the Sequential Test and so reservoir, groundwater and sewer flood risk are addressed during the process of finalising the selection of allocation sites. This process is described in the Level 2 SFRA and involves a more detailed assessment of the implications of reservoir, sewer and groundwater flood risk to establish that more appropriate locations at lower risk are not available. Thus consideration is given to all sources of flood risk using the available data to complete of the Sequential Test so decisions on the selection of preferred sites for allocation address the potential implications of groundwater, reservoir and sewer

flooding and where necessary identify sites where consideration should be given to satisfying the requirements of the Exception Test.

This process is described in the Level 2 SFRA and involves a more detailed assessment of the implications of reservoir, sewer and groundwater flood risk to establish that more appropriate locations at lower risk are not available. Thus consideration is given to all sources of flood risk using the available data to complete of the Sequential Test so decisions on the selection of preferred sites for allocation address the potential implications of groundwater, reservoir and sewer flooding and where necessary identify sites where consideration should be given to satisfying the requirements of the Exception Test.

3.2.1 Flood Zones – rivers risk

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

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

The Flood Zones are:

- **Flood Zone 1: Low risk**: less than a 0.1% chance of river and sea flooding in any given year
- **Flood Zone 2: Medium risk**: between a 1% and 0.1% chance of river flooding in any given year or 0.5% and 0.1% chance of sea flooding in any given year
- **Flood Zone 3a: High risk**: greater or equal to a 1% chance of river flooding in any given year or greater than a 0.5% chance of sea flooding in any given year. Excludes Flood Zone 3b.
- **Flood Zone 3b: Functional Floodplain**: land where water has to flow or be stored in times of flood. SFRAs identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain takes account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain or blocking of water flow routes. It may be required to consider climate change on the functional floodplain; this would need hydraulic modelling to confirm extents and therefore it is recommended that this is considered in a Flood Risk Assessment and a suitable approach is agreed with the EA.
    - FZ3b is based on the best available model data
        - 3.3% AEP where available
        - 2% AEP where the 3.3% is not available
    - Where model data is not available, FZ3a (1% AEP) is used as a conservative proxy

Important note on Flood Zone information in this SFRA

The Flood Zones (Flood Zone 2 and 3a) in the Appendix A Geo-PDFs are shown from the online Environment Agency's **'Flood Map for Planning'** which incorporates modelled data where available. All the models used for this SFRA have been fully incorporated into the EA Flood Zones.

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

Functional floodplain (Flood Zone 3b) is identified as land which would flood with an annual probability of 1 in 30 years (3.3% AEP), where detailed hydraulic modelling exists. The 1 in 30-year, 1 in 50-year (2% AEP) or 1 in 100-year (1% AEP) defended modelled flood extents have been used to represent Flood Zone 3b, where available from the Environment Agency. For areas outside of the detailed model coverage, or where no outputs were available, Flood Zone 3a has been used as a conservative indication. Further work should be undertaken as part of a detailed site-specific Flood Risk Assessment to define the extent of Flood Zone 3b where no detailed modelling exists.

3.2.2 Flood Zones – surface water risk and other sources of flooding

To address the requirement that flood risk from all sources is included in the Sequential Test a further set of surface water Zone maps has been prepared. It is not possible to prepare zone maps for reservoir flood risk, sewer flood risk or groundwater flood risk as the appropriate analyses and data is not available. The existing risk information on reservoirs, sewer flooding and groundwater is used in the sequential approach to development at a site in accordance with paragraph 161 of the NPPF (which could in some instances results in alternative sites being considered).

The surface water Zone maps describe two zones that describe locations at either low or high risk of surface water flood risk based on the extent of the 1 in 1000 surface water modelling described in the Environment Agency Risk of Flooding from Surface Water mapping (RoFSW). The reason for this approach is that normally the proportionate extent of surface water flood risk is less than can be the case for river or sea flooding. Surface water flood risk can also be of much shallower depth and is not normally experienced for such extensive durations as river or sea flooding. However, the safety implications of placing proposed development at locations where there is surface water flood risk together with the potential effects on third parties is a material consideration and thus if it is proposed to place development in a Zone of high surface water flood risk then consideration should be given to the demonstrating that part "b" of the Exception Test can be satisfied (in some instances, if the hazard posed by surface water risk is substantial and extensive then it might be necessary to consider alternative locations for development).

3.2.3 The Sequential Test

Firstly, land at the lowest risk of flooding and from all sources should be considered for development. A test is applied called the 'Sequential Test' to do this. Figure 3-1 summarises the Sequential Test. The LPA will apply the Sequential Test to

strategic allocations. For all other developments, developers must supply evidence to the LPA, with a Planning Application, that the development has passed the test.

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

Whether any further work is needed to decide if the land is suitable for development will depend on both the vulnerability of the development and the Flood Zone it is proposed for. **Table 2 of the NPPG** defines the flood risk vulnerability and flood zone 'incompatibility' of different development types to flooding.

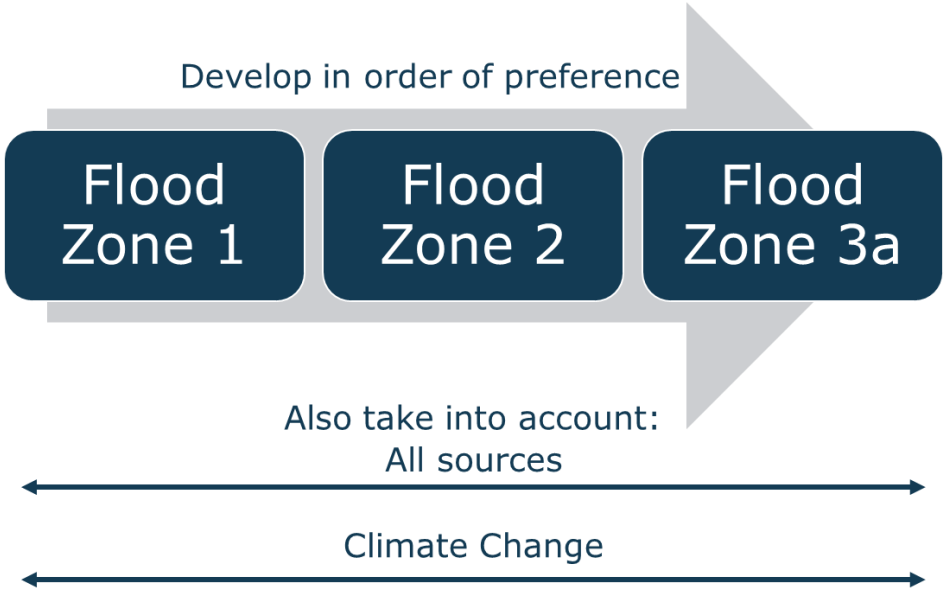

Figure 3-1: The Sequential Test

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

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded. In addition, the risk of flooding from outer sources and the impact of climate change must be considered when considering which sites are suitable to allocate. The SFRA User Guide in Appendix C shows where the Sequential and Exception Test may be required for the datasets assessed in the SFRA, and how to interpret different levels of concern with the datasets, recommending what proposed development sites should be assessed at Level 2.

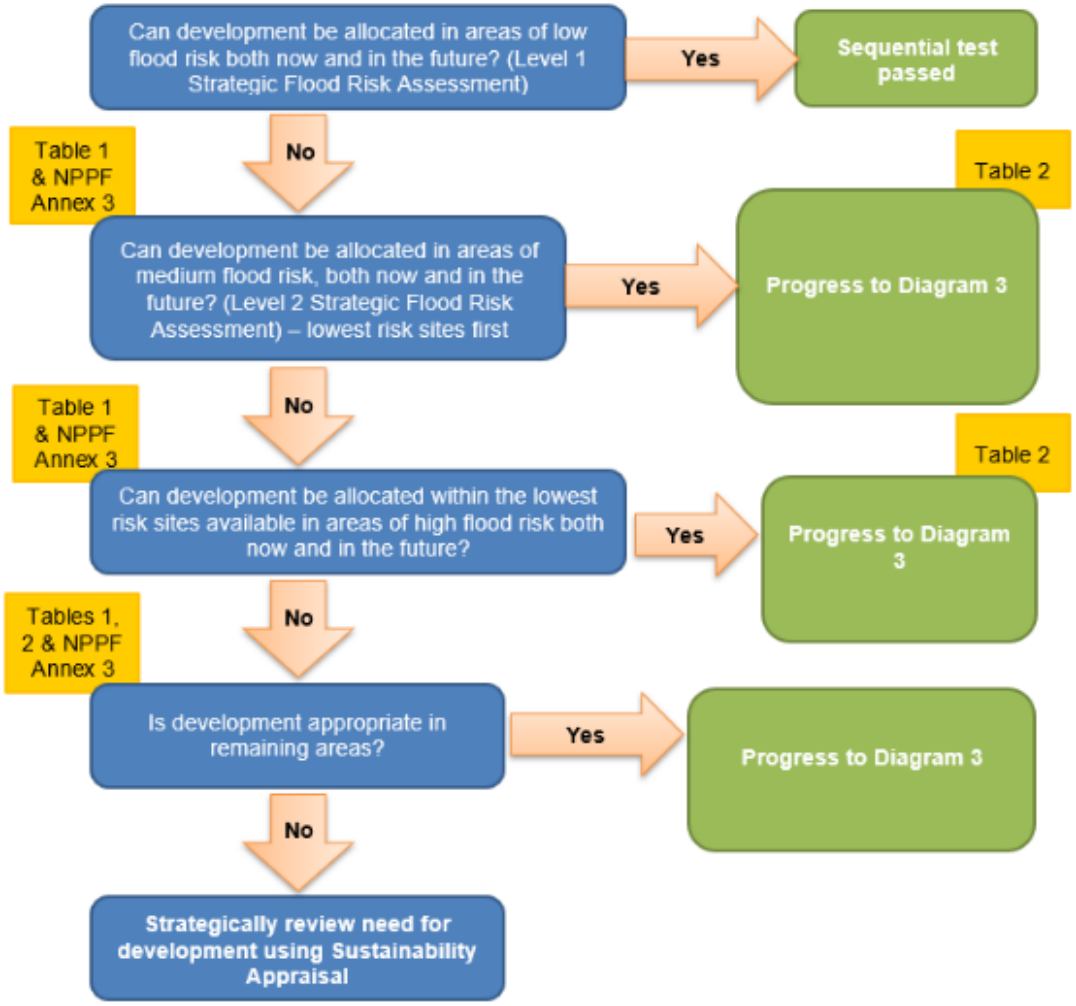

Figure 3-2: Local Plan sequential approach to site allocation

3.2.4 The Exception Test

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

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

- More vulnerable in Flood Zone 3a
- Essential infrastructure in Flood Zone 3a or 3b
- Highly vulnerable in Flood Zone 2 (this is NOT permitted in Flood Zone 3a or 3b)
- Any development in Surface Water Zone "B"
- Land potentially affected by reservoir, sewer or groundwater flood risk

Figure 3-3 summarises the Exception Test.

For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that is appropriate flood resistant and resilient in line with the recommendations in National and Local Planning Policy

and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

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

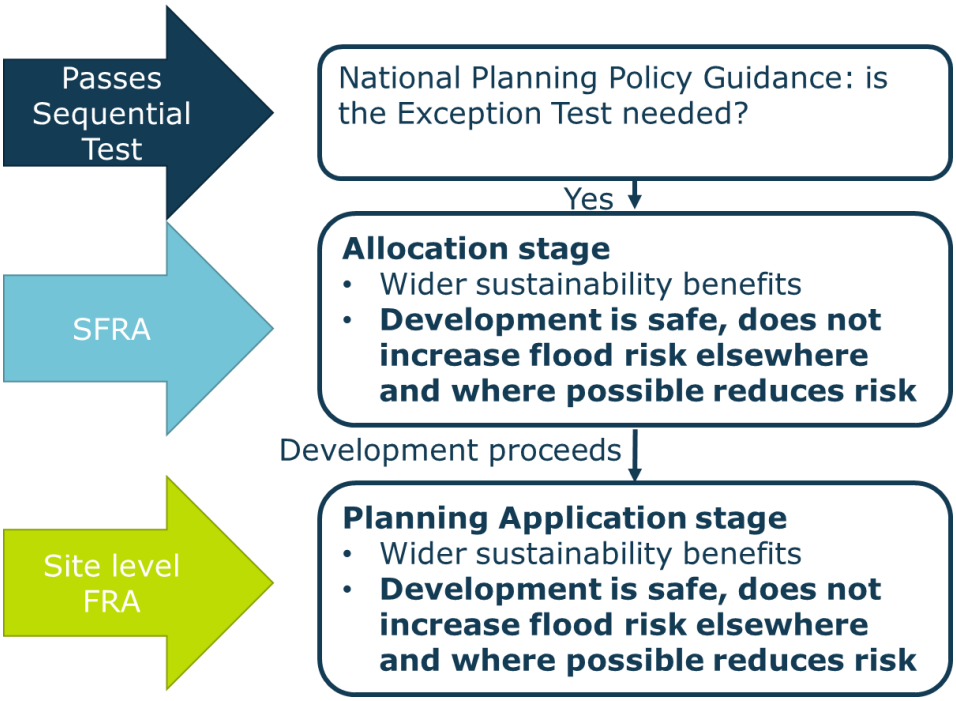

Figure 3-3: The Exception Test

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

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

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

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

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

- 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 in these circumstances for strategic allocations to provide evidence that the principle of development can be supported. At Planning Application stage, a site-specific Flood Risk Assessment will be needed. Both would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.2.5 Making a site safe from flood risk over its lifetime

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

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

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

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

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

3.3.1 Sequential Test

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

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

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

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

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

The sources of information on reasonably available sites may include:

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

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

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

3.3.2 The Exception Test

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

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

- Demonstrating that the development would provide wider sustainability benefits to the community that outweigh the flood risk.
- Applicants should refer to wider sustainability objectives in Local Plan Sustainability Appraisals. These generally consider matters such as biodiversity, green infrastructure, historic environment, climate change adaptation, flood risk, green energy, pollution, health, transport etc.
- Applicants should detail the suitability issues the development will address and how doing it will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

- Demonstrating that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- The site-specific Flood Risk Assessment (FRA) should demonstrate that the site will be safe, and the people will not be exposed to hazardous flooding from any source. The FRA should consider actual and residual risk and how this will be managed over the lifetime of the development, including:
    - The design of any flood defence infrastructure
    - Access and egress
    - Operation and maintenance
    - Design of the development to manage and reduce flood risk wherever possible
    - Resident awareness
    - Flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
    - Any funding arrangements required for implementing measures.

4 Impact of Climate Change

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

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

4.1 Revised Climate Change Guidance

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

In 2018, the government published new UK Climate Projections (UKCP18). The Environment Agency used these projections to update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances which were released in July 2021.

The Environment Agency published **updated climate change guidance** for fluvial risk in July 2021 on how allowances for climate change should be included in both strategic and site-specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development and considers risk allowances on a management catchment level, rather than a river basin level. The guidance was further updated in May 2022 to address the changes to the requirements for rainfall allowances.

Developers should check the government website for the latest guidance before undertaking a detailed Flood Risk Assessment.

4.2 Applying the climate change guidance

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

- The vulnerability of the development – see the **NPPF**
- The likely lifetime of the development – in general 75 years is used for non-residential development and 100 years for residential, but this needs to be confirmed in an FRA as it depends on the characteristics of the development
- The Management Catchment that the site is in – the City lies in the Avon Warwickshire management catchment
- Likely depth, speed and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s)
- The 'built in' resilience measures used, for example, raised floor levels
- The capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

4.3 Relevant allowances for Coventry City

Table 4-1 shows the updated peak river flow allowances that apply in Coventry City for fluvial flood risk for the relevant Management Catchment (last updated in July 2021). These allowances supersede the previous allowances by River Basin District. In agreement with the Environment Agency, the previous climate allowances can still be used where they lie within +/- 10% of the updated guidance.

Table 4-2 shows the updated peak rainfall intensity allowances that apply in Coventry City for pluvial flood risk for the relevant Management Catchment (as of May 2022). These allowances supersede the previous country wide allowances and only apply for small catchments (less than 5km^2) and urban catchments for surface water flood risk. Catchments which are larger than 5km^2 or are rural should use allowances provided in Table 4-2 for peak rainfall intensity. Both the central and higher central allowances should be considered to understand the range of impact.

Table 4-1: Peak river flow allowances for the Management Catchment in Coventry City

River basin district	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Avon Warwickshire	Upper end	22%	31%	59%
	Higher central	12%	14%	32%
	Central	7%	8%	21%

Table 4-2: Peak rainfall intensity allowances for small and urban catchments by Management Catchment in Coventry City

Management Catchment	Allowance Category	Total potential change anticipated for the '2050s' (2022 to 2060)		Total potential change anticipated for the '2070s' (2061 to 2125)	
Avon Warwickshire	Upper end	35%	40%	35%	40%
	Central	20%	20%	25%	25%

4.4 Representing climate change in the Level 1 SFRA

Flood Zone 2 was used as an indicative climate change extent for the 1% AEP event (representing Flood Zone 3). This is appropriate given the Upper End climate change estimates are often similar to the Flood Zone 2 extents; therefore, the differences in effects of climate change are not anticipated to be substantial.

The 1,000-year surface water extent can be used as an indication of surface water risk, and risk to smaller watercourses, which are too small to be covered by the EA's Flood Zones. Modelled Climate Change uplifts for the 3.3% and 1% AEP events were included as part of this SFRA and are presented in in Appendix A: GeoPDFs as 'SW Climate Change Uplifts' for the following events and scenarios:

- 3.3% AEP CC+25%
- 3.3% AEP CC+35%
- 1% AEP CC+25%

- 1% AEP CC+40%

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

Climate change mapping has been provided in Appendix A: GeoPDFs. Flood Zone 2, used as an indicative climate change extent, has been presented under:

- 'Climate Change Extent'

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

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

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

4.5 Impact of climate change in Coventry City

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

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

4.5.1 Impact of climate change on fluvial flood risk

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

Areas in Coventry City most sensitive to fluvial impacts of climate change are:

- Along the path of the River Sherbourne through the west side of Coventry City centre.
- Along the path of Canley Brook through the area of Canley.
- To the west of the River Sowe at Rowley's Green.
- Along the east side of the River Sowe through Manor House.

4.5.2 Impact of climate change on surface water flood risk

Using the 1% AEP surface water mapping datasets with allowances for climate change included, an indication of climate change can be understood (as well as for smaller watercourses; some of which are not included in the Flood Zones).

Areas in the Borough most sensitive to changes in surface water flood risk due to climate change are typically in areas of low-lying topography on the floodplains of the main watercourses. In particular the following areas are sensitive to increased surface water flooding due to climate change:

- The floodplain of the River Sherbourne through Coventry City centre.
- The floodplain of the River Sowe, particularly around Clifford Park, Stoke Hill and Ernesford Grange.
- The floodplain of Canley Brook through Cannon Park.
- In Rowley's Green where there is a build up of surface water behind the railway line and to the east of the A444.

4.5.3 Impact of climate change on groundwater flood risk

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

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

4.5.4 Adapting to climate change

The **NPPG Climate Change guidance** contains information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime;
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development;
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality;
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses;
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space;
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. Coventry City Council and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable.

Locating development in such areas of risk may not be a sustainable long-term option, such as at the defence locations mentioned in Section 6; and

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

5 Understanding flood risk in Coventry City

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

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

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

5.1 Historical flooding

Coventry City Council provided a record of flood incidents within the City that occurred in the vicinity of site allocations. These are shown in Table 5-1 below.

Table 5-1: Historic flooding incidents held by Coventry City Council

Location	Date	Additional information recorded
Far Gosford Street	2013	Fluvial flooding due to overgrown land along riverbank and debris in river
Pickford Green Lane	2008, 2018, 2022	Fluvial flooding due to ditch blockage (2008), highway flooding (2018), discharge of water onto highway due to work by utilities company (2022)
Bennetts Road South	2014	Highway flooding
Fivefield Road	2014, 2017, 2021	Standing water at property (2014), highway flooding (2017 and 2012)
Whitmore Park Road	2021	External fluvial flooding to property
Sutton Stop	2012, 2021	Fluvial flooding (2012), highway flooding (2021)
Charter Avenue	2013, 2015	Highway flooding (2013 and 2015)
Jardine Crescent	2019, 2020	Highway flooding (2019 and 2020)
Hawkes Mill Lane	2013, 2014, 2021	Highway flooding (2013, 2014 and 2021)
Sandy Lane	2019	Highway flooding

In addition, the EA's **Historic Flood Map (HFM)** shows areas of land that have been previously subject to fluvial flooding in the area. This includes flooding from rivers, the sea and groundwater springs but excludes surface water. The Historic Flood Map outlines for Coventry City are shown in Figure 5-1. A very small area in the southeast of the City falls within the extent of the HFM. This signifies a flood event in January 1985 whereby the channel capacity of the River Avon was exceeded.

Please note this does not include all recorded flood events, such as those from other sources, which LLFA's have recorded. Some of the historic extents may

refer to older historic flood events, prior to flood defence improvements. It is recommended that the HFM is viewed alongside the **Recorded Flood Outline** dataset, in Appendix, A mapping.

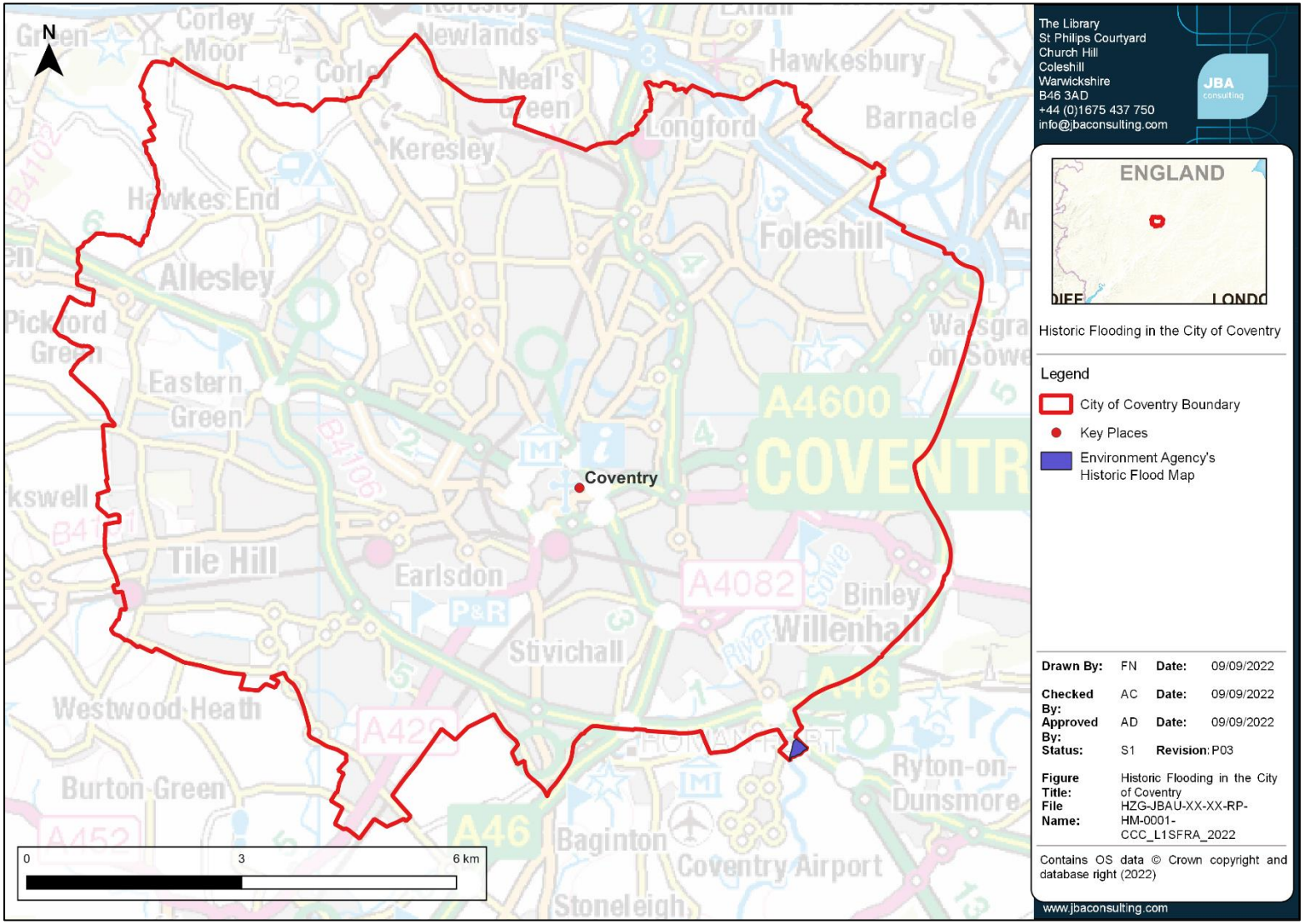

Figure 5-1: Coventry City historic flood outlines from the EA's Historic Flood Map

5.2 Topography, geology, soils and hydrology

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

5.2.1 Topography

Coventry City is predominantly a lowland area with the large rivers of the Sherbourne and Sowe dominating the topography of the area. The topography generally slopes downhill towards the south-east where the River Sowe flows through the eastern part of the study area.

There are some areas of higher topography up to approximately 190m AOD to the north-west of the City around the upper tributaries of the River Sherbourne.

The topography of the study area is shown in Figure 5-2.

5.2.2 Geology

The underlying geology in Coventry City is predominantly the Warwickshire Group comprising of siltstone, sandstone and mudstone. The geology for the eastern part of the City is undifferentiated Triassic Rocks comprised mainly of mudstone, siltstone and sandstone.

The bedrock geology of the study area is shown in

Figure 5-3.

The superficial geology across the City is dominated by the presence of rivers as areas which have superficial deposits tend to be flood plains in the river valleys of the Sherbourne and the Sowe. The superficial deposits here are alluvium comprised of clay, silt and sand, and river terrace deposits which are comprised of sand and gravel. For a large area of the City, especially around the centre and at higher elevation areas in the north-west, information on superficial deposits is not available. Where information is present, the superficial geology varies from glacial sand and gravel to till and diamicton.

The superficial geology of the study area is shown in Figure 5-4.

5.2.3 Soils

Higher elevation areas in Coventry City are predominantly covered in slowly permeable seasonally wet, slightly acid but base-rich loamy and clayey soils. There are also bands of slightly acid loamy and clayey soils with impeded drainage and also freely draining slightly acid loamy soils. The soil type for the rest of the City is unclassified.

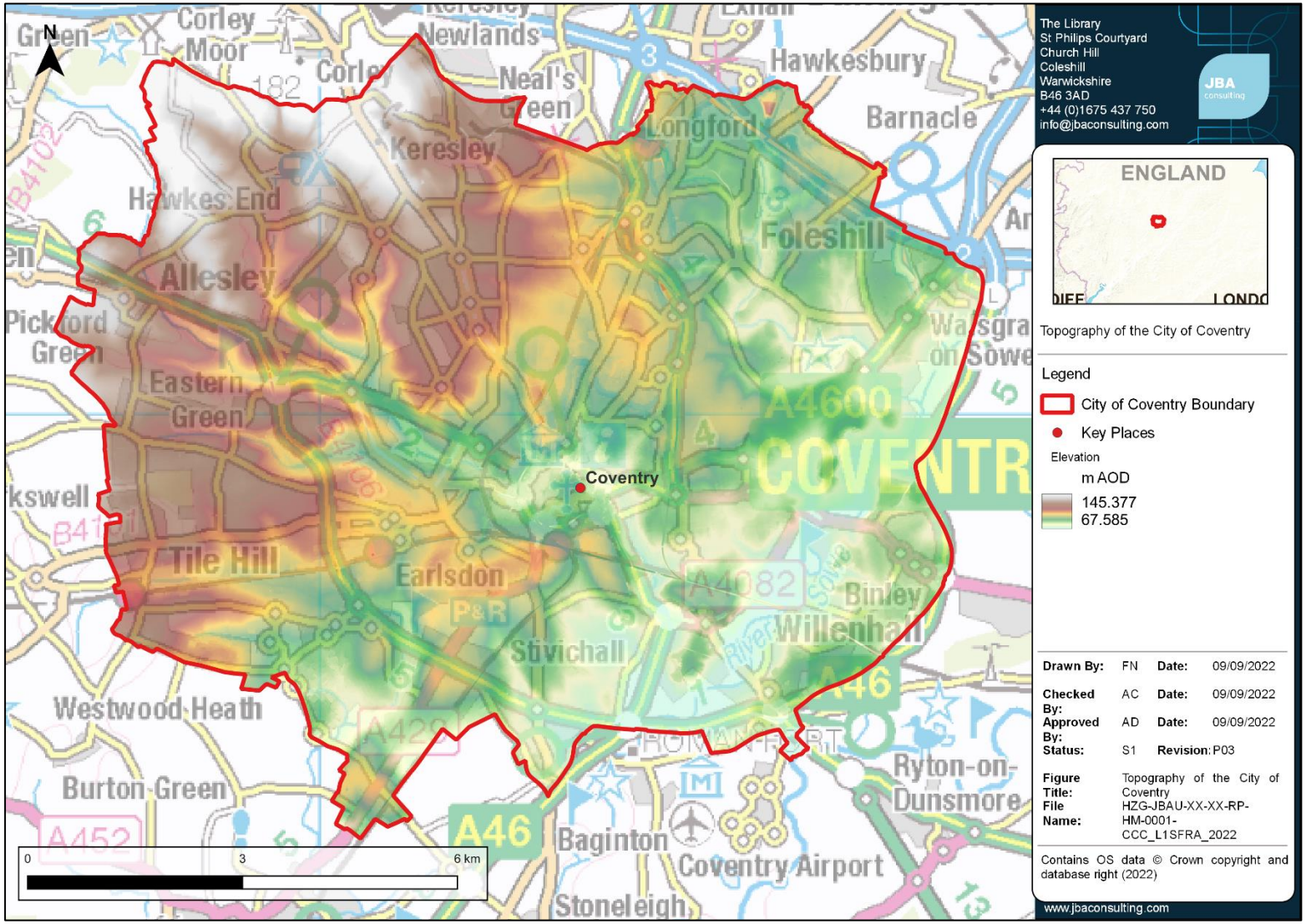

Figure 5-2: Topography of the study area

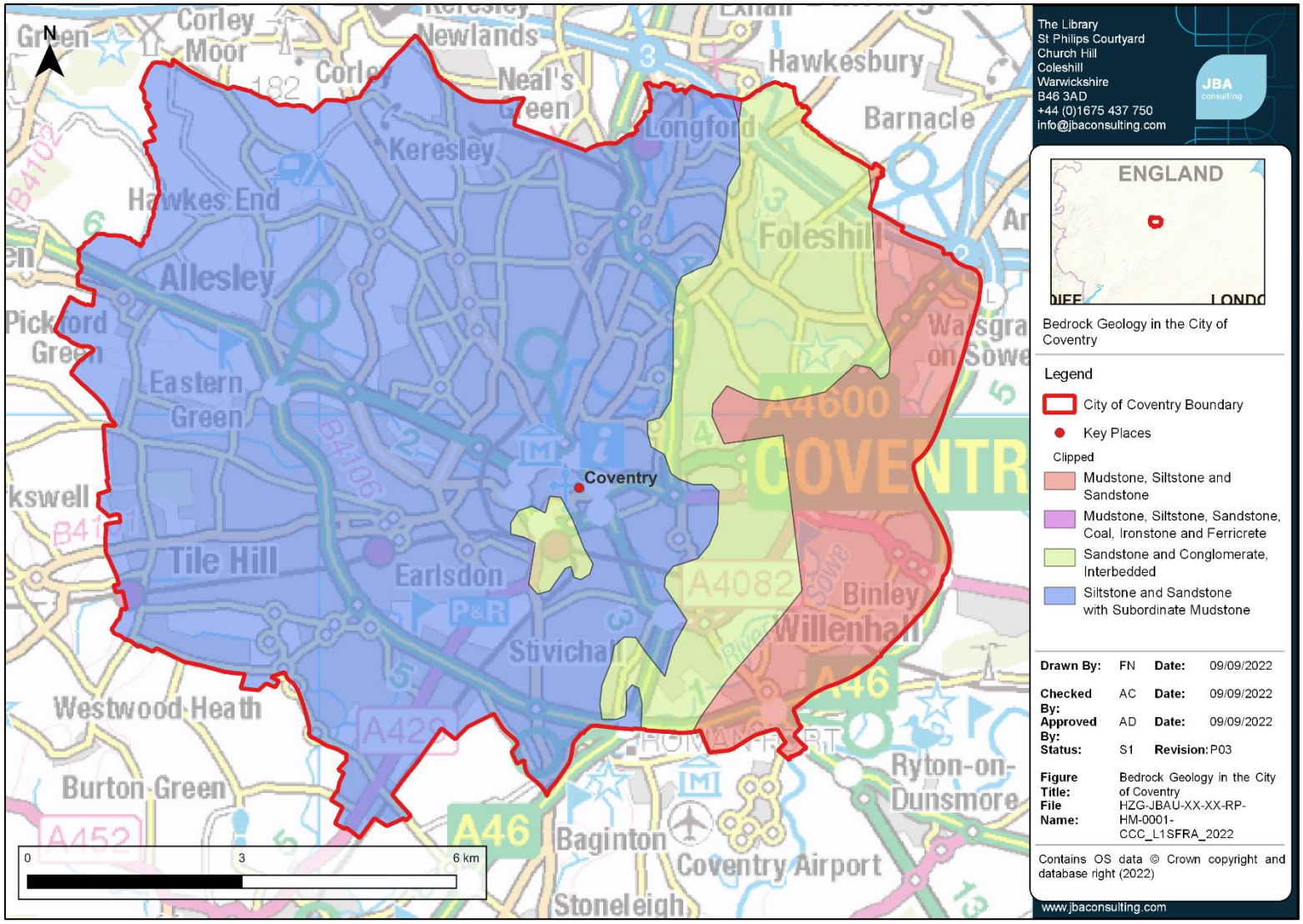

Figure 5-3: Bedrock geology of Coventry City

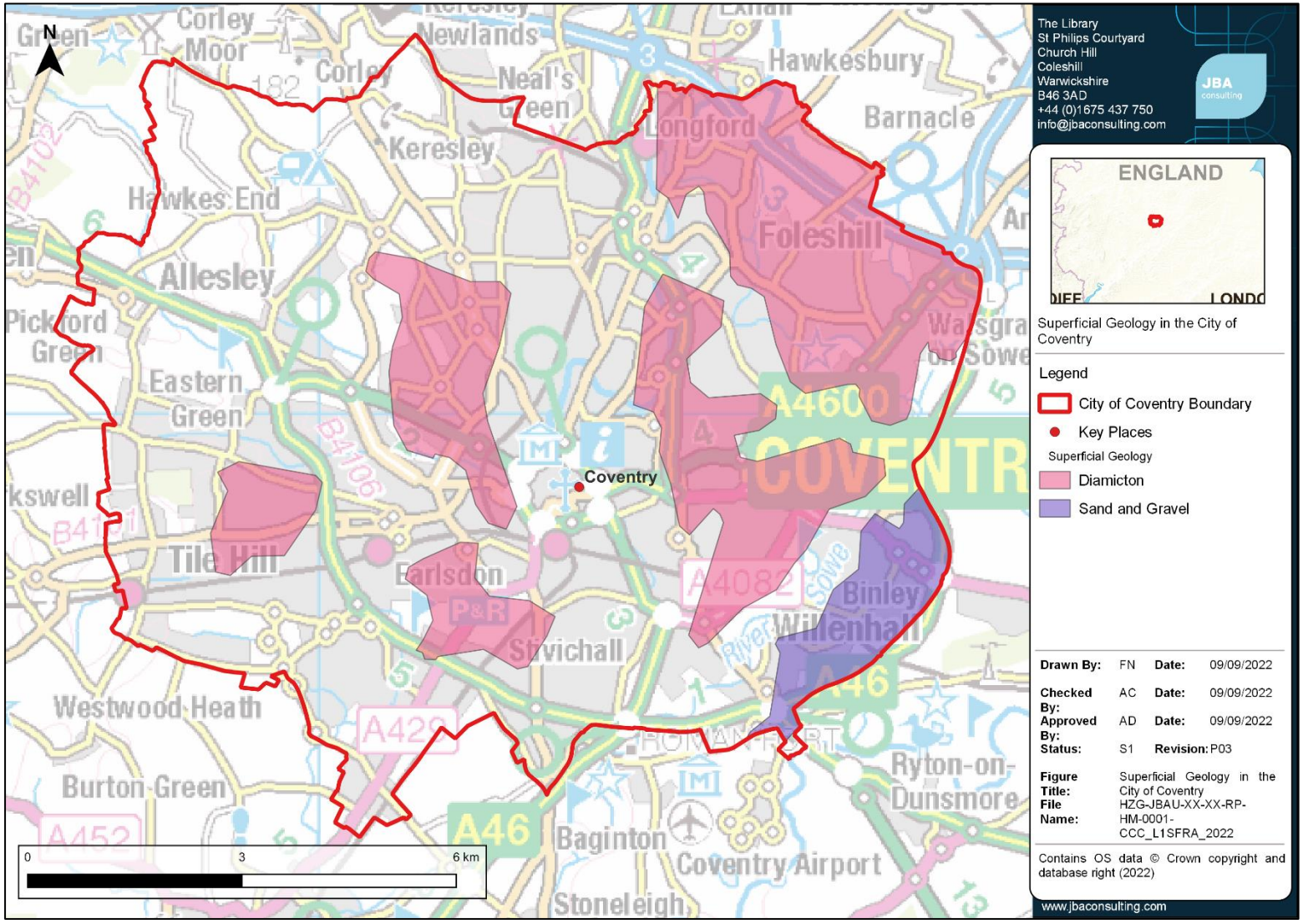

Figure 5-4: Superficial geology of Coventry City

5.3 Hydrology

The principal watercourses flowing through Coventry City are:

- River Sherbourne
- River Sowe
- Pickford Brook
- Smite Brook
- Canley Brook
- Coventry Canal
- Oxford Canal

Tributaries of these watercourses include smaller ordinary watercourses and numerous unnamed drains. A map of the key watercourses is included in Figure 1-2 and Geo-PDF mapping in Appendix A.

5.4 Fluvial flood risk

The primary fluvial flood risk is along the River Sowe and its main tributaries including the River Sherbourne and Canley Brook. The River Sowe enters the Coventry City boundary in the north at Longford and flows in a south easterly direction, potentially posing flood risk to the areas of Manor House, Wood End, Bell Green, Henley Green, Wyken and Walsgrave. Near to the eastern boundary of the City, the river then turns in a south westerly direction and could pose a risk to Stoke Hill, Binley, Ernesford Grange, Stoke Aldermoor and Willenhall before leaving the City.

The River Sherbourne begins in a rural area to the northeast of Coventry City. It flows south eastwards towards Coventry city centre, potentially posing fluvial flood risk to Allesley, Coundon and Spon End. It is culverted through the city centre and re-emerges to the east flowing southwards through Lower Stoke and Whitley until its confluence with the River Sowe at the City boundary.

The fluvial flood extents are fairly well confined in the majority of Coventry City, with wider extents along the River Sowe due to lower lying, flat topography.

The Flood Zone maps for Coventry City are provided in Appendix A: Geo-PDFs, split into Flood Zones 2, 3a and 3b (including an 'indicative 3b' where FZ3a acts as FZ3b in the absence of detailed model data). The flood risk associated with the major locations in Coventry are detailed in Appendix E.

5.5 Surface water flooding

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

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

5.6 Sewer flooding

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

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

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

Severn Trent Water is the water company responsible for the management of the drainage networks across Coventry City. The following data was taken from the previous Level 1 SFRA. Table 5-2 shows data from Severn Trent's DG5 register of historic sewer flooding incidents for Coventry. For confidentiality reasons this data has been supplied on a postcode basis. Please note this data was supplied in 2015 and has been used because more recent data was unavailable.

Table 5-2: Recorded sewer flooding incidents

Post code	Locality associated with post code	Number of properties at risk
CV1 4	Bishopgate Green, Draper's Fields	1
CV2 1	Alderman's Green, Wood End, Henley Green	1
CV2 3	Wyken Green	6
CV2 4	Stoke Park, Upper Stoke	4
CV2 5	Stoke	1
CV3 1	Lower Stoke, Pinley Gardens, Stoke Aldermoor	3
CV3 2	Binley	2
CV3 4	Pinley, Tollbar End	3
CV3 5	Cheylesmore	3
CV3 6	Green Lane, Finham, King's Hill	3
CV4 7	Canley, Gibbet Hill	7
CV4 8	Westwood Heath	1
CV4 9	Tile Hill	1
CV5 6	Earlsdon, Canley Gardens, Westwood Gardens	2
CV5 7	Hockley, Lower Eastern Green, Whoberley	3
CV5 8	Chapel Fields	1
CV5 9	Millison's Wood, Pickford, Allesley, Brownshill Green	3
CV6 1	Coundon	5

CV6 2	Keresley, Coundon Green	3
CV6 3	Radford	1
CV6 4	Holbrooks, Monks Park, Whitmore Park	5
CV6 6	Hawkesbury, Woodshires Green, Longford	1
CV6 9	Foleshill	1
		Total=61

Up to 2015, a total of 61 properties have been recorded as experiencing sewer flooding within the borough. The highest risk localities include properties around Canley, Wyken Green, Coundon and Holbrooks.

5.7 Groundwater flooding

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

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

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

The JBA Groundwater flood risk map for the City is also provided in Appendix A. In high-risk areas, a site-specific risk assessment for groundwater flooding may be required to fully inform the likelihood of flooding. Available groundwater mapping provides information on the potential emergence of groundwater, but does not define the flood risk from the water emanating from the ground, as it takes no account of the topography of the ground surface and how groundwater might flow across the surface.

5.8 Flooding from canals

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

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

Flooding from a breach of a canal embankment is largely dictated by canal and ground levels, canal embankment construction, breach characteristics and the volume of water within the canal that can discharge into the lower lying areas behind the embankment. The volume of water released during a breach is dependent on the pound length (i.e. the distance between locks) and how quickly

the operating authorities can react to prevent further water loss, for example by the fitting of stop boards to restrict the length of the canal that can empty through the breach, or repair of the breach. The Canal and River Trust monitor embankments at the highest risk of failure.

There are two canals in Coventry City:

- The **Coventry Canal** begins in the Coventry Canal Basin, just to the north of the city centre. It meanders in a northerly direction to Hawkesbury Village at the authority boundary, where Hawkesbury Junction provides a connection to the start of the Oxford Canal. There is one record of a canal breach which happened on 15th December 1978 at Bishopsgate Green. This was the result of excavation works on a construction site at the time and the flooding extended a significant distance through Coventry impacting both industrial and residential properties.
- The **Oxford Canal** starts at Hawkesbury Junction at the northern boundary of Coventry City and flows south-eastward alongside the M6. It then leaves the City at Sowe Common heading towards Rugby. There are no recorded instances of breach or overtopping on the Oxford Canal within the City.

The canals have the potential to interact with other watercourses in the study area, such as the River Sowe. These have the potential to become flow paths if the canals were overtopped or breached. Any development proposed adjacent to a canal should include a detailed assessment of how a canal breach would impact the site, as part of a site-specific Flood Risk Assessment. Guidance on development near canals is available from the **Canal and River Trust.**

5.9 Flooding from reservoirs

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

Flooding from reservoirs occurs following partial or complete failure of the control structure designed to retain water in the artificial storage area. Reservoir flooding is very different from other forms of flooding; it may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate but is extremely low compared to flooding from other sources. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe The risk of inundation to Nuneaton & Bedworth Borough as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the Reservoir Flood Mapping (RFM) study. There are 4 reservoirs shown to affect Nuneaton & Bedworth Borough. The reservoirs inundation extents provided by the Environment Agency can be found on the Environment Agency's **Long term flood risk map for England.**

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

The current mapping shows that there is one reservoir located within the Borough and one reservoir located outside the Borough that affect the Borough within the 'dry-day' scenario. A further two reservoirs located outside the Borough affect the Borough during the 'wet-day' scenario. The reservoirs inundation extents provided

by the Environment Agency can be found on the Environment Agency's **Long term flood risk map for England.** Developers and planners should check the online mapping before using the reservoir data shown in this SFRA to make sure they are using the most up to date mapping.

The Environment Agency 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.

Table 5-6 Reservoirs that may potentially affect Coventry City in the event of a breach

Reservoir	Location (northings and eastings)	Reservoir owner	Is the reservoir located within the study area?	Does the reservoir impact the study area in the 'dry-day' scenario?	Local Authority Area
Coombe Pool	438310, 279216	Coventry City Council	No	Yes	Warwickshire County Council
Meriden No.1	425778, 282032	Severn Trent Water	No	Yes	Solihull Borough Council
Meriden No.2	425895, 282117	Severn Trent Water	No	Yes	
Meriden No.3	426000, 282042	Severn Trent Water	No	Yes	
Naseby	466700, 277900	Canal and River Trust	No	Yes	Northamptonshire County Council
Stanford	459628, 280331	Severn Trent Water	No	Yes	
Sulby	465500, 281000	Canal and River Trust	No	Yes	
Welford	465000, 281100	Canal and River Trust	No	No	

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

- Developers should seek to contact the reservoir owner to obtain information which may include:
    - reservoir characteristics: type, dam height at outlet, area/volume, overflow location;
    - operation: discharge rates/maximum discharge;
    - discharge during emergency drawdown; and
    - inspection/maintenance regime.
- Developers should apply the sequential approach to locating development within the site.
- Consult with relevant authorities regarding emergency plans in case of reservoir breach.
- The reservoir owners are contacted to confirm the Reservoir Risk Designation (if determined) and the inspection and maintenance regime of the reservoir.

- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond.
- It should also be understood that the "risk category" of a reservoir is set by the potential damage and loss of life in circumstances where there is a breach or an extreme flood event. Accordingly, it is possible that allocation of new development downstream of an existing reservoir could potentially change the risk category and result in a legal requirement (under the Reservoirs Act 1975) 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 considering the implications and whether it would be more appropriate to place development in alternative locations not associated with such risk. The Level 2 SFRA contains a high-level review of the implications of reservoir flood risk.
- The EA and NRW online Reservoir Flood Maps contain information on the extents, depths and velocities following a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975). For proposed sites located within the extents, consideration should be given to the extent, depths and velocities shown in these online maps.
- 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.

5.10 Flood Alert and Flood Warnings

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

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

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

5.11 Summary of flood risk in Coventry City

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

6 Flood alleviation schemes and assets

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

6.1 Asset management

- Risk Management Authorities hold databases of flood risk management and drainage assets:
- The Environment Agency holds a national database that is updated by local teams
- The LLFA holds a database of significant local flood risk assets, required under Section 21 of the Flood and Water Management Act (2010)
- Highways Authorities hold databases of highways drainage assets, such as gullies and connecting pipes
- Water Companies hold records of public surface water, foul and combined sewers, the records may also include information on culverted watercourses.
- The databases include assets RMAs directly maintain and third-party assets. The drainage network is extensive and will have been modified over time. It is unlikely that any RMA contains full information on the location, condition and ownership of all the assets in their area. They take a prioritised approach to collecting asset information, which will continue to refine the understanding of flood risk over time.
- Developers should collect the available asset information and undertake further survey as necessary to present an understanding of current flood risk and the existing drainage network in a site-specific Flood Risk Assessment.

6.2 Standards of Protection

- Flood defences are designed to give a specific Standard of Protection (SoP), reducing the risk of flooding to people and property in flood prone areas. For example, a flood defence with a 100-year SoP means that the flood risk in the defended area is reduced to at least a 1% chance of flooding in any given year.
- Over time the actual SoP provided by the defence may decrease, for example due to deterioration in condition or increases in flood risk due to climate change. The understanding of SoP may also change over time as RMAs undertake more detailed surveys and flood modelling studies.
- It should be noted that the Environment Agency's on-going hydraulic modelling programme may revise flood risk datasets and, as a consequence, the standard of protection offered by flood defences in the area may differ from those discussed in this report.
- Developers should consider the SoP provided by defences and residual risk as part of a detailed FRA.

6.3 Maintenance

- The Environment Agency and local authorities have permissive powers to maintain and improve Main Rivers and Ordinary Watercourses, respectively. There is no legal duty to maintain watercourses, defences or assets and maintenance and improvements are prioritised based on flood risk. The ultimate responsibility for maintaining watercourses rests with the landowner.
- Highway's authorities have a duty to maintain public roads, making sure they are safe, passable and the impacts of severe weather have been considered. Water companies have a duty to effectually drain their area. What this means in practise is that assets are maintained to common standards and improvements are prioritised for the parts of the network that do not meet this standard e.g. where there is frequent highway or sewer flooding. Coventry City Council as the LLFA has permissive powers and limited resources are prioritised and targeted to where it can have the greatest effect.
- There is potential for the risk of flooding to increase in areas where flood alleviation measures are not maintained regularly. Breaches in raised flood defences are most likely to occur where the condition of a flood defences has degraded over time. Drainage networks in urban areas can also frequently become blocked with debris and this can lead to blockages at culverts or bridges.
- Developers should not assume that any defence, asset or watercourse is being or will continue to be maintained throughout the lifetime of a development. They should contact the relevant RMA about current and likely future maintenance arrangements and ensure future users of the development are aware of their obligations to maintain watercourses.
- Formal structural defences are given a rating based on a grading system for their condition. A summary of the grading system used by the Environment Agency for condition is provided in Table 6-1.

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

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

Source: Condition Assessment Manual – Environment Agency 2006

6.4 Major flood risk management assets in Coventry City

- The Flood Map for Planning contains information on 'Areas Benefiting from Defences' (ABD). This shows areas that benefit from the defences that provide a SoP of at least a 100-year river flood event. It does not show areas that benefit from protection for more frequent events.

- The Environment Agency 'AIMS' flood defence dataset gives further information on all flood defence assets within Coventry City. The following locations benefit from flood defences at a lower (or unknown) standard of protection in the City. In summary it can be observed that there are no significant measures that provide an appropriate standard of protection.

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

Watercourse	Location	Type	Design SOP	Condition Rating
River Sowe	Natural High Ground runs along the length of the river on both banks within the City.	Natural High Ground	Unknown	2 - 4
River Sherbourne	Natural High Ground runs along the length of the river on both banks from Allesley to the confluence with the River Sowe (except for the culverted section through Coventry city centre).	Natural High Ground	Unknown	2 - 3
Canley Brook	Natural High Ground runs along the length of the brook on both banks from Canley to the confluence with Finham Brook outside the City.	Natural High Ground	5 years	2 - 3

6.5 Existing and future flood alleviation schemes

Below are the current and potential future schemes lead by the Environment Agency, Coventry Council and Severn Trent Water.

6.5.1 Natural flood management (NFM)

NFM is used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). Techniques and measures, which could be applied in Coventry City 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
- Restoration of rivers and removal of redundant structures i.e. weirs and sluices no longer used or needed
- Installation or retainment of large woody material in river channels
- Improvements in management of soil and land use
- Creation of rural and urban SuDS

In 2017, the Environment Agency published an online evidence base to support the implementation of NFM and 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. Areas in Coventry where tree planting could potentially be considered as an NFM measure are most notably along the River Sowe.

In collaboration between Coventry City Council, the Environment Agency and Warwickshire Wildlife Trust, NFM measures have been implemented as part of flood risk management in Allesley and Upper Eastern Green. The main measure includes leaky dams which were installed in 2020 in the brook at Slashpitt's Farm in the river catchment upstream of Allesley.

6.6 Other schemes

The EA's **Asset Management** map provides an updated indication of schemes that are under construction or have a forecast start date. There are currently no capital schemes shown in this mapping that affect Coventry.

6.7 Actual and residual flood risk

A Level 2 SFRA (for any strategic allocations) or developer site-specific Flood Risk Assessment will need to consider the actual and residual flood risk due to the presence of flood and drainage assets in greater detail (although it should be noted that Zone 3b is based on the actual flood risk).

6.7.1 Actual flood risk

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

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

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

6.7.2 Residual risk

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

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

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

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

The assessment of residual risk should take into account:

- The flood hazard, depth and velocity that would result from overtopping or breach of defences.
- Flood gate or pumping station failure and/ or culvert blockage (as appropriate). The Environment Agency can provide advice at site-specific development level for advice on breach/ overtopping parameters for flood models.
- The design of the development to take account of the highest risk parts of the site e.g. allowing for flood storage on parts of the site and considering the design of the development to keep people safe e.g. sleeping accommodation above the flood level.
- A system of warning and a safe means of access and egress from the site in the event of a flood for users of the site and emergency services.
- Climate change and/ or policy-dependent residual risks (such as those that may be created if necessary, future defence improvements are required, or those associated with any managed adaptive strategies).

6.7.3 Overtopping

The risk from overtopping of defences is based on the relative heights of property or defence, the distance from the defence level and the height of water above the crest level of the defence. The Defra and Environment Agency **Flood Risks to People** guidance document provides standard flood hazard ratings based on the distance from the defence and the level of overtopping.

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

6.7.4 Defence breach

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

Where defences are present, risk of breach events should be considered as part of the site-specific FRA. Flood flows from breach events can be associated with significant depths and flow velocities in the immediate vicinity of the breach

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

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

7 Cumulative impact of development and strategic solutions

Under the NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para.160), rather than just to or from individual development sites.

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. Similarly the effect of the loss of surface water flow paths, surface ponding and infiltration can also give rise to cumulative effects and potentially exacerbate surface water flood risk.

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 surface water flow paths and storage proposals should normally not increase flood risk downstream.

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

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

Once the proposed development had been assessed against Fluvial Flood Risk, Risk of Flooding from Surface Water, Historic Flooding Incidents, and the potential increased developed area, the CIA identified two High Risk catchments within, or partially within Coventry City. These are:

- Sherbourne – source to confluence with River Sowe
- Sowe – confluence of Breach Brook to confluence with Withy Brook

It is recommended that the CCC work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the District to other local authorities in order to minimise cross boundary issues of cumulative impacts of development.

The Cumulative Impact Assessment (CIA) can be found in Appendix F.

8 Flood risk management requirements for developers

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

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

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

8.1 Principles for new developments

8.1.1 Apply the Sequential and Exception Tests

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

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

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

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

Developers should consult with the Environment Agency, Coventry City Council as LLFA and the water companies at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.

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

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

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific Flood Risk Assessment. At a site level, developers will need to check before commencing on a more detailed Flood Risk Assessment that they are using the latest available datasets. Developers should apply the most up-to-date Environment Agency climate change guidance (last updated in May 2022) and ensure the development has taken into account climate change adaptation measures.

8.1.4 Ensure that the development does not increase flood risk elsewhere

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

8.1.5 Ensure the development is safe for future users

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

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

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

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

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

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

8.2 Requirements for site-specific Flood Risk Assessments

8.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

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

An FRA may also be required for some specific situations:

- If the site may be at risk from the breach of a local defence (even if the site is actually in Flood Zone 1)
- Where evidence of historical or recent flood events have been passed to the LPA
- Land identified in an SFRA as being at increased risk in the future.
- Land potentially affected by reservoir, groundwater or sewer flood risk.

8.2.2 Objectives of a site-specific FRA

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

Site-specific FRAs should establish:

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

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

- **Standing Advice on Flood Risk** (Environment Agency)
- **Flood Risk Assessment for Planning Applications** (Environment Agency); and
- **Site-specific Flood Risk Assessment: CHECKLIST** (NPPF PPG, Defra)

Guidance for local planning authorities for reviewing Flood Risk Assessments submitted as part of planning applications has been published by Defra in 2015 – **Flood Risk Assessment: Local Planning Authorities** Local requirements for mitigation measures

8.2.3 Site layout and design

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

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

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

8.2.4 Modification of ground levels

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

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

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

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

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

8.2.5 Raised floor levels

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

The Environment Agency advises that minimum finished floor levels should be set 600mm above the 100-year plus climate change peak flood level, where the new climate change allowances have been used (see Section 4 for the climate change allowances). An additional allowance may be required because of risks relating to blockages to the channel, culvert or bridge and should be considered as part of an FRA.

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

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

8.2.6 Development and raised defences

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

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

8.2.7 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 or other flood risk management measures 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).

8.2.8 Buffer strips

The provision of a buffer strip to 'make space for water', allows additional capacity to accommodate climate change and ensure access to the watercourse, structures and defences is maintained for future maintenance purposes. It also enables the avoidance of disturbing riverbanks, adversely impacting ecology and having to construct engineered riverbank protection. A buffer strip of 8m is required from any Main River (16m if tidal influence). Where flood defences are present, these distances should be taken from the 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 more difficult. Any development in these areas will likely require a Flood Risk Permit from the Environment Agency alongside any permission. There should be no built development within these distances from main rivers / flood defences (where present).

8.2.9 Making space for water

The **PPG** sets out a clear aim in Flood Zone 3 to create space for flooding by restoring functional floodplain. Generally, development should be directed away from these areas.

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

8.3 Resistance and resilience measures

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

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

Table 8-1: Available temporary measures

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

8.4 Reducing flood risk from other sources

8.4.1 Groundwater

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

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

8.4.2 Surface water and sewer flooding

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

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

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

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

8.4.3 Reservoirs

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

- Developers should contact the reservoir owner for information on:
- the Reservoir Risk Designation
- reservoir characteristics: type, dam height at outlet, area/volume, overflow location
- operation: discharge rates / maximum discharge
- discharge during emergency drawdown; and
- inspection / maintenance regime.
- The EA online Reservoir Flood Maps contain information on the extents, depths and velocities following a reservoir breach (note: only for those reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoir Act 1975). Consideration should be given to the extent, depths and velocities shown in these online maps.

- The GOV.UK website on **Reservoirs: owner and operator requirements** provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.
- In addition, developers should consult the **'Coventry, Solihull and Warwickshire Councils Local Resilience Forum'** about emergency plans.

Developers should use the above information to:

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

Consideration should also be given to the potential implications of proposed development on the risk designation of the reservoir, as it is a requirement that in particular circumstances where there could be a danger to life that a commitment is made to the hydraulic capacity and safety of the reservoir embankment and spillway. The implications of such potential obligations should be identified and understood so that it can be confirmed that these can be met if proposed new development is permitted.

8.5 Emergency planning

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

The 2021 NPPF requires site level Flood Risk Assessments to demonstrate that

"d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan."

Certain sites will need emergency plans:

- Sites with vulnerable users, such as hospitals and care homes
- Camping and caravan sites
- Sites with transient occupants e.g. hostels and hotels
- Developments at a high residual risk of flooding from any source e.g. immediately downstream of a reservoir or behind raised flood defences

- Situations where occupants cannot be evacuated (e.g. prisons) or where it is safer to remain "in-situ" and / or move to a higher floor or safe refuge area (e.g. at risk of a breach).

Emergency Plans will need to consider:

- The characteristics of the flooding e.g. onset, depth, velocity, hazard, flood borne debris
- The vulnerability of site occupants.
- Structural safety
- The impact of the flooding on essential services e.g. electricity, drinking water
- Flood warning systems and how users will be encouraged to sign up for them
- Safe access and egress for users and emergency services
- How to manage the consequences of events that are un-foreseen or for which no warnings can be provided e.g. managing the residual risk of a breach.
- A safe place of refuge where safe access and egress and advance warning may not be possible, having discussed and agreed this first with emergency planners. Proposed new development that places an additional burden on the existing response capacity of the Coventry City authority will not normally be appropriate.

The **Coventry, Solihull and Warwickshire Councils Local Resilience Forum** provides Emergency Planning, resilience based, information that is both general and flood specific. This includes practical advice before, during and after flooding has occurred including, preparation, understanding warnings, actions to limit exposure to risk and recovery.

Further information is available from:

- **The National Planning Policy Guidance**
- **2004 Civil Contingencies Act**
- **DEFRA (2014) National Flood Emergency Framework for England**
- **FloodRe**
- The Environment Agency and DEFRA's **Standing Advice for FRAs**
- Coventry City Council's **'Water management and flooding'** page
- Environment Agency's **'How to plan ahead for flooding'**
- Sign up for **Flood Warnings** with the Environment Agency
- The **National Flood Forum**
- **GOV.UK** - Make a Flood Plan guidance and templates
- **ADEPT Flood Risk Plans for new development**

9 Surface water management and SuDS

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

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

In April 2015, Coventry City Council as the LLFA was made a statutory planning consultee on the management of surface water. The Council provides technical advice on surface water drainage strategies and designs put forward for major development proposals, so that onsite drainage systems are designed in accordance with the current legislation and guidance.

When considering planning applications Coventry City Council will provide advice to the Planning Department on the management of surface water. As an LPA, Coventry City Council should satisfy themselves that the development's proposed minimum standards of operation are appropriate and put in place, using planning conditions or planning obligations and clear arrangements for on-going maintenance over the lifetime of the development.

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

9.2 Sustainable Drainage Systems (SuDS)

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

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

It is a requirement for all new major development proposals to ensure that sustainable drainage systems for management of runoff are put in place, unless there is clear evidence that this would be inappropriate (NPPF para.169). Likewise, minor developments should also ensure sustainable systems for runoff management are provided. The developer is responsible for ensuring the design, construction and future/ongoing maintenance of such a scheme is carefully and clearly defined, and a clear and comprehensive understanding of the existing catchment hydrological processes and current drainage arrangements is essential.

9.3 Sources of SuDS guidance

9.3.1 C753 CIRIA SuDS Manual (2015)

The C753 CIRIA SuDS Manual (2015) provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections

ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

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

Non-Statutory Technical guidance provides non-statutory standards on the design and performance of SuDS. It outlines peak flow control, volume control, structural integrity, flood risk management and maintenance and construction considerations.

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

The Local Authority SuDS Officer Organisation produced their **practice guidance** in 2016 to give further detail to the Non-statutory technical guidance.

9.3.4 Coventry City Planning Policy

Coventry City Council leads consultation on planning policy for any works within the City. The overarching policies are those based on the **Local Plan**. Additional information on current consultation documents is also available **here**.

9.3.5 Coventry City Council SuDS Guidance

Coventry City Council SuDS guidance is set out in their **Policy EM5: Sustainable Drainage Systems (SuDS)**. This includes a summary of what SuDS are, the design principle to consider such as volume control, construction and maintenance requirements and, planning application requirements.

9.4 Other surface water considerations

9.4.1 Groundwater Vulnerability Zones

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

9.4.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones (GSPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The GSPZs require attenuated storage of runoff to operate so infiltration and contamination is prevented. GSPZs can be viewed on **DEFRA's Magic Map.**

Four GSPZ's have been identified in Coventry City. These all lie in the western part of the authority at Spon End, Mount Nod, Green Lane and Keresley.

9.4.3 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies.

The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process.

NVZs can be viewed on the **Environment Agency's website**. There are currently two pre appeal NVZ areas covering Coventry City.

10 Summary and Recommendations

Parts of Coventry City are at risk of flooding from the following sources: fluvial, surface water, groundwater, sewers, reservoir inundation and canal overtopping/breaches. This study has shown that the most significant sources of flood risk in Coventry City are fluvial and surface water.

- *Fluvial flooding*: The primary flood risk is along the River Sowe, the River Sherbourne and their main tributaries. These present fluvial flood risk to suburban communities of Coventry including, but not exclusively, Allesley, Spon End, Whitley, Wood End, Bell Green, Walsgrave and Binley. The fluvial flood extents are fairly well confined in the majority of Coventry City, with wider extents along the River Sowe due to lower lying, flat topography. The river Sherbourne is culverted through Coventry city centre.
- *Surface* water: The Risk of Flooding from Surface Water map shows a number of prominent overland flow routes that largely follow the topography of the watercourses. There are some areas where there are additional flow paths and areas of ponding, for example where water is impounded at road or rail embankments and in low-lying areas. There are also considerable flow routes following the roads throughout the main urban centre of Coventry City which alongside isolated areas of ponding affect a large number of properties across the area.
- *Sewer*: The sewers in Coventry City are managed by Severn Trent Water. Up to 2015, a total of 61 properties have been recorded as experiencing sewer flooding within the borough. The highest risk localities include properties around Canley, Wyken Green, Coundon and Holbrooks.
- *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 as a result of climate change. Flood extents may increase in some locations; although this may be minimal, however flood depth, velocity and hazard may have more of an impact due to climate change. It is recommended that Coventry City Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the City.
- *Groundwater*: The Areas Susceptible to Groundwater Flooding map shows that in general, the majority of Coventry City is shown to be within the "< 25%" and ">= 25% <50%" classifications with a lower susceptibility to groundwater flooding or have no data available. There are however areas along the main rivers in the district, particularly along the River Sowe, where flooding from groundwater is more likely to occur.
- JBA's Groundwater Flood Risk map shows the areas with the predicted shallowest groundwater levels generally following the flow paths of the major watercourses in the City, particularly along the River Sherbourne and River Sowe. Across the majority of the City, the risk of groundwater flooding is considered to be negligible due to the nature of the local geological deposits.
- *Canals*: There are two canals in Coventry City including the Coventry Canal and the Oxford Canal. These have the potential to interact with other watercourses in the study area, namely the River Sowe, and become flow paths during flood events or in breach scenarios. There is one record of breach on the Coventry Canal which happened at Bishopsgate Green as a result of excavation works. Any development proposed adjacent to a canal

should include a detailed assessment of how a canal breach would impact the site, as part of a site-specific Flood Risk Assessment.

- *Reservoirs*: There is a potential risk of flooding from reservoirs outside 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 Flood Risk Assessments (where relevant).

10.1 Recommendations

Reduction of flood risk through site allocations and appropriate site design

- To locate new development in areas of lowest risk, in line with the requirements of the Sequential Test, by steering sites to river Flood Zone 1 and avoiding where possible surface water Flood Zone B. A further assessment should then be performed to confirm that groundwater, reservoir and sewer flood risk does not influence the decision to allocate land (if required) for development. If a Sequential Test is undertaken and a site at flood risk is identified as the only appropriate site for the development, the Exception Test shall be undertaken. If development can't be avoided in a high-risk surface water Zone, then part "b" of the Exception Test should be satisfied.
- After application of the Exception Test, a sequential approach to site design will be used to reduce risk. Any re-development within areas of flood risk which provide other wider sustainability benefits will provide flood risk betterment and more resilience to flooding.
- Identification of long-term opportunities to remove development from the floodplain and to make space for water.
- Ordinary watercourses not currently afforded flood maps should be modelled to an appropriate level of detail to enable a sequential approach to the layout of the development.
- Ensure development is 'safe', dry pedestrian egress from the floodplain and emergency vehicular access should be possible for all residential development. If at risk, then as assessment should be made to detail the flood duration, depth, velocity and flood hazard rating in the 1 in 100-year plus climate change flood event, in line with FD2320.
- Raise residential and commercial finished floor levels 600mm above the 1 in 100-year plus climate change flood level.
- Protect and promote areas for future flood alleviation schemes.
- Safeguard functional floodplain from future development.
- Identify opportunities for brownfield sites in functional floodplain to reduce risk and provide flood risk betterment.
- Identify opportunities to help fund future flood risk management through developer contributions to reduce risk for surrounding areas.
- Seek opportunities to make space for water to accommodate climate change.

Promote SuDS to mimic natural drainage routes to improve water quality

- SuDS design should demonstrate how constraints have been considered and how the design provides multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.
- Planning applications for phased developments should be accompanied by a drainage strategy, which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase.
- Use SuDS management trains to prevent and control pollutants to prevent the 'first flush' polluting the receiving waterbody.

- SuDS are to be designed so that they are easy to maintain, and it should be set out who will maintain the system, how the maintenance will be funded and should be supported by an appropriately detailed maintenance and operation manual.

Reduce Surface Water Runoff from New Developments and Agricultural Land

- Space should be provided for the inclusion of SuDS on all allocated sites, outline proposals and full planning applications.
- Promote biodiversity, habitat improvements and **Countryside Stewardship schemes** to help prevent soil loss and reduce runoff from agricultural land.

Enhance and Restore River Corridors and Habitat

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

Mitigate Against Risk, Improved Emergency Planning and Flood Awareness

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

Annex 1 – Updates to the Planning Practice Guidance (25 August 2022)

The Planning Practice Guidance on Flood Risk and Coastal Change was updated on the 25 August 2022, triggered by: revisions to the NPPF in 2018, 2019 and 2021; practice experience since the PPG was first published in 2014; Policy review of development in flood risk areas; and other stakeholder and committee reviews.

Key Details of the changes included in the PPG update of 25 August 2022:

General

- 'Design flood' includes Climate Change and surface water risk
- Hierarchical approaches prioritises avoidance and passive approaches, which also applies to residual risk.
- Safety of development now accounts for impact of flooding on the services provided by development
- Inappropriate to consider likelihood of defence breach
- Functional floodplain "starting point" for extent uplifted to the 3.3% AEP from 5% AEP
- Lifetime of non-residential development now has a 75yrs starting point
- New culverting and building over culverts is discouraged
- Defra FD2320 research referenced for calculating flood hazard to people

Sequential Test

- Removal of reference to Flood Zones (Diagram 2) when performing Sequential Test and requirement must now consider whether development can be located in the lowest areas (high – medium – low) of flood risk both now and in the future (the test applies to all source of flood risk – whereas previously the test was only performed for present day flood risk for the "Flood Zones" i.e. river and sea flood risk).
- Improved clarity about when test needs to be applied. Potential confusion about 'minor' development has been clarified.
- Clearer roles and responsibilities, with emphasis on the LP to define the area of search and decide if the test is passed.
- Key terms defined (e.g. 'reasonably available')
- Suggests approaches to improve certainty and efficiency
- Clarification about when it's appropriate to move onto the Exception Test
- Explicit statement that Table 2 (was Table 3) cannot be used to support performance of Sequential Test

Exception Test

- Key terms defined (e.g. 'wider sustainability benefits to the community')
- New section on how to demonstrate development has reduced flood risk overall
- Table 2 (was Table 3) shows flood zone ***incompatibility***, NOT whether 'development is appropriate'.

Integrated approach to flood risk management

- Catchment based approaches
- Improved connectivity with other strategies e.g. water cycle studies and drainage and wastewater management plans

- Encourages measures which deliver multiple benefits – including those which unlock sustainable development

Impact of development on flood risk elsewhere

- FRA's must detail any increase in risk elsewhere
- Guidance on compensatory flood storage – requirement for level-for-level storage
- Guidance on mitigating cumulative impacts
- Clarification that stilts/voids should not be relied upon for compensatory storage

Safeguarding land and relocation

- Guidance on how to safeguard land needed for future FCERM infrastructure
- Definition included for unsustainable locations
- Guidance for control of developments in unsustainable locations
- More detail and expectation on requirement to exercise Plan process to relocate development that is susceptible to frequent flood risk or coastal erosion.

Sustainable Drainage Systems (SuDS)

- Clearer definition of what SuDS are – this must meet the '4 pillars'
- Clearer requirement for SuDS Strategy
- Better recognition of wider SuDS benefits e.g. BNG, carbon sequestration, urban cooling
- Encouragement for earlier consideration in the design process
- Encourages policies setting out where SuDS would bring greatest benefits
- Highlights the need to check the need for other permits for SuDS

Reducing the causes & impacts of flooding

- Whole new section – links to all the EA's latest NFM tools, maps and research
- Support for river restoration such as culvert removal and other 'slow the flow' approaches
- Support for making space for river geomorphology e.g. meander migration

Coastal Change

- Encourages more precautionary designation of Coastal Change Management Areas (CCMAs)
- Allows more flexibility for existing buildings/land-use to adapt to change
- Clearer requirement for a 'coastal change vulnerability assessment' with apps for development in CCMAs
- Highlights need to consider removal of some Permitted Development rights in CCMAs

Other changes

- Guidance on how to consider flood risk in LDOs
- More detailed framework for local design code preparation
- Approach to article 4 in relation to flood risk
- Greater clarity on the application of the call-in direction process

- Guidance on development that might affect existing reservoirs
- Updated links to the latest tools and guidance

Impacts on the SFRA

The most relevant points to consider in relation to updating the SFRA process relate to the changes to the Sequential Test requirements and Exception Test requirements, particularly the requirement for updated Climate Change modelling for all sources of flood risk and the functional floodplain starting point at 3.3% AEP. Consideration also needs to be made to the changes to Table 2 (was Table 3) and the flood zone incompatibility. This should be considered during the screening phase prior to the Level 2 SFRA being undertaken.

For more information on the PPG updates, please visit the **gov.uk website** and see the briefing note **available here**.

Appendices

A Interactive Flood Risk Mapping

B Data sources used in the SFRA

C SFRA User Guide

D Flood Alerts and Flood Warnings

E Summary of flood risk across the City of Coventry

F Cumulative Impact Assessment (CIA)

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
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