

South Staffordshire Council Level 2 Strategic Flood Risk Assessment

Final Report

November 2022

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**South
Staffordshire
Council**

JBA Project Manager

Edmund Mumford
The Library
St Philip's Courtyard
Church End
Coleshill
B46 3AD

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Contract

This report describes work commissioned by South Staffordshire Council by an email dated 29 April 2022. Louise Goode and Edmund Mumford of JBA Consulting carried out this work.

Prepared by Louise Goode BSc MRes PhD

Analyst

..... Edmund Mumford BSc MSc

..... Analyst

..... Alex Clark BSc MSc

..... Analyst

..... James Gill BSc MSc

..... Assistant Analyst

Reviewed by Alastair Dale BSc PGDip MIAHR

..... Director

Purpose

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- South Staffordshire Council
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Executive summary

Introduction and context

This Level 2 Strategic Flood Risk Assessment (SFRA) document was created with the purpose of supporting the production of the South Staffordshire Local Plan. It follows on from the Southern Staffordshire Level 1 SFRA completed in 2019 which was a joint SFRA between South Staffordshire District Council, Cannock Chase Council, Lichfield District Council, Stafford Borough Council and Tamworth Borough Council. This Level 2 SFRA assesses sites in South Staffordshire District only.

The 2022 Level 2 SFRA involves the assessment of 7 proposed development sites and contains updated information on flood data, changes to relevant legislation since the Level 1 SFRA, and recommendations for the cumulative impact of development.

The 2019 Level 1 SFRA should be consulted for Planning Framework and Flood Risk policy, and Planning Policy for Flood Risk Management. However, due to July 2021 update to the NPPF changes to policy and guidance from Chapters 2 and 3 of the Level 1 SFRA have been reflected in the Level 2 report. It is noted that at the time of preparation of the Level 2 SFRA the Planning Practice Guidance has not been updated to reflect the July 2021 changes to the NPPF.

SFRA objectives

The Government's Planning Practice Guidance (PPG) on Flood Risk and Coastal Change advocates a tiered approach to risk assessment and identifies the following Level 1 and Level 2 assessments.

The aim of the Level 2 assessment is to build on identified risks from Level 1 for proposed development sites, to provide a greater understanding of fluvial, surface water, groundwater, and reservoir related flooding risks to the site. From this the Local Council and Developers can make more informed decisions and pursue development in an effective and efficient manner. The Level 2 assessment also identifies the scope of further risk analysis at the site-specific Flood Risk Assessment (FRA) stage.

Level 2 SFRA outputs

The Level 2 assessment includes detailed assessments of the proposed site options. These include:

- An assessment of all sources of flooding including fluvial flooding, surface water flooding, groundwater flooding, mapping of the functional floodplain and the potential increase in fluvial and surface water flood risk due to climate change.
- Reporting on current conditions of flood defence infrastructure, where applicable.
- An assessment of existing flood warning and emergency planning procedures, including an assessment of safe access and egress during an extreme event.
- Advice and recommendations on the likely applicability of sustainable drainage systems for managing surface water runoff.
- Advice on whether the sites are likely to pass the second part of the Exception Test with regards to flood risk and on the requirements for a site-specific FRA.

Summary of Level 2 SFRA

South Staffordshire Council provided 8 sites for assessment. These were identified by the Environment Agency as requiring a more detailed analysis of risk, following a consultation exercise on Preferred Options undertaken by South Staffordshire District Council. Detailed site summary tables and GeoPDF mapping have been produced, provided in Appendix A.

The summary tables set out the flood risk to each site, including maps of extent, depth and velocity of flooding as well as hazard mapping for the 100-year defended with climate change

events, where modelled outputs were produced for this assessment. Where there was no hydraulic modelling undertaken, Flood Zone 2 was used as indicative extent for fluvial climate change. The latest Environment Agency peak rainfall allowances were applied to the Environment Agency's Risk of Flooding from Surface Water Dataset to inform the assessment. Each table sets out the NPPF requirements for the site as well as guidance for site-specific FRAs. A broadscale assessment of suitable SuDS options has been provided, giving an indication where there may be constraints to certain types of SuDS techniques.

To accompany each site summary table, there is an Interactive GeoPDF map, with all the mapped flood risk outputs per site. This is displayed centrally, with easy-to-use 'tick box' layers down the right-hand side and bottom of the mapping, to allow easy navigation of the data.

The following points summarise the Level 2 assessment:

- The majority of sites with a detailed Level 2 summary table are at fluvial flood risk. The degree of flood risk varies, but most sites are only marginally affected along their boundaries. As most of the sites lay along unnamed ordinary watercourses, detailed modelling was not available to inform risk to the sites. Broadscale modelling using 2d techniques has been undertaken for these sites- this modelling is suitable for strategic assessment purposes, however, should these sites be brought forward for development more detailed modelling will be required to inform site planning and a site-specific FRA. Broadscale modelling indicated that for most of the sites the area at risk of fluvial flooding is low and limited to the areas in the immediate vicinity of watercourses. Only one site, 0119a, is predicted to be at more extensive risk of flooding. All sites will require more detailed investigations on sequential site layouts, SuDS possibilities, safe access, and egress, etc. as part of a site-specific Flood Risk Assessment at the planning application stage.
- Most sites are not at significant surface water risk, with surface water risk commonly aligning with floodplain topography of the ordinary watercourses. Sites at greatest risk of surface water flooding are generally those where surface water flood risk is located in areas away from fluvial flood risk, in particularly site 463, where a surface water flow path bisects the site. Surface water should also be considered when assessing safe access and egress to and from the site, particularly where surface water has the potential to impact access/egress on routes outside of the immediate site boundary, e.g. where sites are accessed by a single road flooding on the road may impede access even though the site itself remains unaffected. Consideration should be made to these sites as to how safe access and egress can be provided during flood events, both to people and emergency vehicles. Also, consideration should be given to whether the risk forms a flow path or bisects the site where access from one side to another may be compromised.
- Fluvial and surface water climate change mapping indicates that flood extents will increase. As a result, the depths, velocities, and hazard of flooding may also increase. The significance of the increase generally depends on the topography of site and the percentage allowance used. The Council and the Environment Agency require the 100-year plus Central and Higher fluvial scenarios and surface water scenarios to be considered in future developments, as well as the Upper End for significant new developments or urban extensions, for the 2080s epoch ([click here to access the latest EA Climate Change allowances](#)) as of July 2022. This SFRA reflects current advice at the time of writing however developers should check [Gov.uk](#) guidance for site-specific FRAs to ensure the impact of climate change in line with latest guidance.
- Residual risk was considered at the sites. Formal flood defences are not present at any of the sites therefore there is no residual risk from flood defences. A number of sites are in the vicinity of canals, however due to topography the residual risk from overtopping/breach to sites is low. Where watercourses are culverted under roads near to sites, there may be a risk to the site if culverts become blocked. Blockage locations were determined by visual inspection of the OS mapping and ground topography in the vicinity of the site, to determine whether a structure upstream, downstream, or within

the site could have an impact on the site. Blockage modelling has not been undertaken as part of this assessment and these would need to be considered further as part of a site-specific assessment.

- A strategic assessment was conducted of SuDS options using regional datasets and the Areas susceptible to Groundwater Flooding dataset. A detailed site-specific assessment of suitable SuDS techniques would need to be undertaken at site-specific level to understand which SuDS option would be best.
- In respect of cumulative impact, development sites proposed have the potential to provide a betterment to existing communities downstream within the catchment. However, all of these developments also have the potential to increase flood risk offsite if both National and Local SuDS Standards are not applied. They also offer a great potential to enhance the wider Green and Blue Infrastructure of the local area through integrated planning for flood risk, sustainable drainage, biodiversity, amenity and sustainable transport provision.

At the planning application stage, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses where there are no detailed hydraulic models present, or where there are sites reported to be at high risk of surface water in the EA's mapping, to verify flood extent (including latest **climate change allowances**). This will inform development zoning within the site and confirm that the Exception Test is satisfied.

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 the SFRA.

For developments that have not been allocated in the Local Plan, developers must undertake the Sequential Test followed by the Exception Test (if required) 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.

It is recommended that as part of the early discussions relating to development proposals developers discuss requirements relating to site-specific Flood Risk Assessment and drainage strategies with both the Local Planning Authority and the LLFA, to identify any potential issues that may arise from the development proposals.

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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.
CIA	Cumulative Impact Assessment
CIRIA	Construction Industry Research and Information Association
Defra	Department for Environment, Food and Rural Affairs
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.
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).
FWA	Flood Warning Area
FWMA	Flood 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.
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
Greenfield	Undeveloped parcel of land
Ha	Hectare
JBA	Jeremy Benn Associates
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

Term	Definition
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
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.
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
ReFH	Revitalised Flood Hydrograph
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.
RMA	Risk Management Authority - Operating authorities who's remit and responsibilities concern flood and/or coastal risk management.
RoFfSW	Risk of Flooding from Surface Water (formerly known as the Updated Flood Map for Surface Water (uFMfSW))
Sequential Test	Set out in the NPPF, the Sequential Test is a method used to steer new development to areas with the lowest probability of flooding.
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
SFRA	Strategic Flood Risk Assessment
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

Term	Definition
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.
SWDS	Surface Water Drainage Strategy
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.
URBEXT	Urban extent catchment descriptor, describing the level of urbanisation in a catchment.
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)

This Level 2 Strategic Flood Risk Assessment (SFRA) 2021 document provides an assessment of sites allocated within South Staffordshire District and was prepared in accordance with the 2021 National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG), which was updated in July 2021 during the time of preparing the Level 2 SFRA. The content of the Level 2 SFRA builds on the information presented in the Level 1 SFRA in 2019

1.2 Levels of SFRA

The **Planning Practice Guidance**¹ advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

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

This report fulfils the requirements of a **Level 2** SFRA.

1.3 SFRA objectives

The objectives of this 2022 Level 2 SFRA are to:

- 1 Provide individual flood risk analysis for site options using the latest available flood risk data, thereby assisting the Council in applying the Exception Test to their proposed site options in preparation of their Local Plan.
- 2 Using available data, provide information and a comprehensive set of maps presenting flood risk from all sources for each site option.
- 3 Where the Exception Test is required, provide recommendations for making the site safe throughout its lifetime.
- 4 Take into account most recent policy and legislation in the NPPF, PPG and LLFA SuDS guidance.
- 5 Update the catchments that are most sensitive to new development in flood risk terms and further review policy and recommendations for these catchments.

1.4 Context of the Level 2 assessment

The Level 1 SFRA was undertaken to support the production of the Local Plan for each of the Southern Staffordshire Authorities (South Staffordshire District, Cannock Chase

¹ Planning Practice Guidance – Flood Risk and Coastal Change - Paragraph: 012 Reference ID: 7-012-20140306

District, Lichfield District, Stafford Borough, Tamworth Borough). JBA Consulting were commissioned by South Staffordshire Council (SSC) to prepare a Level 2 Strategic Flood Risk Assessment (SFRA) for the South Staffordshire administrative area only, following on from the Level 1 SFRA completed in 2019. The purpose of this study is to provide a comprehensive and robust evidence base to inform the preparation of the **Local Plan**.

This 2022 Level 2 SFRA builds on the work undertaken in the Level 1 SFRA and assesses actual flood risk at potential site allocations. In addition, there have been updates to national and local planning policy, flood event data and recommendations for the cumulative impact of development since the preparation of the Level 1 SFRA.

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

This Level 2 SFRA follows the Level 1 assessment published in 2019 and is written in accordance with the 2021 NPPF and PPG. Due to the NPPF update in July 2021 changes to policy and guidance from Chapters 2 and 3 of the Level 1 SFRA have been reflected in the Level 2 report. It is noted that at the time of preparation the Level 2 SFRA the Planning Practice Guidance has not been updated to reflect the July 2021 changes to the NPPF.

1.5 Consultation

SFRAs should be prepared in consultation with other risk management authorities. The following parties (external to South Staffordshire Council) have been consulted during the preparation of this Level 2 SFRA:

- Staffordshire County Council (SCC)
- Environment Agency
- Severn Trent Water
- Canal and Rivers Trust
- Neighbouring Authorities
 - Bromsgrove District
 - Cannock Chase District
 - City of Wolverhampton District
 - Dudley District
 - Shropshire
 - Stafford District
 - Telford and Wrekin
 - Walsall District
 - Wyre Forest District
 - Tamworth Borough

1.6 How to use this report

Table 1-1 SFRA report guide

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA	For general information and context.
2. Sources of information used in preparing the Level 2 SFRA	Summarises the data used in the Level 2 assessments and GeoPDF mapping	Users should refer to this section in conjunction with the summary tables and GeoPDF mapping to understand the data presented. Developers should refer back to this section when understanding requirements for a site-specific FRA.
3. 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.
4. Level 2 Assessment Methodology	Summarises the sites taken forward to a Level 2 assessment and the outputs produced for each of these sites.	This section should be used in conjunction with the site summary tables and GeoPDF mapping to understand the data presented.
5. Flood risk management requirements for developers	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Refers back to relevant sections in the L1 SFRA for mitigation guidance.	Developers should use this section to understand requirements for FRAs and what conditions/ guidance documents should be followed. Developers should also refer to the L1 SFRA for further information on flood mitigation options.
6. Surface water management and SuDS	An overview of any specific local standards and guidance for Sustainable Drainage Systems (SuDS) from the Lead Local Flood Authority. Refers back to relevant sections in the L1 SFRA for information on SuDS and surface water management.	Developers should use this section to understand what national, regional and local SuDS standards are applicable. Hyperlinks are provided. Developers should also refer to the L1 SFRA for further information on types of SuDS, the hierarchy and management trains information.
7. Summary of Level 2 assessment and recommendations	Summarises the results and conclusions of the Level 2 assessment, and signposts to the L1 SFRA for planning policy recommendations.	Developers and planners should use this section to see a summary of the Level 2 assessment and understand the key messages from the site summary tables. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.

Section	Contents	How to use
Appendix A: Level 2 assessment - Site summary tables and Interactive mapping	Provides a detailed summary of flood risk for sites requiring a more detailed assessment. The section considers flood risk, emergency planning, climate change, broadscale assessment of possible SuDS, exception test requirements and requirements for site-specific FRAs. Provides interactive PDF mapping for each Level 2 assessed site showing flood risk at and around the site.	Planners should use this section to inform the application of the Sequential and Exception Tests, as relevant. Developers should use these tables to understand flood risk, access and egress requirements, climate change, SuDS, and FRA requirements for site-specific assessments. Planners and developers should use these maps in conjunction with the site summary tables to understand the nature and location of flood risk.
Appendix B: Cumulative impact of development and strategic solutions	Builds on recommendations from the Level 1 SFRA, identifying the cumulative impact of development in the site catchments and providing recommendations for storage and betterment for all potential development sites in the catchment.	Planners should use this section to help develop policy recommendations for the sites specified. Developers should use this section to understand the potential storage requirements and betterment opportunities for the sites assessed.

Hyperlinks to external guidance documents/websites are provided in green throughout the SFRA – the **hyperlink to click on to access the document is in bold green**.

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

1.1 SFRA Study Area

South Staffordshire Council's (SSC) administrative area covers an area of approximately 407.4km² shown in Figure 1-1. It has a population of approximately 112,126 (2018 Census ONS UK).

SSC is bound by Bromsgrove District Council, Cannock Chase District Council, City of Wolverhampton Council, Dudley Metropolitan Borough Council, Shropshire Council, Stafford Borough Council, Telford and Wrekin Council, Walsall District Council and Wyre Forest Council (Figure 1-2).

The main towns in the study are Codsall, Wombourne Penkridge, Brewood and Huntington. The main rivers in the study area are the River Penk, Smestow Brook and the River Stour with several smaller watercourses draining into these rivers. The Staffordshire and Worcester Canal runs through the length of the study area, and the Shropshire Union Canal runs through the northern part of the district. There are also a number of ponds and lakes within the study area. See Figure 1-3 for a map of the main watercourses in the area.

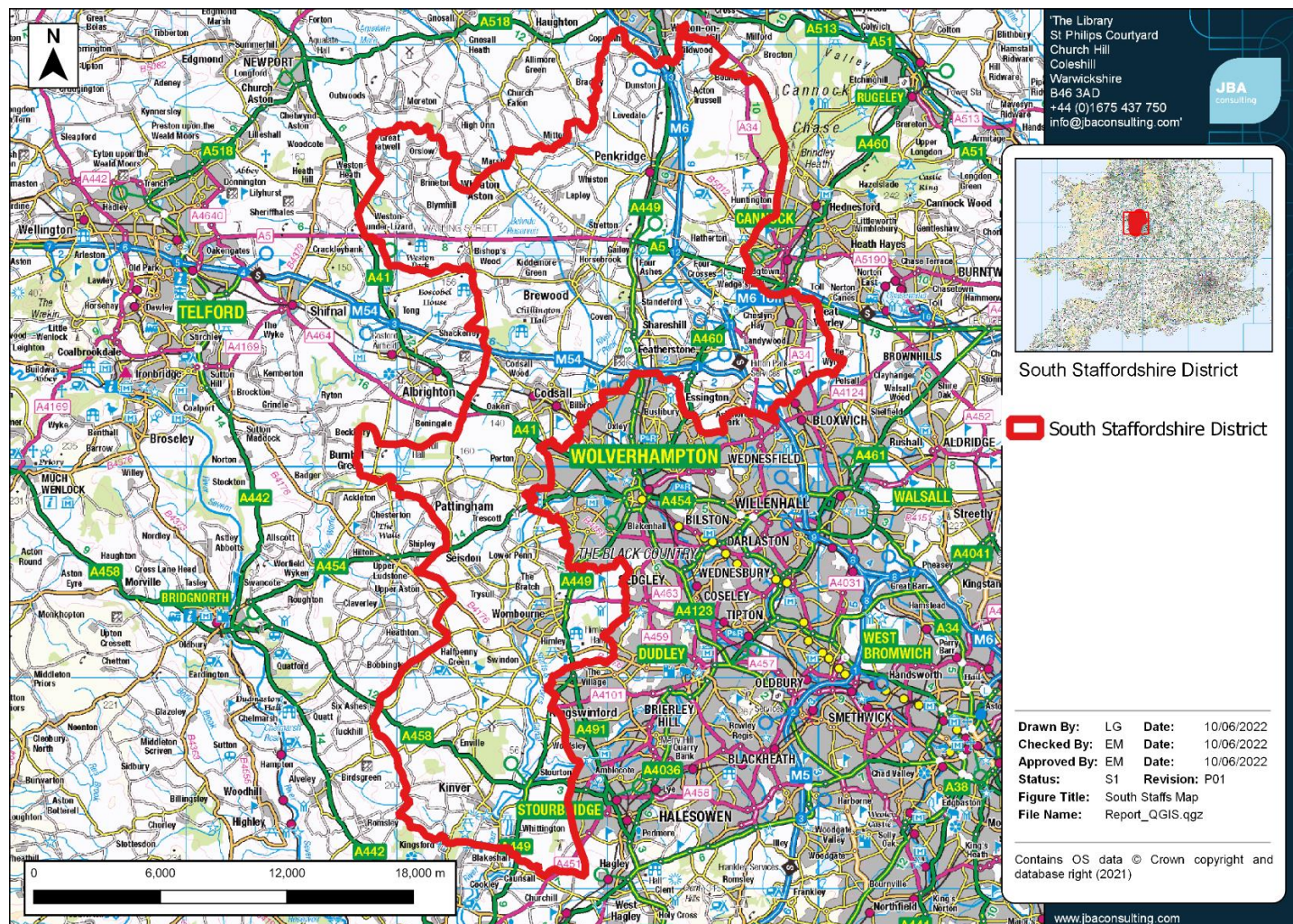


Figure 1-1: South Staffordshire District authority area

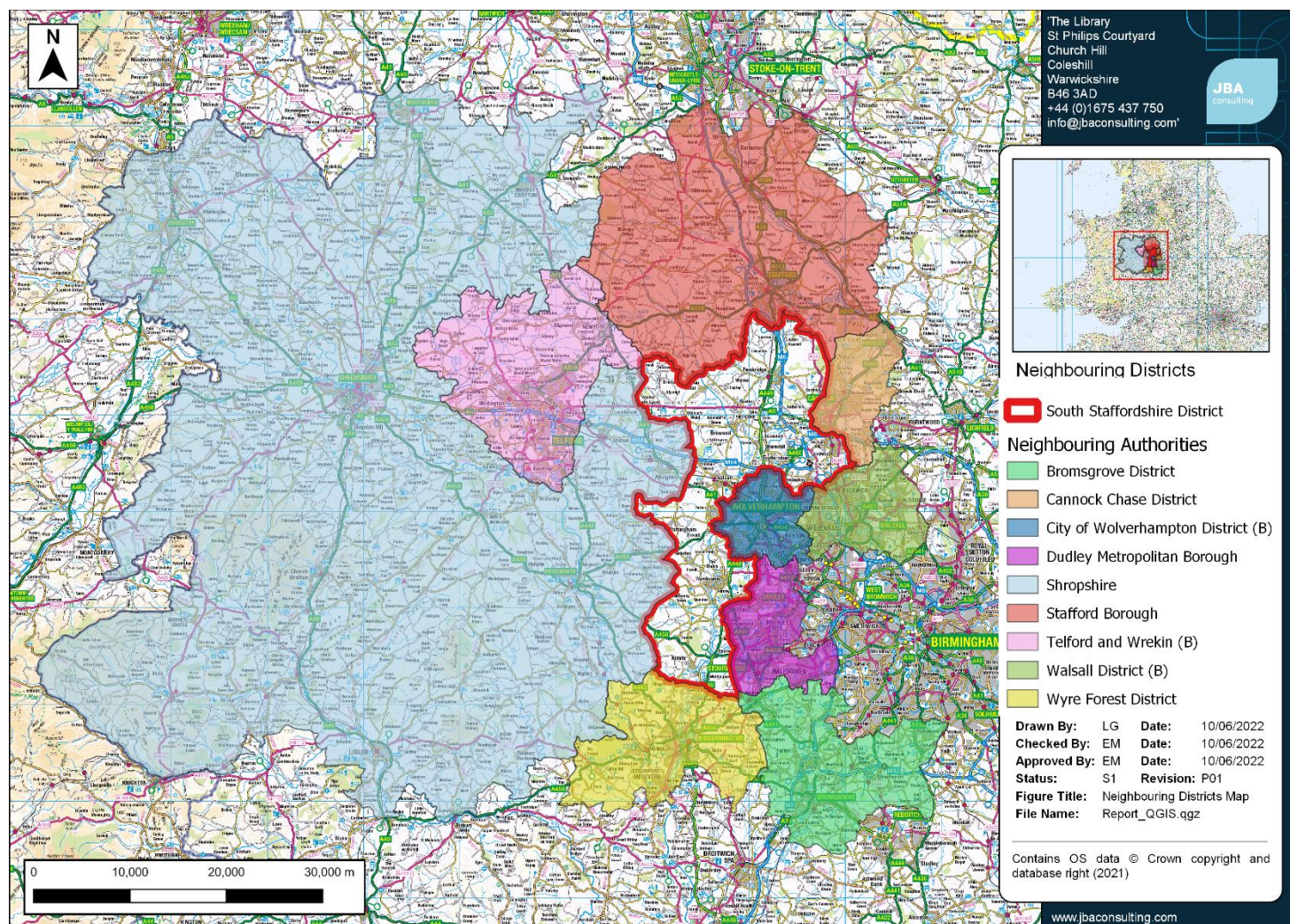


Figure 1-2 South Staffordshire and neighbouring Local Authority Boundaries

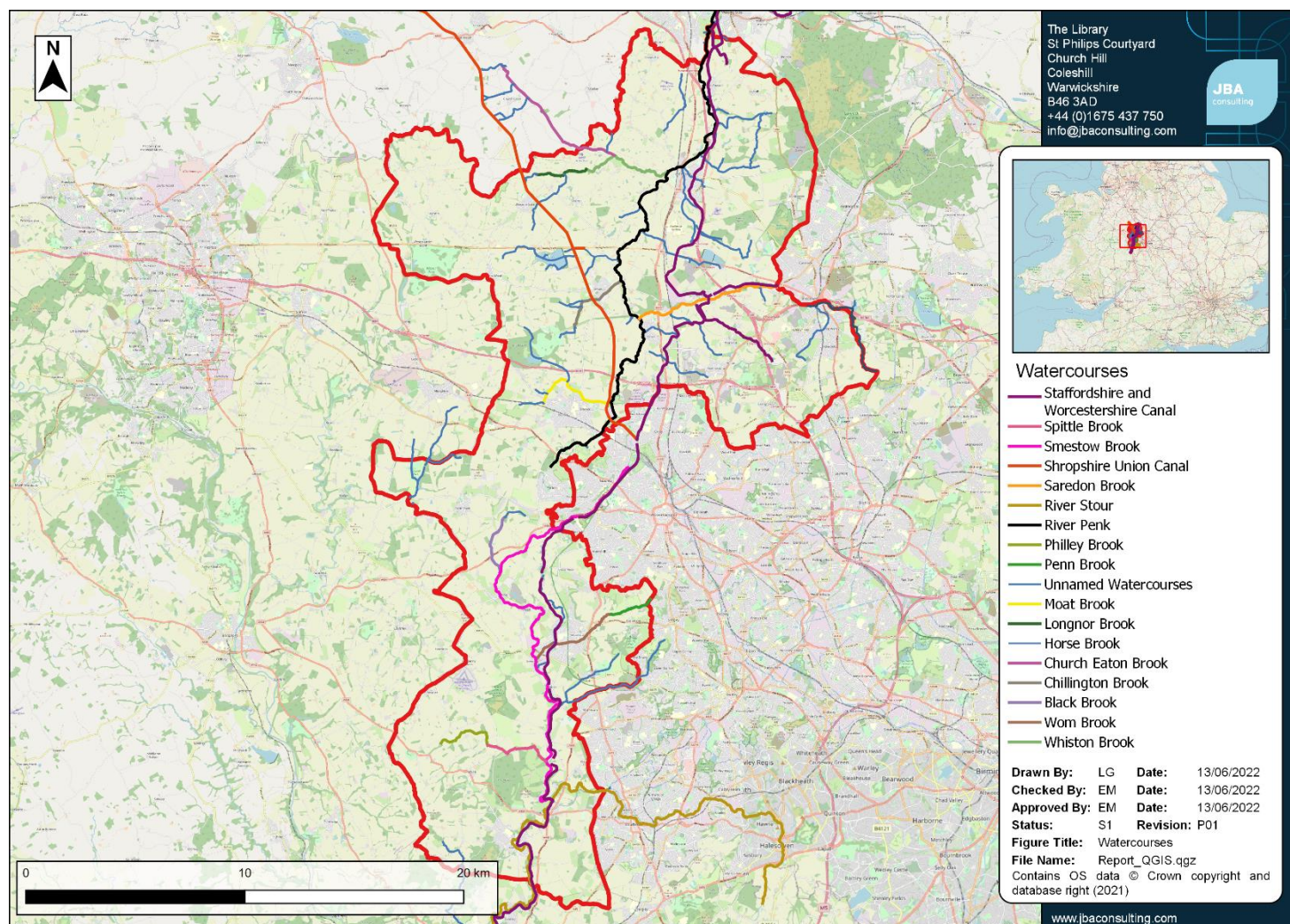


Figure 1-3 Main rivers and ordinary watercourses within the South Staffordshire boundary

2 The Planning Framework and Flood Risk Policy

2.1 Introduction

The overarching aim of development and flood risk planning policy in the UK is to ensure that the potential risk of flooding is considered at every stage of the planning process. This section of the Level 2 SFRA provides an overview of the planning framework, flood risk policy and flood risk responsibilities, given the changes since the Level 1 SFRA and updated guidance. In preparing the subsequent sections of this SFRA, appropriate planning and policy amendments have been acknowledged and considered.

SFRAs contain information that should be referred to in responding to the Flood Risk Regulations and the formulation of local flood risk management strategies and plans. SFRAs are also linked to the preparation of Catchment Flood Management Plans (CFMPs), Surface Water Management Plans (SWMPs) and Water Cycle Strategies (WCSs).

2.2 Roles and Responsibilities for Flood Risk Management

There are a number of different organisations in and around South Staffordshire that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are shown below in 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. 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 Staffordshire County Council as LLFA do have powers, but limited 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 Flood Risk Management

Risk Management Authority	Strategic Level	Operational Level	Planning Role
Environment Agency	<ul style="list-style-type: none"> • Strategic overview for all sources of flooding • National Strategy • Reporting and general supervision 	<ul style="list-style-type: none"> • Main rivers • Reservoirs 	<ul style="list-style-type: none"> • Statutory consultee for development in Flood Zones 2 and 3 for coastal and fluvial extents
Staffordshire County Council - Lead Local Flood Authority (LLFA)	<ul style="list-style-type: none"> • Preliminary Flood Risk Assessment • Local Flood Risk Management Strategy 	<ul style="list-style-type: none"> • Surface Water • Groundwater • Ordinary Watercourses (consenting and enforcement) • Ordinary watercourses (works) 	<ul style="list-style-type: none"> • Statutory consultee for all major developments
South Staffordshire Council - Local Planning Authority (LPA)	<ul style="list-style-type: none"> • Local Plans as Local Planning Authorities 	<ul style="list-style-type: none"> • Determination of Planning Applications as Local Planning Authorities • Production of the Local Plan as the LPA • Managing open spaces under Council ownership 	<ul style="list-style-type: none"> • As described in operational level
Water Companies: Severn Trent Water	<ul style="list-style-type: none"> • Asset Management Plans supported by Periodic Reviews (business cases) • Develop Drainage and Wastewater management plans 	<ul style="list-style-type: none"> • Public sewers 	<ul style="list-style-type: none"> • Non-statutory consultee for all major developments. Also provides comments below this threshold where a specific request is received from Council' • Adoption of SuDS under Sewerage Sector Guidance
Highways Authorities: National Highways - motorways and trunk roads	<ul style="list-style-type: none"> • Highway drainage policy and planning 	<ul style="list-style-type: none"> • Highway drainage • Local Highway Authority is able to adopt some highway drainage features 	<ul style="list-style-type: none"> • Internal planning consultee regarding highways and design standards and options

2.3 Relevant Legislation

The following legislation is relevant to development and flood risk in South Staffordshire authority area:

- **Flood Risk Regulations (2009)** transpose the EU Floods Directive (2000) into UK law and require the Environment Agency and LLFAs to produce Preliminary Flood Risk Assessments (PFRAs) and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk

Management Plan are produced. This is a six-year cycle of work and the second cycle started in 2017.

- **Town and County Planning Act (1990), Water Industry Act (1991) , Land Drainage Act (1991),** Environment Act (2005) and **Flood and Water Management Act (2010)** – as amended and implanted via secondary legislation. These set out the roles and responsibilities for organisations that have FRM role.
- **Land Drainage Act (1991)** and **Environmental Permitting Regulations (2016)** define where developers need to apply for additional permission (and Planning Permission) to undertake works to an ordinary watercourse or Main River.
- **Water Environment Regulations (2017)** transpose the European Water Framework Directive (2000) into law, requiring 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 reach '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.
- Note that secondary UK legislation implementing EU Directives such as the Flood Risk Regulations and Water Environment Regulations are subject to repeal/ amendment following the UK exit from the EU. At the time of publishing this report the references here were correct.

2.4 Relevant Flood Risk Policy and Strategy Documents

Table 2-2 summarises some of the relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. There are hyperlinks to the documents in the table. 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 mitigation and climate change adaptation plans may affect a development site.
- 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 Guidance, Policy and Strategy Documents

Level	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	National Planning Policy Framework and Guidance (MCHLG) updated July 2021	No	No	Yes	-
National	Building Regulations Part (MCHLG) 2015	No	No	Yes	-
National	Sewerage Section Guidance (UK Water) 2020	Yes	No	Yes	-
Regional	Humber river basin district river management plan (Environment Agency) 2016	No	Yes	No	Due to be reviewed in 2021/22
Regional	Severn river basin district river management plan (Environment Agency) 2018	No	Yes	No	Due to be reviewed in 2021/22
Regional	Climate Change Guidance for Flood Risk Assessments (Environment Agency) updated May 2022	No	No	Yes	-
Regional	River Trent Catchment Flood Management Plan (Environment Agency) 2009	No	Yes	No	-
Regional	River Severn Catchment Flood Management Plan (Environment Agency) 2009	No	Yes	No	-
Local	Southern Staffordshire Councils Level 1 SFRA (SSC) 2019	Yes	Yes	Yes	-
Local	Local Flood Risk Management Strategy (Staffordshire County Council) 2015	Yes	No	Yes	-
Local	Surface Water Management Plan (Phase 1) (SSC and SCC) 2011	Yes	Yes	No	-
Local	Staffordshire County Council SuDS Handbook (SCC) 2017	Yes	Yes	Yes	-

2.5 Relevant Flood Risk Management Studies and Documents

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

The **National Flood and Coastal Erosion Risk Management (FCERM) Strategy** 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 emphasis of The Strategy is on developing resilient places and communities. The Strategy has been split into three 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,
- developing 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 completed in 2020 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.

2.6 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 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.

Staffordshire County Council's SuDS requirements for new developers are set out in the **Staffordshire County Council SuDS Handbook**. See Section 8.1.4 for more details.

The 2021 NPPF states that flood risk should be managed "using opportunities provided by new development to reduce causes and impacts of flooding". As such, the LLFA expects SuDS to be incorporated on minor development as well as major development. Masterplans should be designed to ensure that space is made for above ground SuDS features. Underground tanks should only be used on sites as a last resort.

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 an area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments.

South Staffordshire Council commissioned a joint **Surface Water Management Plan (SWMP)** in 2011 along with Cannock Chase, Lichfield, Staffordshire, Stafford Borough and Tamworth Borough Councils. The SWMP has taken into account the outcomes of previous detailed modelling of the interactions between surface water, sewers and culverted watercourses, using national surface water mapping, local detailed modelling and groundwater mapping.

This data has been analysed to identify those areas that are most at risk from localised flooding, applying greatest weight to those areas that have flooded in the past. Areas have been identified as a result of this work. In no particular order, the locations of the particularly high flood risk clusters are:

- Penkridge
- Wombourne
- Codsall
- Perton
- Kinver

2.8 Relevant flood risk management schemes and projects ongoing in South Staffordshire

There are no known flood risk management schemes/projects currently in progress in South Staffordshire. Information and location of flood alleviation schemes within Southern Staffordshire can be found on the Environment Agency's Programme of flood and coastal erosion risk management (FCERM) schemes.

3 Planning Policy for Flood Risk Management

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 taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements, although the 2021 update states that the Sequential and Exception Tests aim to steer development towards areas of the lowest risk of flooding from any source of flooding (not just fluvial). 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. A risk-based approach sets out requirements in a way that is proportionate to the risk present. Therefore, in the context of a strategic flood risk assessment, recommendations made are proportionate to the level of risk present on site. This risk-based approach informs the Sequential test set out in section 3.4.

3.3 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
 - 5%AEP where available and 3.3%AEP is not
- Where model data is not available, FZ3a (1%AEP) is used as a conservative proxy

3.4 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, mapping of surface water risk 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 are 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 result in alternative sites being considered).

The surface water maps describe show locations of surface water flood risk based on the extent of the 1 in 30, 1 in 100, and 1 in 1000 surface water modelling described in the Environment Agency Risk of Flooding from Surface Water mapping (RoFSW).

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 an area 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).

3.5 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 sites in the Sequential Test. The Sequential Test can be undertaken as part of a Local Plan Sustainability Appraisal. Alternatively, it can be demonstrated through a free-standing document, or as part of Strategic Housing Land 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.

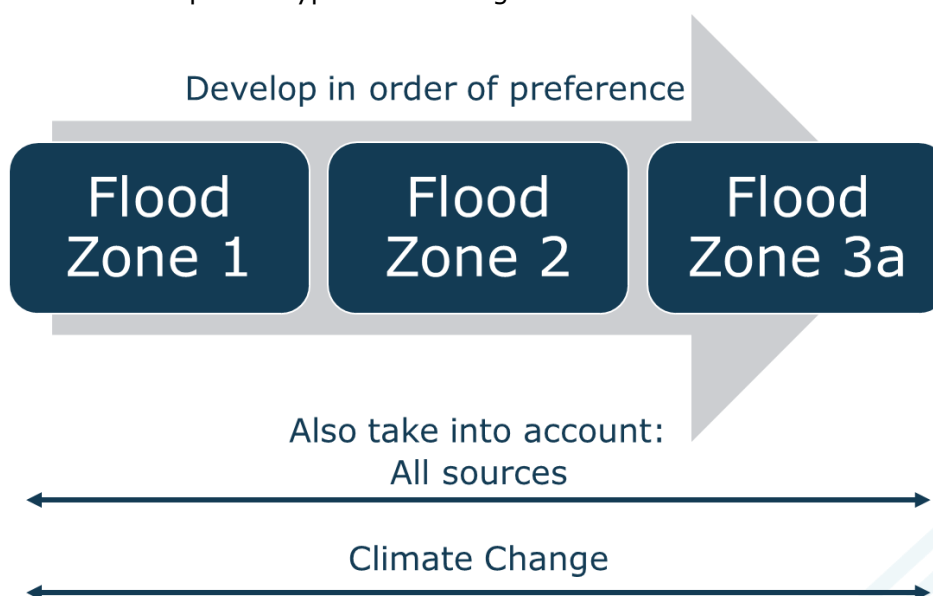


Figure 3-1 The Sequential Test

Table 3-2 below shows how site allocation is determined by the Fluvial Flood Zone - this forms only part of the Sequential Test, and the risk from all other sources of flooding should also be considered.

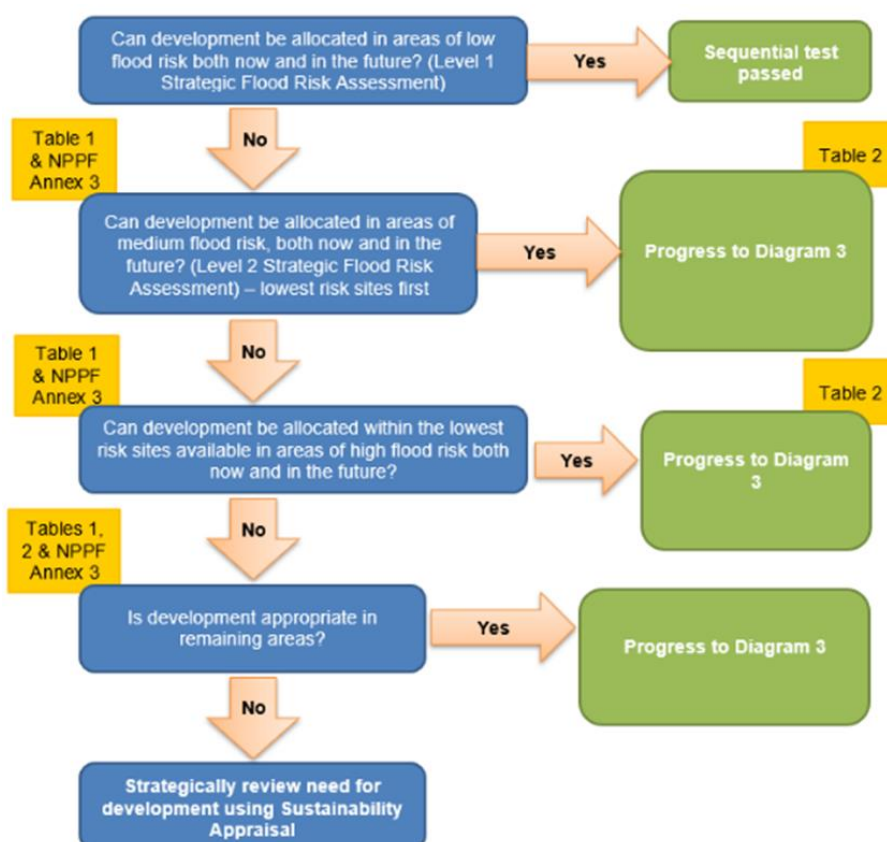
Table 3-1 Local Plan Sequential Approach to Site Allocation

Development location	Appropriateness for site allocation
Flood Zone 1	Appropriate for allocation.
Flood Zone 2	Appropriate for allocation if highly vulnerable development can be located in Flood Zone 1.
Flood Zone 3a	Appropriate for allocation if: highly vulnerable development is located in Flood Zone 1. can demonstrate that there are wider strategic planning objectives for the development in high risk areas. can demonstrate that that development would remain safe and not increase the flood risk elsewhere.
Flood Zone 3b	Not appropriate for development (except water compatible infrastructure such as amenity, biodiversity and public open space, and essential infrastructure passing the Exception 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.

For South Staffordshire, the Sequential test has been undertaken collaboratively with Staffordshire County Council as LLFA. Sites were first screened based on fluvial flood zones. Following the initial screening of sites, the LLFA was consulted and sites with flood risk issues that could not be mitigated were filtered out. Sites at risk of flooding from smaller watercourses (not covered by Flood Zones) or at risk from other sources of flooding (including surface water) were taken forward for a Level 2 assessment (see Appendix A).



Note - other sources of flood risk should also be considered, as per the 2021 update to NPPF but formal zone mapping is not available (Surface Water Zones "A" and "B" used to define risk sequentially)*

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

3.6 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”

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 it is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

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.

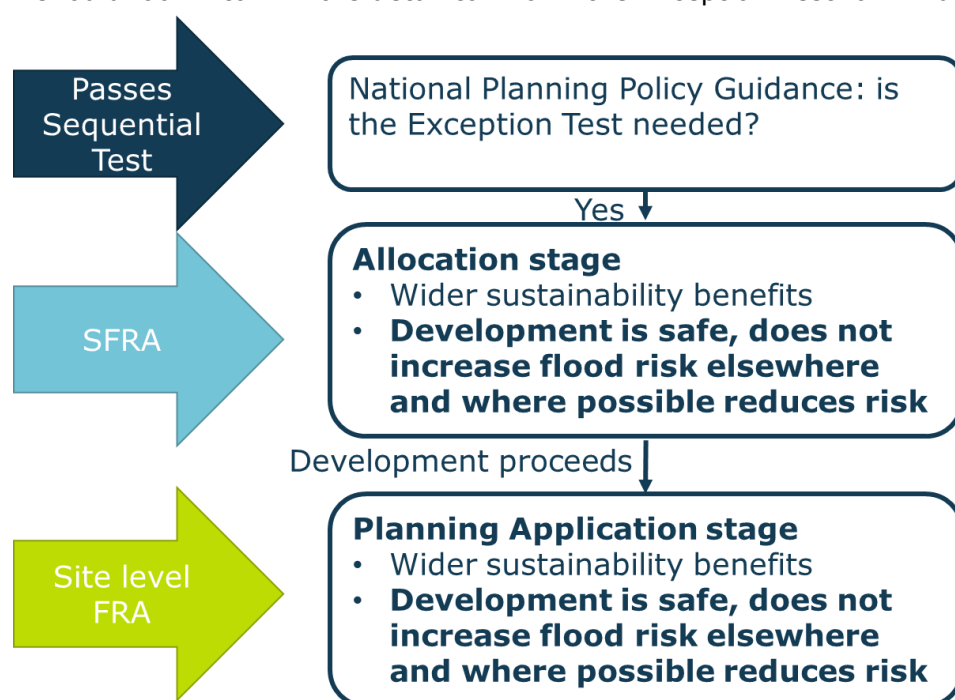


Figure 3-3 The Exception Test

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.

At Planning Application stage, a site-specific Flood Risk Assessment will be needed and would need to consider the actual and residual risk and how this will be managed over the lifetime of the development.

3.7 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% AEP chance flood in any year event (and 0.5% AEP chance for tidal) 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.

Shelter in situ in a safe, dry accessible space for all occupants that has an external escape route may be suitable for some developments when the duration of flooding is not likely to be significant. This would need to be above the 0.1% AEP flood event flood level taking account of climate change. Access for emergency services should be considered and this is more likely to be appropriate for smaller infill developments than larger strategic ones where access routes should be planned such that access is available as a minimum for emergency services. A Flood evacuation and warning plan that is regularly tested would be necessary.

- 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% AEP 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 breach.
 - Structural failure of any flood defences, such as breaches in embankments or walls.
 - Blockage of culverts (by debris or collapse) that results in localised flooding which is more severe than would be expected due to asset performance being compromised.

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. These plans should consider requirements of the ADEPT guidance on the preparation of the Flood Emergency Plans. Where emergency plans are required, suitability of the site and appropriate use of the site should be considered.

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

3.8 The Sequential Test and Exception Test and Individual Planning Applications

3.8.1 The Sequential Test

South Staffordshire 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 250m²), 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 (SHELAAAs)/ five-year land supply/ annual monitoring reports
- Locally listed sites for sale

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

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

3.8.2 The Exception Test

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

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 proceeding with development will outweigh the flood risk concerns for the site e.g. by facilitating wider regeneration of an area, providing community facilities, infrastructure that benefits the wider area etc.

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

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

- The design of any flood defence infrastructure
- Operation and maintenance
- Access and egress
- Design of the development to manage and reduce flood risk
- 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

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 taken into account.

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.
- The likely lifetime of the development – in general 60 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA.
- The River Basin that the site is in – South Staffordshire lies within the Upper Trent Basin District, the Severn Middle Shropshire District and the Severn Middle Worcestershire District.
- The Management Catchment that the site is in.
- 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 South Staffordshire

Table 4-1 shows the peak river flow allowances that apply to the Southern Staffordshire area for fluvial flood risk, and Table 4-2 shows the peak rainfall intensity allowances that apply in South Staffordshire for small catchments (less than 5km²) and urban catchments for surface water flood risk. Both the central and upper end allowances should be considered to understand the range of impact.

Table 4-1 2021 Peak river flow allowances for the Management Catchments in South Staffordshire

Management Catchment	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s'	Total potential change anticipated for '2080s'

			(2040 to 2069)	(2070 to 2115)
Trent Valley Staffordshire	Upper end	30%	38%	61%
	Higher central	19%	23%	39%
	Central	15%	17%	29%
Severn Middle Shropshire	Upper end	30%	42%	72%
	Higher central	20%	25%	44%
	Central	15%	18%	33%
Severn Middle Worcestershire	Upper end	25%	38%	67%
	Higher central	16%	21%	40%
	Central	12%	15%	30%

Table 4-2 Peak rainfall intensity allowance for the management catchments in South Staffordshire

Management Catchment	Allowance category	Total potential change anticipated for '2050s' (up to 2060)	Total potential change anticipated for '2070s' (2061 to 2125)
Trent Valley Staffordshire	3.3% annual exceedance rainfall event		
	Upper end	35%	35%
	Central	20%	25%
	1% annual exceedance rainfall event		
	Upper end	40%	40%
	Central	25%	25%
Severn Middle Shropshire	3.3% annual exceedance rainfall event		
	Upper end	35%	40%
	Central	20%	25%
	1% annual exceedance rainfall event		
	Upper end	40%	45%
Severn Middle Worcestershire	3.3% annual exceedance rainfall event		
	Upper end	35%	35%
	Central	20%	25%
	1% annual exceedance rainfall event		
	Upper end	40%	40%
	Central	20%	25%

4.4 Representing climate change in the Level 2 SFRA

For this Level 2 SFRA, modelling undertaken to inform fluvial risk to sites included the latest July 2021 climate change allowances for the 2080s epoch to the 3.3% and 1% AEP fluvial events.

For the sites not covered by modelling, Flood Zone 2 was used as an indicative climate change extent for Flood Zone 3. This is appropriate given the Higher Central and Upper End flows are often similar to the Flood Zone 2 extents.

The latest Environment Agency peak rainfall allowances for the 2070s epoch were applied to the Environment Agency's Risk of Flooding from Surface Water dataset.

Developers may need to undertake a more detailed assessment of climate change as part of the planning application process when preparing FRAs, 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 Environment Agency 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 for the sites assessed in Appendix A: GeoPDFs. In summary, the climate change outputs on the GeoPDF maps for the SFRA are:

- 'Climate Change Central, Higher Central and Upper End': Where hydraulic models exist and were run for the latest (July 2021) allowances in this Level 2 SFRA.

It is important to note that although the flood extent is not predicted to increase noticeably on some watercourses for the climate change scenario, the flood depth, velocity, and hazard may increase compared to the 100-year current-day event. It is recommended that the impact of climate change on a proposed site is considered as part of a detailed Flood Risk Assessment, using the percentage increases which relate to the proposed lifetime and the vulnerability classification of the development. The Environment Agency should be consulted to provide further advice for developers on how best to apply the new climate change guidance.

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

- Confirm which national guidance on climate change and new development applies by visiting [GOV.uk](https://www.gov.uk).
- 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.

4.5 Impact of climate change on groundwater flood risk

The effect of climate change on groundwater flooding, and those watercourses where groundwater has a large influence on winter flood flows, is more uncertain. There is no technical modelling data available to assess climate change impacts on groundwater. Potential change effects would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example the influence of prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

Milder wetter winters may increase the frequency of groundwater flooding incidents in areas that are already susceptible, but warmer drier summers may counteract this effect by drawing down groundwater levels to a greater extent during the summer months.

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

4.6 Impact of climate change on the functional floodplain

The potential impacts from Flood Zone 3b (30-year modelled extent) plus climate change may need to be considered at site-specific assessment stage. As Flood Zone 3b predictions include an allowance for the performance of defences care should be taken to understand how the standard of protection offered by defences might change in the future. If this scenario is not explicitly modelled, the modelled 30-year output (FZ3b) could be compared against a return period similar to that expected if the 30-year flow was to be uplifted by say 30%, 42% or 72% as per the EA's guidance. This may equate to a 75-year or 100-year flood event in the future (possibly higher in some locations). Elsewhere, it could be assumed that FZ3a could be considered an indicative extent for FZ3b with climate change (but it should be noted that the fluvial flood zones will not account of the standard of protection or the presence of flood defences where such assets are in place).

4.7 Impact of climate change on surface water

The potential impacts of surface water plus climate change may need to be considered at site-specific assessment stage. If this is not explicitly modelled, the 1,000-year extent from the RoFfSW or updated SWMP mapping could be used as a proxy to understand potential impacts in the future from climate change (as well as for smaller watercourses; some of which are not included in the EA's Flood Zones).

Across most sites assessed, there were more similarities between the 30-year and 100-year extents, with more significant areas at risk in the 1,000-year extent.

4.8 Impact of climate change on sewers and highway drainage systems

Surface water and fluvial flooding with climate change (and indeed water discharging from highway drainage systems) have the potential to impact on the sewerage system, so careful management of these is needed for development. Due to differing ages of settlements, there will be drainage systems consisting of different types of sewers. Increasing pressures from climate change, urban creep and infill development could impact on the performance of the sewerage system.

Severn Trent Water advise that surface water is to be kept separate from foul sewerage wherever possible, as this will result in a more resilient sewerage system.

4.9 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; and
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and

amenity, for example by leaving areas shown to be at risk of flooding as public open space.

- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. The Council and developers will need to work with RMAs and use the SFRA datasets to understand whether development is affordable or deliverable. Locating development in such areas of risk may not be a sustainable long-term option.
- It is recommended that the differences in flood extents from climate change are compared by the Council when allocating sites, to understand how much additional risk there could be, where this risk is in the site, whether the increase is marginal or activates new flow paths, whether it affects access/egress and how much land could still be developable overall.

5 Sources of information used in preparing the Level 2 SFRA

This chapter outlines the datasets used in assessing the sites in the Level 2 SFRA.

5.1 Data used to inform the SFRA

Table 5-1 provides an overview of the supplied data, used to inform the appraisal of flood risk for South Staffordshire Council

Table 5-1 Overview of supplied data for South Staffordshire Council Level 2 SFRA

Source of flood risk	Data used to inform the assessment	Data supplied by
Historic (all sources)	Historic Flood Map and Recorded Outlines Hydraulic Modelling Reports, where provided	Environment Agency
Historic (all sources)	2019 L1 SFRA	Staffordshire County Council
Historic (all sources)	Historic flood incidents/records and detailed studies, from 1960-2021	Staffordshire County Council
Fluvial (including climate change)	Site-specific hydraulic modelling undertaken for this assessment Flood Zones Risk of Flooding from Rivers and Sea	JBA Consulting Environment Agency
Surface Water	Risk of Flooding from Surface Water dataset – including climate change uplifts applied for this assessment Local Flood Risk Management Strategy Communities at Risk Surface Water Management Plan	Environment Agency JBA Consulting
Groundwater	Areas Susceptible to Groundwater Flooding dataset Bedrock geology/superficial deposits dataset	Environment Agency
Sewer	At Risk Register Historic flooding records	Severn Trent Water
Reservoir	National Inundation Reservoir Mapping	Environment Agency

5.2 Flood Zones 2 and 3a

Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning. In this Level 2 SFRA, site-specific modelling for specific sites near Brewood, Cheslyn Hay, Coven Heath, Great Wyrley and Wombourne has also been used to cross-check against the Flood Zones.

Where there are no detailed models, the Flood Zones are represented by older 2D generalised model outputs (EA's Flood Map for Planning) are used.

5.2.1 Flood Zone 3b

Flood Zone 3b has been identified as land which would flood with an annual probability of 1 in 30 years (3.3% AEP). It has been derived from the 30-year defended modelled flood extent), where detailed Environment Agency hydraulic models exist, and where no detailed models exist, Flood Zone 3a should be used as an indication of Flood Zone 3b. No sites assessed in this SFRA were located in or near areas designated as Flood Zone 3b, however site specific modelling has been undertaken which shows that some sites may be at risk in the 3.3% AEP event..

Note on the Environment Agency Flood Map for Planning

Where flood outlines are not informed by detailed hydraulic modelling, the Flood Map for Planning is based on generalised modelling to provide an indication of flood risk. Whilst the generalised modelling is generally accurate on a large scale, they are not provided for specific sites or for land where the catchment of the watercourse falls below 3km².

For watercourses with smaller catchments, the Risk of Flooding from Surface Water map provides an indication of the floodplain of small watercourses and ditches. It is more accurate in upper to mid river valley locations than lower valley locations near the coast. This is because it does not represent the floodplain for small watercourses as well in largely flat areas.

Even where more detailed models of Main Rivers have been used by the Environment Agency to inform the Flood Map for Planning, they will be largely based on remotely detected ground model data and not topographic survey. In this area, the Flood Map for Planning does not include all modelled outputs, hence the Level 1 SFRA derived its own Flood Zones based on latest available data, and any further modelling updates since 2019 for the L2 SFRA has been accounted for.

For this reason, the Flood Map for Planning is not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. Accordingly, for site-specific assessments it will be necessary to perform more detailed studies in circumstances where flood risk is an issue.

5.3 Climate change

For this Level 2 SFRA, the sites at fluvial flood risk were located near five locations including Brewood (Chillington Brook), Cheslyn Hay (unnamed tributary of the Wryley Brook), Coven Heath (unnamed tributary of the Watershead Brook), Great Wryley (Wash Brook) and Wombourne (Wom Brook). JBA were commissioned to develop models for watercourses near these sites for this Level 2 assessment.

The latest July 2021 EA peak river flow allowances for the Trent Valley Staffordshire Management Catchment for the 2080s epoch (Central +29%, Higher Central +39%) were modelled for the 3.3%, 1%, and 0.1% AEP events for all sites apart from Wombourne. Additionally the Upper End=61% allowance was applied to the Coven Heath Model due to the size of the development site (Site 646).

Wombourne is located within the Severn Middle Worcestershire management catchment, therefore the 2080s epoch climate change allowances were applied (Central +30%, Higher Central +40%)

Developers may need to undertake detailed modelling of climate change allowances as part of a site-specific FRA, following the [climate change guidance](#) set out by the Environment Agency. They should also contact the Environment Agency to determine the latest models publicly available.

5.4 Surface Water

Mapping of surface water flood risk in South Staffordshire district has been taken from the Environment Agency's Risk of Flooding from Surface Water (RoFFSW) mapping. Surface water flood risk is subdivided into the following four categories:

- **High:** An area has a chance of flooding greater than 1 in 30 (3.3%) each year.
- **Medium:** An area has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%) each year.
- **Low:** An area has a chance of flooding between 1 in 1,000 (0.1%) and 1 in 100 (1%) each year.
- **Very Low:** An area has a chance of flooding of less than 1 in 1,000 (0.1%) each year.

The results should be used for high-level assessments such as SFRA for local authorities. If a particular site is indicated in the Environment Agency mapping to be at risk from surface water flooding, a more detailed assessment should be required to illustrate the flood risk more accurately at a site-specific scale. Such an assessment should use the RoFFSW in partnership with other sources of local flooding information to confirm the presence of a surface water risk at that particular location.

For this Level 2 SFRA, the latest climate change uplifts were updated to the existing EA model (3.3% AEP event plus 25% and 35% climate change allowances; 1% AEP event plus 25% and 40% climate change allowances).

Detailed modelling based on site survey will be necessary where there is a significant risk of surface water flooding.

5.5 Groundwater

In comparison to fluvial flooding, current understanding of the risks posed by groundwater flooding is limited and mapping of flood risk from groundwater sources is in its infancy. Groundwater level monitoring records are available for areas on Major Aquifers; however, for lower lying valley areas, which can be susceptible to groundwater flooding caused by a high-water table in mudstones, clays, and superficial alluvial deposits, very few records are available. Additionally, there is increased risk of groundwater flooding where long reaches of watercourse are culverted as a result of elevated groundwater levels not being able to naturally pass into watercourses and be conveyed to less susceptible areas.

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater Flooding (AStGWF) dataset.

The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and does not take account of the chance of flooding from groundwater rebound. This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist.

5.6 River networks

Main Rivers are represented by the Environment Agency's Statutory Main River layer. Ordinary Watercourses are represented by the Environment Agency's Detailed River Network (DRN) layer. Caution should be taken when using these layers to identify culverted watercourses which may appear as straight lines but in reality, are not.

Developers should be aware of the need to identify the route of and flood risk associated with culverts. CCTV condition survey will be required to establish the current condition of the culvert and hydraulic assessments will be necessary to establish culvert capacity

of both culverts on site and those immediately offsite that could pose a risk to the site. The risk of flooding should be established using site survey, including the residual risk of culvert blockage.

5.7 Flood warning

Flood Warning Areas and Flood Alert Areas are represented by the Environment Agency's Flood Warning Area GIS dataset.

5.8 Reservoirs

The risk of inundation as a result of reservoir breach or failure of a number of reservoirs within the area has been identified from the Environment Agency's **Long Term Flood Risk Information website**.

5.9 Sewer flooding

Historical incidents of flooding are detailed by Severn Trent Water through their sewer flooding register. The sewer flooding register records incidents of flooding relating to public foul, combined or surface water sewers and displays which properties suffered flooding. Due to licencing and confidentiality restrictions, sewer flooding data has not been represented on the mapping.

5.10 Historic flooding

Historic flooding was assessed using the Environment Agency's Historic Flood Map, as well as any incidents provided by Staffordshire County Council as LLFA and the Canal and River Trust.

5.11 Flood defences

Flood defences are represented by Environment Agency's Asset Information Management System (AIMS) Spatial Defences data set. Their current condition and standard of protection are based on those recorded in the tabulated shapefile data. The Council's asset register was also obtained in the Level 1 SFRA.

5.12 Residual risk

The residual flood risk to sites is identified as where potential blockages or overtopping/ breach of defences could result in the inundation of a site, with the sudden release of flood water with little warning.

Potential culvert blockages that may affect a site were identified on OS Mapping and the Environment Agency's Detailed River Network Layer to determine where watercourses flow into culverts or through structures (i.e. bridges) in the vicinity of the sites. Any potential locations affecting sites included in the Level 2 assessment have been identified in the site summary tables. These will need to be considered by the developer as part of a site-specific Flood Risk Assessment.

Residual risk from breaches to flood defences, whilst rare, needs to be considered in Flood Risk Assessments. 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, if required.

5.13 Depth, velocity and hazard to people

The Level 2 assessment seeks to map the probable depth and velocity of flooding as well as the hazard to people during the defended fluvial 100-year (1% AEP) plus climate change (Central/ Higher Central) flood event, because the Level 2 assessment helps inform the Exception Test and usually flood mitigation measures and access/ egress

requirements focus on flood events lower than the 1,000-year event (0.1% AEP) (e.g. the 100-year plus climate change event). Where there are no defences the analysis and mapping describes the predicted actual level of hazard within the flood zone.

Where detailed model outputs were available, the 100-year plus climate change depth, velocity and hazard data has been used. This data is only present where models have a 2D element, representing the floodplain in detail.

In the absence of detailed hydraulic models (or models with detailed 1D-2D outputs), the Risk of Flooding from Rivers and Sea dataset has been used, as well as the Risk of Flooding from Surface Water datasets. The depth, hazard, and velocity of the 100-year surface water flood event has also been mapped and considered in this assessment.

Hazard to people has been calculated using the following criteria as suggested in Defra's FD2321/TR2 "Flood Risk to People". The different hazard categories are shown in Table 5-2. Developers should also test the impact of climate change depths, velocities, and hazard on the site, at Flood Risk Assessment stage.

Table 5-2 Defra's FD2321/TR2 "Flood Risks to People" classifications

Description of Flood Hazard Rating	Flood Hazard Rating	Classification Explanation
Very Low Hazard	< 0.75	Flood zone with shallow flowing water or deep standing water"
Danger for some (i.e. children)	0.75 - 1.25	"Danger: flood zone with deep or fast flowing water"
Danger for most	1.25 - 2.00	Danger: flood zone with deep fast flowing water"
Danger for all	>2.00	"Extreme danger: flood zone with deep fast flowing water"

As part of a site-specific FRA, developers will need to undertake more detailed hydrological and hydraulic assessments of the watercourses to verify flood depth, velocity and hazard based on the relevant 100-year plus climate change event, using the relevant climate change allowance based on the type of development and its associated vulnerability classification. Not all this information is known at the strategic scale.

5.14 Note on SuDS suitability

The hydraulic and geological characteristics of each site were assessed to determine the constraining factors for surface water management. This assessment is designed to inform the early-stage site planning process and is not intended to replace site-specific detailed drainage assessments.

The assessment is based on catchment characteristics and additional datasets such as the ASTGWF map and British Geological Survey (BGS) Soil maps of England and Wales which allow for a basic assessment of the soil characteristics on a site-by-site basis. LIDAR data was used as a basis for determining the topography and average slope across each development site. Other datasets were used to determine other factors. These datasets include:

- Historic landfill sites
- Groundwater Source Protection Zones
- Detailed River Network
- Flood Zones derived as part of this Level 2 SFRA.

This data was then collated to provide an indication of particular groups of SuDS systems which might be suitable at a site. SuDS techniques were categorised into five main groups, as shown in Table 5-3. This assessment should **not** be used as a definitive guide as to which SuDS would be suitable but used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what

SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 5-3 Summary of SuDS categories

SuDS Type	Technique
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench
Conveyance	Dry Swale, Under-drained Swale, Wet Swale

The suitability of each SuDS type for the site options has been described in the summary tables, where applicable. The assessment of suitability is broadscale and indicative only; more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS. Staffordshire County Council as LLFA should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors. SuDS in South Staffordshire must be designed so that they are in accordance the **Staffordshire County Council SuDS Handbook** which sets guidance across South Staffordshire.

6 Level 2 assessment methodology

This chapter outlines how sites were screened against flood risk datasets to determine which sites needed a Level 2 assessment. It also identifies other sites at lower risk with general recommendations for developers.

6.1 Background

A Local Plan flood risk sites assessment was prepared for the Level 1 SFRA (Section 8) using sites provided at the time. This provided an early indication of what considerations should be taken into account. This identified five Strategic Recommendations, following the Sequential Test application:

- Strategic Recommendation A - consider withdrawing the site based on significant level of fluvial flood risk.
- Strategic Recommendation B - Exception Test required if site passes Sequential Test.
- Strategic Recommendation C - consider site layout and design around the identified flood risk, if site passes Sequential Test.
- Strategic Recommendation D - site can be permitted on flood risk grounds due to limited perceived risk, subject to consultation with the LPA / LLFA.
- Strategic Recommendation E - can be allocated on flood risk grounds subject to consultation with the LPA / LLFA.

These strategic recommendations supported the Council's initial decision-making process on which sites may not be suitable for development, which require the Exception Test, which may require mitigation and which have low/ negligible risk. This approach has been taken into account in the site screening process outlined below, applying the methodology to the latest sites provided and latest data received. The outcome of the exercise is to identify the sites that should be included in a Level 2 SFRA.

6.2 Site screening

South Staffordshire City Council provided 8 sites for assessment in the 2021 Level 2 SFRA. These sites were screened against a suite of available flood risk information and spatial data to provide a summary of risk to each site, including:

- The proportion of the site in each Flood Zone derived from the Level 1 SFRA, which includes modelling data
- Whether the site is shown to be at risk from surface water flooding in the RoFfSW and, if so, the lowest return period from which the site is at surface water flood risk
- Whether the site is shown to be at risk from updated surface water modelling undertaken as part of the Surface Water Management Plan (SWMP)
- Whether the site is shown to be located in a SWMP 'hotspot'
- Whether the site is within, or partially within, the Environment Agency's Historic Flood Map.

The screening was undertaken using JBA's in-house software called "FRISM". FRISM is a GIS package that computes a range of flood risk metrics based on flood and receptor datasets.

The results of the screening provide a quick and efficient way of identifying sites that are likely to require a Level 2 Assessment, assisting South Staffordshire Council with Sequential Test decision-making so that flood risk is taken into account when considering allocation options.

The screening also provides an opportunity to identify sites which may show to be 100% in Flood Zone 1, but upon visual inspection in GIS, have an ordinary watercourse flowing through or adjacent to them but for which no Flood Zone information is currently

available. *Note: although there are no Flood Zone maps available for these watercourses, it does not mean the watercourse does not pose a risk, it just means no modelling has yet been undertaken to identify the risk.*

The Flood Zones are not provided for specific sites or land where the catchment of the watercourse falls below 3km². For this reason, the Flood Zones are not of a resolution to be used as application evidence to provide the details of possible flooding for individual properties or sites and for any sites with watercourses on, or adjacent to the site. The Risk of Flooding from Surface Water has been used in these cases because this provides a reasonable representation of the floodplain of such watercourses to use for a strategic assessment.

All 7 sites were carried forward to a Level 2 assessment.

Table 6-1 summarises the sites which have been taken forward to the Level 2 assessment on this basis.

Table 6-1 Sites carried forward to a Level 2 assessment

Site Location	Site Code	Flood Zones %	Flood Zones %	Flood Zones %	Risk of Flooding from Surface Water %	Risk of Flooding from Surface Water %	Risk of Flooding from Surface Water %
		FZ3a	FZ2	FZ1	3.3% AEP	1% AEP	0.1% AEP
Pool View, Churchbridge	139	0	0	100	1.6	7.0	11.8
Land West of ROF Featherstone	646	0.02	0.1	99.9	1.2	1.8	5.8
Brewood	617	0.01	0.1	99.9	0	0.1	1.9
Land Between Billy Buns Lane and Smallbrook Lane	463	0	0	100	1.2	2.2	9.6
Land off Gilbert Lane, Wombourne	284	8.5	20.2	71.3	3.3	5.0	8.2
Land off Saredon Road, Cheslyn Hay	119a	0	0	100	3.6	7.0	18.8
Land East of Bilbrook	SA1	0.01	0.1	99.9	0.3	1.3	5.6
Land North of Penkridge	SA4	1.4	1.8	98.2	8.1	10.3	13.7

The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone, including the percentage of the site at flood risk at a higher risk zone. For example: If 50% of a site is in the Flood Zones, taking each Flood Zone individually, 50% would be in Flood Zone 2 but say only 30% might be in Flood Zone 3a. This would be displayed as stated above, i.e. the total % of that particular Flood Zone in that site. Flood Zone 1 is the remaining area of the site outside of Flood Zone 2, so Flood Zone 2 + Flood Zone 1 will equal 100%.

Values quoted reflect the Environment Agency's Flood Map for Planning and do not include areas of flood risk identified by site specific modelling. For information on the modelled risk to sites, refer to the relevant Site Summary Table in Appendix A.

It should be noted that for the sites reviewed the results for the Flood Zones also are also representative of the actual risk, as there are no Flood Risk Management measures (such as defences) in place.

6.3 Site summary tables

As part of the Level 2 SFRA, detailed site summary tables have been produced for the sites listed above in Table 6-1. The summary tables can be found in Appendix A.

Where available, the results from existing detailed Environment Agency hydraulic models were used in the assessment to provide depth, velocity, and hazard information.

Detailed site summary tables have been produced for the site options (see Appendix A). Each table sets out the following information:

- Basic site information
 - Location of site in the catchment
 - Area, type of site, current land use (greenfield/ brownfield), proposed site use
- Sources of flood risk
 - Existing drainage features
 - Fluvial – proportion of site at risk including description from mapping/ modelling
 - Surface Water – proportion of site at risk including description from RoFfSW mapping
 - Reservoir
 - Canals
- Flood History
- Flood risk management infrastructure
 - Defences – type, Standard of Protection, and condition (if known), and description
 - Description of residual risk (e.g. blockage or breach potential)
- Emergency Planning
 - Flood Warning Areas
 - Access and egress
- Climate change
 - Summary of climate change allowances and increase in flood extent compared to Flood Zones (actual flood risk)
- Requirements for drainage control and impact mitigation
 - Broadscale assessment of possible SuDS to provide indicative surface water drainage advice for each site assessed for the Level 2 SFRA.
 - Groundwater Source Protection Zone
 - Historic Landfill Site
 - JBA's Groundwater mapping
- NPPF Planning implications
 - Exception Test requirements – this is aimed at the Local Authority for allocating the sites and whether the Exception Test is needed.
 - Requirements and guidance for site-specific FRA (including consideration of opportunities for strategic flood risk solutions to reduce flood risk) – this is aimed at developers with regards to specific site-level guidance for the FRA stage, though is useful for the Local Authority to understand for when reviewing planning applications.
- Key messages – summarising considerations for the development to be able to proceed
- Mapping information – description of data sources for the following mapped outputs:
 - Flood Zones (actual flood risk)
 - Climate change
 - Fluvial depth, velocity, and hazard mapping

- Surface water
- Surface water depth velocity and hazard mapping

6.3.1 Interactive GeoPDF mapping

To accompany each site summary table, there is an Interactive GeoPDF map, with all the mapped flood risk outputs per site. This is displayed centrally, with easy-to-use 'tick box' layers down the right-hand side and bottom of the mapping, to allow navigation of the data.

Flood risk information in the GeoPDFs include:

- Site boundary and Council boundary
- Title bar showing area, grid reference, site name, proposed development use (e.g. residential/ employment) and percentage Flood Zone coverage
- Actual modelled flood risk and Flood Zones 2, 3a and 3b (functional floodplain) and indicative FZ3b (FZ3a in the absence of detailed models)
- Modelled 100-year plus climate change fluvial depth, velocity, and hazard rating (where affects sites – e.g., River Trent and Fowlea Brook)
- Fluvial climate change extents – Central, Higher Central and Upper End allowances (where detailed models are available) and Indicative climate change extents (FZ2, where no detailed models are available)
- RoFfSW extents (30-years, 100-years, and 1,000-years)
- RoFfSW 30-year, 100-year and 1,000-year depth, velocity, and hazard rating
- Flood risk from SWMP updated surface water mapping
- Areas Susceptible to Groundwater Flooding
- JBA's Groundwater Risk Mapping
- Flood Warning and Flood Alert Areas
- Historic Flood Map
- Defences (embankment and wall)
- Main Rivers/ Ordinary watercourses

7 Cumulative Impact Assessment

7.1 Introduction

Under the revised 2021 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).

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume and potential effects of increased volumes of runoff from proposed development. Whilst the loss of storage or potential increase in flow volume for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

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

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

7.2 Cross-Boundary Issues

The topography of South Staffordshire District creates the watershed between the Severn River Basin District and Humber River Basin District, with catchments flowing south into the Severn, and north-east into the Humber. Consequently, development within Cannock Chase District, Walsall District, City of Wolverhampton District and Dudley Metropolitan Borough is more likely to have downstream impacts within South Staffordshire and development within South Staffordshire is more likely to have downstream impacts within Wyre Forest District.

Watercourses in the southern half of the study area within the River Stour catchment (including as the Smestow Brook, Merry Hill Brook and Bobs-Holbeche Brook) which flow into the study area from Dudley Metropolitan Borough and drain into the River Severn. The western edge of the study area borders Shropshire County where tributaries of the River Worfe catchment (including the Stratford Brook, Hilton-Claverley Brook, Albrighton Brook and Neachley Brook) drain west out of South Staffordshire. Watercourses draining the north of the study area are mostly tributaries of the River Trent, including the Whitson Brook, River Penk and Saredon Brook. The River Meese drains north-west into Shropshire.

As such, future development both within and outside South Staffordshire can have the potential to affect flood risk to development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

South Staffordshire has boundaries with the following Local Authorities:

- Bromsgrove District
- City of Wolverhampton District
- Shropshire
- Telford and Wrekin
- Wyre Forest District
- Cannock Chase District
- Dudley Metropolitan Borough
- Stafford Borough
- Walsall District

Development control should ensure that the impact on receiving watercourses from development in South Staffordshire has been considered during the planning stage and appropriate development management decisions put in place so there is no

adverse effect on flood risk or water quality. All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest guidance and legislation relating to flood risk and sustainable drainage, they should result in no increase in flood risk within South Staffordshire. The neighbouring authorities were contacted for information on their site allocations, to determine where development in neighbouring authorities may have an impact on.

The following Local Plans in neighbouring authorities have been adopted these Plans include policies relevant to drainage and flood risk:

- **Bromsgrove District Local Plan 2011-2030**
- **Cannock Chase District Local Plan 2006-2028**
- **City of Wolverhampton District Local Plan (under review 'Black Country Plan')**
- **Dudley Metropolitan Borough Local Plan 2011-2039**
- **Shropshire Council Local Plan (draft) 2016 - 2038**
- **Stafford Borough Local Plan 2020-2040**
- **Telford and Wrekin Local Plan 2011-2031**
- **Walsall District Local Plan (under review 'Black Country Plan')**
- **Wyre Forest District Local Plan 2016-2036**

7.3 Findings from the Southern Staffordshire Councils' Level 1 SFRA CIA

A Broadscale Cumulative Impact Assessment (CIA) was undertaken as part of the Level 1 SFRA for the Southern Staffordshire Councils' Level 1 SFRA in 2018, which included catchments within South Staffordshire District.

The CIA is prepared to identify those catchments at highest risk of flooding, where development might have the potential to increase flood risk and where, with appropriate planning policies in place, there is the opportunity for development to contribute towards a reduction in flood risk across the wider area. This assessment was performed in parallel with the Surface Water Management Plan tasks, which involved identification of surface water hotspot areas for localised flooding.

The following catchments within the area of South Staffordshire were identified as those at high risk:

- Saredon Brook and tributaries
- Smestow Brook, Smestow to Swindon
- River Penk, including Perton, Tettenhall, Bilbrook and Oxley
- River Stour, Stourbridge and Brierley Hill
- Smestow Brook, from Kingswinford
- Gains Brook and Wash Brook, including Norton Canes
- Smestow Brook and Black Brook, including Seisdon

7.4 Broadscale Cumulative Impact Assessment

The Southern Staffordshire Councils' Level 1 Strategic Flood Risk Assessment included a broadscale Cumulative Impact Assessment, that has been rerun for this assessment using updated development data and assessed for the South Staffordshire study area only. The broadscale assessment identifies where the cumulative impacts of development may have the biggest effect on flood risk based on historic and predicted flood risk. Catchments at the highest risk are taken forward to a catchment-level analysis.

Table 7-1 Summary of datasets used in the Broadscale Cumulative Impact Assessment

Dataset	Coverage	Source of Data	Use of Data
Catchment Boundaries	South Staffordshire Study Area	Water Framework Directive Catchments	Assessment of susceptibility to cumulative impacts of development by catchment.
National Receptor Dataset (2014)	South Staffordshire Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Risk of Flooding from Surface Water	South Staffordshire Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment.
Fluvial Flood Zones	South Staffordshire Study Area	Environment Agency	Assessing the number of properties at risk of fluvial flooding within each catchment
Future development areas (recently built out sites/sites under construction/sites with planning permission/previously allocated sites/currently allocated sites)	South Staffordshire & neighbouring authorities	South Staffordshire District Council	Assessing the impact of proposed future development on risk of flooding.
Historic Flooding Incidents	South Staffordshire Study Area	South Staffordshire District Council	Assessing incidences of historic flooding within the study area.

7.5 Broadscale Methodology

Future development sites within the study area were provided by South Staffordshire Council. Catchments within South Staffordshire study area were ranked on four metrics: sensitivity to increased fluvial flood risk, prevalence of recorded historic flood incidents, sensitivity to increased risk of surface water flooding and area of new development proposed within the catchment.

Catchments are ranked relative to other catchments within the study area and natural breaks in the data have been identified to sort catchments into groups with a similar degree of risk. Figure 3-1 shows the catchments considered for the purpose of preparing the assessment.

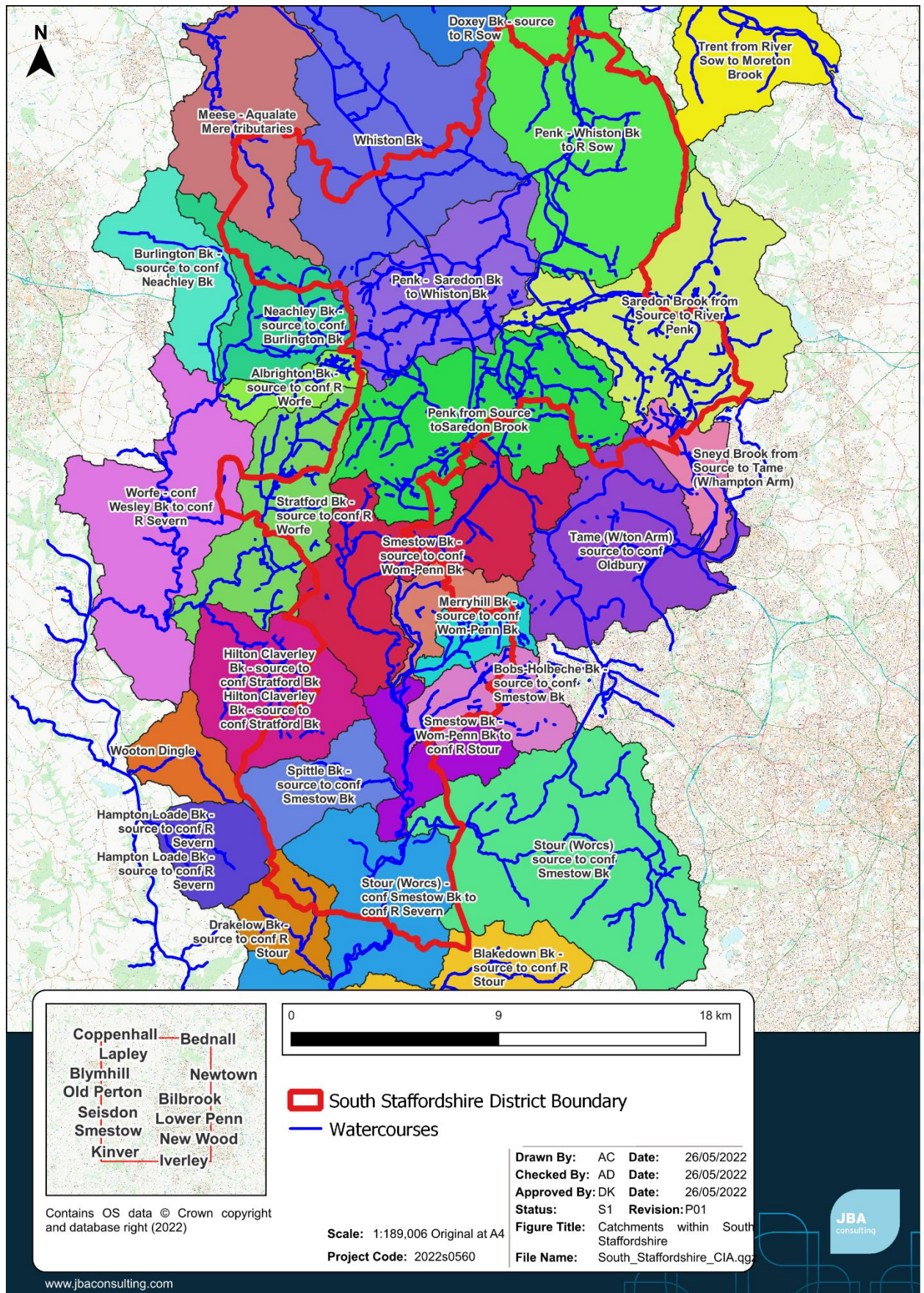


Figure 7-1: Catchment within South Staffordshire

The results of this assessment provide a rating of low, medium, or high risk for each metric, for each catchment within the study area, the boundaries of which were

derived from WFD. The rating of each catchment in each of these assessments was combined to give an overall ranking.

The conceptual basis for this assessment is to identify existing locations that are recorded as being sensitive to changes in flood risk and to better understand the characteristics of the catchment so that consideration can be given to the potential effects of proposed development within those catchments.

7.5.1 Sensitivity to fluvial flooding

The number of properties within Flood Zone 2 not presently within Flood Zone 3 was taken, as a percentage of the total properties in the catchment. These properties are considered to be potentially sensitive to increased flood risk as a result of climate change.

Catchments with greater than 2% properties at increased risk were considered high risk.

Table 7-2 Catchments considered highly sensitive to increased fluvial flood risk in future

Catchment	% properties sensitive to increased fluvial flood risk	Rank
Doxey Bk – Source to R Sow	4.42	1
Smestow Bk – Wom-Penn Bk to Conf R Stour	4.2	2
Trent from River Sow to Moreton Brook	2.97	3

7.5.2 Sensitivity to surface water flooding

The number of properties within the 1000-year surface water extent not presently within the 100-year extent was taken, as a percentage of the total properties in the catchment. These properties are considered sensitive to increased flood risk as a result of climate change.

Catchments with greater than 4% properties at increased risk were considered high risk.

Table 7-3 Catchments considered highly sensitive to increased surface water flood risk in future

Catchment	% properties sensitive to increased surface water flood risk	Rank
Penk from Source to Saredon Brook	4.56	1
Wom-Penn Bk – source to conf Smestow Bk	4.46	2
Bobs-Holbeche Bk – source to conf Smestow Bk	4.16	3
Tame (W/ton Arm) source to conf Oldbury	4.15	4
Smestow Bk – source to conf Wom-Penn Bk	4*	5

*Rounded up from 3.9% as this forms the natural break between High and Medium risk catchments.

7.5.3 Prevalence of historic flooding incidents

South Staffordshire Council provided a list of historic flood incidents and the number of flood incidents in each catchment was identified. Catchments with more than 20 recorded incidents were considered high risk.

Table 7-4 Catchments with the highest number of recorded historic flood incidents

Catchment	Number of recorded incidents	Rank
Penk from Source to Saredon Brook	145	1
Saredon Brook from Source to River Penk	131	2
Penk – Whiston Bk to R Sow	55	3

7.5.4 Area of proposed development

South Staffordshire Council and neighbouring authorities provided a list of likely new development sites and the total area of new development in each catchment was measured, as a percentage of catchment area. Development proposals overall are comprised of small site areas in relation to catchment areas. Therefore, catchments with more than 0.0002% area earmarked for development were considered high risk, although the extent of proposed development is negligible in comparison to the catchment area.

Table 7-5 Catchments with the highest percentage cover of proposed development

Catchment	Area of proposed development (ha)	Rank
Penk from Source to Saredon Brook	270.96	1
Saredon Brook from Source to River Penk	131.85	2
Wom-Penn Bk – source to conf Smestow Bk	27.11	3
Merryhill Bk – source to conf Wom-Penn Bk	20.96	4

7.6 Overall rankings

As can be seen from the above tables and Figure 3-2, there are catchments that are at high risk in multiple categories. Rankings from each assessment have been combined to give an overall ranking. A Red-Amber-Green (RAG) rating was then applied to the catchments, with red being high risk, amber being medium risk and green being low risk. The catchments with a combined ranking score between 10 and 40 were deemed high risk.

The catchments rated as high-risk in the broadscale assessment are:

- Penk from Source to Saredon Brook
- Wom-Penn Brook – source to conf Smestow Brook
- Smestow Bk – source to conf Wom-Penn Brook
- Smestow Bk – Wom-Penn Brook to conf River Stour
- Tame (W/ton Arm) source to conf Oldbury
- Penk – Whiston Brook to River Sow
- Saredon Brook from Source to River Penk*

*Increased from Medium to High risk due to ranking High for Development increase and Historic incidents, and only scoring 41.

Whilst the Merryhill Brook (source to conf Wom-Penn Brook) and Bobs-Holbeche Brook (source to conf Smestow Brook) catchments are ranked as medium, this because of low ranking for Fluvial Flood Zones, and low and medium and for historic incidents. However, increased development and surface water in these catchments ranked high. Consideration should therefore still be made in these catchments with regards to surface water attenuation and the potential loss of natural surface storage in the catchment as a consequence of proposed new development, despite their final ranking score of medium.

Although not ranking for any other criteria, the Doxey Brook (source to River Sow) and Trent (from River Sow to Moreton Brook) catchments ranked High for Fluvial Flood Risk. Consideration should therefore still be made in these catchments with regards to surface water attenuation and the potential loss of natural surface storage in the catchment as a consequence of proposed new development, despite their final ranking score of medium.

Some catchments that border the South Staffordshire Study area or are within neighbouring catchments were discounted from the final RAG Assessment outputs as their results were not applicable due to their being no countable data for one or more assessment criteria, as well as them being located outside of the study area.

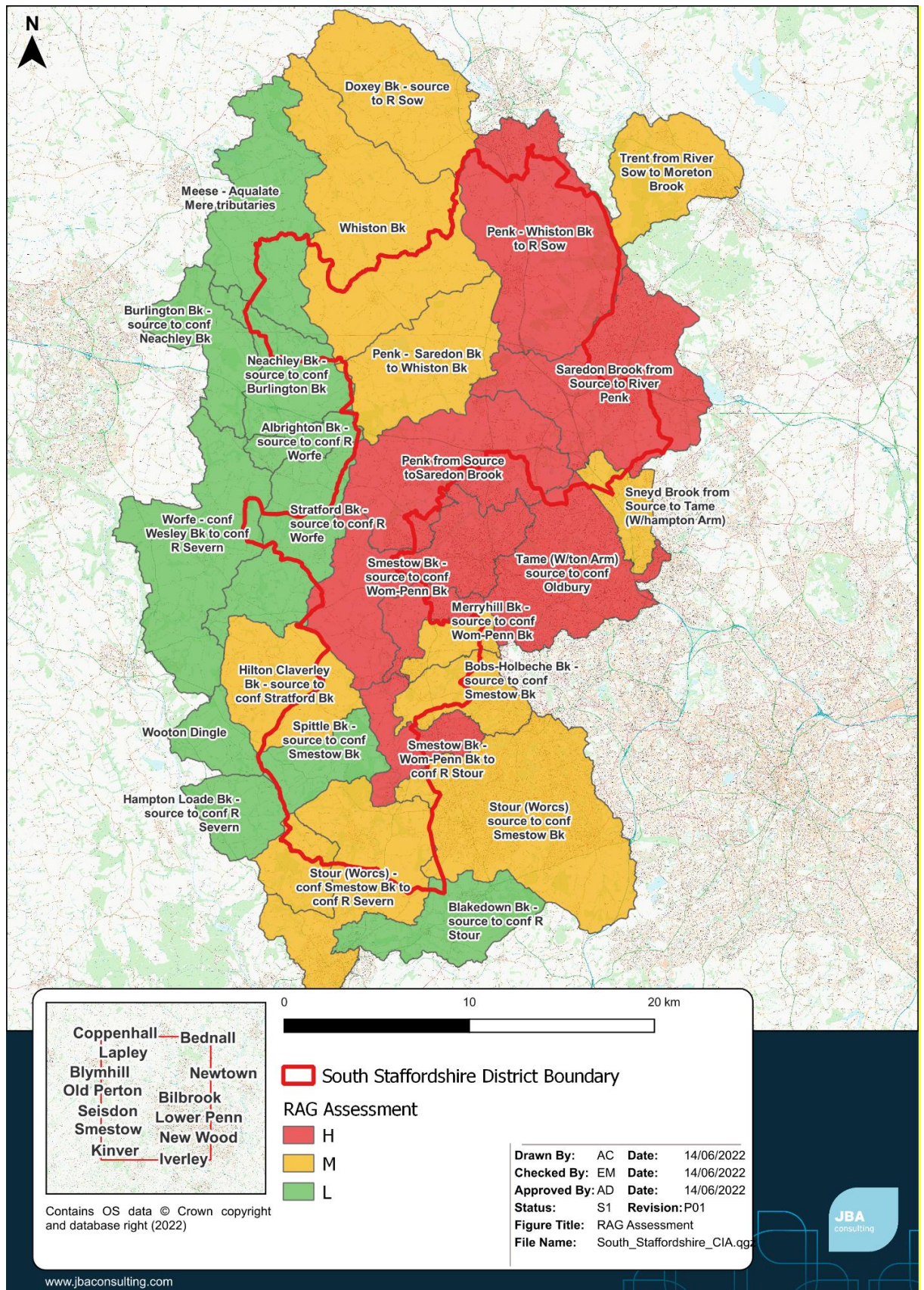


Figure 7-2: Final catchment rankings of susceptibility to the impacts of cumulative impacts within South Staffordshire

7.7 Catchment-Level Assessment

In the catchment-level assessment, a detailed analysis of the high-risk catchments, as identified in the broadscale assessment, is undertaken. Other factors, such as the catchments' existing urban extent, topography and location within the wider river drainage network, are also considered to determine policy recommendations to address the specific risks within the catchment.

Historic flooding incidents are also considered and presented as a Hotspot 250m grid across the catchments to indicate areas potentially sensitive to flooding. This dataset includes records from SSDC Highways Maintenance, SDCC Questionnaires and SDCC Flooding Hotspots, comprised of records from 'other RMA's', Local District Councils, Parish Councils, local residents, and unknown sources (source information extracted from shapefile metadata).

7.7.1 Penk from Source to Saredon Brook

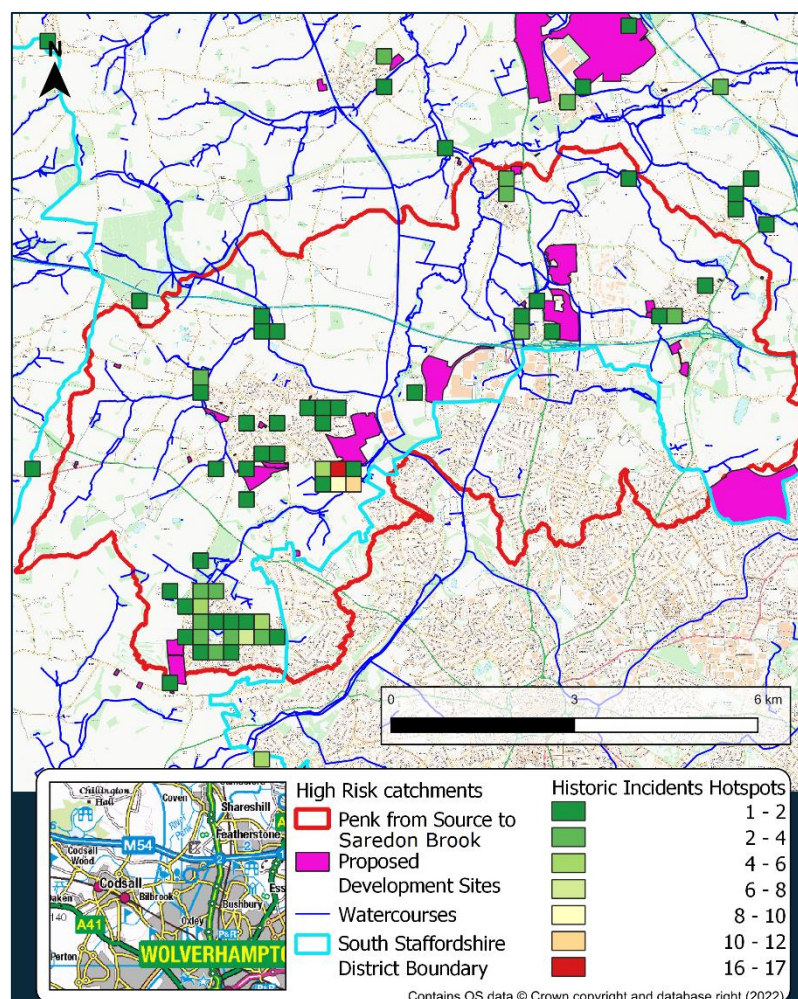


Figure 7-3: Proposed development and historic flooding hotspots within the Penk from Source to Saredon Brook catchment

The headwater catchment of the River Penk rises near Perton and flows northwest towards its' confluence with the Saredon Brook at Coven. The watercourse passes through rural farmland and is joined by field drains and irrigation channels, as well as other watercourses including the Moat Brook from the west, and the Watershead Brook from the east. The quantity of incoming channels may pose a cumulative risk by increasing connectivity to the watercourse during high rainfall events. This can be seen as a positive trend between the tributaries and flooding hotspots along them.

In terms of fluvial flood risk, the most significant areas of flooding are near Codsall where a watercourse passes beneath a railway bridge causing impounded flood water to connect to a minor tributary. A large development site is proposed at this same location (Site 519 'Land East of Bilbrook') which has the potential to affect flood risk in the area. Modelling suggests that a large number of properties may be at increased risk of flooding in future if flows in the Penk catchment were to increase in future as a result of development and climate change.

Other sites within, or partially within 250m of historic flood events include:

- Site 082 'Land between A449 Stafford Rd & School Lane'
- Site 168 'Brinsford Lodge'
- Site 397 'Land adjacent Brinsford Lodge, Brookhouse Lodge'
- Site 646 a&b 'Land to the West of ROF Featherstone'
- Site 419 a&b 'Land at Keepers Lane'
- Site 239 'West Wrottesley Park Rd south'
- Two un-referenced sites, one adjacent to site 239, and one adjacent to site 419

As the main areas of risk are distributed across the catchment, there is the potential for upstream measures, such as SuDS implementation and preservation and enhancement of natural surface water storage mechanisms, to reduce the risk to these areas. The majority of potential future development within the catchment appears to be predominantly at greenfield locations, therefore there are likely to be many potential opportunities to provide additional betterment for SuDS and surface water attenuation beyond the existing runoff rate.

Given the suburban/rural mixed nature of the catchment, surface water flood risk is distributed widely across natural topographic depressions and channels as well as urban areas. These are susceptible to increased surface water flooding in future. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues and that careful consideration is given to proposals that affect the natural storage and flow of surface water.

7.7.2 Wom-Penn Brook – source to conf Smestow Brook

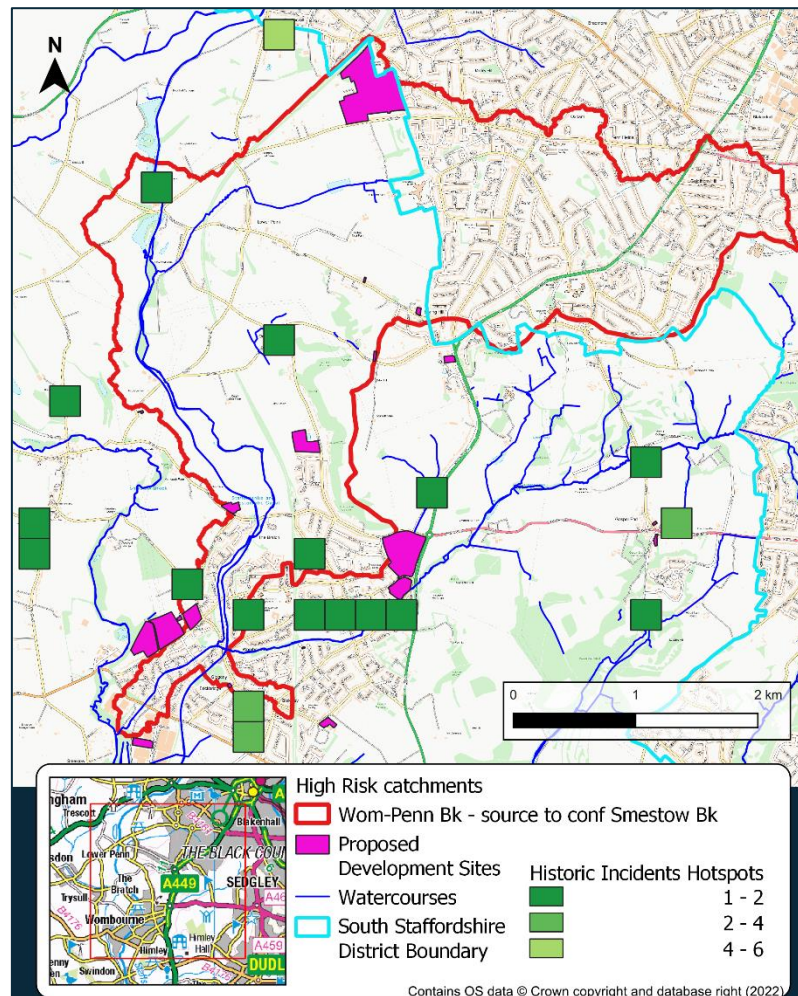


Figure 7-4: Proposed development and historic flooding hotspots within the Wom-Penn Brook – source to conf Smestow Brook catchment

The Penn arm of the Wom-Penn Brook rises near Hill Croft Farm, west of Penn, and flows through mainly rural land before adjacent to the Staffordshire and Worcestershire Canal, before joining the Wom Brook in Wombourne. From there, the Wom-Penn brook flows south to its confluence with the Smestow Brook.

In terms of fluvial flood risk, the areas' most sensitive to increasing flood risk in the future are The Bratch area of Wombourne, and Lower Penn. Given the rural nature of the catchment and the catchment, there are likely to be opportunities for upstream measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues downstream.

Although the watercourse rises on Hill Croft Farm in the middle of the catchment, the upper catchment is largely urban and likely culverted (and not modelled) until this point.

The rural nature of the catchment means surface water flood risk is largely restricted to natural topographic depressions and natural channels through the central part of the catchment, although properties in the urban areas are susceptible to increased surface water flooding in future. The urban extent of the upper catchment is likely to contribute large volumes of surface water to the watercourse which may be exacerbated by future developments.

Modelling suggests that properties and proposed development sites within Wombourne may be at increased surface water flood risk in the future if flows in the

Wom-Penn Brook catchment were to increase as a result of development and climate change. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues.

There is little development proposed within the catchment, therefore there are limited opportunities for SuDS to be implemented as part of development; however, this assessment highlights these issues and the importance of ensuring that runoff does not increase in future and that careful consideration is given to proposals that affect the natural storage and flow of surface water. There remains the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.

7.7.3 Smestow Brook – source to conf Wom-Penn Brook

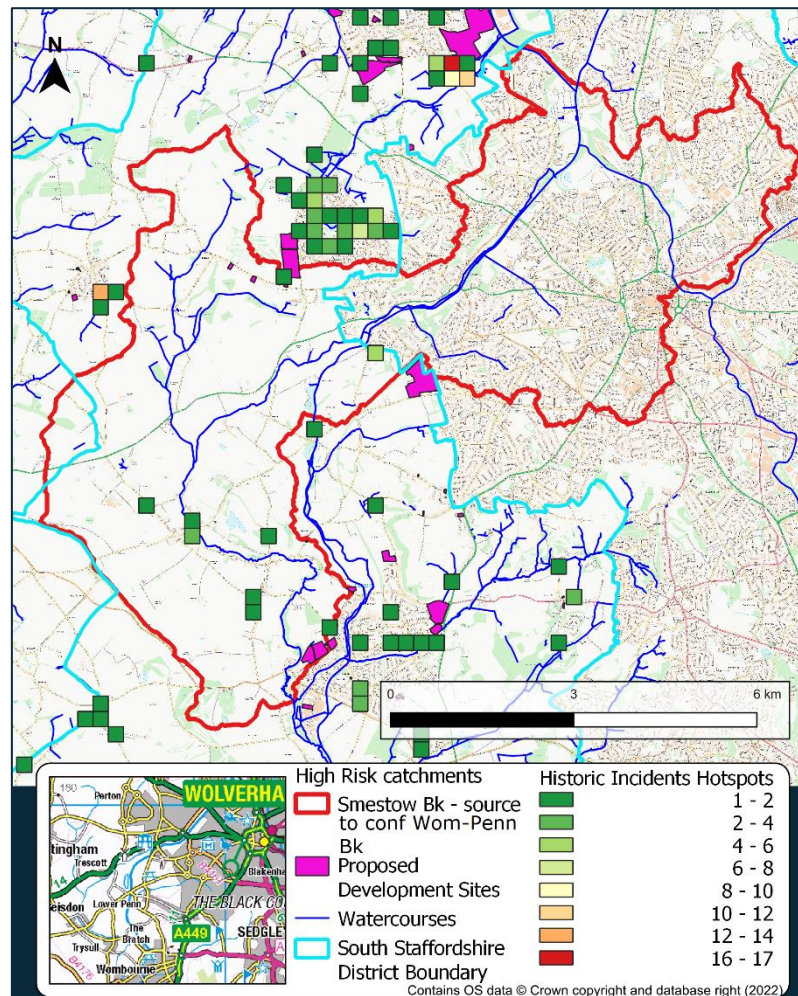


Figure 7-5: Proposed development and historic flooding hotspots within the Smestow Brook – source to conf Wom-Penn Brook catchment

This upper reach of the Smestow Brook rises near Claregate and Dunstall Hill in Wolverhampton flows south-west towards its confluence with the Wom-Penn Brook near Wombourne. The upper catchment drains a large urban area, and the Black Brook tributary drains rural land to the north-west of the catchment before joining the Smestow brook roughly halfway along its length. The Smestow Brook flows adjacent to the Staffordshire and Worcestershire Canal for almost all of its course before joining with the River Stour, which then flows adjacent to the canal from the confluence with the Smestow Brook, to its confluence with the River Severn in Stourport.

In terms of fluvial flood risk, this upper reach of the Smestow Brook is low risk, with only Seisdon being the main area of risk (Figure 7-5). Given the rural nature of parts of the upper catchment, there are likely to be opportunities for upstream measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues downstream. Opportunities should also be sought through the Smestow Valley near its source in Wolverhampton.

The semi-rural nature of the catchment means surface water flood risk is largely restricted to natural topographic depressions and natural channels through the central part of the catchment, although properties in the urban areas are susceptible to increased surface water flooding in future. The urban extent of the upper catchment is likely to contribute large volumes of surface water to the watercourse which may be exacerbated by future developments. The only development sites

within, or partially within this catchment are in or around Old Perton which is rural and surface water risk here is contained to the highways and adjacent ditches. However, risk may be increased in the future if flows in the catchment were to increase as a result of further development and climate change. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues.

The small amount of proposed development also means there are limited opportunities for SuDS to be implemented as part of development; however, this assessment highlights these issues and the importance of ensuring that runoff does not increase in future and that careful consideration is given to proposals that affect the natural storage and flow of surface water. There remains the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.

7.7.4 Smestow Brook – Wom-Penn Brook to conf River Stour

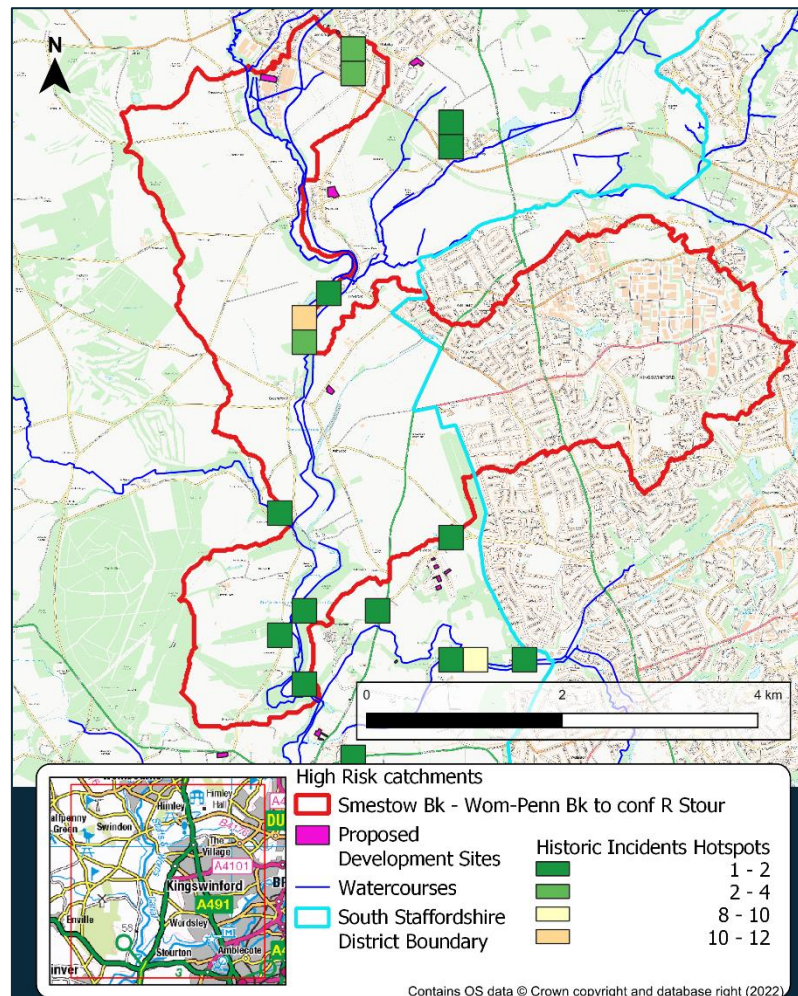


Figure 7-6: Proposed development and historic flooding hotspots within the Smestow Brook – Wom-Penn Brook to conf River Stour catchment

This lower stretch of the Smestow Brook is the drains the upper Smestow Brook as well as tributaries including the Bobs-Holbeche Brook (which flows through, Gornal, Himley and Baggeridge Country Park), Spittle Brook, Wom-Penn Brook and Bobs-Holbeche Brook. The Dawley Brook is included within this catchment area which drains the urban area of Wall Heath to the east of the Smestow Brook.

In terms of fluvial flood risk, this lower reach of the Smestow Brook is high risk, with all tributaries as well as the main river impacted by Flood Zone 2, including in urban areas such as Swindon. Overspill into the Staffordshire and Worcestershire Canal is also likely. Given the semi-rural nature of parts of the catchment, there are likely to be opportunities for measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues downstream. Opportunities should also be sought through the Baggeridge Country Park and Himley Estate.

The semi-rural nature of the catchment means surface water flood risk is largely restricted to natural topographic depressions and natural channels through the central part of the catchment, although properties in the urban areas are susceptible to increased surface water flooding in future. The urban extent of the tributaries to the east are likely to contribute large volumes of surface water to the watercourse which may be exacerbated by future developments. The only development sites within, or partially within this is near the rural hamlet of Greensforge where surface water risk is largely contained to the highways and ditches. However, risk may be

increased in the future if flows in the catchment were to increase as a result of further development and climate change. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues.

The small amount of proposed development also means there are limited opportunities for SuDS to be implemented as part of development; however, this assessment highlights these issues and the importance of ensuring that runoff does not increase in future and that careful consideration is given to proposals that affect the natural storage and flow of surface water. There remains the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.

7.7.5 Tame (W/ton Arm) source to conf Oldbury

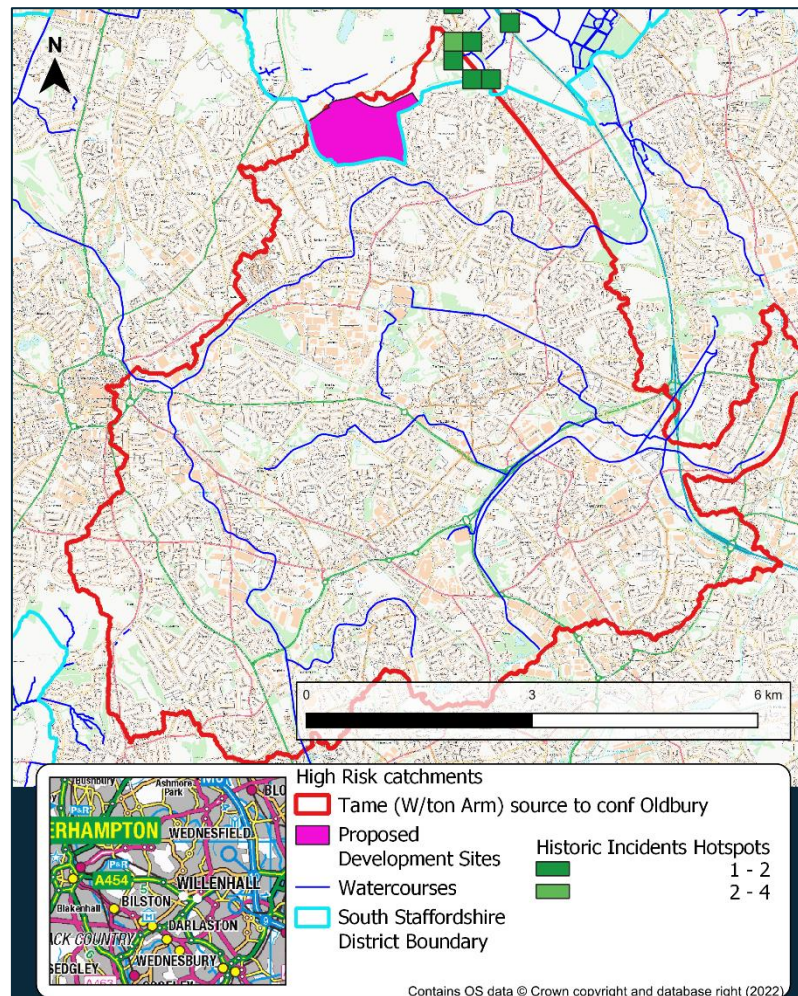


Figure 7-7: Proposed development and historic flooding hotspots within the Tame (W/ton Arm) source to conf Oldbury catchment

This upper catchment of the Tame is predominantly urban, draining the eastern side of Wolverhampton, and intersected by numerous canal systems. The watercourse within the catchment comprises the River Tame and 2 tributaries which converge to near the A454 Black Country Route highway. The northern tributary drains the areas around Wellington Place and Chapel Green, and the Darlaston Brook drains a small area from Loxdale. The main River Tame flows east from Stow Heath, through Portobello and Willenhall. The River Tame then turns south after being joined by the Sneyd Brook to flow towards the north of Birmingham. The catchment is designated as 'heavily modified' with numerous physical modifications including weirs and culverts.

All but the northernmost edge of this catchment lies within the neighbouring authorities of City of Wolverhampton District and Walsall District, therefore development within these regions are more likely to impact on fluvial and surface water flood risk. Proposed development data was not available from these authorities for this assessment, however further consideration should be made to flood risk and cross boundary issues from these authorities. The only development site within South Staffordshire District in this catchment is site 486c 'Land off Blackhalve Lane'.

In terms of fluvial flood risk, the main area of risk is within Bilston, Stow Lawn, Portobello, Willenhall, Wellington Place, Chapel Green, Summerford Place, Shepwell Green, and County Bridge. In many of these locations, Flood Zone 2 extends far along highways and through residential estates, and the area between Bilston and

Loxdale being significantly impacted by Flood Zone 3. Due to the large number of bridges and culverts in this catchment, impoundment flooding is also a risk, with modelling indicating this occurrence at Loxdale, and around the canal systems near the A454, Bentley Mill Way and Bentley Road South.

Given the urban nature of the majority of the catchment, there are unlikely to be opportunities for upstream measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues downstream.

Surface water flood risk ranked high in this catchment due to the urban environment, and is distributed significantly across the catchment, with risk extents covering the majority of highways within the urban area where properties are susceptible to increased surface water flooding. This risk may be increased in the future if flows in the catchment were to increase as a result of further development and climate change. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues.

The small amount of proposed development also means there are limited opportunities for SuDS to be implemented as part of development; however, this assessment highlights these issues and the importance of ensuring that runoff does not increase in future and that careful consideration is given to proposals that affect the natural storage and flow of surface water. There remains the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.

7.7.6 Penk – Whiston Brook to River Sow

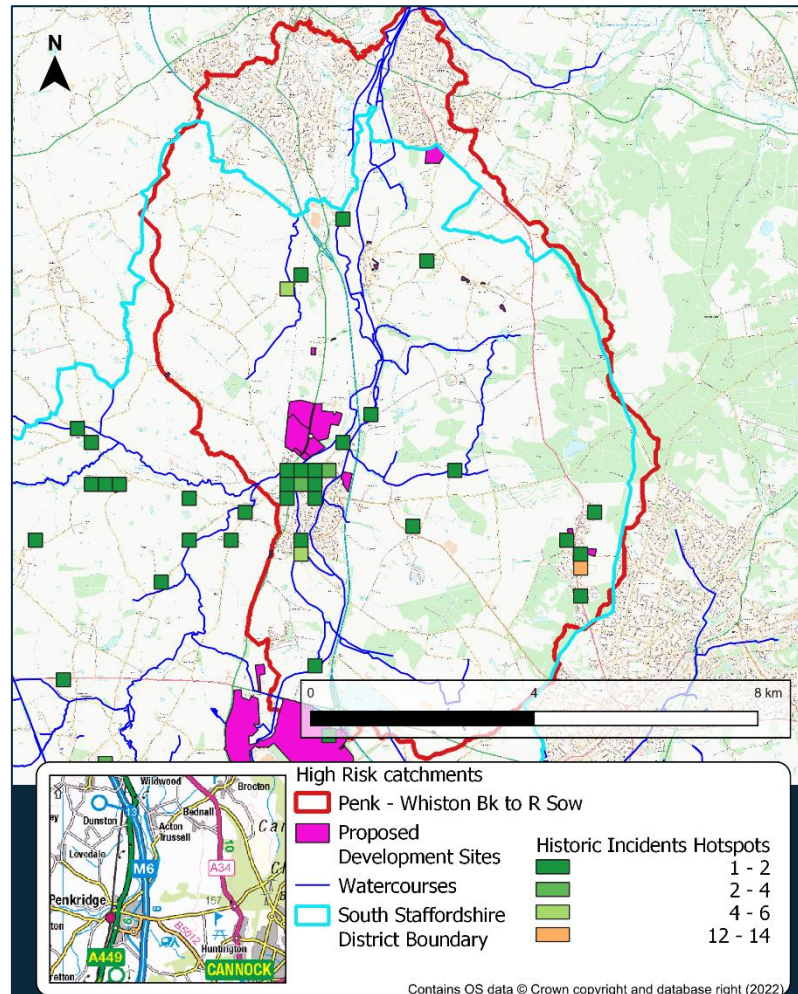


Figure 7-8: Proposed development and historic flooding hotspots within the Penk – Whiston Brook to River Sow catchment

This reach of the River Penk drains the upper catchment to the south, and the Whitson Brook to the west. From here, it flows north through the centre of the catchment to its confluence with the River Sow in Stafford. It is joined by 3 tributaries and numerous field drains near the areas of Wildwood and Rickerscote in Stafford. Two un-named watercourses join the River from the east, whilst the Pothooks Brook drains the area to the west. This partially forms the district boundary between South Staffordshire District and Stafford Borough, as does the River Penk from the confluence of the Pothooks Brook to the confluence of Deepmore Drain with the River near Wildwood. The Staffordshire and Worcestershire Canal runs adjacent to the river through the majority of the catchment.

In terms of fluvial flood risk, the main areas of risk are within Penkridge at the upstream end of the catchment, and Huntington in the east, as the hotspots data exemplifies (Figure 7-8).

In Penkridge, a proposed development site along Bellbrook is located within 250m of historic flood events, In Huntington, proposed development sites 016 'Pear Tree Farm' and 591 'Land at Oakfield Farm' are located partially within 250m of historic flood events. One other site partially within 250m of historic flood events is the West Midlands Interchange on the M6 Motorway in the south of the catchment. Although not within 250m of any historic flood events, the large development on the outskirts of Penkridge would likely contribute a significant amount of surface water to the River Penk.

Given the rural nature of the majority of the catchment, there are likely to be opportunities for upstream measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues downstream in Stafford.

Smaller development sites within this catchment are distributed sparsely across the catchment, in villages such as Bednall and Acton Trussell, however surface water risk may be increased in the future if flows in the catchment were to increase as a result of further development and climate change. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues. These sites however are located within the historic flooding hotspot grids, so surface water management should be seriously considered when developing these sites.

The amount of proposed development within this catchment means there are good opportunities for SuDS to be implemented as part of development; however, this assessment highlights these issues and the importance of ensuring that runoff does not increase in future and that careful consideration is given to proposals that affect the natural storage and flow of surface water. There remains the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.

7.7.7 Saredon brook from source to River Penk

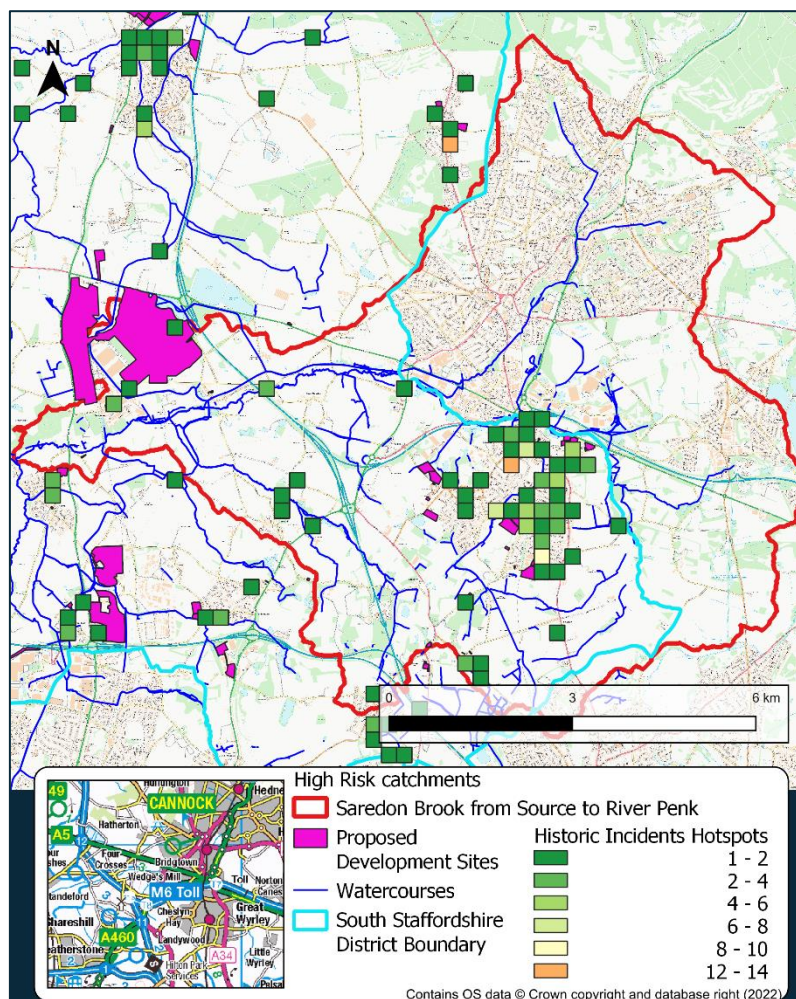


Figure 7-9: Proposed development and historic flooding hotspots within the Saredon brook from source to River Penk catchment

The Saredon Brook rises near Chasewater and drains the area of Cannock, formed at the point where the Wash Brook and Ridings Brook converge on the district boundary with Cannock Chase District. The Ridings Brook which drains Cannock from the north whilst the Wash Brook drains the central eastern area of the catchment of Norton Caines, and Cheslyn Hay in South Staffordshire. A third un-named tributary drains the southwest of the catchment from Essington near the catchment boundary. The catchment comprises a number of tributaries and drains that join the major tributaries across the rural areas. The Staffordshire and Worcestershire Canal bisects the catchment east-west/southwest.

In terms of fluvial flood risk, Flood Zones 2 and 3 are largely restricted to the watercourse channels, however there are a few areas where the extents spread over wider areas and along highways and residential areas. These include Churchbridge (including the M6 Toll and A5 Watling Street highways), Deepmore, where the un-named watercourse joins the Saredon Brook, and parts of Coven, where the Saredon Brook joins the River Penk. Some of these locations have also been identified in the flooding incidents hotspots data exemplified (Figure 7-9), including Coven, and the M6 Toll/A5 corridor past Churchbridge.

Given the semi-rural nature of the catchment, there are likely to be opportunities for upstream measures such as flood storage and natural flood management (NFM) techniques to be implemented to reduce the flood risk issues at confluence points and downstream in Deepmore and Coven.

There are a number of proposed development sites within this catchment, primarily located around the Wash Brook in Great Wyrley, Cheslyn Hay and Churchbridge. Flooding Hotspot Grids indicate that many of these sites are within 250m of at least one historic flooding event. A small amount of smaller developments are proposed further downstream in the catchment.

However, the majority of surface water flood risk from proposed development within the Saredon Brook to the lower catchment and downstream catchments is from the large site at the West Midlands Interchange. This crosses into the neighbouring catchments of the River Penk (Whiston Bk to R Sow; also High Risk) and the River Penk – Saredon Bk to Whiston Bk; Medium Risk). This site is also contains/partially contains 2 historic flood events. Further investigation into these flooding events, and those mentioned in the Wash Brook above, is recommended at the earliest available opportunity before development progresses. Surface water management should also be comprehensively addressed when developing these sites.

Surface water elsewhere in the catchment is not limited by topography and highways and residential areas are significantly impacted across the catchment. The upstream reaches of the Wash Brook, and conduits leading to it from Heath Hayes and Norton Canes are prominent, as are conduits into and through the Newlands Brook, a minor tributary to the Ridings Brook, which flows into the lake near the M6 Toll near Leacroft.

Surface water flooding risk may be increased in the future if flows in the catchment were to increase as a result of further development and climate change. It is therefore particularly important that development does not increase runoff and contribute to the existing known surface water issues.

The amount of proposed development also means there are numerous opportunities for SuDS to be implemented as part of development; however, this assessment highlights these issues and the importance of ensuring that runoff does not increase in future and that careful consideration is given to proposals that affect the natural storage and flow of surface water. There remains the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.

7.8 Broadscale Policy Recommendations

The broadscale cumulative impact assessment for South Staffordshire has highlighted that the potential for development to have a cumulative impact on flood risk is moderately low across the area. Catchments have been identified as high, medium or low risk. The assessment provides a spatial illustration of the locations in the respective catchments that are potentially sensitive to changes in the flood risk and where more detailed assessment might be appropriate to assess the potential effect of all proposed development within a catchment.

Flood risk will potentially be affected by proposed development and thus it is appropriate that provisions for incremental action and betterment in flood risk terms across all of South Staffordshire is supported.

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

- South Staffordshire Council should work closely with neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the South Staffordshire authority area to other local authorities in order to minimise cross boundary issues of cumulative impacts of development.
- Developers should incorporate SuDS and provide details of adoption, ongoing maintenance and management on all development sites. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible. Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure in the districts where practicable. Developers should refer to the **Staffordshire County Council Sustainable Drainage Systems (SuDS) Handbook** for the requirements for Suds in South Staffordshire, including Technical and Development Type-specific Guidance for Developers.
- South Staffordshire Council as LLFA will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should take into account all sources of flooding to ensure that future development is resilient to flood risk and does not increase flood risk elsewhere.
- Where appropriate, that the opportunity for Natural Flood Management in rural areas, SuDS retrofit in urban areas and river restoration should be maximised. Culverting should be opposed, and day-lighting existing culverts promoted through new developments. Careful consideration should be given to proposals that affect the natural storage and flow of surface water so that the existing capacity to absorb and convey surface water runoff is not compromised.
- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) for all sites, with a target for 30% betterment, unless it can be demonstrated that this is not practicable. Developers should refer to the **Staffordshire County Council Sustainable Drainage Systems (SuDS) Handbook** for the requirements for Suds in South Staffordshire, including Technical and Development Type-specific Guidance for Developers.
- All development proposals should undertake a site-specific Flood Risk Assessment. Site-specific FRAs should explore opportunities to provide wider community flood risk benefit through new developments. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered. This may be either by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.

- South Staffordshire Council should consider requiring developers to contribute to community flood defences outside of their red line boundary to provide wider benefit and help offset the cumulative impact of development. There are proposed and ongoing Flood Alleviation Schemes which may help to reduce fluvial risk in the town centre, and there may be opportunities for development to support the funding/delivery of these schemes.

Catchment-specific recommendations are made for high-risk catchments below.

7.9 Recommendations for high-risk catchments

From analysing the results produced above, high-level recommendations for flood storage and betterment have been proposed for sites in each of the high-risk catchments. These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to ascertain the true storage needs and potential at each site at the planning application stage. Particular attention should be paid to the effect of all proposed development in a plan at the location of existing sensitive receptors and included as appropriate for the assessments performed at the respective sites in the plan (but this also applies to “windfall” sites within these catchments).

Developers should also include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the Environment Agency, LLFA and the LPA regarding the proposed management approach during the construction phase to address surface water management during storm events.

For developments in high risk catchments, the LLFA and LPA should consult with Local Non-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships (**Worcestershire Middle Severn Catchment Partnership, Staffordshire Trent Valley Catchment Partnership, Tame Anker & Mease Catchment Partnership**) to understand ongoing and upcoming projects where NFM, flood storage and attenuation, and environmental betterment may be possible alongside developments and aid in reducing flood risk.

7.9.1 Penk from Source to Saredon Brook

- In Coven, near the confluence with the Saredon Brook, LPAs should work closely with the Environment Agency and LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features
- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchment.
- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

7.9.2 Wom-Penn Brook – source to conf Smestow Brook

- In Wombourne, near the confluence with the Smestow Brook, LPAs should work closely with the Environment Agency and LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features.
- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchment.

- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

7.9.3 Smestow Brook – source conf Wom-Penn Brook

- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchment.
- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

7.9.4 Smestow Brook – Wom-Penn Brook to conf River Stour

- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchment.
- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

7.9.5 Tame (W/ton Arm) source to conf Oldbury

- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and the potential for the retrofitting of SuDS within the existing urban areas to reduce runoff.
- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as seeking to identify opportunities to introduce green infrastructure.

7.9.6 Penk – Whiston Brook to River Sow

- As the catchment drains through Penkridge, LPAs should work closely with the Environment Agency and LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features.
- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchment.
- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

7.9.7 Saredon Brook from Source to River Penk

- As the catchment drains through Stafford and Churchbridge, LPAs should work closely with the Environment Agency and LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features.
- The LLFA should work closely with the Environment Agency to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features in the upper catchment.
- There is the potential for development in this catchment to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.

8 Flood risk management requirements for developers

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

A detailed Flood Risk Assessment (FRA) may show that a site is not appropriate for development of a particular vulnerability or even at all. However, a detailed Flood Risk Assessment undertaken for a windfall site² may find that the site is entirely inappropriate 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 be seen as an alternative to proving these tests have been met.

8.1 Principles for new developments

Apply the Sequential and Exception Tests

Developers must provide evidence that the Sequential Test has been passed for windfall developments. If the Exception Test is needed, they must also provide evidence that all parts of the Test can be met for all developments, based on the findings of a detailed Flood Risk Assessment.

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 layout be varied to reduce the number of people or flood risk vulnerability or building units located in higher risk parts of the site?

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

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

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

² '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.

apply the latest Environment Agency climate change guidance and ensure the development has taken into account climate change adaptation measures.

Ensure that development does not increase flood risk elsewhere and in line with the NPPF, seeks to reduce the causes and impacts of flooding

Chapter 10 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.

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.

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.

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. Evidence would need to be provided showing there is no other economically viable alternative and that appropriate mitigation measures are being implemented to offset any ecological or flood risk impacts. Permission from the Environment Agency (and LLFA for ordinary watercourses) is unlikely to be granted without these requirements.

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

Wherever possible, developments should seek to help reduce flood risk in the wider area e.g., by contributing to a wider community scheme or strategy for strategic measures, such as defences or natural flood management or by contributing in kind by mitigating wider flood risk on a development site. Developers must demonstrate in an FRA how this has been considered at a site level.

8.2 Requirements for site-specific Flood Risk Assessments

8.2.1 When is an FRA required?

Site-specific FRAs are required for most developments within Flood Zones 2 & 3, including the following circumstances:

- Proposals in Flood Zone 2 or 3 including minor developments (such as non-residential extensions, alterations which do not change the size of the building or householder developments) and change of use.
- Proposals more than 1 hectare in area in Flood Zone 1.
- Proposals less than 1 hectare in area in Flood Zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (e.g. surface water, reservoirs)

- Proposals in an area within Flood Zone 1 which has critical drainage problems, as notified by the Environment Agency.

Additionally, 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); the Environment Agency should be contacted to agree the breach assessment approach.
- Where evidence of historical or recent flood events have been passed to the LPA.
- At locations where the proposed development potentially affects the risk designation of a reservoir (as defined under the Reservoirs Act ,1975).
- Refer to Table E1 in SSC's **Local SuDS Handbook**.

8.2.2 Objectives of site-specific FRAs

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

- Whether consideration should be given to alternative sites at locations identified as affecting the extent or safety of proposed development
- whether a proposed development will be at risk of flooding, from all sources, both now and in the future, taking into account climate change.
- 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 Staffordshire County Council. 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);
- **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**.

8.3 Local requirements for mitigation measures

The Level 1 SFRA provides details on the following mitigation measures in Section 10, and should be referred to alongside this report:

- Site layout and design (10.2)
- Modification of ground levels (10.2.1)
- Raised floor levels (10.2.2)
- Development and raised defences (10.2.3)
- Resistance and Resilience measures (10.2.5)

8.4 Flood warning and emergency planning

Section 10.5 of the Level 1 SFRA discusses NPPF requirements and what an Emergency Plan will need to consider and other relevant information on emergency planning. Further information is provided by the **Staffordshire Local Resilience Forum** in reducing flood risk from other sources.

Section 4.6-4.8 of the Level 1 SFRA discusses how to reduce flood risk from other sources, such as groundwater, surface water and sewer flooding.

8.5 Reservoirs

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 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 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 requirement** provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report and incident.

Developers should consult the **Staffordshire Local Resilience Forum** about emergency plans for reservoir breach.

Developers should use the above information to:

- Apply the sequential approach to locating development within the site or if appropriate confirm why it is not appropriate to consider alternative sites at lower risk.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that that the proposed infrastructure fabric could withstand the structural loads.
- Develop site-specific Emergency Plans and/ or Off-site Plans if necessary and ensure the future users of the development are aware of these plans. This may need to consider emergency drawdown and the movement of people beforehand, similar to the response to the Toddbrook Reservoir incident in Whaley Bridge, Derbyshire, 2019.

8.6 Duration and onset of flooding

The duration and onset of flooding affecting a site depends on a number of factors:

- The position of the site within a river catchment, with those at the top of a catchment likely to flood sooner than those lower down. The duration of flooding tends to be longer for areas in lower catchments.
- The River Stour drains a large area of the South Staffordshire. Upstream reservoirs in these catchments will provide some online flood storage that reduce the flood risk downstream and delays the onset of flooding. At the confluence of the larger watercourses and smaller tributaries, there may be different timings of peak flows, for example smaller tributaries would peak much earlier than the larger catchments.
- The principal source of flooding: where this is surface water, depending on the intensity and location of the rainfall, flooding could be experienced within 30 minutes of the heavy rainfall event e.g., a thunderstorm. Typically, the duration of flooding for areas at risk of surface water flooding or from flash flooding from small watercourses is short (hours rather than days).
- The preceding weather conditions prior to the flooding: wet weather lasting several weeks will lead to saturated ground. Rivers respond much quicker to rainfall in these conditions.
- Whether a site is defended, noting that if the defences were to fail, a site could be affected by very fast flowing and hazardous water within 15 minutes of a breach developing (depending on the size of the breach and the location of the site in relation to the breach), causing danger to life.
- Catchment geology, for example chalk catchments take longer to respond than typical clay catchments.

Table 8-1 Guidelines on the duration of and onset of flooding

Principal source of flooding	Duration	Onset
Surface water	Up to 4 hours	Within 30 minutes
Fluvial	4 – 24* hours	Within 2 - 8 hours

**Depending on where in the catchment a site is located, flooding could be rapid and flashy in the upper catchment (e.g. small tributaries), and slower responding and longer in duration in the lower catchment.*

It is recommended that a site-specific Flood Risk Assessment refines this information, based on more detailed modelling work where necessary.

9 Surface water management and SuDS

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

The Level 1 SFRA summarises guidance and advice on managing surface water runoff and flooding in Chapter 9. Below is a guide to what is included in sections not expanded on here, for reference alongside this Level 2 SFRA:

- Section 9.1 – Role of the LLFA and LPA in surface water management
- Section 9.2 – Sustainable Drainage Systems (SuDS)

9.1 Sources of SuDS guidance

9.1.1 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.

9.1.2 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.

In February 2021, Defra published its **research project** to review and recommend updates to the Non-Statutory Technical guidance. The proposals have not yet been adopted but would bring the standards in line with current best practice according to the construction industry research and information association (CIRIA) SuDS Manual.

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

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

9.1.4 Staffordshire County Council SuDS Handbook

The **Staffordshire County Council SuDs** Handbook was originally developed by Staffordshire County Council 2017.

The Handbook was introduced as local policy through the implementation of the LFRMS and is adopted for use in nine LLFAs in the West Midlands including South Staffordshire. It is intended to be used alongside the CIRIA SuDs Manual, but should be consulted in the early stages of planning. It outlines national and local SuDs standards for the listed areas of the West Midlands.

Appendix E of the Handbook contains the Staffordshire County Councils LLFA-specific information, including Technical and Development Type-specific Guidance for Developers.

9.2 Other considerations

9.2.1 Groundwater Vulnerability Zones

The Environment Agency have 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](#).

9.2.2 Groundwater Source Protection Zones (GSPZ)

The Environment Agency also defines Groundwater Source Protection Zones (SPZs) near groundwater abstraction points. These protect areas of groundwater used for drinking water. The Groundwater SPZ requires attenuated storage of runoff to prevent infiltration and contamination. Groundwater Source Protection Zones can be viewed on the [Defra website](#).

Most of the South Staffordshire is located within a Groundwater Source Protection Zone (Zone III – Total Catchment). The northern area such as Penkridge is located outside of a Groundwater Source Protection Zone.

9.2.3 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. The NVZ coverage can be viewed on [Defra's interactive mapping](#). The entirety of South Staffordshire is located within a surface water NVZ.

9.3 SuDS suitability across the study area

The suitability of SuDS techniques is dependent upon many variables, including the hydraulic and geological characteristics of the catchment.

The permeability of the underlying soils can determine the infiltration capacity and percolation capacities. As such, a high-level review of the soil characteristics has been undertaken using BGS soil maps of England and Wales which allow for a basic assessment of the soil characteristics and infiltration capacity. The results of the assessment and mapping of the soil characteristics are shown in the Level 1 SFRA.

This strategic assessment should **not** be used as a definitive site guide as to which SuDS would be suitable but rather as an indicative guide of general suitability based solely on soil type. Several other factors can determine the suitability of SuDS techniques including land contamination, the depth and fluctuation of the water table, the gradient of local topography and primary source of runoff etc. When considering NVZs and if areas have pollutants, infiltration may only be suitable where treatment measures are provided, prior to any discharge to surface or groundwaters.

Further site-specific investigation should be conducted to determine what SuDS techniques could be utilised at a particular development. The result of this assessment does not remove the requirements for geotechnical investigation or detailed infiltration testing and does not substitute the results of site-specific assessments and investigations. The LLFA should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors.

10 Summary of Level 2 assessment and recommendations

10.1 Assessment methods

As part of the Level 2 SFRA, 8 detailed site summary tables have been produced for the Level 2 sites assessed.

The summary tables set out the flood risk to each site, including Flood Zone (actual risk) coverage, maps of extent, depth, and velocity of flooding as well as hazard mapping for the 100-year + climate change defended event, where available. Climate change mapping has also been produced to indicate the impact which different climate change allowances may have on the site (where models are available) or using Flood Zone 2 as an indication of climate change. The national Risk of Flooding from Surface Water dataset, including the latest climate change uplifts applied as part of this study, has been used to assess the risk to sites. and updated detailed modelling. Each table also sets out the NPPF requirements for the site as well as guidance for site-specific FRAs.

A broadscale assessment of suitable SuDS options has been provided giving an indication where there may be constraints to certain sets of SuDS techniques. This assessment is indicative and more detailed assessments should be carried out during the site planning stage to confirm the feasibility of different types of SuDS. It may be possible that those SuDS techniques highlighted as possibly not being suitable can be designed to overcome identified constraints. Where residual risk was thought to be a potential concern, comments were made on potential culvert blockages at sites.

Interactive mapping is shown in Appendix A.2 and should be viewed alongside the detailed site summary tables.

10.2 Summary of key site issues

- The majority of sites with a detailed Level 2 summary table are at fluvial flood risk. The degree of flood risk varies, but most sites are only marginally affected along their boundaries. As most of the sites lie alongside unnamed ordinary watercourses, detailed modelling was not available to inform risk to the sites. Broadscale modelling using 2d techniques has been undertaken for these sites- this modelling is suitable for site screening purposes however should these sites be brought forward for development more detailed modelling will be required to inform site planning and a site-specific FRA. Broadscale modelling indicated that for most of the sites the area of the site at risk of fluvial flooding is low and limited to the areas in the immediate vicinity of the watercourse. Only one site, 0119a, is at more extensive risk of flooding. All sites will require more detailed investigations on sequential site layouts, SuDS possibilities, safe access, and egress and so on, as part of a site-specific Flood Risk Assessment at the planning application stage.
- Most sites are not at significant surface water risk, with surface water risk commonly aligning with floodplain topography of the ordinary watercourses. Sites at greatest risk of surface water flooding are generally those where surface water flood risk is located in areas away from fluvial flood risk, in particularly site 463, where a surface water flow path bisects the site. Surface water should also be considered when assessing safe access and egress to and from the site, particularly where surface water has the potential to impact access/egress on routes outside of the immediate site boundary, e.g. where sites are accessed by a single road flooding on the road may impede access even though the site itself remains unaffected. Consideration should be made to these sites as to how safe access and egress can be provided during flood events, both to people and emergency vehicles. Also, consideration should be given to whether the risk

forms a flow path or bisects the site where access from one side to another may be compromised.

- Fluvial and surface water climate change mapping indicates that flood extents will increase. As a result, the depths, velocities, and hazard of flooding may also increase. The significance of the increase tends to depend on the topography of site and the percentage allowance used. The Council and the Environment Agency require the 100-year plus Central and Higher fluvial scenarios and surface water scenarios to be considered in future developments, as well as the Upper End for significant new developments or urban extensions, for the 2080s epoch ([click here to access the latest EA Climate Change allowances](#)) as of July 2022. This SFRA reflects current advice at the time of writing however developers should check [Gov.uk](#) guidance for site-specific FRAs to ensure the impact of climate change in line with latest guidance.
- Residual risk was considered at the sites. Formal flood defences are not present at any of the sites therefore there is no residual risk from flood defences. A number of sites are in the vicinity of canals, however due to topography the residual risk from overtopping/breach to sites is low. Where watercourses are culverted under roads near to sites, there may be a risk to the site if culverts become blocked. Blockage locations were determined by visual inspection of the OS mapping and ground topography in the vicinity of the site, to determine whether a structure upstream, downstream, or within the site could have an impact on the site. Blockage modelling has not been undertaken as part of this assessment and these would need to be considered further as part of a site-specific assessment.
- A strategic assessment was conducted of SuDS options using regional datasets and the Areas susceptible to Groundwater Flooding dataset. A detailed site-specific assessment of suitable SuDS techniques would need to be undertaken at site-specific level to understand which SuDS option would be best.
- In respect of cumulative impact, development sites proposed have the potential to provide a betterment to existing communities downstream within the catchment. However, all of these developments also have the potential to increase flood risk offsite if both National and Local SuDS Standards are not applied. They also offer a great potential to enhance the wider Green and Blue Infrastructure of the local area through integrated planning for flood risk, sustainable drainage, biodiversity, amenity and sustainable transport provision.

10.2.1 Considering the Exception Test for the proposed sites in South Staffordshire

In principle, it is possible for all sites assessed in the Level 2 SFRA to pass the flood risk element of the Exception Test and for the principle of development to be supported, for example by:

- siting development away from the highest areas of risk into Flood Zone 1 (in the majority of sites assessed, the risk is from a watercourse along a site boundary, so steering development away from these areas is advised) (apply sequential approach at a site scale),
- considering safe access/ egress in the event of a flood (from all parts of the site, if say the site is severed by a flood flow path),
- using areas in Flood Zone 2 for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. Residential development should not be permitted in Flood Zone 3 and no development at all should be permitted in Flood Zone 3b (aside from essential infrastructure, such as a bridge crossing the lowest points of a site),
- testing flood mitigation measures if these are to be implemented, to ensure that they will not displace water elsewhere (for example, if land is raised to permit

development on one area, compensatory flood storage will be required in another),

- considering space for green infrastructure in the areas of highest flood risk where this is appropriate.

Consideration must also be given to the surface water risk within South Staffordshire. National surface water mapping does not account for culverts, structures, channel hydraulics or sewer capacity, and this is deemed to potentially overestimate risk and therefore the confidence in this dataset is reduced. It is recommended that developers investigate surface water risk in more detail at the planning application stage and may need to consider undertaking integrated modelling

If larger sites, for example Site 646 (Land west of ROF Featherstone), are split in future into smaller land parcels for development, and some of those parcels are in areas of flood risk, the Exception Test may need to be re-applied by the Developer at the planning application stage.

10.3 Planning Policy recommendations

The Planning Policy recommendations in Chapter 10 of the Level 1 SFRA still stand for the site allocations and any windfall development that comes forward. Recommendations in the L1 are made in relation to:

- Considering flood resilience measures for new development.
- Combining infiltration (e.g. permeable surfaces) and attenuation (e.g. balancing ponds and flood storage reservoirs) SuDS techniques to overcome constraints to the area of a site set aside for infiltration systems caused by development pressures.
- Seeking opportunities for betterment where possible, where surface water flooding issues are present.
- Encouraging the use of permeable surfacing in gardens and use measures to optimise drainage and reduce runoff.
- Considering opportunities for water conservation through rainwater harvesting and water butts where appropriate for new and existing development.
- Promoting land management practices where appropriate to attenuate runoff and alleviate potential issues downstream.

Further catchment-specific recommendations have been made in the Level 2 report regarding Cumulative Impact Assessment. These are made in Chapter 7

10.4 Guidance for windfall sites and sites not assessed in the L2

- For sites not represented in the Environment Agency's Flood Zones, or where Flood Zones do exist, but no detailed hydraulic modelling is present, it is recommended that developers construct detailed hydraulic models at these sites as part of a site-specific FRA using channel, structure and topographic survey, to confirm flood risk.
- If a site's extents either include or borders with a Main River (including a culverted reach of Main River), an easement of 8m is required from either bank for access and maintenance. Any future development will require a flood risk permit from any activity within 8m of a Main River.
- If an ordinary watercourse is within or immediately adjacent to the site area, consultation with the Lead Local Flood Authority should be undertaken. If alterations or discharges are proposed to the watercourse, a land drainage consent will be required.
- Where necessary, blockages of nearby culverts may need to be simulated in a hydraulic model to confirm residual risk to the site.

- Surface water risk should be considered in terms of the proportion of the site at risk in the 30-year, 100-year or 1,000-year events, whether the risk is due to isolated minor ponding or deeper pooling of water, or whether the risk is due to a wider overland flow route.
- Surface water risk and mitigation should be considered as part of a detailed site-specific Flood Risk Assessment and Surface Water Drainage Strategy.
- Access and egress should be considered at the site, but also in the vicinity of the site, for example, a site may have low surface water risk, but in the immediate locality, access/ egress to and from the site could be restricted for vehicles and/ or people.
- Sites where there is a canal within or immediately adjacent to the site area, developers should consult the Canal and Rivers Trust. Any proposed alterations to the canal or discharges must be agreed with the Canal and Rivers Trust.
- If a site is located within 250m of a landfill site, there could be amenity, dirt and contamination issues. Sites could be sensitive from the perspective of controlled waters and therefore any redevelopment must ensure there is no pollution risk to the water environment.

10.5 Use of SFRA data and future updates

It is important to recognise that the SFRA has been developed using the best available information at the time of preparation. This relates both to the current risk of flooding from rivers, and the potential impacts of future climate change.

The SFRA should be a 'living document', and as a result should be updated when new information on flood risk, flood warning or new planning guidance or legislation becomes available. New information on flood risk may be provided by South Staffordshire District Council, the Highways Authority, Canal and Rivers Trust, Severn Trent Water and the Environment Agency. Such information may be in the form of:

- New hydraulic modelling results
- Flood event information following a future flood event
- Policy/ legislation updates
- Environment Agency flood map updates
- New flood defence schemes, or alleviation schemes.

The Environment Agency regularly reviews their flood risk mapping, and it is important that they are approached to determine whether updated (more accurate) information is available prior to commencing a detailed Flood Risk Assessment. It is recommended that the SFRA is reviewed in line with the Environment Agency's Flood Zone map updates to ensure latest data is still represented in the SFRA, allowing a cycle of review and a review of any updated data by checking with the above bodies for any new information.

10.5.1 Neighbourhood Plans

Flood risk should be fully addressed in the plan preparation and in bringing forward policies for the allocation of land and therefore the SFRA findings should be used in the production of Neighbourhood Plans.

Neighbourhood planners can use the information in the Level 1 and Level 2 SFRA on the sources of flood risk across South Staffordshire and the flood risk mapping, to assess the risk of flooding to sites within their community. The SFRA will also be helpful for developing community level flood risk policies in high flood risk areas.

The Level 1 SFRA 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 recorded historical flood events for Staffordshire are listed in the Level 1 SFRA and this can be used to supplement local knowledge regarding areas worst hit by flooding. The Level 2 SFRA uses the same updated information as the 2019 Level 1 report to assess sites; this includes latest flood incident data from the LLFA. Please contact the Council to obtain further information.

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 Level 2 Assessment

A.1 Site Summary Tables

A.2 GeoPDF mapping

Instructions for using GeoPDFs

1. GeoPDFs should be opened with Adobe. They display the mapping datasets relevant to this report for each site
2. Datasets shown in the legend can be switched on and off using the tick boxes. If nothing displays, it means there is no data available associated with that location.

B Modelling Technical Note

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Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
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