Nuneaton and Bedworth Borough Council Level 2 Strategic Flood Risk Assessment

Final Report

A1-C01

August 2023

Prepared for:

Nuneaton and Bedworth Borough Council

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Contract

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This report describes work commissioned by Nuneaton and Bedworth Borough Council, by an instruction dated February 2023. The Client's representative for the contract was Jacqueline Padbury of Nuneaton and Bedworth Borough Council. Georgie Troy, Freya Nation, Sarah Hambling, Helen Dawson, Edmund Mumford, Abigail Betts, Emma Elwood and Louise Goode of JBA Consulting carried out this work.

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between January 2023 and "date and Year") and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by JBA. This Report cannot be relied upon by any other party without the prior and express written agreement of JBA.

Acknowledgements

We would like to acknowledge the assistance of Nuneaton and Bedworth Borough Council, Coventry City Council, North Warwickshire Borough Council, Rugby Borough

Council, Hinckley and Bosworth Borough Council, Warwickshire County Council, the Environment Agency, and Severn Trent Water.

Contents

List of Figures

List of Tables

Abbreviations

1D	One Dimensional (modelling)
2D	Two Dimensional (modelling)
AEP	Annual Exceedance Probability
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Survey
CCTV	Closed Circuit Television
CIRIA	Company providing research and training in the construction industry
DLR	Docklands Light Railway
EA	Environment Agency
FRA	Flood Risk Assessment
FRISM	Flood Risk Metrics [JBA Consulting's impact analysis software]
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
GIS	Geographical Information System
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NBBC	Nuneaton and Bedworth Borough Council
NPPF	National Planning Policy Framework
NRW	Natural Resources for Wales
OS	Ordnance Survey
PM	Project Manager
PPG	Planning Policy Guidance
RBMP	River Basin Management Plan
SFRA	Strategic Flood Risk Assessment
SI	Site Investigation
STW	Sewage Treatment Works

Executive Summary

Introduction and context

This Level 2 Strategic Flood Risk Assessment (SFRA) document was created with the purpose of supporting the review and update of the Nuneaton and Bedworth Borough Plan to cover the plan period 2024 - 2039. It involves the screening of 33 proposed development sites which have been identified by Nuneaton and Bedworth Borough Council (NBBC); 24 of these sites were identified as having significant risk of flooding and/or access and egress issues. These were further assessed in 19 detailed site summary tables due to some smaller sites with minimal fluvial or surface water flood risk being combined with larger sites located nearby which have greater flood risk concerns. This SFRA incorporates recent changes to national and local planning policy and considers the cumulative impacts of development across the Borough.

SFRA objectives

The Government's Planning Practice Guidance (PPG) on Flood Risk and Coastal Change advocates a tiered approach to risk assessment involving 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 sites for 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:

- Providing an up-to-date Strategic Flood Risk Assessment, taking into account the most recent policy and legislation in the National Planning Policy Framework (2022).
- An assessment of all sources of flooding including fluvial flooding, tidal flooding, surface water flooding, groundwater flooding, mapping of the functional floodplain and the potential increase in fluvial flood risk due to climate change, and how these may be mitigated.
- 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.

- To provide a comprehensive set of maps presenting flood risk from all sources that can be used as evidence base for use in the emerging Local Plan.
- Advice on whether the sites are likely to pass the second part of the Exception Test and the Sequential Test with regards to flood risk and on the requirements for a site-specific FRA, and outline specific measures or objectives that are required to manage flood risk.

As part of the Level 2 SFRA, detailed site summary tables have been produced for the proposed sites, covering the above. To accompany each site summary table, there is a GeoPDF map, with all the mapped flood risk outputs.

Summary of Level 2 SFRA

NBBC provided 33 sites for assessment. These were chosen through a combination of a site's potential for allocation and its flood risk as determined through the site assessment process. These sites were screened against flood risk datasets to assess how many were to be carried forward to a Level 2 SFRA assessment. In total, 24 sites were carried forward to a Level 2 assessment. These have been detailed in 19 site summary tables due to some smaller sites with minimal fluvial or surface water flood risk being combined with larger sites located nearby which have greater flood risk concerns. Additional sites which may have flood risk issues with access and egress are also flagged in this report.

Detailed site summary tables setting out the flood risk to each site and the NPPF requirements for the site, as well as guidance for site-specific FRAs, have been produced. 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 a 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 of the mapping, to allow easy navigation of the data.

The following points summarise the Level 2 assessment:

- Fluvial Flooding: Some areas of Nuneaton and Bedworth Borough are at greater risk than others. The main watercourses associated with fluvial risk are:
    - River Anker - the River Anker flows through Nuneaton. Modelled flood extents suggest that properties in Weddington, Attleborough (and to the east of here) and properties within the centre and west of Nuneaton are at flood risk from the River Anker, particularly in the areas where there are historic recorded flood outlines.
    - Wem Brook - tributary of the River Anker (partly covered by the River Anker and WCC Nuneaton models) flows south through the centre of the

Borough from the Anker. Properties at risk include those surrounding the floodplain to the south of Attleborough.
    - Bar Pool Brook – flows through the north of Nuneaton. Modelled flood extents (covered by the WCC Nuneaton model) suggest that properties in Whittleford, Chapel End and Camp Hill are at flood risk from the Bar Pool Brook.
    - River Sowe – flows through Bedworth in the southern part of the Borough. Modelled flood extents suggest that very few properties within the Borough are at risk of flooding from the River Sowe, even in the most extreme climate change scenarios.
    - Ordinary watercourses - there are a number of small ordinary watercourses within the Borough which are not currently modelled but have the potential to cause fluvial flood risk. For this assessment, the surface water mapping has been used to provide an indication of risk; however, modelling of these watercourses will be essential in a Flood Risk Assessment to inform the risk to any development proposals within the vicinity of unmodelled watercourses.
- Site-specific hydraulic modelling was undertaken for sites located in the Weddington and Bermuda areas, within or close to present day Flood Zones, but where Flood Zones do not have a fluvial model covering the area. This additional site-specific modelling is discussed in Appendix B.
- Despite most sites not being at significant risk from fluvial flooding, updated fluvial modelling showed sites GAL-7, SHA1, SHA2, SEA-1, SEA-2, SEA-4, ABB-4, ABB-6, ABB-7 and ABB-8 have some fluvial flood risk.

- Surface Water: Surface water tends to follow topographic flow routes, for example along the path of watercourses or isolated pockets of ponding where there are topographic depressions.
- The majority of sites with a detailed Level 2 summary table are at surface water flood risk. The degree of flood risk varies, with some sites being only marginally affected along their boundaries, and other sites being more significantly affected within the site. The sites at most significant surface water risk are: GAL-7, ARB-1, BUL-9, SEA-2, SEA-5, SHA-5, SHA3-2, SHA-6 and ABB-7.

- Whilst not at significant flood risk within the site boundary, several sites have potential access and egress issues as a result of fluvial and surface water flooding on the surrounding roads. 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 the nature of the risk, for example whether the flooding 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 are predicted to 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 the site and the climate change percentage allowance used; fluvial extents would be larger than Flood Zone 3 (1% AEP event), but maximum extents are likely to be similar to Flood Zone 2 (0.1% AEP event). The 0.1% AEP surface water flood extent can also be used as an indication of climate change to surface water risk. Site-specific FRAs should confirm the impact of climate change using latest guidance. It is recommended that Nuneaton and Bedworth Borough Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the Borough.

- Historic data provided by Warwickshire County Council (WCC) showed 115 incidences of recorded flooding within the study area since 2012; 9 of these incidences were associated with Main River flooding. Details of whether the flooding was internal to properties or affected only highways and curtilage was not available for the majority of records. The majority of flooding within the Borough was a result of surface water flooding, or flooding from highways.

- Groundwater: Groundwater emergence mapping indicates that the majority of the Borough is at very low risk from groundwater emergence. JBA's Groundwater Emergence map shows the areas with the shallowest groundwater levels generally follow the flow paths of the major watercourses in the Nuneaton and Bedworth Borough, particularly along the River Anker and Wem Brook, and the low-lying topography in the centre of Nuneaton. Here, groundwater levels are between 0.5-5.0m below the ground level, or at or very near the ground surface, and in these areas there may be a risk to subsurface assets. There are large areas across the area where the risk of groundwater emergence is considered to be negligible due to the nature of the local geological deposits.

- Canals: The Coventry Canal runs through the centre of the Borough, north to south, and has connections with ordinary watercourses and the Wem and Griff Brooks. There is also the Ashby Canal and the Oxford Canal. The canals have the potential to interact with other watercourses in the area and become a conduit for flow paths during flood events or in a breach scenario. There are however no recorded overtopping or breach events within Nuneaton and Bedworth, and due to the local topography, the canals are unlikely to pose a risk to any existing development within the Borough.

- Reservoirs: There are records of flooding from reservoirs in the study area during the 'Wet day' and 'dry day' flooding scenarios. The risk is mainly confined to the

north of the Borough along the River Anker, Wem Brook and Griff Brook. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

- Any sites located where there is Main River (including culverted reaches of Main River) will require an easement of 8m either side of the watercourse from the top of the bank. This may introduce constraints regarding what development will be possible and consideration will also need to be given for access and maintenance at locations where there are culverts. Developers will be required to apply for appropriate permits so the activity being carried out over easements does not increase flood risk.
- A strategic assessment was conducted of SuDS options using regional datasets. 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 the Cumulative Impact Assessment, the highest ranked catchment is the 'Anker from Wem Brook to River Sence'. This catchment is classified as high-risk when considering the cumulative impact of development on loss of floodplain storage volume and increase in runoff flow volume.
- Developers proposing windfall sites in the high-risk Cumulative Impact Assessment catchment should demonstrate through a site-specific FRA how SuDS and surface water mitigation techniques will ensure that development does not increase flood risk elsewhere and seeks to reduce flood risk to existing communities. The catchment-based Cumulative Impact Assessment has been updated using the latest available data for the Level 2 SFRA and supersedes the catchment-based assessment in the Level 1 SFRA. The methodology and results of this CIA are in Section 8 of this report.

At the planning application stage, developers may need to undertake more detailed hydrological and hydraulic assessments of the watercourses so that the potential effects of proposals can be evaluated at site level and where there are no detailed hydraulic models present. The modelling should verify flood extent (including latest climate change allowances), inform development zoning within the site and prove, if required, whether the Exception Test can be passed.

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 adopting the sequential approach such that is appropriate flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA.

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. Developers will need to apply the Exception Test and use information in a site-specific Flood Risk Assessment to inform this test at planning application stage:

- Highly vulnerable and in Flood Zone 2
- Essential infrastructure in Flood Zone 3a or 3b
- More vulnerable in Flood Zone 3a
- Any development with significant* risk in the surface water 1% AEP event plus 40% climate change allowance flood extent; or Surface water Flood Zone B (high risk).
- Any development with significant* risk the Risk of Flooding from Reservoirs mapping 'Wet Day' flood extent.

*Flood risk issues are not always black and white - the significance of issues requires professional judgement, based on the location, topography and nature (including depth, velocity and hazard) of flooding, rather than simply whether part of a site is within a given flood extent. This would be determined as part of a Level 2 assessment.

The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should investigate in more detail to inform the Exception Test for windfall sites.

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

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 2021, paragraph 160)

JBA Consulting were commissioned by Nuneaton and Bedworth Borough Council (NBBC) to prepare a Level 2 SFRA. The purpose of this study is to provide a comprehensive and robust evidence base to inform the review and update of the Nuneaton and Bedworth Borough Plan to cover the plan period 2024 - 2039.

This was prepared in accordance with the 2021 update to the National Planning Policy Framework (NPPF) and the update to the Planning Practice Guidance (PPG) in August 2022.

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.

1.2 Levels of SFRA

The PPG identifies the following two levels of SFRA:

- Level 1: where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable application of the Sequential Test.
- Level 2: where land outside Flood Zones 2 and 3 cannot appropriately accommodate all necessary development, creating the need to apply the NPPF's 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. In accordance with the July 2021 changes to the NPPF the content of the Level 2 SFRA considers the risk of flooding from all sources now and in the future. and the implications with respect to the implementation of development at the proposed allocation sites. This addresses the requirements that the Exception Test applies to flood risk from any source.

1.3 SFRA objectives

The objectives of this SFRA are:

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 the update to the Nuneaton and Bedworth Borough Plan.
2. Use available data to 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 Consultation

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

- Environment Agency (EA)
- Severn Trent Water
- Warwickshire County Council as LLFA
- Coventry City Council
- Hinckley and Bosworth Borough Council
- North Warwickshire Borough Council
- Rugby Borough Council

1.5 How to use this report

Table 1-1 below outlines the contents of this report and details how different users can apply this information.

Table 1-1: Outline of the contents of each section of this report and how they should be applied.

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA	For general information and context.

Section	Contents	How to use
2. The Planning Framework and Flood Risk Policy	Includes information on the implications of recent changes to planning and flood risk policies and legislation, as well as documents relevant to the study.	Users should refer to this section for any relevant policy which may underpin strategic or site-specific assessments.
3. 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 to this section when understanding the requirements for a site-specific FRA.
4. Impact of climate change	Outlines the latest climate change guidance published by the EA and how this was applied to the SFRA. Sets out how developers should apply the guidance to inform site-specific FRAs.	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
5. 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.
6. Flood risk management requirements for developers	Identifies the scope of the assessments that must be submitted in FRAs supporting applications for new development. Refers 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.
7. Surface water management and SuDS	Refers to relevant sections in the L1 SFRA for information on SuDS and surface water management and provides an overview of SuDS suitability across the study area.	Developers should use this section to understand the suitability of SuDS across the study area and refer to the L1 SFRA for further information on types of SuDS, the hierarchy and management trains information.

Section	Contents	How to use
8. 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.
9. 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: JBA 2D Hydraulic Modelling Technical Notes	Provides technical information about the site-specific modelling undertaken for select sites as part of this assessment.	Planners and developers should read this information to understand limitations of modelling an to inform any edits to modelling the may wish to make to further inform risk to the site.
Appendix C: GeoPDF User Guide	Provides information about how to use and interepret information displayed in the GeoPDF Mapping	This should be read and referred to alongside the GeoPDF Mapping.
Appendix D: Red Amber Green Site Table Summary	Provides a summary of site screening outputs for sites assessed in this study.	This is included for reference only.

Hyperlinks to external guidance documents/websites are provided in blue through the SFRA.

1.6 SFRA study area

The NBBC area is approximately 7,950 ha and has a population of approximately 134,200 (Census 2021). Figure 1-1 below shows the NBBC study area. A map showing the main rivers running through the Borough is also provided in Figure 1-2.

The principal watercourses in the NBBC area are as follows:

- River Anker
- River Sowe
- Bar Pool Brook
- Wem Brook
- Breach Brook

- Griff Brook
- Change Brook

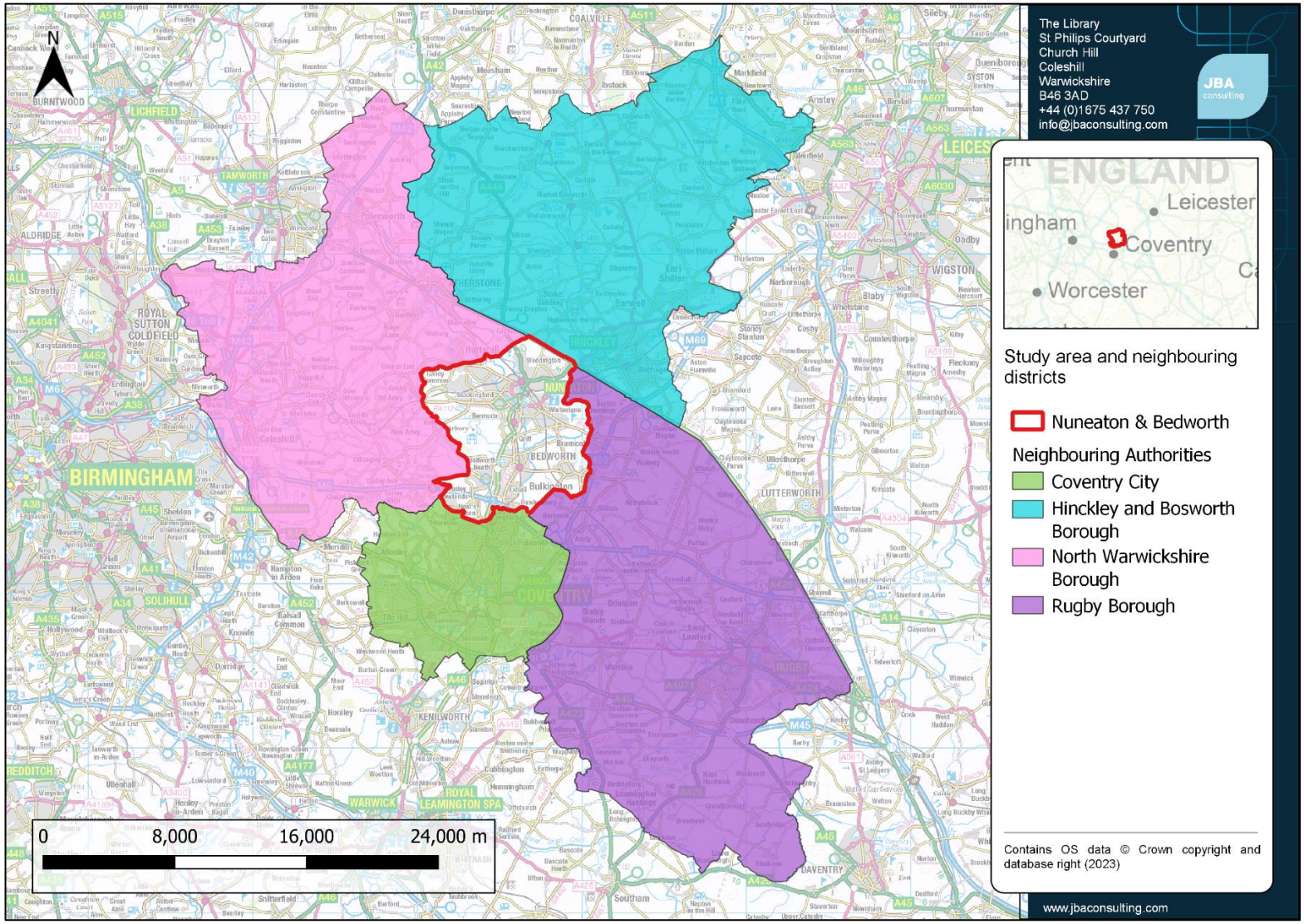

Figure 1-1: Overview map of the Nuneaton and Bedworth Borough study area and neighbouring authorities.

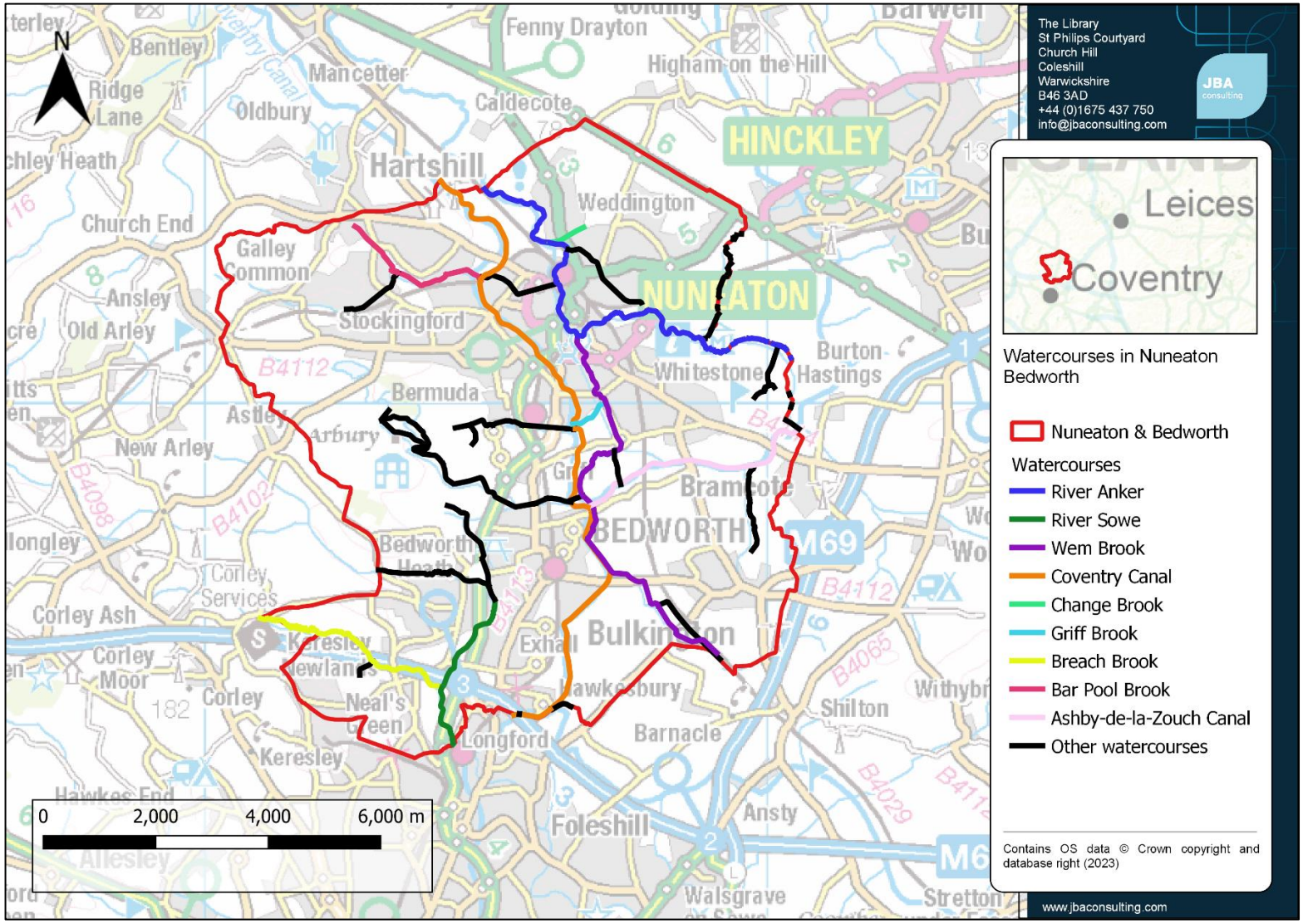

Figure 1-2: Key watercourses in the Nuneaton and Bedworth Borough study area.

2 The Planning Framework and Flood Risk Policy

2.1 Introduction

This section of the Level 2 SFRA provides an overview of the planning framework, flood risk policy and flood risk responsibilities. In preparing the subsequent sections of this SFRA, appropriate planning and policy amendments have been acknowledged and considered.

2.2 Roles and responsibilities for Flood Risk management

Risk Management Authorities (RMAs) are comprised of different organisations that have responsibilities for flood risk management. The RMAs in and around Nuneaton and Bedworth Borough are shown below in Table 2-1, with a summary of their responsibilities.

Table 2-1: Roles and responsibilities for Flood Risk Management.

Risk Management Authority	Strategic Level	Operational Level	Planning Role
Environment Agency	Strategic overview for all sources of flooding, national strategy, reporting and general supervision.	Main rivers and reservoirs.	Statutory consultee for development in Flood Zones 2 and 3 for coastal and fluvial extents.
Warwickshire County Council - LLFA	Preliminary FRA and Local Flood Risk Management Strategy.	Surface water, groundwater and Ordinary watercourses (consenting, enforcement and works).	Statutory consultee for all major developments.
NBBC - Local Planning Authority (LPA)	Local Plans.	Determination of Planning Applications and managing open spaces under Council ownership.	Determination of Planning Applications and managing open spaces under Council ownership.

Risk Management Authority	Strategic Level	Operational Level	Planning Role
Water Companies: Severn Trent	Asset Management Plans supported by Periodic Reviews (business cases) and develop Drainage and Wastewater management plans.	Public sewers.	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: Highways England (for motorways and trunk roads) and NBBC, Local Highway Authority (for other adopted roads	Highway drainage policy and planning.	Highway drainage. The Local Highway Authority can adopt some highway drainage features.	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 NBBC. Hyperlinks are provided to external documents:

- Flood Risk Regulations (2009) - these transpose the European Floods Directive (2000) into law and require the EA and LLFAs to produce PFRAs and identify where there are nationally significant Flood Risk Areas (FRAs). For the FRAs, detailed flood maps and a Flood Risk Management Plan (FRMP) are produced; this is done in a six-year cycle.
- Town and Country Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991), Environment Act (1995), 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 a role in Flood Risk Management.
- The Land Drainage Act (1991, as amended) and Environmental Permitting Regulations (2018) also set out where developers will need to apply for additional permission (as well as planning permission) to undertake works to an Ordinary Watercourse or Main River.

- The Water Environment Regulations (2017) – these transpose the European Water Framework Directive (WFD) (2000) into law and require the EA to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reaches 'good' status.
- Other environmental legislation such as the Conservation of Habitats and Species Regulations 2017, SI 2017/1012 (the Habitats Regulations), Town and Country Planning (Environmental Impact Assessment) Regulations 2017 SI 2017 No571 and Environmental Assessment of Plans and Programmes Regulations 2004, SI 2004/1633 also apply as appropriate to strategic and site-specific developments to guard against environmental damage. This has been transposed into English law.
- 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

This section highlights policies and other relevant documents for the NBBC area. Hyperlinks are provided to external documents:

- Humber River Basin District (RBD) River Basin Management Plan (RBMP) and Severn River Basin District (RBD) River Basin Management Plan (RBMP) (EA) - the EA's most recent review and update of the RBMPs took place in December 2022.
- Climate change guidance for flood risk assessment – the EA's guidance was last updated in 2022. UKCP18 projections were used to update peak river flow allowances, and these are now based on management catchments rather than river basin districts. There has also been a change in how peak river flow allowances should be applied, with a greater focus placed on the 'central' allowance. In May 2022 peak rainfall allowances were updated and are now based on management catchments rather than the previous flat rates for the whole country.
- Humber River Basin District Flood Risk Management Plan (FRMP) and Severn River Basin District Flood Risk Management Plan (FRMP) (EA) - the FRMP is a plan to manage significant flood risks in designated Flood Risk Areas within the Humber and Severn River Basin Districts. The current version was published in 2022, running through to 2027.
- Warwickshire County Council Local Flood Risk Management Strategy - the most recent strategy was published in 2016. This covers the county of Warwickshire comprising five local authorities including Nuneaton and Bedworth Borough.

- Warwickshire County Council LLFA Flood Risk and Sustainable Drainage Local Guidance for developers document - this was first published in 2015 and last updated in 2020.
- Warwickshire County Council Surface Water Management Plan (SWMP) (2015).- the SWMP establishes a long-term action plan to manage surface water in NBBC and inform prioritisation of flood management schemes.

2.4.1 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 Nuneaton and Bedworth Borough 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 Nuneaton and Bedworth Borough Level 1 SFRA highlights on a broad scale where flood risk from all sources 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.

2.5 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’ (National Planning Policy Framework 2021, paragraph 169).

When considering planning applications, local planning authorities should consult the LLFA on the management of surface water to satisfy that:

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

Level 1 and Level 2 SFRAs have been prepared for NBBC local planning authorities and should be referred to when assessing flood risk.

For proposed development in NBBC, reference should be made to NBBC’s SuDS requirements for new developers which are set out in Warwickshire County Council's Flood Risk and Sustainable Drainage local guidance for developers document which can be downloaded from the Council's website here.

The 2021 NPPF states that:

- “All plans should apply a sequential, risk-based approach to the location of development” and should achieve this by “using opportunities provided by new development… to reduce causes and impacts of flooding.” (National Planning Policy Framework 2021, paragraph 161).

As such, NBBC expects SuDS to be incorporated on minor development as well as major development and if possible, development in areas at material risk of flooding should be avoided. Masterplans should be designed to ensure that space is made for above ground SuDS features and that the requirements of existing surface water flow paths and storage volumes are appropriately accommodated. Underground tanks should only be used on sites as a last resort.

2.6 Updated Strategic Flood Risk Assessment Guidance

There have been several updates (the latest being in March 2022) to the 'How to prepare a Strategic Flood Risk Assessment guidance' including a new section on setting up governance arrangements when preparing a SFRA which lists who to consult and when, and what to include in Level 1 SFRAs. It includes links to various nature strategies, management plans and local design guidance. There is also guidance on improving the clarity on the sequential test and use of SuDS. This Level 2 assessment is undertaken in accordance with this guidance. The full guidance can be found on the Government website here.

3 Sources of information used in preparing the Level 2 SFRA

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

3.1 Data used to inform the SFRA

Table 3-1 provides an overview of the supplied data used to inform the appraisal of flood risk for NBBC.

Table 3-1: Overview of supplied data for NBBC Level 2 SFRA.

Source of flood risk	Data used	Data source
Historic (all sources)	Historic Flood Map and Recorded Flood Outlines datasets	EA
Historic (all sources)	Recorded flood incidences	Warwickshire County Council
Fluvial (including climate change)	2010 River Sowe model: Defended 3.3% AEP, 1% AEP, 1% AEP +21% CC, 1% AEP +32% CC, 1% AEP +59% CC and 0.1% AEP results (climate change uplifts run by JBA) 2015 River Anker Model: Defended 3.3% AEP, 1% AEP, 1% AEP +22% CC, 1% AEP +30%CC, 1% AEP +51%CC, 0.1% AEP results (climate change uplifts run by JBA) Flood Map for Planning dataset	EA and JBA Consulting
Fluvial (including climate change)	2D TUFLOW models of two areas; • Weddington – SHA-1 • Bermuda – SHA2-1 (including other smaller sites: SHA2-2, ARB-1, SEA-1, SEA-4) Both models were run for the following AEP events: 0.5%, 1%, 1% +22%, 1% +30, 1% +51%, 0.1%, 0.1% +22%, 0.1% +30%, 0.1% +51%. Further discussion of this modelling can be found in Appendix B	JBA Consulting
Fluvial (including	2023 Warwickshire County Council	Warwickshire

Source of flood risk	Data used	Data source
climate change)	Nuneaton model: Defended 50% AEP, 5% AEP, 2% AEP, 1% AEP, 1% AEP +22% CC, 1% AEP +30% CC, 1% AEP +51% CC, 0.1% AEP results (+22% and +30% climate change uplifts run by JBA)	County Council and JBA Consulting
Surface Water (including climate change)	Risk of Flooding from Surface Water dataset (3.3% AEP +25%, 3.3% AEP +35%, 1% AEP +25%, 1% AEP +40% climate change uplifts run by JBA)	EA and JBA Consulting
Groundwater	Areas Susceptible to Groundwater Flooding dataset Bedrock geology/superficial deposits dataset	EA
Groundwater	JBA Groundwater emergence map	JBA Consulting
Sewer	Recorded sewer flooding incidences	Severn Trent Water
Reservoirs	National Reservoir Flood Mapping	EA

3.2 Fluvial Flood Zones

3.2.1 Flood Zones 2 and 3a

Flood Zones 2 and 3a have been taken from the most up-to-date hydraulic modelling outputs. For further information on this, please refer to section 4.4 in this report. Where detailed hydraulic modelling is not available, the EA's FMfP has been used.

The following provides additional information on the FMfP:

- Where flood outlines are not informed by detailed hydraulic modelling, the FMfP 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 RoFSW 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 EA to inform the FMFP, they will be largely based on remotely detected ground model data and not topographic survey. In this area, FMfP does not include all modelled outputs, hence the Level 2 SFRA has derived its own Flood Zones based on latest available data.
- For this reason, the FMfP 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.

3.2.2 Flood Zone 3b

Flood Zone 3b has been identified as land which would flood with an annual probability of 3.3% AEP (1 in 30 year). It has been derived from the 3.3% AEP modelled flood extent where detailed hydraulic modelling is available. Where no detailed modelling exists, Flood Zone 3a (using the EA's Flood Map for Planning layer) has been used as an indication of Flood Zone 3b.

3.3 Climate change

The Appendix A mapping included in this SFRA provides a strategic assessment of climate change risk; developers should 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.

For the northern part of Nuneaton and Bedworth Borough, this would include the peak river flow Central (1% AEP +22%), Higher Central (1% AEP +30%) and Upper End (1% AEP +51%) climate change allowances for the Tame, Anker and Mease management catchment's 2080s epoch, which are to be applied to fluvial models. The peak rainfall Central (1% AEP +25%) and Upper End (1% AEP +40%) climate change allowances for the Tame, Anker and Mease management catchment's 2070s epoch are to be applied to surface water models.

For the southern part of Nuneaton and Bedworth Borough, this would include the peak river flow Central (1% AEP +21%), Higher Central (1% AEP +32%) and Upper End (1% AEP +59%) climate change allowances for the Avon Warwickshire management catchment's 2080s epoch, which are to be applied to fluvial models. The peak rainfall Central (1% AEP +25%) and Upper End (1% AEP +40%) climate change allowances for the Avon Warwickshire management catchment's 2070s epoch are to be applied to surface water models.

Table 3-2: Peak river flow climate change allowances for the 1% AEP fluvial event in the 2080s epoch

May 2022 updated guidance	Central	Higher Central	Upper End
Tame, Anker and Mease management catchment	22%	30%	51%
Avon Warwickshire management catchment	21%	32%	59%

For this Level 2 SFRA, site-specific modelling was undertaken for sites SHA-1 and SHA2-1, the latter model incorporating smaller sites that are in close proximity to SHA2-1 including SHA2-2, ARB-1, SEA-1 and SEA-4. Since these watercourses are located within the Tame, Anker and Mease Management catchment, these climate change allowances were applied to these models.

For the other sites, the Environment Agency's River Anker and River Sowe hydraulic models were used, and the WCC's updated fluvial model through Nuneaton was used. The Tame, Anker and Mease management catchment peak river flow climate change allowances were used for the upper catchment models running through Nuneaton (River Anker and WCC Nuneaton model).

The River Sowe model is located within the Avon Warwickshire Management Catchment, and so this model was updated using these peak river flow climate change allowances.

The climate change allowances for the models with a +/-5% range of each of the updated climate change allowances was not updated as per EA guidance.

For any sites not covered by the EA's detailed modelling, Flood Zone 2 was used as a conservative indication of climate change extent, and the 0.1% AEP (1 in 1,000-year) surface water extent as an indication for smaller watercourses not shown to be in the Flood Zones.

The Environment Agency surface water climate change projections are also based on management catchments. The relevant peak rainfall uplifts for the Tame, Anker and Mease management catchment and the Avon Warwickshire management catchment are the same. For the 3.3% AEP event in the 2070s epoch, the rainfall uplifts are +25% in the Central and +35% in the Upper End scenario. For the 1% AEP event in the 2070s epoch, the rainfall uplifts are +25% in the Central and +40% in the Upper End scenario. These uplifts have been used within both the Level 1 and Level 2 SFRAs for Nuneaton and Bedworth Borough.

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, given the ongoing phased modelling studies. To appropriately investigate the potential effects of flood risk at a site scale it is probable that more detailed site-specific modelling will be required so that FRA models can appropriately represent the potential effects of changes resulting from the implementation of proposed development.

3.4 Surface water

Mapping of surface water flood risk in Nuneaton and Bedworth Borough 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 3.3% AEP (1 in 30) each year.
- **Medium:** An area has a chance of flooding between 1% AEP (1 in 100) and 3.3% AEP (1 in 30) each year.
- **Low:** An area has a chance of flooding between 0.1% AEP (1 in 1,000) and 1% AEP (1 in 100) each year.
- **Very Low:** An area has a chance of flooding of less than 0.1% AEP (1 in 1,000) each year.

The results should be used for high-level assessments such as SFRAs 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.

Detailed modelling based on site survey will be necessary where there is a significant risk of surface water flooding. It is the intention that the Environment Agency will prepare updated and improved surface water mapping in the course of updating the National Flood Risk Assessment (NaFRA). It is anticipated that this data will be available in 2024 and at that time it is recommended that the surface water risk assessment is reviewed. It is not anticipated that the updated mapping will fundamentally change the locations identified to be at risk from surface water flooding, but the improved analysis techniques will reduce some of the uncertainties associated with the assessment.

3.5 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.

The JBA Groundwater Emergence Map has been used to map groundwater flood risk for Nuneaton and Bedworth Borough. This is provided as 5m resolution grid squares and shows the risk of groundwater flooding to both surface and subsurface assets, based on predicted groundwater levels.

The JBA Groundwater Emergence Map 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.

3.6 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.

3.7 Flood warning

Flood Warning Areas and Flood Alert Areas are represented by the Environment Agency's Flood Warning Area GIS dataset. The sites effected by Flood Warning and Flood Alert Areas are detailed in the site summary tables in Appendix A.

3.8 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. Reservoir risk has been divided into 'wet day' and 'dry day' extents. The 'wet day' extent shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held when local rivers had already overflowed their banks. The 'dry day' extent shows the individual flood extents for all large, raised reservoirs in the event that they were to fail

and release the water held when local rivers are at normal levels. Further information can be found on the DEFRA Data Download Website.

3.9 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. Sewer flooding records are displayed in Table 3-3. Due to licencing and confidentiality restrictions, sewer flooding data has not been represented on the mapping.

Table 3-3: Severn Trent Water's sewer flooding records within the Nuneaton and Bedworth Borough (last updated September 2022)

Postcode	Number of external flooding incidents	Number of internal flooding incidents	Number of foul and surface flooding incidents	Total number of incidents
CV7 9	1	2	0	3
CV10 0	8	11	1	20
CV10 9	1	0	0	1
CV11 5	16	0	0	16
CV11 6	6	0	0	6
CV12 8	4	1	0	5
CV12 9	17	3	28	48
CV21 9	1	0	0	1
CV35 8	1	0	0	1
Total	55	17	29	101

3.10 Historic flooding

Historic flooding was assessed using the Environment Agency's Historic Flood Map and Recorded Flood Outlines mapping.

3.11 Flood defences

Flood defences are represented by the Environment Agency's Asset Information Management System (AIMS) Spatial Defences dataset. Their current condition and standard of protection are based on those recorded in the tabulated shapefile data. The majority of the sites being assessed are not formally protected by a defence. There are three sites that are protected by defences which are SEA-2, SHA-1 and

SHA3-4. SEA-2 and SHA-1 have site tables (see Appendix A) and SHA3-4 is included in

Table 5-1.

3.12 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 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 were flagged 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 of flood defences, whilst rare, needs to be considered in Flood Risk Assessments. There are several defences located in the north-east and south-west of Nuneaton and Bedworth Borough, some of which are situated within, or in close proximity to, a number of sites. These defences include flood walls, high ground, flood relief channels and flood embankments. 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.

3.13 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 1% AEP event. The 1% AEP flood event has been investigated in further detail 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 0.1% AEP event (e.g. the 1% AEP plus climate change event).

Where detailed model outputs were available, i.e. along the River Anker and River Sowe, the 1% AEP 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 Flood Map for Planning and Risk of Flooding from

Surface Water datasets have been used. The depth, hazard, and velocity of the 3.3% AEP plus climate change and 1% AEP plus climate change surface water flood events have also been mapped and considered in this assessment. Hazard to people has been calculated using the below formula as suggested in Defra's FD2321/TR2 "Flood Risk to People". The different hazard categories are shown in Table 3-4. Developers should also test the impact of climate change depths, velocities, and hazard on the site, at Flood Risk Assessment stage.

Table 3-4: 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 1% AEP 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 and the level of resolution may not be appropriate to enable site scale assessment of proposed development schemes.

3.14 Note on SuDS suitability

The hydraulic and geological characteristics of each site were assessed to determine the factors that potentially constrain schemes 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 JBA's Groundwater Emergence Mapping 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 3-5. 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 3-5: 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.

4 Impact of Climate Change

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

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

4.1 Revised climate change guidance

In 2018, the government published new UK Climate Projections (UKCP18). The EA 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 EA 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 FRA.

4.2 Applying the climate change guidance

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

- The vulnerability of the development – see Annex 3 in the NPPF.
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 years for residential development, but this needs to be confirmed in an FRA.
- The management catchment that the site is in:
    - The north of the Nuneaton and Bedworth Borough lies within the Tame Anker and Mease management catchment.
    - The south of the Borough lies within the Avon Warwickshire management catchment.
- Likely depth, speed, and extent of flooding for each allowance of climate change over time considering the allowances for the relevant epoch (2020s, 2050s and 2080s).
- The ‘built in’ resilience measures used, for example, raised floor levels.
- The capacity or space in the development to include additional resilience measures in the future, using a ‘managed adaptive’ approach.

4.3 Relevant allowances for Nuneaton and Bedworth Borough

Nuneaton and Bedworth Borough is within both the Tame Anker and Mease management catchment and the Avon Warwickshire management catchment. Table 4-1 shows the updated peak river flow allowances that apply in the borough for fluvial risk. Table 4-2 shows the peak rainfall allowances that apply when considering surface water risk in small catchments (less than 5km^2) and urbanised drainage catchments.

Both the central and upper end allowances should be considered to understand the range of impact.

Table 4-1: Peak river flow allowances for the management catchments which cover Nuneaton and Bedworth Borough

Management catchment	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Tame Anker and Mease	Upper end	24%	30%	51%
Tame Anker and Mease	Higher central	15%	17%	30%
Tame Anker and Mease	Central	10%	11%	22%
Avon Warwickshire	Upper end	22%	31%	59%
Avon Warwickshire	Higher central	12%	14%	32%
Avon Warwickshire	Central	7%	8%	21%

Table 4-2: Peak rainfall intensity allowances for the management catchments which cover Nuneaton and Bedworth Borough

Management catchment	Allowance category	Total potential change anticipated for '2050s' (2040 to 69)	Total potential change anticipated for '2070s' (2061 to 2125)
Tame Anker and Mease	3.3% AEP Upper end	35%	35%
Tame Anker and Mease	3.3% AEP Central	20%	25%

Management catchment	Allowance category	Total potential change anticipated for '2050s' (2040 to 69)	Total potential change anticipated for '2070s' (2061 to 2125)
Tame Anker and Mease	1% AEP Upper end	40%	40%
Tame Anker and Mease	1% AEP Central	20%	25%
Avon Warwickshire	3.3% AEP Upper end	35%	35%
Avon Warwickshire	3.3% AEP Central	20%	25%
Avon Warwickshire	1% AEP Upper end	40%	40%
Avon Warwickshire	1% AEP Central	20%	25%

4.4 Representing climate change in the Level 2 SFRA

Flood Zones 2 and 3a have been taken from the most up-to-date hydraulic modelling outputs. The following models were made available for this SFRA or developed as part of this SFRA and were run with the current climate change allowances for the 2080s central, higher central, and upper end estimates for the Tame, Anker and Mease catchment:

- **EA's 2015 River Anker model** – re-run in March 2023 by JBA Consulting. New LiDAR was used in the re-run due to the original LiDAR file being unavailable.
- **Warwickshire County Council's 2023 Nuneaton model** – provided by WCC in April 2023 and re-run by JBA Consulting in 2023 to provide the climate change uplifts.
- **EA's 2010 River Sowe (Coventry Up) model** – re-run in March 2023 by JBA Consulting.
- **Site-specific 2D watercourse modelling** - developed by JBA Consulting in 2023 for sites SHA-1, and SHA2-1 (including other smaller sites listed below). This modelling was carried out for the following reasons:
    - The site in the Weddington area (SHA-1) was not covered by the Environment Agency's Flood Map for Planning, despite a tributary of the River Anker (Change Brook) running along its southern boundary. There are also several drains within the site.
    - The sites in the Bermuda area (SHA2-1, SHA2-2, ARB-1, SEA-1 and SEA-4) are situated near the Griff Brook which currently has no hydraulic model, despite the Flood Map for Planning covering this unnamed watercourse.

Further discussion of this modelling can be found in Appendix B.

For any sites not covered by the EA's detailed modelling, Flood Zone 2 was used as an indicative climate change extent. This is appropriate given the Upper End flows are often similar to the 0.1% AEP/Flood Zone 2 extents; therefore, the differences in effects of climate change are not anticipated to be substantial.

For surface water flood risk, the following uplifts were applied to the EA's RoFfSW:

- 3.3% AEP + 25% climate change (2070's epoch Central Climate Change scenario)
- 3.3% AEP + 35% climate change (2070's epoch Upper End Climate Change scenario)
- 1% AEP + 25% climate change (2070's epoch Central Climate Change scenario)
- 1% AEP + 40% climate change (2070's epoch Upper End Climate Change scenario)

Climate change mapping for each site has been provided in Appendix A: Geo-PDF maps.

It is important to note that although the flood extent may not increase noticeably on some watercourses, the flood depth, velocity, and hazard may increase compared to the 1% AEP current-day event.

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

When undertaking a site-specific FRA, developers should:

- Confirm which national guidance on climate change and new development applies by visiting the flood risk assessments: climate change allowances page available on the government website here.
- 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 become 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. It would depend on the flooding mechanism, historic evidence of known flooding and geological characteristics, for example prolonged rainfall in a chalk catchment. Flood risk could increase when groundwater is already high or emerged, causing additional overland flow paths or areas of still ponding.

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 on Flood Zone 3b (3.3% AEP modelled extent) from climate change may need to be considered at site-specific assessment stage. Modelled flood extents can be compared to the Flood Zone 3a extent, and where no detailed modelling exists, Flood Zone 3a can be compared against Flood Zone 2, for an indication of areas most sensitive to climate change.

For this SFRA, both the River Anker and River Sowe models have been re-run by JBA Consulting in 2023 to produce the following results:

- 3.3% AEP (+22% CC)
- 3.3% AEP (+30% CC)
- 3.3% AEP (+51% CC)

These results have been used to assess the impacts on Flood Zone 3b (functional floodplain).

4.7 Impact of climate change on sewers

Surface water and fluvial flooding with climate change 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.

4.8 Adapting to climate change

The NPPG Climate Change guidance contains information and guidance for how to identify suitable mitigation and adaptation measures in the planning process to

address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.
- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses.
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.
- Considering the standard of protection of defences and sites for future development, in relation to sensitivity to climate change. 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 Level 2 Assessment Methodology

This section 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.

5.1 Site screening

Nuneaton and Bedworth Borough Council provided 33 sites for assessment. These sites were screened against 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 River Anker and River Sowe hydraulic model outputs, and where detailed modelling was unavailable the information is taken from the EA's Flood Map for Planning
- whether the site is shown to be at risk from surface water flooding in the RoFfSW mapping and, if so, the lowest return period from which the site is at surface water flood risk
- whether the site is within, or partially within, the reservoir 'Dry Day' or 'Wet Day' flood extents
- whether historic flooding records held by Warwickshire County Council show any flooding incidents within or near the site
- whether the site is within a Source Protection Zone
- whether there are any flood defences near the site
- how deep beneath the ground surface groundwater levels are within the site
- whether the site is within a postcode area in which Severn Trent Water have recorded sewer flooding incidents; and
- whether the site is within, or partially within, a Flood Alert Area or Flood Warning Area.

The screening was undertaken using JBA in-house software called “FRISM”. FRISM is an internal JBA 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 NBBC 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, rather 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 3km^2. 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.

5.2 Sites taken forward to a Level 2 assessment

Out of the 33 sites provided by NBBC, 24 sites were carried forward to a Level 2 assessment.

A Red-Amber-Green system was applied to the sites on the basis, that: red sites needed a Level 2 assessment, amber sites did not need a Level 2 due to lower flood risk but are flagged in this report for developer considerations (recommendations provided in section 5.3), and green sites that had no/ negligible risk. Appendix D in this report details each site's categorisation according to the Red-Amber-Green system.

Sites were taken forward if they were at fluvial flood risk or if surface water risk was deemed significant. In order to assess whether a site was deemed to have significant surface water risk, professional judgment was used based on the extent and location of the surface water issues relative to the site and access and egress.

For example, if there was an area of deep ponding, a prominent flow route bisecting a site, immediate constraints to site access at the boundary, potential for highly vulnerable types of development to occupy a site etc.

For other sites with less significant but still noteworthy surface water issues, these have been highlighted in Table 5-2 and the LLFA expect the developer to take these into account at an early stage when planning the form and layout of the site, the surface water drainage system and any surface water mitigation measures that may be necessary.

Table 5-1 summarises the sites which have been taken forward to the Level 2 assessment on this basis.

Table 5-1: Sites carried forward to a Level 2 assessment

Site Code	Reason for Level 2	% of site within FMfP Flood Zone 3	% of site within FMfP Flood Zone 2	% of site within FMfP Flood Zone 1	% of site in RoFfSW 3.3% AEP extent	% of site in RoFfSW 1% AEP extent	% of site in RoFfSW 0.1% AEP extent
ABB-8	Fluvial	0	0.1	99.9	0	0	9.1
ABB8-1 *	Fluvial	0	0	0	0	0	0
ARB-1*	Surface water	0	0	100	0.6	3.1	22.5
BUL-9	Surface water	0	0	100	0	6.1	26.3
EXH-1	Fluvial	0	4.1	95.9	0.5	0.7	2.3
GAL-7	Surface water	0	0	100	28.8	38.2	54.4
SEA-1	Fluvial/ surface water	0	0.3	99.7	0.5	1.1	3.6
SEA-2	Fluvial/ surface water	7.1	7.6	92.4	4.5	6.2	12.4
SEA-4	Fluvial /surface water	1.1	4.0	96.0	1.2	1.5	4.4
SEA-5	Surface water	0	0	100	2.5	5.6	18.1
SEA-6	Surface water	0	0	100	2.0	3.0	6.3
SEA-6-1*	Surface water	0	0	100	0	0.2	4.0
SHA-1	Fluvial/ surface water	2.3	2.9	97.1	1.8	4.1	10.0
SHA2-1	Surface water	0	0	100	2.3	3.5	8.4
SHA2-2*	Surface water	0	0	100	0	3.4	5.6
SHA3-1	Surface water	0	0	100	0.7	1.6	6.0
SHA3-2*	Surface water	0	0	100	1.4	4.7	11.0
SHA3-4	Fluvial/ surface water	7.0	13.0	87.0	0.8	1.3	12.5
SHA-5	Surface water	0	0	100	1.9	4.2	13.7

Site Code	Reason for Level 2	% of site within FMfP Flood Zone 3	% of site within FMfP Flood Zone 2	% of site within FMfP Flood Zone 1	% of site in RoFfSW 3.3% AEP extent	% of site in RoFfSW 1% AEP extent	% of site in RoFfSW 0.1% AEP extent
SHA-6	Surface water	0	0	100	2.9	4.9	12.9
ABB-4	Fluvial	2.5	4.1	93.4	0	0	1.9
CAM-1	Surface water	0	0	100	0.6	2.9	6.4
ABB-6	Fluvial	12.0	18.6	69.4	0	1.2	6.3
ABB-7	Fluvial/ surface water	78.6	100	0	6.5	47.6	87.5

**Despite having a low surface water flood risk, some sites have been included in the above table due to their close proximity to other larger sites which have greater fluvial or surface water flood risk. With this in mind, some site summary tables address the flood risk of multiple sites. These are as follows:*

- *ABB-8 – which includes the smaller site ABB8-1.*
- *SHA2-1 – which includes the smaller sites SHA2-2 and ARB-1.*
- *SEA-6 – which includes the smaller site SEA-6-1.*
- *SHA3-1 – which includes the smaller site SHA3-2.*

The Flood Zone values quoted show the percentage of the site at flood risk from that particular Flood Zone/event, **including** the percentage of the site at flood risk at a higher risk zone. This is because the values quoted are the area covered by each Flood Zone/extent within the site boundary. For example: Flood Zone 2 includes Flood Zone 3. Flood Zone 1 is the remaining area outside Flood Zone 2 (FZ2+ FZ1 = 100%).

5.3 Recommendations for sites not taken forward to a Level 2 assessment

The 'amber' sites identified as having some lower-level flood risk, but not requiring a Level 2 assessment, are shown in Table 5-2 below. These sites have minor surface water and/or access and egress issues which should be considered as part of a stie-specific FRA should they be taken forwards. Surface water mapping at these sites can be seen in the Level 1 SFRA Appendix A: GeoPDF mapping.

Table 5-2: Sites flagged at lower flood risk

Site Code	Nature of low flood risk/ considerations for the developer	% of site in RoFfSW 3.3% AEP extent	% of site in RoFfSW 1% AEP extent	% of site in RoFfSW 0.1% AEP extent
ABB-5	Minor surface water risk. Access and egress may be impacted in the 1% and 0.1% AEP surface water events. Safe access and egress must be demonstrated in the 1% AEP surface water and fluvial events, including an allowance for climate change. Raising of access routes should not impede surface water flows.	0	2.2	3.0
EXH-8		0	0	3.6
EXH-2		0	0.1	2.4
EXH-3		0.7	1.6	5.2
SHA-4		0.2	0.4	2.0
SHA3-3		0.7	2.0	5.7
SEA-3		2.3	3.0	4.5
EXH-14	Minimal surface water risk to site, but flooding in the surrounding area may affect access and egress.	0	0	0
KIN-2		0	0	0.04

If flows are likely to limit access/egress to the sites, this should be considered further as part of a site-specific flood-risk assessment. Developers will need to demonstrate safe access and egress is possible during the 1% AEP surface water event, including an allowance for climate change. Given the low risk to the sites, a shelter-in-situ policy may be appropriate dependent on the expected duration of flooding. This should be quantified as part of a site-specific FRA.

Further recommendations relating to managing the cumulative impacts of development are stated in section 8 of this report for consideration at the site-specific Flood Risk Assessment stage.

5.4 Site summary tables

As part of the Level 2 SFRA, detailed site summary tables have been produced for the sites listed above in

Table 5-1. 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. For more information on these models, please refer to section 4.4 in this report.

Additional modelling was undertaken in 2023 to provide depth, velocity and hazard outputs for two specific sites. For more information on these site-specific models, please refer to section 4.4 in this report.

The Environment Agency's Risk of Flooding from Surface Water mapping has also had central and upper end climate change uplifts applied to it in order to indicate the future risk of surface water flooding during the 3.3% AEP and 1% AEP events.

Using the model information combined with the Flood Zones, climate change and Risk of Flooding from Surface Water (RoFfSW) mapping, 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 flood risk
- Flood History
- Flood risk management infrastructure
- Description of residual risk
- Emergency Planning
    i. Flood Warning Areas
    ii. Access and egress
- Climate change
- Summary of climate change allowances and increase in flood extent compared to Flood Zones
- 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.
    i. Groundwater Source Protection Zone
    ii. Historic landfill sites
- NPPF Planning implications
    i. Exception Test requirements
- Requirements and guidance for site-specific FRA (including consideration of opportunities for strategic flood risk solutions to reduce flood risk)
- Key messages – summarising considerations for the Exception Test to be passed

- Mapping information – description of data sources for the following mapped outputs:
    i. Flood Zones
    ii. Climate change
    iii. Fluvial depth, velocity, and hazard mapping
    iv. Surface water
    v. Surface water depth, velocity, and hazard mapping

5.4.1 Interactive GeoPDF mapping

To accompany each site summary table, there are two interactive GeoPDF maps, with all the mapped flood risk outputs per site. One map displays present day flood risk data, the second map displays flood risk data with an allowance for climate change. This data is displayed centrally, with easy-to-use 'tick box' layers in the legend, to allow navigation of the data.

Flood risk information in the GeoPDFs is split into 'present day' and 'climate change' maps, which include:

Present Day

- Site boundary and Nuneaton and Bedworth Borough boundary
- Main Rivers/ Ordinary watercourses
- EA LiDAR 1m Data 2022
- Flood defences (EA AIMS data)
- EA's Historic Flood Map
- EA's Areas Susceptible to Groundwater Flooding mapping
- JBA's Groundwater Emergence Mapping (groundwater depth below surface)
- EA's Flood Warning and Alert Areas
- Fluvial Flood Zones 2, 3a and 3b (functional floodplain) and indicative FZ3b (FZ3a in the absence of detailed models)

Climate Change

- Site boundary and Nuneaton and Bedworth Borough boundary
- Main Rivers/ Ordinary watercourses
- EA LiDAR 1m Data 2022
- Flood defences (EA AIMS data)
- EA's Historic Flood Map
- EA's Areas Susceptible to Groundwater Flooding mapping
- JBA's Groundwater Emergence Mapping (groundwater depth below surface)
- EA's Flood Warning and Alert Areas
- Modelled Fluvial flooding plus climate change (3.3% AEP +25%, 3.3% AEP +35%, 1% AEP +25% and 1% AEP +40%) extent, depth,

	velocity and hazard rating
• EA's Risk of Flooding from Surface Water- 3.3% AEP, 1% AEP and 0.1% AEP extent, depth, velocity and hazard mapping	• Modelled Risk of Flooding from Surface Water plus climate change (3.3% AEP +25%, 3.3% AEP +35%, 1% AEP +25% and 1% AEP +40%) extent, depth, velocity and hazard rating
• EA's Reservoir Flood Extents mapping for the ‘dry day’ and ‘wet day’ scenarios	• EA's Reservoir Flood Extents mapping for the ‘dry day’ and ‘wet day’ scenarios

6 Flood Risk Management Requirements for Developers

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

This report provides a strategic assessment of flood risk in Nuneaton and Bedworth Borough. 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 watercourse to verify flood extents (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

A detailed FRA undertaken for a windfall site[1] may find that the site is entirely inappropriate for development of a particular vulnerability, or even at all.

6.1 Principles for new developments

Apply the Sequential and Exception Tests

Developers should refer to the Level 1 SFRA for more information on how to consider the Sequential and Exception Tests. For allocated sites, NBBC have already applied the Sequential and Exception Tests. For windfall sites, a developer must undertake the Sequential Test, which includes considering reasonable alternative sites at lower flood risk. Only if it passes the Sequential Test should the Exception Test then be applied if required. The Sequential and Exception Tests in the NPPF apply to all developments and an FRA should not be seen as an alternative to proving these tests have been met.

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

- Can risk be avoided through substituting less vulnerable uses or by amending the site layout?
- Can it be demonstrated that less vulnerable uses for the site have been considered and reasonably discounted? and

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

- Can the site 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 NBBC, the EA, Warwickshire 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 FRA. At a site level, developers will need to check before commencing on a more detailed FRA that they are using the latest available datasets. Developers should apply the most up-to-date climate change guidance (which can be found on the Government's website here) and take 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

Section 7 of this report 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.

Consider and contribute to wider flood mitigation strategy and measures in Nuneaton and Bedworth Borough 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.

6.2 Requirements for site-specific Flood Risk Assessments

6.2.1 When is an FRA required?

Site-specific FRAs are required in the following circumstances:

- Proposals within Flood Zones 2, 3a or 3b, including minor development and change of use.
- Proposals within Flood Zone 1 where:
    - the SFRA shows it is at risk from other sources of flooding or will be during its lifetime and the development would introduce a more vulnerable use, or;
    - the proposal is greater than one hectare.
- Proposals in an area which has critical drainage problems as notified by the EA.

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 in Flood Zone 1); the EA should be contacted to agree the breach assessment approach.
- Where the evidence of historical or recent flood events have been passed to the LPA.

6.2.2 Objectives of site-specific FRAs

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

- whether a proposed development will be at risk of flooding, from any source, both now and in the future, considering 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 NBBC, the EA, and Warwickshire County Council. Guidance and advice for developers on the preparation of site-specific FRAs are listed below, with hyperlinks to the relevant websites:

- Preparing a flood risk assessment: standing advice (EA)
- Flood risk assessments if you're applying for planning permission (EA)
- Site-specific Flood Risk Assessment: CHECKLIST (Defra)

Guidance for local planning authorities for reviewing FRAs was submitted as part of planning applications was published by Defra in 2015 and last updated in February 2022 to reflect the updates to the NPPF. This guidance is available on the Government website here.

6.3 Local requirements for mitigation measures

The Level 1 SFRA provides details on the following mitigation measures in Section 8.2, and should be referred to alongside this report:

- Site layout and design (8.2.3)
- Modification of ground levels (8.2.4)
- Raised floor levels (8.2.5)
- Development and raised defences (8.2.6)
- Developer contributions (8.2.7)
- Buffer strips (8.2.8)
- Making space for water (8.2.9)

6.4 Flood warning and emergency planning

Appendix D of the Level 1 SFRA details the EA Flood Warning's and Flood Alert's available within the Borough at the time of publication. Section 8.5 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 Coventry, Solihull and Warwickshire Council's Local Resilience Forum.

6.5 Reservoirs

Each reservoir flood scenario represents a prediction of a credible worst-case scenario; however, it is unlikely that any actual flood would be this large. Despite this, there remains a residual risk to development from reservoirs and the allocation of proposed new development downstream of a reservoir can have implications for the risk designation of the reservoir. This can trigger the need for substantive investment in the reservoir assets so that a flood can be safely passed. Accordingly, care should

be taken when allocating development downstream of a reservoir so that the implications with respect to risk designation and any necessary investment to improve the safety of the asset are appropriately addressed. In addition, developers should consider the following 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 Environment Agency provide mapping for two flooding scenarios for the reservoir flood maps: a ‘dry-day’ and a ‘wet-day’. The ‘dry-day’ scenario shows the predicted flooding extent which would occur if the dam or reservoir fails when rivers are at normal levels. The ‘wet-day’ scenario shows the predicted worsening of the flooding which would be expected if a river is already experiencing an extreme natural flood. Currently only flood extents are available; although depth and velocity mapping was also undertaken as part of the mapping study this has not been made publicly available.
- The GOV.UK website on Reservoirs: owner and operator requirements, available here, provides information on how to register reservoirs, appoint a panel engineer, produce a flood plan and report an incident.

Developers should consult the Coventry, Solihull and Warwickshire Council's Local Resilience Team about emergency plans for reservoir breach.

Developers should use the above information to:

- Apply the sequential approach to locating development within the site.
- Consider the impact of a breach and overtopping, particularly for sites proposed to be located immediately downstream of a reservoir. This should consider whether there is sufficient time to respond, and whether in fact it is appropriate to place development immediately on the downstream side of a reservoir.
- Assess the potential hydraulic forces imposed by sudden reservoir failure event and check that 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.

6.6 Duration and onset of flooding

The duration and onset of flooding affecting a site depends on several 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 lower in river catchments.
- Reservoirs in upper catchments will provide some online flood storage that reduces 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: the permeability of a catchment affects its response time, for example chalk catchments take longer to respond than clay catchments.

Table 6-1 provides guidelines on typical response time that may be expected for fluvial and surface water flooding. However, these are only broad guidelines, and it is recommended that a site-specific FRA refines this information based on more detailed modelling work where necessary.

Table 6-1: 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	Between 4 and 24* hours	Within 2 to 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.

7 Surface Water Management and SuDS

This section 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 section 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)
- Section 9.3 - Sources of SuDS guidance
- Section 9.4 - Other surface water considerations covering Groundwater Vulnerability Zones, Groundwater Source Protection Zones and Nitrate Vulnerable Zones (NVZs)

7.1 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 review of the soil characteristics has been undertaken using Soilscapes online soil maps of England and Wales which allow for a basic assessment of the soil characteristics and infiltration capacity. Soilscapes is not intended as a means for supporting detailed assessments, specific site investigations should be undertaken to determine the soil types across the study area. A high-level assessment of the suitability of SuDS is included in the site tables in Appendix A.

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. Warwickshire County Council as LLFA have set out their requirements for developers

in the Flood Risk and Sustainable Drainage document, first published in September 2015 and last updated in January 2020.

8 Cumulative impact of development, schemes, and strategic solutions

8.1 Background

The cumulative impact of development should be considered at both the Local Plan making stage and the planning application and development design stages. Paragraph 160 of the National Planning Policy Framework (NPPF, 2021) states:

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

Appropriate mitigation measures should be undertaken to prevent exacerbation of flood risk, and where possible the development should be used to reduce existing flood risk issues, both onsite and downstream of the development.

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

Conditions imposed by NBBC should allow for mitigation measures, so any increase in runoff because of development is properly managed and should not exacerbate flood risk issues, either within, or outside of the NBBC administrative area.

8.2 Assessment of Cross-Boundary Issues

NBBC is bordered by the following Local Authority areas, shown in Figure 1-1 (Section 1):

- Coventry City
- Hinckley and Bosworth Borough
- North Warwickshire Borough
- Rugby Borough

The topographic characteristics of NBBC are dominated by the presence of watercourses. The Borough is predominantly low-lying, but topography is higher towards the south and west of the district.

Future development, both within and outside of the Borough, as well as climate change, have the potential to affect flood risk to existing development and the surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

The majority of rivers within the study area run through the district and neighbouring boroughs. The River Anker flows through North Warwickshire, to Hinckley and Bosworth, and then through NBBC before flowing into the River Tame at Tamworth. It is joined by a number of small tributaries draining the south of NBBC including the Wem Brook and the Change Brook. The River Sowe rises in Bedworth and flows south through Coventry to join the River Avon near Rugby. As such, future development both within and outside NBBC can have the potential to affect flood risk to development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation.

The watercourses within the study area that flow into neighbouring authorities (as mentioned above) comprise the headwater tributaries of the River Anker (and the Anker itself), such as the Wem Brook, and the headwater tributaries of the River Sowe (and the Sowe itself), such as the Breach Brook. Most catchments within the region are tributaries to the River Anker and River Sowe, which form the majority of the northern and southern district boundaries; The watershed between these two major catchments lies east to west through the south of the district.

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

Development control should ensure that the impact on receiving watercourses from development in the Borough has been sufficiently considered during the planning stage. The National Planning Policy Framework (NPPF) sets out how developments should demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest planning policy, guidance and legislation relating to flood risk and sustainable drainage, they should result in no increase in flood risk within the Borough. The neighbouring authorities were contacted for information on their site allocations, to determine where development in neighbouring authorities may have an impact on NBBC.

8.3 Broadscale assessment methodology

A broadscale Cumulative Impact Assessment (CIA) was undertaken as part of the Level 2 SFRA for the Nuneaton and Bedworth Borough Council SFRA.

The CIA is prepared to identity 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.

8.3.1 Broadscale Methodology

This work follows on from the Level 1 SFRA. The broadscale Level 1 SFRA found only one high risk catchment, the Sowe confluence of the Breach Brook to confluence of the Withy Brook, to the south of the Borough. The Level 1 SFRA ranked catchments across six Local Authority areas; Rugby, Warwick, Stratford-on-Avon, Nuneaton and Bedworth, Coventry, and North Warwickshire Districts. This Level 2 assessment considers only those catchments within Nuneaton and Bedworth and utilises new or updated datasets. Therefore the results from the previous Level 1 SFRA will not be directly comparable to those from this more recent work. As part of the Level 2 assessment, a catchment scale CIA was undertaken as well as the broadscale CIA (see Section 8.4).

The Broadscale assessment has been rerun for this assessment using updated development sites provided by NBBC for the L2 SFRA.

Future development sites within the study area were provided by Nuneaton and Bedworth Borough Council. Catchments have been defined using the Water Framework Directive (WFD) Catchments within the 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 similar groups where development might have the potential to increase flood risk elsewhere.

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.

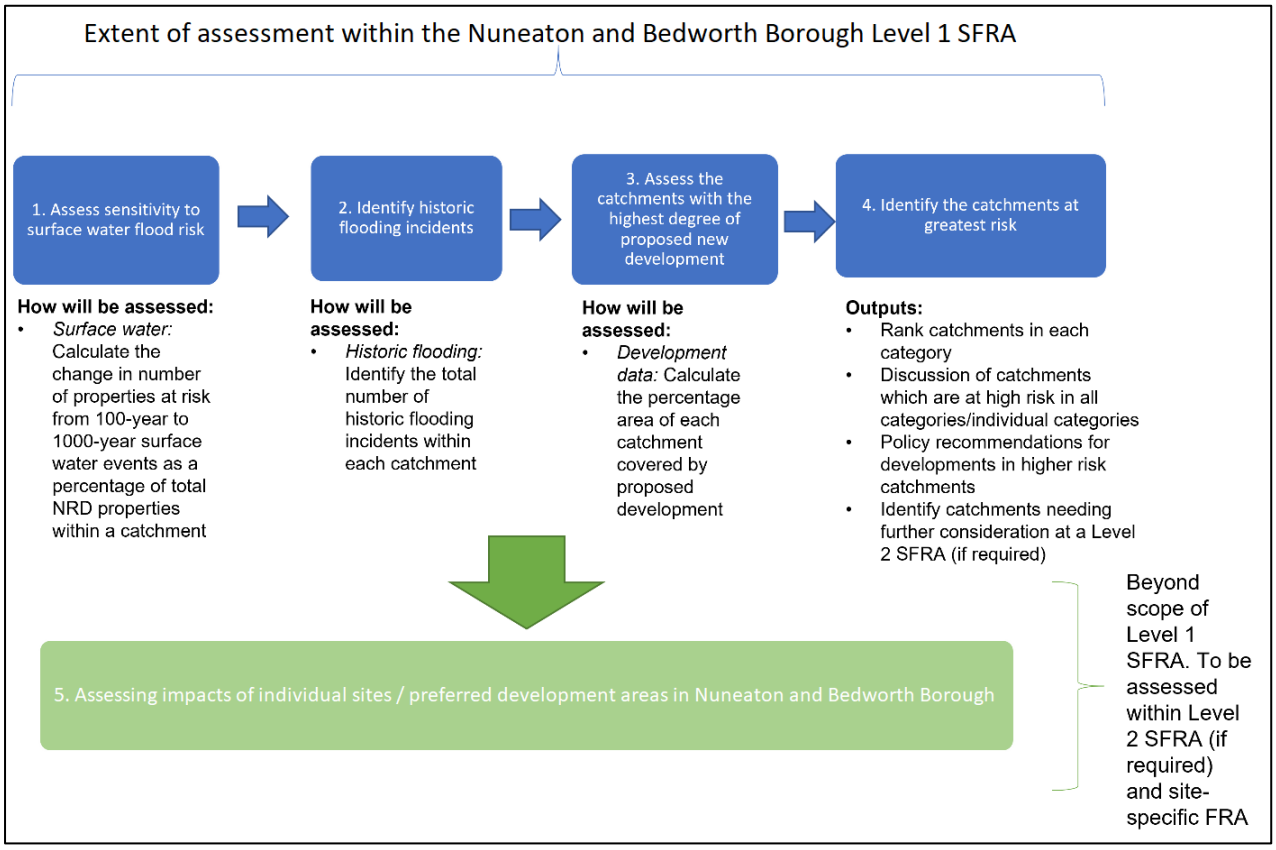

Figure 8-1: Overview of the method used within the CIA

Figure 8-1 shows the methodology used and

Dataset	Coverage	Source of Data	Use of Data
Catchment Boundaries	Nuneaton and Bedworth Study Area	Water Framework Directive Catchments	Assessment of susceptibility to cumulative impacts of development by catchment
OS Open Zoomstack	Nuneaton and Bedworth Study Area	Ordnance Survey	Assessing the number of properties at risk of surface water and fluvial flooding within each catchment
Risk of Flooding from Surface Water	Nuneaton and Bedworth Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment

Dataset	Coverage	Source of Data	Use of Data
Fluvial Flood Zones	Nuneaton and Bedworth 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)	Nuneaton and Bedworth Study Area	Nuneaton and Bedworth Borough Council, Rugby Borough Council, Coventry City Council, Hinckley and Bosworth Borough Council, North Warwickshire Borough Council	Assessing the impact of proposed future development on risk of flooding
Historic Flooding Incidents	Nuneaton and Bedworth Study Area	Warwickshire County Council	Assessing incidences of historic flooding within the study area

summarises the datasets used within the Warwickshire cumulative development scenario.

Table 8-1: Summary of datasets used within the Broadscale Cumulative Impact Assessment

Dataset	Coverage	Source of Data	Use of Data
Catchment Boundaries	Nuneaton and Bedworth Study Area	Water Framework Directive Catchments	Assessment of susceptibility to cumulative impacts of development by catchment
OS Open Zoomstack	Nuneaton and Bedworth Study Area	Ordnance Survey	Assessing the number of properties at risk of surface water and fluvial flooding within each catchment
Risk of Flooding from Surface Water	Nuneaton and Bedworth Study Area	Environment Agency	Assessing the number of properties at risk of surface water flooding within each catchment

Dataset	Coverage	Source of Data	Use of Data
Fluvial Flood Zones	Nuneaton and Bedworth 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)	Nuneaton and Bedworth Study Area	Nuneaton and Bedworth Borough Council, Rugby Borough Council, Coventry City Council, Hinckley and Bosworth Borough Council, North Warwickshire Borough Council	Assessing the impact of proposed future development on risk of flooding
Historic Flooding Incidents	Nuneaton and Bedworth Study Area	Warwickshire County Council	Assessing incidences of historic flooding within the study area

Future development sites within the study area were provided by the Warwickshire Authorities. Catchments within the study area were initially ranked using the following five metrics: sensitivity to increased fluvial flood risk; prevalence of recorded historic flood incidents (limited by the data available); prevalence of historic sewer flooding instances; sensitivity to increased risk of surface water flooding; and area of new development proposed within the catchment.

The final results of this assessment gave a cumulative impact rating of low, medium, or high 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.

8.3.2 Sensitivity to increases in surface water flooding

For the purpose of the CIA, this is the measure of the increase in the number of properties at risk of surface water flooding from a 1% AEP (1 in 100-year) event to a 0.1% AEP (1 in 1000-year) event. It is an indicator of where areas are sensitive to increased risk of surface water flooding, which may be due to any number of reasons, including climate change and new development. It is not an absolute figure or prediction of the impact that new development will have on flood risk, but rather an indicator of the sensitivity of receptors to cumulative effects.

The Ordnance Survey Zoomstack mapping (2023) was used to identify all properties within the study area.

This will be assessed by calculating the change in the number of properties at risk from the 1% AEP to the 0.1% AEP events for surface water flooding, given 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. Sensitivity to increases in fluvial flooding

8.3.3 Sensitivity to increases in fluvial flooding

For the purpose of the CIA, this is the measure of the increase in the number of properties at risk of fluvial flooding from the 1% AEP event to the 0.1% AEP event. It is an indicator of where areas are sensitive to increases in fluvial flood risk, which may be due to any number of reasons, including climate change and new development. It is not an absolute figure or prediction of the impact that new development will have on flood risk, but rather an indicator of the sensitivity of receptors to cumulative effects.

The Ordnance Survey Zoomstack mapping (2023) was used to identify all properties within the study area.

This will be assessed by calculating the change in the number of properties at risk from the 1% AEP (Flood Zone 3) to the 0.1% AEP (Flood Zone 2) events for fluvial flooding, given as a percentage of the total properties in the catchment, to allow comparison between catchments of different sizes.

8.3.4 Growth in the area

Development within authorities has the potential to affect flood risk in neighbouring authorities, especially if there are existing flood risk issues.

Areas for future proposed development were received from the surrounding local authorities and were assessed as part of this CIA. The area of potential new development within each catchment was expressed as a percentage of the total catchment area to determine the potential for the cumulative impacts of development to affect flood risk as a result of new development.

8.3.5 Historic flood risk

Recorded flooding events data for fluvial or surface water flooding within the study area was provided by Warwickshire County Council and Coventry City Council as LLFAs. Data was filtered to only include incidences where properties were affected. Details of historic flood events can be found in Section 5.1 of the main SFRA report. Each point represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly).

A count of historical flood incidents was conducted for each catchment to compare the prevalence of historic flooding within catchments.

8.3.6 Historic sewer flooding incidences

Recorded sewer flooding events data was provided by Severn Trent Water. Data was filtered to only include incidences where property was affected (as opposed to highways flooding). Each point represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly).

A count of historical flood incidents was conducted for each catchment to compare the prevalence of historic flooding within catchments.

8.3.7 Ranking the results

The ranking results were combined from all five metrics to give an overall High, Medium and Low ranking for all catchments within the study area. The results for each assessment were ranked into High, Medium and Low susceptibility as shown in Table 8-2. Ranking delineations were given at natural breaks in the results.

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

Table 8-2: Ranking assessment criteria

Flood risk ranking	% of properties at increased risk of fluvial flooding	% of properties at increased risk of SW flooding	No. of Recorded Historic Flooding Incidents	No. of Recorded Sewer Flooding Incidents	% Area of Catchment Covered by new development
Low	<3%	<3%	0	<5	<4%
Medium	3 to 5 %	3 to 5 %	1-5	6-10	4 to 10%
High	>5%	>5%	>5	>10	>10

8.3.8 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 the cumulative impacts of development.

Table 8-3: Sensitivity of catchments to increased fluvial flood risk in future

Dataset	% properties sensitive to increased fluvial flood risk	Rank
Anker from Wem Brook to River Sence	2.8%	1
Anker - source to Wem Bk	1.9%	2
Sketchley Brook from source to River Anker	1.0%	3
Sowe - source to conf Breach Bk	0.9%	4
Wem Brook from source to River Anker	0.7%	5
Sowe - conf Breach Bk to conf Withy Bk	0.6%	6
Withy Bk - source to conf R Sowe	0.3%	7
Breach Bk - source to conf R Sowe	0.1%	8

8.3.9 Sensitivity to surface water flooding

The number of properties within the 0.1% AEP surface water extent not presently within the 1% AEP 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.

Table 8-4: Sensitivity of catchments to increased surface water flood risk in future

Catchment	% properties sensitive to increased surface water flood risk	Rank
Anker from Wem Brook to River Sence	4.9%	1
Sowe - source to conf Breach Bk	4.4%	2
Sketchley Brook from source to River Anker	3.8%	3
Sowe - conf Breach Bk to conf Withy Bk	3.0%	4
Wem Brook from source to River Anker	2.2%	5
Breach Bk - source to conf R Sowe	2.2%	5
Anker - source to Wem Bk	2.2%	5
Withy Bk - source to conf R Sowe	2.1%	6

8.3.10 Prevalence of historic flooding incidents

Historic flood incidents data for fluvial or surface water was available for this assessment from Nuneaton and Bedworth Borough Council and Warwickshire County Council. Data was filtered to include only flooding that affected properties. While this will not provide a detailed scope of historic flooding incidents across the region, the number of flood incidents in each catchment from the data available were identified to provide a broadscale understanding of historic flooding. Catchments with more than 5 recorded incidents were considered high risk.

Table 8-5: Catchments with the highest number of recorded historic flood incidents

Catchment	Number of recorded incidents	Rank
Anker from Wem Brook to River Sence	37	1
Wem Brook from source to River Anker	16	2
Withy Bk - source to conf R Sowe	13	3
Sketchley Brook from source to River Anker	11	4
Sowe - conf Breach Bk to conf Withy Bk	10	5
Sowe - source to conf Breach Bk	8	6
Anker - source to Wem Bk	2	7
Breach Bk - source to conf R Sowe	1	8

8.3.11 Area of proposed development

The 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. Catchments with more than 10% of their area earmarked for development were considered high risk.

Table 8-6: Catchments with the highest percentage cover of proposed development

Catchment	Area of proposed development (ha)	Area of proposed development (%)	Rank
Sowe - conf Breach Bk to conf Withy Bk	303.60	11.5%	1
Breach Bk - source to conf R Sowe	60.97	6.1	2
Wem Brook from source to River Anker	141.56	4.6	3
Anker from Wem Brook to River Sence	238.93	4.1	4
Sketchley Brook from source to River Anker	50.00	3.2	5
Sowe - source to conf Breach Bk	28.71	1.7	6
Withy Bk - source to conf R Sowe	52.23	1.6	7
Anker - source to Wem Bk	19.96	0.6	8

8.3.12 Overall rankings

As can be seen from the above tables and Figure 8-2 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 (Table 8-2). The catchments with a combined ranking score of less than 10 were deemed high risk.

The overall rankings of each catchment within Nuneaton and Bedworth Borough, are shown in Table 8-7.

Due to the proposed amount of development increasing in the north of the Borough, the Anker from Wem Brook to River Sence, and the highest amount of historic flooding incidents within this catchment, it has been upgraded to a high risk catchment from the Level 1 SFRA CIA. The Sowe confluence of Breach Brook to confluence of the Withy Brook has been downgraded to a medium risk catchment as it is less sensitive to climate change than the catchment mentioned above.

Table 8-7: Final catchment rankings of susceptibility to the impacts of cumulative impacts within Nuneaton and Bedworth Borough

Catchment	Overall Rank	RAG
Anker from Wem Brook to River Sence	8	High
Wem Brook from source to River Anker	17	Medium
Sketchley Brook from source to River Anker	20	Medium
Sowe - conf Breach Bk to conf Withy Bk	20	Medium
Sowe - source to conf Breach Bk	22	Medium
Anker - source to Wem Bk	25	Low
Withy Bk - source to conf R Sowe	26	Low
Breach Bk - source to conf R Sowe	27	Low

8.3.13 Assumptions and Limitations

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Surface water flood risk; Flood Zone 2 and 3	Total area of properties flooded	Assumption that all properties have been included in the Zoomstack dataset and are residential properties (as opposed to less vulnerable/water compatible uses). It may not include all new build properties.	This was the most up to date and best data available.

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Historic Flooding incidents	Total number of historic events and severity of flooding	Only flooding incidents recorded that could be georeferenced with XY coordinates to produce GIS files. Each point represents a location where it is known there has been at least one flood incident. The severity of the historic flooding event relating to the point has not been considered, just the total number of points within each catchment where there has been a flood incident.	GIS data sourced provided the best available results for the location of historic flooding incidents in the study area.

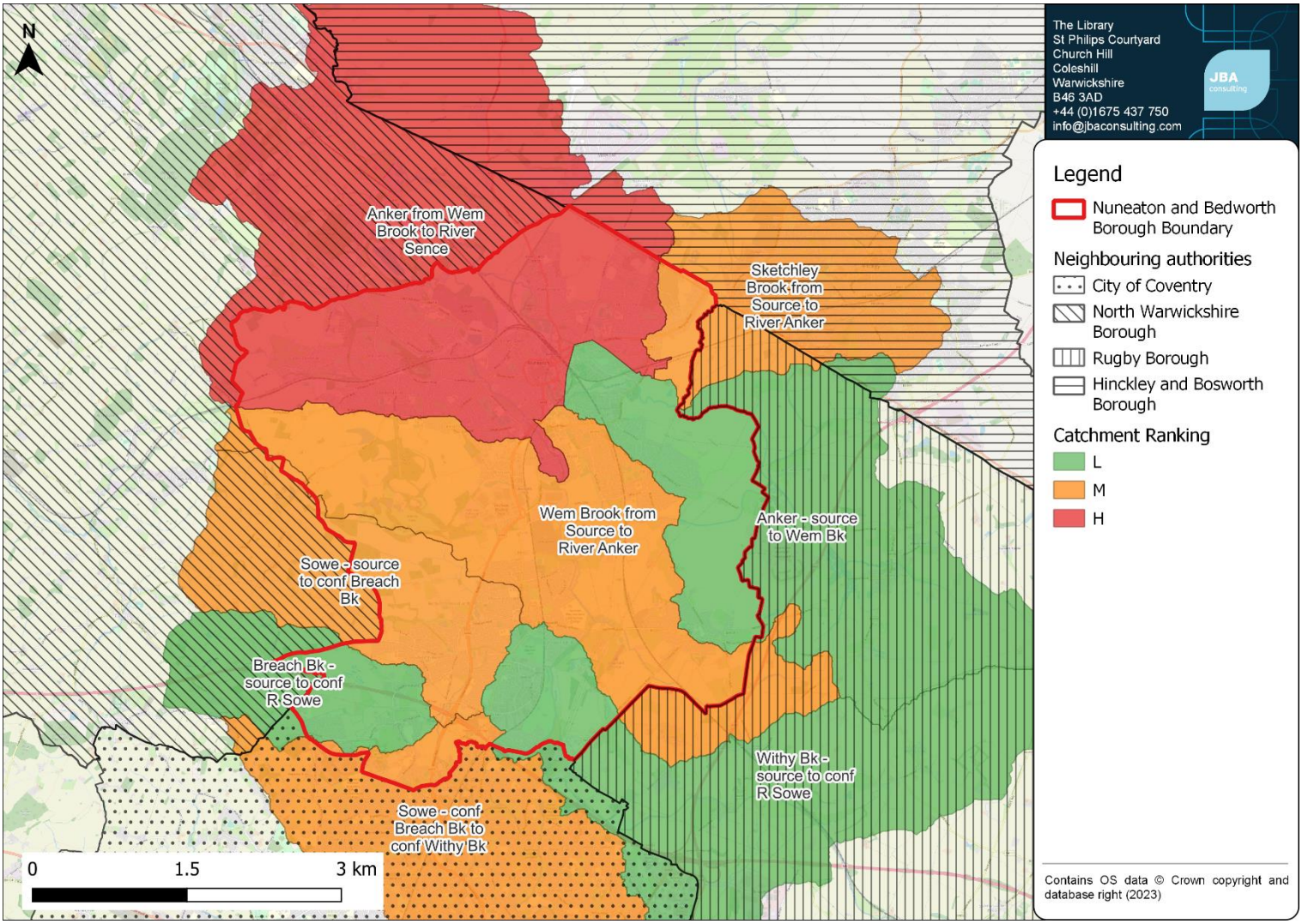

Figure 8-2: Final catchment rankings of susceptibility to the impacts of cumulative impacts within Nuneaton and Bedworth Borough

8.4 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 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.

8.4.1 Anker from Wem Brook to River Sence

This section of the Anker catchment covers the area between Nuneaton at the confluence of the Wem Brook with the Anker and Atherstone at the confluence with the River Sence.

The Coventry Canal flows parallel to the River Anker, with many ordinary watercourses connecting the canal with the river. Settlements include Hartshill, a large village 4km northwest of Nuneaton and Fenny Dreyton to the north of Nuneaton. Mancetter and Witherley border Atherstone in the north-west of the catchment cell. East of Hartwell, large lakes associated with quarrying are deeply incised into the local landscape. The catchment is also bisected by the A5 (Watling (Roman) Road) and railway lines.

Watercourses within this catchment are shown in Figure 8-3 below.

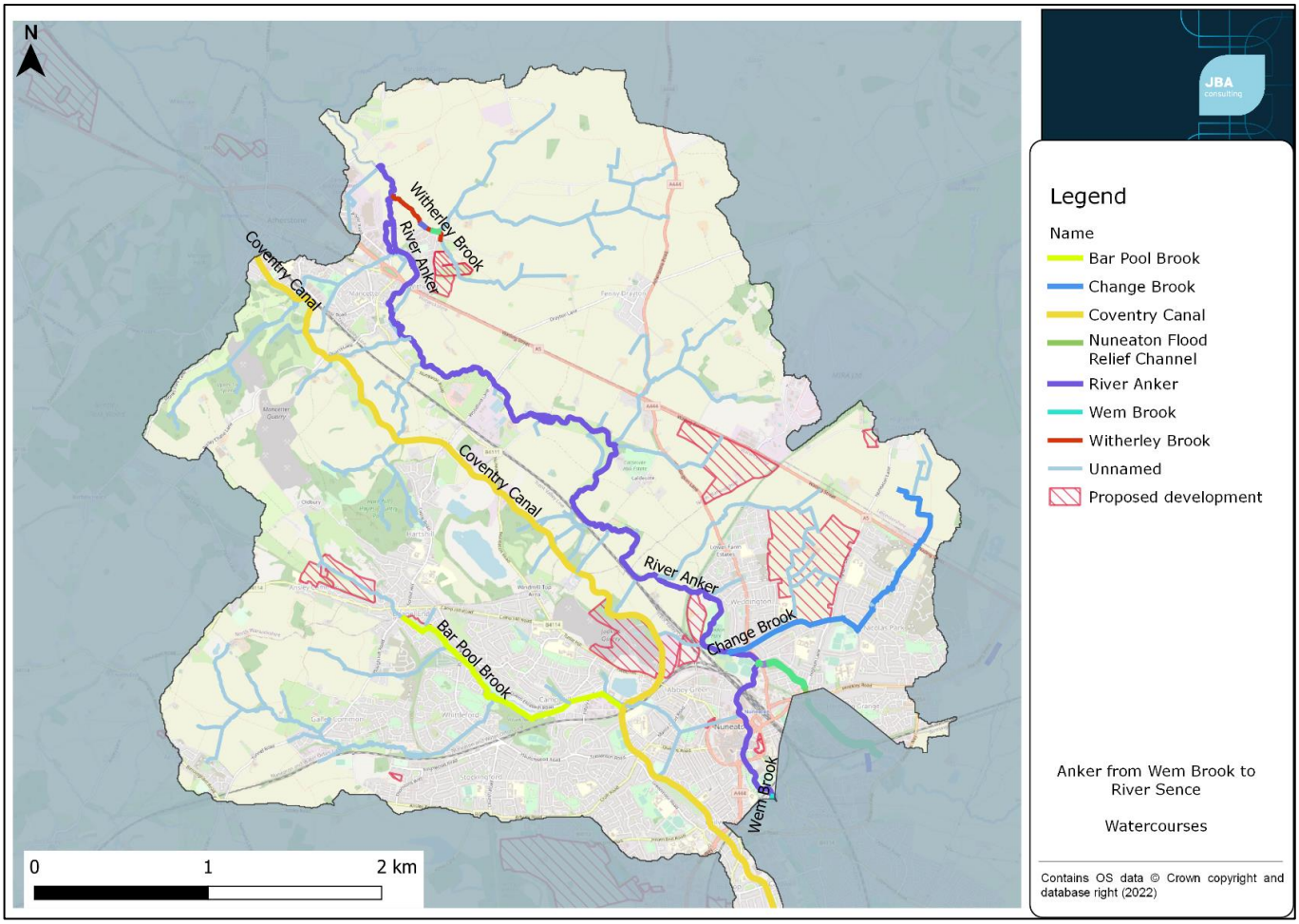

Figure 8-3: Watercourses within the Anker catchment

8.4.2 Historic flood risk

There is a long history of flooding in Nuneaton, with photographic evidence from 1900 and 1932 in Nuneaton town centre[2]. Records of flooding from surface water and sewers have also been recorded by the Lead Local Flood Authority as shown in Figure 8-4 below. Flooding report hotspots are generally focused in urban areas such as Nuneaton town centre Chapel End and Mancetter. It is noted that the hotspots

2 Flooding in the Borough. | Behind the Scenes at Nuneaton Museum (wordpress.com)

indicate reports of flooding and therefore may include repeated reports of flooding at the same address.

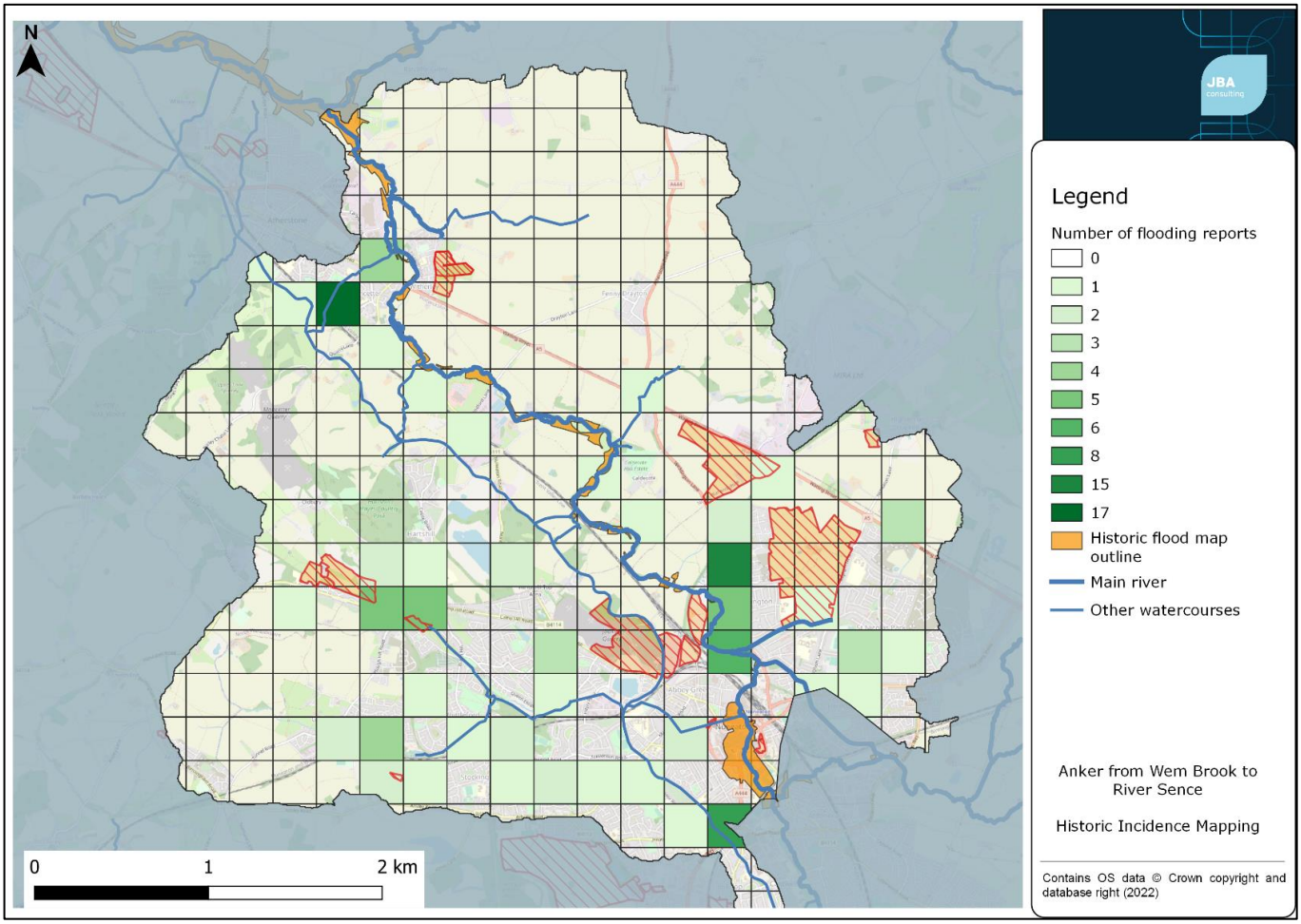

Figure 8-4: Historic flood incidents

8.4.3 Fluvial flooding

Due to repeated flooding, flood relief works were undertaken in 1976 which created two channels of the River Anker. The main channel passes through Nuneaton Town Centre, whilst a bypass channel which flows through the north of the town before joining at Weddington. The Nuneaton Flood Defence Scheme is maintained by the Environment Agency and is critical for flood risk management in the town, protecting more than 1000 properties from flooding in the 1% annual probability flood, as listed in the Nuneaton and Bedworth Borough Plan submission background paper on managing flood risk and water quality.

Environment Agency main rivers in the catchment include the River Anker, Change Brook, Flood Relief Channel and downstream section of the Witherley Brook at Witherley.

8.4.4 Surface Water

Risk of flooding from surface water (RoFSW) mapping shows the centre of Nuneaton as high risk for surface water flooding, as well as flow routes at Stockingford, Nicholas Park and Camp Hill. Significant accumulations of surface water flood risk are predicted west of Weddington adjacent to the old railway embankment.

Surface water flood risk in Witherley is largely representative of flood risk from the Witherley Brook, although it is noted that a flow route flowing north towards chapel lane is included in the modelled outline associated with an unnamed tributary of the Witherley Brook. A surface water flow route is also shown following the route of the A5 out of the CIA catchment area into Atherstone. No development is included in the proposals in, or to the west of Mancetter.

8.4.5 Groundwater

The JBA Groundwater flood map shows areas where groundwater is likely to emerge but does show groundwater flow routes. Emergence in this catchment is linked to the presence of superficial river terrace deposits, predominantly in the areas close to the River Anker. Large scale development is not anticipated in close proximity to the main river channel and therefore the potential for cumulative impacts on groundwater is limited. However, there are limited areas where groundwater emergence is possible elsewhere in the catchment.

8.4.6 Canals

Canals do not generally pose a direct flood risk as they are a regulated water body. The residual risk from canals tends to be associated with lower probability events such as overtopping and embankment failure. However, there are no recorded breach or overtopping events within Nuneaton and Bedworth. Cumulative impacts on flood risk from canals is considered for developments draining to, or adjacent to, the canal.

8.4.7 Reservoirs

Site SHA1 adjacent to Sandon Park at Weddington and site BUL-9 in Nuneaton are both inside the reservoir (wet day) outline. At BUL-9, reservoir flood risk is associated with Seeswood Pool to the south west of Nuneaton. On the Bar Brook, reservoir flood risk is associated with the Oldbury Reservoir, operated by Severn Trent Water. There is, therefore, a possibility that the cumulative impact of development could increase the maintenance burden upstream where development is brought forward in areas at residual risk of reservoir flooding.

8.5 Conclusions and Recommendations

8.5.1 Surface water drainage

- Due to the number of watercourses with the catchment, it is highly likely that the preferred surface water discharge method will be connection to a local watercourse in or adjacent to the site boundary. Surface water runoff to watercourses must be limited by sub-catchment and is a particular consideration for sites which include or border multiple watercourses.
- Infiltration testing to determine whether infiltration can be achieved should be expected for all sites as early as possible in the master planning process. For sites where topography, geology and ground conditions vary, infiltration testing should be undertaken at a range of locations and for each discharge point.
- Where infiltration is viable for only part of the site, this should form the basis of the drainage strategy for that area unless there are significant overriding considerations such as high groundwater or contamination.
- Development are evenly spread across sub-catchments in the CIA study area. However, without surface water runoff rate and volume restrictions, fluvial flood risk in the north of Nuneaton could potentially increase both during the construction phase and afterwards.
- Sustainable drainage systems (SUDS), as well cumulatively decreasing the risk of flooding, can also contribute significantly to mitigating biodiversity impact calculation outcomes and can count towards the Planning and Advisory Group (PAG) requirement where the requirements are met.
- Surface water runoff mitigation (rates and volumes) should be considered in the construction phase, with site wide infrastructure in place prior to parcel development which should include surface water drainage provision. Parcel phasing and delivery should consider the limitation of surface water runoff whilst construction is underway and temporary works may be required

8.5.2 Groundwater

- High groundwater may be encountered during the construction phase. High groundwater may be associated with local superficial (river terrace) deposits which are most prevalent in areas close to the River Anker. Displacement of groundwater may occur during the construction phase, and the cumulative impacts of overpumping can increase flood risk downstream. A watching brief is recommended for sites where the JBA Groundwater flood map indicates that areas of the site may be in zones 3 or 4. Site investigation works for those development sites should include trial pits to determine the depth to groundwater during a suitable monitoring period indicative of normal-high groundwater levels.

8.5.3 Reservoir safety

- Local planning authorities should consider any implications for reservoir safety and reservoir owners and operators caused by new development located downstream of a reservoir, by consulting with reservoir owners and operators on plan and development proposals.
- Sites SHA-1 and BUL-9 fall within the residual risk wet day flood outline. There is therefore potential for cumulative development on the upstream impounding reservoir
- A sequential approach to development, placing development in areas outside of the area at residual risk of flooding is recommended.

8.5.4 Canals and modified channels

- The Coventry Canal flows through site SHA1. The canal is lower than the surrounding land according to national LiDAR and therefore there is little potential increase in residual risk to this site likely to increase emergency response burdens for flooding from the canal.
- The cumulative impact of development could potentially have strategic implications for flood risk management infrastructure in Nuneaton including the Nuneaton Flood Relief Channel. The proposed development in this catchment is unlikely to significantly increase the numbers of properties afforded protection by existing defences.

8.5.5 Access and maintenance

- Any development boundary adjacent to, or including a canal or watercourse should be set back at eight metres from the channel top unless an agreed bylaw distance is in place. This provides a buffer strip and allows access for maintenance or repair along the length of the watercourse or canal.

8.5.6 Opportunities for reduction in off-site flood risk

- Policies to reduce the existing runoff rate of brownfield sites for the lifetime of the development should be considered, using sustainable drainage features wherever possible
- Interception storage should be provided for the first 5mm of rainfall wherever possible in line with National Standards for Sustainable Drainage Systems.

8.5.7 Costs to continue to mitigate flood risk

- Developers should be expected to cover any additional costs incurred, as required by the National Planning Policy Framework's 'agent of change' policy (paragraph 187). This could be through Community Infrastructure Levy or section 106 obligations for example. This could include, but is not limited to:

i. Increased operational costs to reservoir undertakers
ii. Increased operational costs for flood risk management, including off-site impacts during the construction phase

9 Policy Recommendations

9.1 Broadscale Recommendations

The broadscale cumulative impact assessment for Nuneaton and Bedworth Borough shows that in different areas within the Borough, the potential for development to have a cumulative impact on flood risk is either high, medium or low. The majority of the cumulative flood risk in the catchment area is low to medium, with the high risk areas situated within the northern part of Nuneaton and Bedworth Borough. Please refer to Figure 8-2 in this report for further details.

New development can potentially increase flood risk and thus the need for incremental action and betterment in flood risk terms across all of Nuneaton and Bedworth Borough is appropriate.

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

- The Warwickshire Authorities should work closely with each other and neighbouring local authorities to develop complementary Local Planning Policies for catchments that drain into and out of the City 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 relevant LLFA guidance from Warwickshire County Council for the SuDS requirements in Nuneaton and Bedworth Borough, including Technical and Development Type-specific Guidance for Developers. For further information, please refer to the Warwickshire Flood Risk & Sustainable Drainage Local Guidance for Developers document.

Further guidance on SuDS can be found in Section 9 of the main SFRA report.

- Warwickshire County Council as LLFA will review Surface Water Drainage Strategies in accordance with their local requirements for major and non-major developments. These should take into account all sources of flooding so 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.
- Runoff rates from all development sites must be limited to greenfield rates (including brownfield sites) for all sites unless it can be demonstrated that this is not practicable. If it is demonstrated that greenfield rates are not practicable then the runoff rates should be restricted to the closest rate that is practicable. Developers should refer to the relevant LLFA guidance for the requirements for SuDS in Nuneaton and Bedworth Borough.
- Nuneaton and Bedworth Borough 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.

Section 6.3 of the main SFRA report details the local requirements for mitigation measures. Catchment-specific recommendations are made for high-risk catchments below.

9.2 Recommendations for medium and high-risk catchments

Medium Risk catchments are detailed in Table 9-1 and Table 9-2 below. From analysing the results produced above, high-level recommendations to manage the risks of the cumulative impacts of development have been proposed for the medium and high-risk catchments. These recommendations include policy recommendations for the Local Authority and considerations for developers as part of site-specific proposals.

Table 9-1: Medium Risk Catchments within the Nuneaton and Bedworth Borough Study Area

Medium Risk catchments within Nuneaton and Bedworth Borough
Sketchley Brook from source to River Anker
Wem Brook from source to River Anker
Sowe – source to confluence with Breach Brook
Sowe – confluence with Breach Brook to confluence with Withy Brook

Table 9-2: High Risk Catchments within the Nuneaton and Bedworth Borough Study Area

High Risk catchments within Nuneaton and Bedworth Borough
Anker from Wem Brook to River Sence

- Nuneaton and Bedworth Borough Council should work closely with the EA and the LLFA to identify any areas of land that should be safeguarded for any future flood alleviation schemes and natural flood management features, including land which may lie outside their boundaries.
- Nuneaton and Bedworth Borough Council should explore the potential for development in High-Risk catchments to contribute towards works to reduce flood risk and enable regeneration as well as contributing to the wider provision of green infrastructure.
- Nuneaton and Bedworth Borough Council, in discussion with Warwickshire County Council as LLFA should consider requiring additional betterment for runoff rates from brownfield sites, beyond those currently set. Currently, the Warwickshire Local Guidance for Developers states that greenfield sites should limit runoff to greenfield rates whilst brownfield sites should reduce runoff to greenfield rates or achieve a minimum 50% reduction in runoff where it can be proved greenfield rates are not possible. 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.
- For any sites where an FRA is required, developers should explore, through the site-specific FRA, opportunities to provide wider community flood risk & water resource benefits as part of new development and justify where such measures are not included. Measures that can be put in place to contribute to a reduction in flood risk downstream should be considered, with a focus on slowing the flow of water downstream, particularly in the upper catchment. This could include the provision of additional storage e.g. oversized SuDS and/or Partnership Funding contributions towards wider community schemes.
- Nuneaton and Bedworth Borough Council should consult with Local Non-For-Profit organisations such as wildlife trusts, rivers trusts and catchment partnerships 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.

9.2.1 Recommendations for Developments in High-Risk Catchments

Catchments that have been scored an overall ranking of high, should also consider the following recommendations:

- That a Level 2 SFRA or detailed local area Strategic Drainage Study considers further how the cumulative effects of potential peak rates and volumes of water

from development sites would impact on peak flows, duration of flooding and timing of flood peaks on receiving watercourses. Such studies could be used to justify greater restrictions/ enforce through Local Planning Policy development site runoff rates and volumes specific to each catchment that are over and above those required by National and Local SuDS Standards. They could also identify where there are opportunities with allocated sites to provide off-site betterment e.g. online/ offline flood storage and where land should be safeguarded within proposed site allocations to fulfil this purpose.

- 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 be by provision of additional storage on site e.g. through oversized SuDS, natural flood management techniques, green infrastructure and green-blue corridors, and/ or by providing a Partnership Funding contribution towards any flood alleviation schemes.
- That a Surface Water Drainage Strategy be required for all developments, regardless of development size. Developers should also include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the EA, the LLFA and the LPA regarding the proposed management approach during the construction phase to address surface water management during storm events.
- That Nuneaton and Bedworth Borough Council consider requiring developers to contribute to community flood defences both within and outside of their red line boundary in these catchments to provide wider benefits and help offset the cumulative impact of development.

10 Summary of Level 2 assessment and recommendations

10.1 Assessment methods

As part of the Level 2 SFRA, 24 sites have been assessed within 19 detailed site summary tables. This was due to some smaller sites with minimal fluvial or surface water flood risk being combined with larger sites located nearby which have greater flood risk concerns.

The summary tables set out the flood risk to each site, including Flood Zone coverage, and the potential extents, depths, velocities and hazard ratings of fluvial flooding and surface water flooding. Climate change mapping has also been produced to indicate the impact which different climate change allowances may have on the sites (where models are available) or using Flood Zone 2 as an indication of climate change. 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.

Interactive mapping is shown in Appendix A and should be viewed alongside the detailed site summary tables. There are hydraulic model outputs available for the River Sowe and River Anker, but where models are unavailable, the EA's Flood Zones from the FMfP have been used. Also, where the watercourses are smaller and not represented in the Flood Zones, the RoFfSW mapping datasets have been used.

The Level 2 SFRA also identifies the need to consider the implications of allocating land that could potentially be affected by other sources of flooding, including groundwater and reservoir flood risk.

10.2 Summary of key site issues

NBBC provided 33 sites for assessment. These were chosen through a combination of a site’s potential for allocation and its flood risk as determined through the site assessment process. These sites were screened against flood risk datasets to assess how many were to be carried forward to a Level 2 SFRA assessment. In total 24 sites were carried forward to a Level 2 assessment. These have been detailed in 19 site summary tables due to some smaller sites with minimal fluvial or surface water flood risk being combined with larger sites located nearby which have greater flood risk

concerns. Additional sites which may have issues with access and egress are also flagged in this report.

Detailed site summary tables setting out the flood risk to each site and the NPPF requirements for the site as well as guidance for site-specific FRAs have been produced. 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 a 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 of the mapping, to allow easy navigation of the data.

The following points summarise the Level 2 assessment:

- Fluvial Flooding: Some areas of Nuneaton and Bedworth Borough are at greater risk than others. The main watercourses associated with fluvial risk are:
    - River Anker - the River Anker flows through Nuneaton. Modelled flood extents suggest that properties in Weddington and Attleborough (and to the east of here) within the Borough are at risk of flooding from the River Anker, particularly where there are recorded flood outlines.
    - Wem Brook - tributary of the River Anker (partly covered by the River Anker model) flows south through the centre of the Borough from the Anker. Properties at risk include those surrounding the flood plain to the south of Attleborough.
    - River Sowe – flows through Bedworth in the southern part of the Borough. Modelled flood extents suggest that very few properties within the Borough are at flooding from the River Sowe, even in the most extreme climate change scenarios.
    - Ordinary watercourses - there are a number of small ordinary watercourses within the Borough which are not currently modelled but have the potential to cause fluvial flood risk. For this assessment, the surface water mapping has been used to provide an indication of risk; however, modelling of these watercourses will be essential to inform the risk to any development proposals within the vicinity of unmodelled watercourses.
- Site-specific hydraulic modelling was undertaken for sites located in the Weddington and Bermuda areas, within or close to present day Flood Zones, but where Flood Zones do not have a fluvial model covering the area. This additional site-specific modelling is discussed in Appendix B.
- Despite most sites not being at risk from fluvial flooding, updated fluvial modelling showed sites GAL-7, SHA1, SHA2, SEA-1, SEA-2, SEA-4, ABB-4, ABB-6, ABB-7 and ABB-8 have some fluvial flood risk.

- Surface Water: Surface water tends to follow topographic flow routes, for example along the watercourses or isolated pockets of ponding where there are topographic depressions.
- The majority of sites with a detailed Level 2 summary table are at surface water flood risk. The degree of flood risk varies, with some sites being only marginally affected along their boundaries, and other sites being more significantly affected within the site. The sites at most significant surface water risk are: GAL-7, ARB-1, BUL-9, SEA-2, SEA-5, SHA3-2, SHA-5, SHA-6 and ABB-7.

- Whilst not at significant flood risk within the site boundary, several sites have potential access and egress issues as a result of fluvial and surface water flooding of the surrounding roads. For some sites, there is the potential for safe access and egress to be impacted by fluvial or surface water flooding. 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 the nature of the risk, for example whether the flooding 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 are predicted to 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 the site and the percentage allowance used; fluvial extents would be larger than Flood Zone 3, but maximum extents are likely to be similar to Flood Zone 2. The 0.1% AEP surface water flood extent can also be used as an indication of climate change to surface water risk. Site-specific FRAs should confirm the impact of climate change using latest guidance. It is recommended that Nuneaton and Bedworth Borough Council work with other Risk Management Authorities (RMAs) to review the long-term sustainability of existing and new development in these areas when developing climate change plans and strategies for the Borough.

- Historic data provided by Warwickshire County Council showed 115 incidences of recorded flooding within the study area since 2012. 9 of these incidences were associated with Main River flooding. Details of whether the flooding was internal to properties or affected only highways and curtilage was not available for the majority of records. The majority of flooding within the Borough was a result of surface water flooding, or flooding from highways.

- Groundwater: Groundwater emergence mapping indicates that the majority of the Borough is at very low risk from groundwater emergence. JBA's Groundwater Emergence map shows the areas with the shallowest groundwater levels

generally follow the flow paths of the major watercourses in the Nuneaton and Bedworth Borough, particularly along the River Anker and Wem Brook, and the low-lying topography in the centre of Nuneaton. Here, groundwater levels are between 0.5-5.0m below the ground level, or at or very near the ground surface, and in these areas there may be a risk to subsurface assets. There are large areas across the area where the risk of groundwater emergence is considered to be negligible due to the nature of the local geological deposits.

- Canals: The Coventry Canal runs through the centre of the Borough, north to south, and has connections with ordinary watercourses and the Wem and Griff Brooks. There is also the Ashby Canal and the Oxford Canal. The canals have the potential to interact with other watercourses in the area and become a conduit for flow paths during flood events or in a breach scenario. There are however no recorded overtopping or breach events within Nuneaton and Bedworth, and due to the local topography, the Canal is unlikely to pose a risk to any existing development within the Borough.

- Reservoirs: There are records of flooding from reservoirs in the study area during the 'Wet day' and 'dry day' flooding scenarios. The risk is mainly confined to the north of the District along the River Ankers, Wem Brook and Griff Brooks. The level and standard of inspection and maintenance required under the Reservoirs Act means that the risk of flooding from reservoirs is relatively low. However, there is a residual risk of a reservoir breach and this risk should be considered in any site-specific Flood Risk Assessments (where relevant).

- Any sites located where there is Main River (including culverted reaches of Main River) will require an easement of 8m either side of the watercourse from the top of the bank. This may introduce constraints regarding what development will be possible and consideration will also need to be given for access and maintenance at locations where there are culverts. Developers will be required to apply for appropriate permits so the activity being carried out over easements does not increase flood risk.
- A strategic assessment was conducted of SuDS options using regional datasets. 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 the Cumulative Impact Assessment, the highest ranked catchment is the 'Anker from Wem Brook to River Sence'. This catchment is classified as high-risk when considering the cumulative impact of development on loss of floodplain storage volume and increase in runoff flow volume.
- Developers proposing windfall sites in the high-risk Cumulative Impact Assessment catchments should demonstrate through a site-specific FRA how SuDS and surface water mitigation techniques will ensure that development does

not increase flood risk elsewhere and seeks to reduce flood risk to existing communities. The catchment-based Cumulative Impact Assessment has been updated using the latest available data for the Level 2 SFRA and supersedes the catchment-based assessment in the Level 1 SFRA. The methodology and results of this CIA are in Section 8 of this report.

10.2.1 Considering the Exception Test for the proposed sites in Nuneaton and Bedworth

In principle, it is possible for the majority of sites assessed in the Level 2 SFRA to satisfy the flood risk element of the Exception Test, 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 either along a site boundary or the risk is posed by a flow path running through the site, so steering away from this is advised),
- 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 in 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.

In some areas of Nuneaton and Bedworth Borough, more detailed fluvial modelling has been carried out in recent years, providing a more accurate representation of the Flood Zones within specific catchments. For the purposes of this SFRA, two hydraulic models have been produced to provide more accurate fluvial flood risk data than the current EA's FMfP.

Consideration should be given to the surface water risk within Nuneaton and Bedworth Borough as this must also be addressed by the Exception Test. Care should be taken with use of the national surface water mapping as it does not account for culverts, structures, channel hydraulics or sewer capacity, and therefore can provide an overestimated 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 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 Section 10 of the Level 1 SFRA still stand for the site allocations and any windfall development that comes forward and should be referred to alongside this report.

10.4 Guidance for windfall sites and sites not assessed in Level 2 SFRA

- For sites not represented in the EA'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 during the 1% AEP plus climate change 'design event'. Site-specific flood modelling will likely need to be developed in locations where it is necessary to understand the effects of proposed development schemes on the existing flood flow paths and flood volume storage, in the present day and in the future.
- If a site's extent either includes or borders an EA Main River (including a culverted reach of Main River), an easement of 8m is required from both banks for access and maintenance. Any future development will require a flood risk permit for 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 (Warwickshire County Council) 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 3.3%, 1% and 0.1% AEP events (with an appropriate allowance for climate change), 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 FRA 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.
- For sites where there is a canal within or immediately adjacent to the site area, developers should consult the Canal and River Trust. Any proposed alterations to the canal or discharges must be agreed with the Canal and River 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 NBBC, Warwickshire County Council, the Highways Authority, Severn Trent Water and the EA. Such information may be in the form of:

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

The EA 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 FRA. It is recommended that the SFRA is reviewed in line with the EA'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.

A GeoPDF Mapping and Site Summary Tables

A.1 Instructions for using GeoPDFs

To accompany each site summary table, there are two interactive GeoPDF maps, with all the mapped flood risk outputs per site. One map displays present day flood risk data, the second map displays data which displays flood risk with an allowance for climate change.

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.

B JBA 2D Hydraulic Modelling Technical Notes

C GeoPDF User Guide

D Red-Amber-Green Site Table Summary

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