

Bassetlaw District Level 2 Strategic Flood Risk Assessment

Draft Report

April 2021

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Bassetlaw District Council



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This report describes work commissioned by Samuel Walker, on behalf of Bassetlaw District Council, by an email dated 9th July 2020. Hannah Coogan, Freyja Scarborough, Ed Mumford, Hannah Booth, Laura Thompson and Dularee Goontilleke of JBA Consulting carried out this work.

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Purpose

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Executive Summary

Introduction and Context

This Level 2 Strategic Flood Risk Assessment (SFRA) document undertakes a Level 2 assessment of site options identified by Bassetlaw District Council. It builds upon the Level 1 SFRA completed in 2019 for Bassetlaw District.

This Level 2 SFRA involves the assessment of 18 proposed development sites. In addition, since the previous SFRA was published, there have been updates to national and local planning policy, including the release of updated SFRA guidance in August 2019. This 2021 Level 2 SFRA has updated information on flood data, flood risk policy and has recommendations for the cumulative impact of development.

SFRA Objectives

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

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

Level 2 SFRA Outputs

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

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

The Level 2 Strategic Flood Risk Assessment has assessed the necessary flood mitigation required to bring forward development in Flood Zones 2 and 3. Development in higher flood risk areas with suitable flood mitigation, will be necessary in order to achieve the required housing targets set out in the Local Plan. Such development will also help to address the social and economic needs of the District, promoting essential regeneration of existing brownfield sites especially within Worksop Town Centre. This regeneration will help to retain the vitality of Worksop as the most accessible and sustainable location in the District. To manage the proposed growth within Worksop Town Centre more effectively, the Council is producing a separate Development Plan Document (DPD) (known as the Worksop Central DPD). A separate Level 2 SFRA will be prepared later in 2021 to support the DPD.

Summary of the Level 2 SFRA

Bassetlaw District Council determined the sites which required a Level 2 assessment, based on the information from the Level 1 SFRA and proximity of the sites to watercourses and known flood risk areas.

18 sites were initially proposed for Level 2 assessment in Bassetlaw District. Following a screening exercise, 14 were chosen to undergo a Level 2 assessment, of which 3 sites required additional modelling to understand fluvial and tidal risk.

- 2 sites required the latest climate change allowances to be applied to the Tidal Trent model.
- 1 site (HS7) required additional broadscale modelling where a critical railway culvert is not represented in the current Flood Zone modelling.

Each site-specific summary table produced sets out the flood risk to each site based on a range of flood risk datasets and the strategic modelling completed as part of this study. Each table sets out the NPPF requirements for the site as well as guidance for site-specific FRAs. A broadscale assessment of suitable Sustainable Drainage Systems (SuDS) options has been provided, giving an indication where there may be constraints to certain types of SuDS techniques.

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

The following points summarise the Level 2 assessment:

The following points summarise the Level 2 assessment:

- The majority of the sites assessed as part of this Level 2 SFRA are not currently at significant at fluvial flood risk. The exceptions are:
 - Cottam Power station- 74% of the site within Flood Zone 2
 - High Marnham power- 14% of the site within Flood Zone 2
 - HS6 & HS7- 11% of the site within Flood Zone 2.

Sites significantly affected by fluvial and tidal flooding will require more detailed investigations to inform a sequential approach to site layouts, SuDS possibilities, safe access and egress etc, as part of a site-specific Flood Risk Assessment taken forward by a developer. Specific recommendations for sites can be found in the site summary tables, Appendix B.

- The majority of sites are also a risk from surface water flooding, with significant flows and ponding in the higher return period events across some sites and the access roads surrounding them. Furthermore, for most of the sites within Retford and Worksop, there is a significant increase on the extent of surface water flooding between the 1% AEP and 0.1% AEP events, indicating a high sensitivity to climate change. Surface water tends to follow topographic flow routes, for example along the watercourses or isolated pockets of ponding where there are topographic depressions. The impact of surface water flooding at sites such as this will need more detailed investigations undertaken as part of a site-specific Flood Risk Assessment at a later stage.
- Climate change allowances were applied to the existing Tidal Trent model and 2D generalised modelling completed as part of this SFRA. For the 3.3% AEP, 1% AEP and 0.1% AEP events, the 2080s period was used, and all three allowance categories were modelled (20%, 30% & 50%). Sea level rise allowances were made using the Upper End estimates from **Table 3** of the governments published climate change allowances. Modelling indicates that flood extents will increase as a result of climate change and therefore, the depths, velocities and hazard of flooding are also seen to increase. Some sites are more sensitive to climate change increases than others. Site-specific Flood Risk Assessments (FRAs) should confirm the impact of climate change using latest guidance.
- For some sites, there is the potential for safe access and egress to be impacted by fluvial, tidal and/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. Where there is no safe access of egress, shelter in situ should be provided.

- 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 to understand which SuDS option would be best.
- Sites which have areas designated by the Environment Agency as being a historic landfill site will require site ground investigations to determine the extent of the contamination and the impact this may have on SuDS.
- The Cumulative Impact Assessment (CIA) identified two areas as at a high risk of increased risk as a result of development in the future. These are:
 - Retford
 - Worksop

Additionally, there are 7 sites of significant size, 5 on greenfield land, that will need careful consideration of downstream impacts, including a Surface Water Management Strategy and Masterplan.

The full CIA and recommendations are found in section 9.

- Several proposed sites within Worksop are at significant risk from fluvial and surface water flooding and any development within the town centre has the potential to exacerbate these existing issues. To facilitate regeneration in Worksop Town Centre, a carefully considered flood risk and sustainable drainage strategy covering all the sites in the Worksop Central DPD Area must support early master planning and feasibility work. This work should be undertaken alongside and in support of the work led by the Environment Agency to develop a flood alleviation scheme for the town. This will be explored further in a specific Level 2 SFRA for Worksop Town Centre later in 2021.

Developers should enter into conversations with the District Council at pre-application stage to understand the latest position with regards to the Environment Agency led Worksop scheme.

- Cottam Power Station is at a particularly high risk of fluvial flooding from the River Trent and major reprofiling and mitigation works are likely to be required to allow development of such a vulnerable site. The main risk to the site is fluvial flooding from the River Trent. Embankments on the Trent currently defend against a 1% AEP flood event, although there remains a risk from a breach or a severe 0.1% event if the defences overtop. The risk will increase from climate change and during the lifetime of the development, the modelling shows that the defences would overtop in a future 1% fluvial event (upper end scenario), which means the standard of protection will be lower than the 1% design event for fluvial flooding.

To ensure the users of this site would be safe from flooding over the lifetime of the development, either the defences along this stretch of the Trent would need to be raised (over a considerable distance to account for water reaching the site across the floodplain) or site level mitigation would be required. Any work undertaken on site would need to be undertaken cautiously, to ensure there was no overall loss of floodplain or displacement of water onto other areas. The feasibility of this level of site mitigation needs to be taken into account when considering if the site would pass the Exception Test. It is possible that the overall capacity of the site for the required level of the development could be affected by the need for flood mitigation measures.

At the planning application stage and as part of an FRA, developers will need to undertake detailed hydrological and hydraulic assessments of watercourses and tidal flooding, to verify flood extent, depth, velocity and hazard (including considering the 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 such that is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. The Exception Test must be reapplied at this stage even where it has been undertaken for the Local Plan as a further check on the suitability of the site for development. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

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

Contents

1	Introduction	1
1.1	Purpose of the Strategic Flood Risk Assessment	1
1.2	Levels of SFRA	1
1.3	SFRA Objectives	1
1.4	Context of the Level 2 Assessment	2
1.5	Consultation	2
1.6	How to Use this Report	3
1.7	SFRA Study Area	4
2	The Planning Framework and Flood Risk Policy	8
2.1	Introduction	8
2.2	Roles and Responsibilities for Flood Risk Management	8
2.3	Relevant Legislation	9
2.4	Relevant Flood Risk Policy and Strategy Documents	10
2.5	Relevant Flood Risk Management Studies and Documents	13
2.5.1	National Flood and Coastal Erosion Risk Management Strategy for England (2020)	13
2.6	LLFAs, Surface Water and SuDS	14
2.7	Surface Water Management Plans	14
2.8	Updated Strategic Flood Risk Assessment Guidance	14
3	Planning Policy for Flood Risk Management	15
3.1	National Planning Policy Framework and Guidance	15
3.2	The Risk Based Approach	15
3.3	The Flood Zones	15
3.4	The Sequential Test	16
3.5	The Exception Test	17
3.6	Making a Site Safe from Flood Risk over its Lifetime	19
3.7	The Sequential Test and Exception Test and Individual Planning Applications	19
3.7.1	The Sequential Test	19
3.7.2	The Exception Test	20
4	The Impact of Climate Change	22
4.1	Introduction	22
4.2	Revised Climate Change Guidance	22
4.3	Applying the Climate Change Guidance	22
4.3.1	Relevant Allowances for Bassetlaw	23
4.4	Representing Climate Change in a Level 2 SFRA	23
4.5	Adapting to Climate Change	23
5	Sources of Information Used in Preparing the Level 2 SFRA	25
5.1	Data Used to Inform the SFRA	25
5.2	Flood Zones	25
5.3	Climate Change	26
5.4	Surface Water	26
5.5	Groundwater	26
5.6	River Networks	26
5.7	Flood Warnings	27
5.8	Reservoirs	27
5.9	Sewer Flooding	27
5.10	Historic Flooding	27
5.11	Canal Flooding	27
5.12	Flood Defences	27
5.13	Residual Risk	27
5.14	Depth, Velocity and Hazard to People	27
5.15	Note of SuDS Suitability	29



6	Level 2 Assessment Methodology	30
6.1	Sites Taken Forward to Level 2 Assessment	30
6.2	Site Summary Tables and Mapping	32
7	Flood Risk Management Requirements for Developers	34
7.1	Introduction	34
7.2	Principles for New Developments	34
7.3	Requirements for Site-Specific Flood Risk Assessments	35
7.3.1	When is an FRA Required?	35
7.3.2	Objectives of Site-Specific FRAs	36
7.4	Local Requirements for Mitigation Measures	36
7.4.1	Flood Storage Compensation	36
7.4.2	Resistance and Resilience Measures	36
7.4.2.1	Resistance measures	37
7.4.2.2	Resilience Measures	37
7.5	Reducing Flood Risk from other Sources	37
7.6	Duration and Onset of Flooding	37
7.6.1	Flood Warning and Emergency Planning	38
8	Surface Water Management and SuDS	39
8.1	Role of the LLFA and Local Planning Authority in surface water management	39
8.2	Sustainable Drainage Systems	39
8.3	Natural flood management (NFM)	39
8.4	Sources of SuDS Guidance	39
8.4.1	C753 CIRIA SuDS Manual (2015)	39
8.4.2	Non-statutory Technical Guidance, Defra (March 2015)	39
8.4.3	A Guide to SuDS and Drainage in Nottinghamshire	40
8.4.4	Severn Trent Sewer Adoption Guidance	40
8.4.5	Water UK Sewerage Section Guidance (Design & Construction Guidance)	40
8.5	Other Surface Water Considerations	40
8.5.1	Groundwater Vulnerability Zones	40
8.5.2	Groundwater Source Protection Zones (GSPZ)	40
8.5.3	Nitrate Vulnerable Zones	40
9	Cumulative Impact of Development & Strategic Solutions	42
9.1	Introduction	42
9.2	Findings from the Level 1 SFRA	42
9.3	Update to Level 1 CIA	43
9.4	Cross Boundary Considerations	43
9.5	Approach to Level 2 Analysis	44
9.5.1	Impact of proposed development	44
9.5.2	Assessing the storage need at potential development sites	44
9.6	Overview of Development in Bassetlaw District	45
9.7	Retford	46
9.8	Workshop	49
9.9	New settlements and larger strategic sites (Including Bassetlaw Garden Village, Cottam Power Station, HS1, HS7, and HS13)	52
9.10	Policy Recommendations	54
9.10.1	Bassetlaw District Wide Recommendations	54
9.10.2	Retford	54
9.10.3	Workshop	56
9.10.4	New Settlement and larger strategic sites (Including Bassetlaw Garden Village, Cottam Power Station, HS1, HS7, and HS13)	57
10	Summary of Level 2 Assessment	58
10.1	Assessment Methods	58
10.2	Summary of Key Site Issues	58



10.3	Considering the Exception Test for the Proposed Sites	60
10.4	Planning Policy Recommendations	60
10.5	Use of SFRA Data and Future Updates	61
A	Level 2 Assessment – Site Summary Tables	62
B	Level 2 Assessment – Interactive Mapping	62
C	Modelling Summary	62
D	Bassetlaw District Council’s Statement on Worksop Development Plan Document	63

List of Figures

Figure 1-1 Overview Map of Study Area and Neighbouring Authorities	6
Figure 1-2 Key watercourses in the Bassetlaw District study area	7
Figure 3-1 The Exception Test	18
Figure 9-1 Map of development sites within Retford parish	47
Figure 9-2 Map of development sites within Worksop parish	50
Figure 9-3 Pre- and post-development and SuDS hydrographs in the catchment of the unnamed watercourse draining Bassetlaw Garden Village	52

List of Tables

Table 1-1 SFRA User Guide	3
Table 2-1 Roles and Responsibilities for Flood Risk Management	8
Table 2-2 National, Regional and Local Flood Risk Guidance, Policy and Strategy Documents	11
Table 3-1 Flood Zone Summary – Flooding from Rivers and Sea	15
Table 3-2 Local Plan Sequential Approach to Site Allocation	17
Table 4-1 Peak River Flow Allowances by River Basin District	23
Table 4-2 Peak Rainfall Intensity Allowance in Small and Urban Catchments	23
Table 5-1 Overview of data used for the Bassetlaw Level 2 SFRA	25
Table 5-2 Defra’s FD2321/TR2 “Flood Risks to People” Classifications	28
Table 5-3 Summary of SuDS Categories	29
Table 6-1 Summary of present day risk to sites at Level 2 Assessment	31
Table 6-2 Contents of Level 2 SFRA site summary tables and maps	32
Table 9-1 Summary of sites within high risk parishes, as identified in the Level 1 SFRA	45
Table 9-2 Long term and attenuation storage volumes for sites within Retford, calculated via the ReFH2 method	48
Table 9-3 Long term and attenuation storage volumes for sites within Worksop, calculated via the ReFH2 method	51
Table 9-4 Long term and attenuation storage volumes for the significant new developments within Bassetlaw District, calculated via the ReFH2 method	53

Abbreviations and Glossary of Terms

Term	Definition
1D model	One-dimensional hydraulic model
2D model	Two-dimensional hydraulic model
AEP	Annual Exceedance Probability
AStGWf	Areas Susceptible to Groundwater flooding
Brownfield	Previously developed parcel of land
CC	Climate change - Long term variations in global temperature and weather patterns caused by natural and human actions.
CIA	Cumulative Impact Assessment
DTM	Digital Terrain Model
DPD	Development Plan Document
EA	Environment Agency
Exception Test	Set out in the NPPF, the Exception Test is used to demonstrate that flood risk to people and property will be managed appropriately, where alternative sites at a lower flood risk are not available. The Exception Test is applied following the Sequential Test.
Flood defence	Infrastructure used to protect an area against floods, such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Flood Map for Planning	The Environment Agency Flood Map for Planning (Rivers and Sea) is an online mapping portal which shows the Flood Zones in England. The Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences and do not account for the possible impacts of climate change.
Flood risk Area	An area determined as having a significant risk of flooding in accordance with guidance published by Defra and WAG (Welsh Assembly Government).
FWA	Flood Warning Area
Fluvial Flooding	Flooding resulting from water levels exceeding the bank level of a River.
FRA	Flood Risk Assessment - A site-specific assessment of all forms of flood risk to the site and the impact of development of the site to flood risk in the area.
Greenfield	Undeveloped parcel of land
Ha	Hectare
IH124	A hydrology methodology produced by the Institute of Hydrology to assess the runoff from small catchments.
JBA	Jeremy Benn Associates
JFlow	2D generalised hydrodynamic modelling software.
LIDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority - Local Authority responsible for taking the lead on local flood risk management.
Main Watercourse	Main rivers are designated by the Environment Agency and are usually larger rivers and streams. It consults with other risk management authorities and the public before making these decisions. The Environment Agency carries out maintenance, improvement or construction work on Main Rivers to manage flood risk and their powers to carry out flood defence work apply to main rivers only.
m AOD	metres Above Ordnance Datum
NPPF	National Planning Policy Framework
NRD	National Receptor Database
Ordinary Watercourse	All watercourses that are not designated Main River. Local Authorities or, where they exist, IDBs have similar permissive powers as the Environment Agency in relation to flood defence work. However, the riparian owner has the responsibility for maintenance.
PPG	Planning Practice Guidance



Term	Definition
Pluvial flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity.
ReFH	Revitalised Flood Hydrograph
Risk	In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.
RoFSW	Risk of Flooding from Surface Water (formerly known as the Updated Flood Map for Surface Water (uFMfSW))
Sequential Test	Set out in the NPPF, the Sequential Test is a method used to steer new development to areas with the lowest probability of flooding.
SFRA	Strategic Flood Risk Assessment
SPZ	(Groundwater) Source Protection Zone
Stakeholder	A person or organisation affected by the problem or solution or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.
SuDS	Sustainable Drainage Systems - Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Surface water flooding	Flooding as a result of surface water runoff as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse or cannot enter it because the network is full to capacity, thus causing what is known as pluvial flooding.
URBEXT	Urban extent catchment descriptor, describing the level of urbanisation in a catchment.

1 Introduction

1.1 Purpose of the Strategic Flood Risk Assessment

The following text is taken from the National Planning Policy Framework, paragraph 156:

“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.”.

This Strategic Flood Risk Assessment (SFRA) 2021 document provides a Level 2 assessment of strategic sites identified for potential allocation within the Bassetlaw District.

1.2 Levels of SFRA

The **Planning Practice Guidance** (PPG) advocates a tiered approach to risk assessment and 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.

1.3 SFRA Objectives

The objectives of the Level 2 SFRA are to:

- 1 Undertake site-specific flood risk analysis for the site identified using the latest available flood risk data, thereby assisting the Council in applying the Exception Test to its proposed site options in preparation of its Local Plan.
- 2 Using available data, provide information and a comprehensive set of maps presenting flood risk from all sources for each site option.
- 3 Where the Exception Test is required, provide recommendations for making the site safe throughout its lifetime.
- 4 Consider most recent policy and legislation in the NPPF, PPG and LLFA Developer Guidance.
- 5 Undertake strategic analysis of the catchments within the Bassetlaw Local Plan area.

1.4 Context of the Level 2 Assessment

The **Bassetlaw District Level 1 SFRA** was undertaken by JBA Consulting and published in January 2019. This report appraised flood risk from all sources within Bassetlaw District.

Currently, the **Core Strategy** and **Development Plan Documents**, adopted in December 2011, sets out the vision for change in Bassetlaw and policies to achieve this vision. The Council is currently developing a **Local Plan** which will replace the Core Strategy and cover the period 2018-2037. A second consultation on the draft local plan was completed in November 2020 and once adopted, this will become the principal statutory development plan document for the area.

JBA Consulting were provided with a list of sites for Level 2 assessment from Bassetlaw District Council. In total, 14 sites have been assessed for this Level 2 SFRA.

This SFRA does not cover sites in Worksop Town Centre. A separate Level 2 SFRA will be prepared later in 2021 to support the Worksop Central Development Plan Document (DPD) that will cover those sites.

1.5 Consultation

SFRAs should be prepared in consultation with other Risk Management Authorities (RMAs). The following parties, external to Bassetlaw District Council have been consulted during the preparation of the Level 2 SFRA:

- Nottinghamshire County Council (LLFA)
- Environment Agency
- Canal & River Trust
- Severn Trent Water
- Internal Drainage Boards (IDBs)
 - Isle of Axholme & North Nottinghamshire Water Level Management Board
 - Trent Valley IDB
 - Scunthorpe & Gainsborough Water Management Board
- Neighbouring Authorities including:
 - Bolsover District Council
 - Doncaster District Council
 - Mansfield District Council
 - Newark and Sherwood District Council
 - North Lincolnshire Council
 - Rotherham District Council
 - West Lindsey District Council

1.6 How to Use this Report

Table 1-1 SFRA User Guide

Section	Contents	How to use
1. Introduction	Outlines the purpose and objectives of the Level 2 SFRA.	For general information and context.
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. Planning policy for flood risk management	Provides an overview of both national and existing Local Plan policy on flood risk management.	Users should use this section to understand and follow the steps required for the Sequential and Exception Tests.
4. Impact of climate change	Outlines the latest climate change guidance published by the Environment Agency and how this was applied to the SFRA. Sets out how developers should apply the guidance to inform site-specific Flood Risk Assessments.	This section should be used to understand the climate change allowances for a range of epochs and conditions, linked to the vulnerability of a development.
5. Sources of information used in preparing the Level 2 SFRA	Summarises the data used in the Level 2 assessments and GeoPDF mapping.	Users should refer to this section in conjunction with the summary tables and GeoPDF mapping to understand the data presented. Developers should refer back to this section when understanding requirements for a site-specific FRA.
6. Level 2 Assessment Methodology	Summarises the sites requiring 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.
7. Flood risk management requirements for developers	Identifies the scope of the assessments that must be submitted in FRA's 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 FRA's and what conditions/ guidance documents should be followed. Developers should also refer to the L1 SFRA for further information on flood mitigation options.
8. Surface water management and SuDS	An overview of any specific local standards and guidance for Sustainable Drainage Systems (SuDS) from the Lead Local Flood Authority, Severn Trent Water and the water sector. Refers back to relevant sections in the L1 SFRA for information on SuDS and surface water management.	Developers should use this section to understand what national, regional and local SuDS standards are applicable. Hyperlinks are provided. Developers should also refer to the L1 SFRA for further information on types of SuDS, the hierarchy and management trains information.
9. Cumulative impact of development and strategic solutions	Makes policy recommendations regarding the cumulative impact of development on flood risk for the catchments within the Bassetlaw Local Plan area.	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.

10. 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 provide an overview of the Level 2 assessment. Planners should use this section to identify which potential site allocations have the least risk of flooding. Developers should refer to the Level 1 SFRA recommendations when considering requirements for site-specific assessments.
Appendix A: Level 2 Assessment - Site Summary Tables	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.	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.
Appendix B: Mapping	Mapping for each Level 2 assessed site showing flood risk at and around the site.	Planners and developers should use these maps in conjunction with the site summary tables to understand the nature and location of flood risk.
Appendix C: Modelling summary	Provides a summary of the modelling work undertaken to inform the flood risk to sites.	For technical background information.
Appendix D. Bassetlaw District Council's Statement on the Sequential Test and the Worksop Development Plan Document	Provides a statement of the Council's strategic aims and plan for the regeneration of Worksop town centre.	For information when applying the Sequential Test and/ or considering sites in Worksop Town Centre.

1.7 SFRA Study Area

Bassetlaw District covers an area of approximately 63,780ha and has a population of approximately 117,459¹.

Bassetlaw is the northernmost District within Nottinghamshire, lying to the north of Nottingham, between Sheffield and Lincoln. There are two main urban areas within the study area, Worksop, in the West of the district, and Retford in the centre. The remainder of the district is predominantly rural with a number of smaller towns and villages such as Tuxford and Harworth spread throughout. The district contains over 10,000 ha of forest and over 300 protected wildlife sites. To the north of Bassetlaw, the Idle lowlands are characterised by gently undulating arable landscape, with areas to the east of Retford having a rich coal mining heritage. The Trent and Idle Washlands offer fertile farming and Bassetlaw has a generous historic parkland such as Clumber Park and Welbeck Estate.

¹ Office for National Statistics. Estimates of the population for the UK, England and Wales, Scotland and Northern Ireland. Mid-2019: April 2020 Local Authority District Codes.
<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesandscotlandandnorthernireland>

The map below, Figure 1-1, shows the Bassetlaw study area location in the context of the UK and also with its' neighbouring authorities, North Lincolnshire, West Lindsey, Newark & Sherwood, Bolsover, Mansfield, Rotherham, and Doncaster.

The principal watercourse within the study area include:

- River Idle
- River Ryton
- River Poulter
- River Trent
- Chesterfield Canal
- North Beck
- Wheatley Beck
- Redborough Beck

Tributaries of these watercourses include smaller ordinary watercourses and some unnamed and named drains including Catchwater Drain and Seymour Drain. There are also a number of ponds and lakes within the study area.

Figure 1-1 Overview Map of Study Area and Neighbouring Authorities

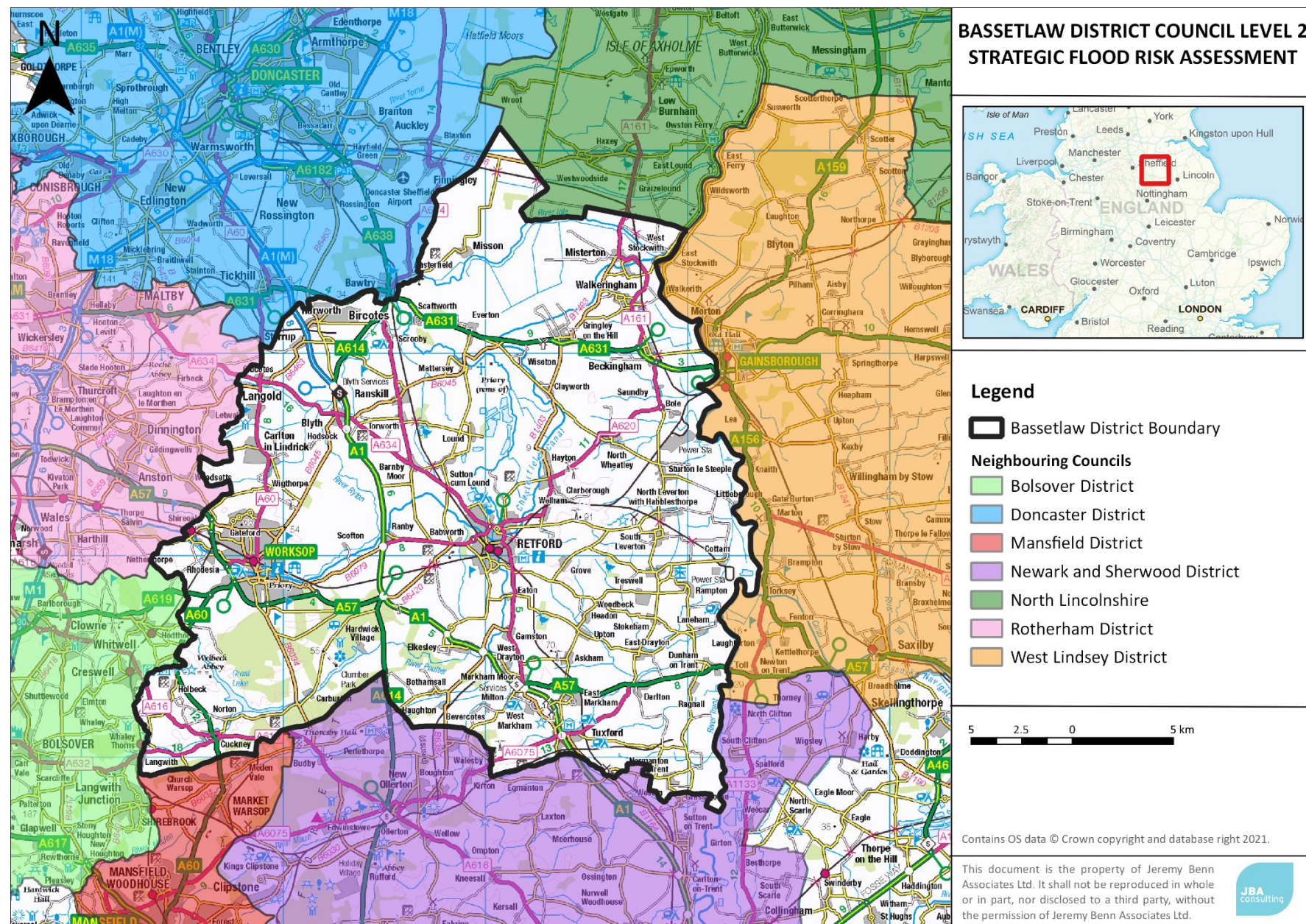
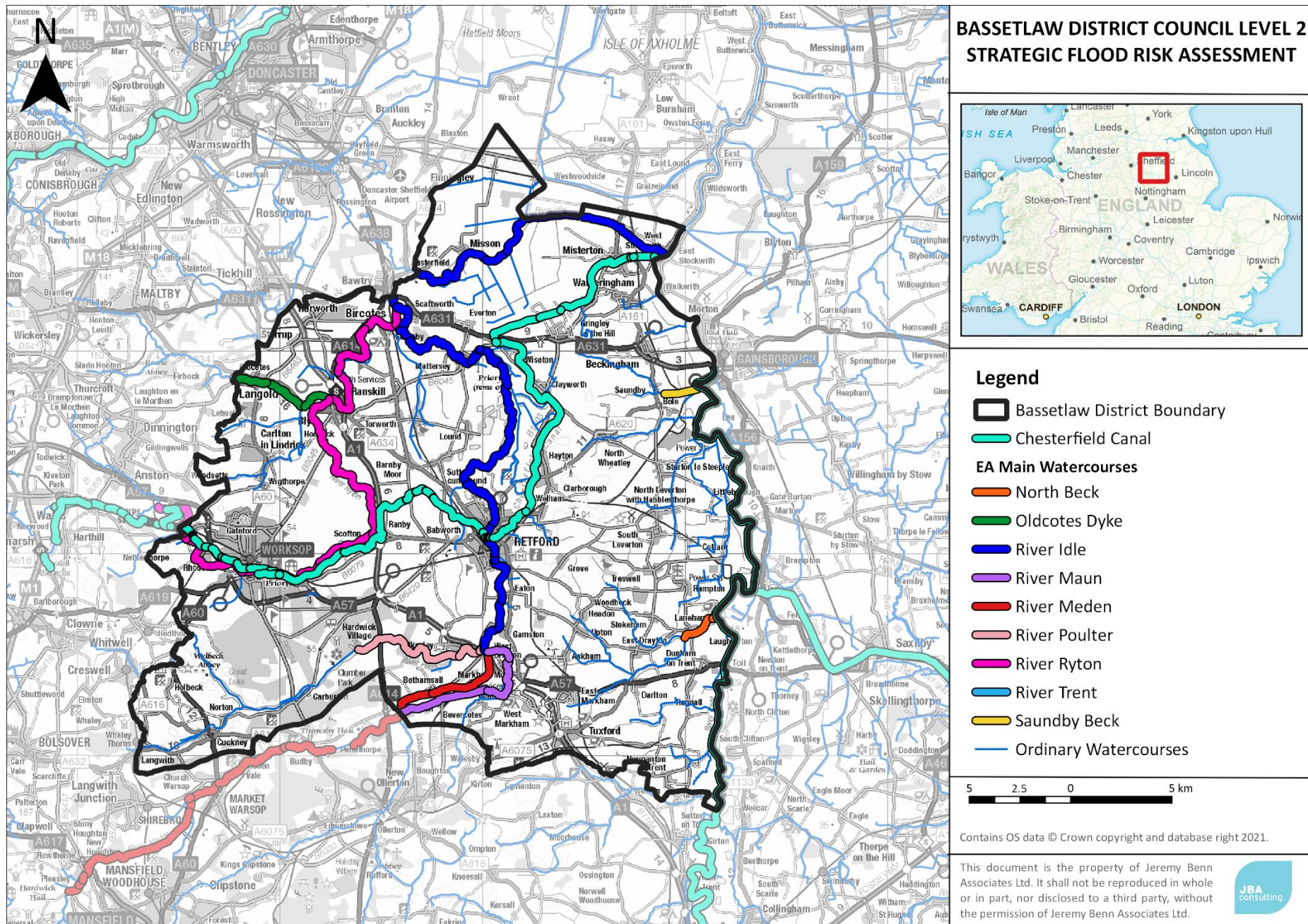


Figure 1-2 Key watercourses in the Bassetlaw District study area



2 The Planning Framework and Flood Risk Policy

2.1 Introduction

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

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

2.2 Roles and Responsibilities for Flood Risk Management

There are a number of different organisations in and around Bassetlaw that have responsibilities for flood risk management, known as Risk Management Authorities (RMAs). These are shown below in Table 2-1, with a summary of their responsibilities.

It is important to note that land and property owners are responsible for the maintenance of watercourses either on or next to their properties. Property owners are also responsible for the protection of their properties from flooding. More information can be found in the Environment Agency publication [Owning a Watercourse](#) (2018).

When it comes to undertaking works to reduce flood risk, the Environment Agency and Nottinghamshire County Council as LLFA do have powers, but limited resources must be prioritised and targeted to where they can have the greatest effect.

Table 2-1 Roles and Responsibilities for Flood Risk Management

Risk Management Authority	Strategic Level	Operational Level	Planning Role
Environment Agency	<ul style="list-style-type: none"> Strategic overview for all sources of flooding National Strategy Reporting and general supervision 	<ul style="list-style-type: none"> Main rivers Reservoirs 	<ul style="list-style-type: none"> Statutory consultee for development in Flood Zones 2 and 3 for coastal and fluvial extents
Nottinghamshire County Council - Lead Local Flood Authority (LLFA)	<ul style="list-style-type: none"> Preliminary Flood Risk Assessment Local Flood Risk Management Strategy 	<ul style="list-style-type: none"> Surface Water Groundwater Ordinary Watercourses (consenting and enforcement) Ordinary watercourses (works) 	<ul style="list-style-type: none"> Statutory consultee for all major developments
Bassetlaw District Council - Local Planning Authority (LPA)	<ul style="list-style-type: none"> Local Plans as Local Planning Authorities 	<ul style="list-style-type: none"> Determination of Planning Applications as Local Planning Authorities Managing open spaces under 	<ul style="list-style-type: none"> As left

Risk Management Authority	Strategic Level	Operational Level	Planning Role
		Council ownership	
Internal Drainage Boards: <ul style="list-style-type: none"> <i>Trent Valley</i> <i>Isle of Axholme and North Nottinghamshire</i> <i>Doncaster East</i> 	<ul style="list-style-type: none"> Water level management and environmental conservation 	<ul style="list-style-type: none"> Permissive powers for water level management Ordinary Watercourses within Internal Drainage Districts 	<ul style="list-style-type: none"> Non-statutory consultee Other statutory powers to determine development suitability
Water Companies: <ul style="list-style-type: none"> <i>Anglian Water</i> <i>Severn Trent Water</i> 	<ul style="list-style-type: none"> Asset Management Plans supported by Periodic Reviews (business cases) Develop Drainage and Wastewater management plans 	<ul style="list-style-type: none"> Public sewers 	<ul style="list-style-type: none"> Non-statutory consultee for all major developments. Also provides comments below this threshold where a specific request is received from Council' Adoption of SuDS under Sewerage Sector Guidance
Highways Authorities: Highways England - motorways and trunk roads Nottinghamshire County Council, Local Highway Authority – Other adopted roads	<ul style="list-style-type: none"> Highway drainage policy and planning 	<ul style="list-style-type: none"> Highway drainage Local Highway Authority is able to adopt some highway drainage features 	<ul style="list-style-type: none"> Internal planning consultee regarding highways and design standards and options

2.3 Relevant Legislation

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

- Flood Risk Regulations (2009)** transpose the EU Floods Directive (2000) into UK law and require the Environment Agency and LLFA's to produce Preliminary Flood Risk Assessments (PFRAs) and identify where there are nationally significant Flood Risk Areas. For the Flood Risk Areas, detailed flood maps and a Flood Risk Management Plan are produced. This is a six-year cycle of work and the second cycle started in 2017.
- Town and County Planning Act (1990), Water Industry Act (1991), Land Drainage Act (1991)**, Environment Act (2005) and **Flood and Water Management Act (2010)** – as amended and implanted via secondary legislation. These set out the roles and responsibilities for organisations that have FRM role.

- **Land Drainage Act (1991)** and **Environmental Permitting Regulations (2016)** define where developers need to apply for additional permission (and Planning Permission) to undertake works to an ordinary watercourse or Main River.
- **Water Environment Regulations (2017)** transpose the European Water Framework Directive (2000) into law, requiring the Environment Agency to produce River Basin Management Plans (RBMPs). These aim to ensure that the water quality of aquatic ecosystems, riparian ecosystems and wetlands reach 'good status'.
- Other environmental legislation such as the Habitats Directive (1992), Environmental Impact Assessment Directive (2014) and Strategic Environmental Assessment Directive (2001) also apply as appropriate to strategic and site-specific developments to guard against environmental damage.
- Note that secondary UK legislation implementing EU Directives such as the Flood Risk Regulations and Water Environment Regulations are subject to repeal/ amendment following the UK exit from the EU. At the time of publishing this report the references here were correct.

2.4 Relevant Flood Risk Policy and Strategy Documents

Table 2-2 summarises some of the relevant national, regional and local flood risk policy and strategy documents and how these apply to development and flood risk. There are hyperlinks to the documents in the table. These documents may:

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

Table 2-2 National, Regional and Local Flood Risk Guidance, Policy and Strategy Documents

Level	Document, lead author and date	Information	Policy and Measures	Development Design Requirements	Next Update Due
National	Flood and Coastal Management Strategy (Environment Agency) 2020	No	Yes	No	Due to be reviewed in 2026
National	National Planning Policy Framework and Guidance (MCHLG) 2018/2015	No	No	Yes	
National	Building Regulations Part H (MCHLG) 2010	No	No	Yes	-
National	Sewerage Section Guidance (UK Water) 2020	Yes	No	Yes	
Regional	Humber river basin district river basin management plan (Environment Agency) 2016	No	Yes	No	Due to be reviewed in 2021
Regional	Climate Change Guidance for Flood Risk Assessment (Environment Agency) 2020	No	No	Yes	Due to be reviewed in 2021
Regional	SuDS Design Manual (Anglian Water)	Yes	No	Yes	
Local	Bassetlaw District Level 1 Strategic Flood Risk Assessment (JBA Consulting) 2019	Yes	No	No	-
Local	Bassetlaw Core Strategy Bassetlaw District Council (2011)	Yes	Yes	Yes	To be superseded by the Bassetlaw Local Plan
Local	Preliminary Flood Risk Assessment Report & 2017 Addendum Nottinghamshire County Council (2011)	Yes	No	No	Due to be reviewed in 2023
Local	Nottinghamshire Local Flood Risk Management Strategy Nottinghamshire County Council 2016	Yes	Yes	Yes	Update to be published 2021

Level	Document, lead author and date	Information	Policy and Measures	Development Design Requirements	Next Update Due
Local	<p>Nottinghamshire County Council's Guidance Note on the Validation Requirements for Planning Applications</p> <p>Nottinghamshire County Council (2019)</p>	Yes	Yes	Yes	-

2.5 Relevant Flood Risk Management Studies and Documents

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

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

The emphasis of The Strategy is on developing resilient places and communities. The Strategy has been split into three high level ambitions: climate resilient places, today's growth and infrastructure resilient in tomorrow's climate, and a nation ready to respond and adapt to flooding and coastal change. Measures include:

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

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

1. Upgrading and expanding flood defences and infrastructure across the country,
2. Managing the flow of water to both reduce flood risk and manage drought,
3. Harnessing the power of nature to not only reduce flood risk, but deliver benefits for the environment, nature, and communities,
4. Better preparing communities for when flooding and erosion does occur, and

5. Ensuring every area of England has a comprehensive local plan for dealing with flooding and coastal erosion.

2.6 LLFAs, Surface Water and SuDS

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

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

Nottinghamshire County Council's SuDS requirements for new developers are set out in the **Nottinghamshire County Council's Guidance Note on the Validation Requirements for Planning Applications**.

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

2.7 Surface Water Management Plans

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location. SWMPs are undertaken, when required, by LLFA's in consultation with key local partners who are responsible for surface water management and drainage in their area. SWMPs establish a long-term action plan to manage surface water in an area and are intended to influence future capital investment, drainage maintenance, public engagement and understanding, land-use planning, emergency planning and future developments. There are no known SWMPs in the Bassetlaw area.

2.8 Updated Strategic Flood Risk Assessment Guidance

There was an update to the '**How to prepare a Strategic Flood Risk Assessment guidance**' in August 2019, which had some key additions to both Level 1 and Level 2 assessments. The Level 2 assessment is undertaken in accordance with this guidance.

3 Planning Policy for Flood Risk Management

3.1 National Planning Policy Framework and Guidance

The revised National Planning Policy Framework (**NPPF**) was published in February 2019, replacing the 2012 version. The NPPF sets out Government's planning policies for England. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions. The NPPF defines Flood Zones, how these should be used to allocate land and flood risk assessment requirements. The NPPF states that:

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

Planning Practice Guidance on flood risk was published in March 2014 and sets out how the policy should be implemented. **Diagram 1 in the PPG** sets out how flood risk should be considered in the preparation of Local Plans.

3.2 The Risk Based Approach

The NPPF takes a risk-based approach to development in flood risk areas. A risk-based approach sets out requirements in a way that is proportionate to the risk present. Therefore, in the context of a strategic flood risk assessment, recommendations made are proportionate to the level of risk present on site. This risk-based approach informs the Sequential test set out in 3.4 below.

3.3 The Flood Zones

The definition of the Flood Zones is provided below in Table 3-1. The Flood Zones described in the table below depict the flooding from rivers and the sea. The Flood Zones do not consider defences. This is important for planning long term developments as long-term policy and funding for maintaining flood defences over the lifetime of a development may change over time.

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

Table 3-1 Flood Zone Summary – Flooding from Rivers and Sea

Zone	Probability	Description
Zone 1	Low	<ul style="list-style-type: none">This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1% AEP).All land uses are appropriate in this zone.For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment.
Zone 2	Medium	<ul style="list-style-type: none">This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1% AEP) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1% – 0.5% AEP) in any year.Essential infrastructure, water compatible infrastructure, less

Zone	Probability	Description
		<p>vulnerable and more vulnerable land uses (as set out by NPPF) as appropriate in this zone. Highly vulnerable land uses are allowed as long as they pass the Exception Test.</p> <ul style="list-style-type: none"> All developments in this zone require an FRA.
Zone 3a	High	<ul style="list-style-type: none"> This zone comprises land assessed as having a greater than 1 in 100 annual probability of river flooding (>1.0% AEP) or a greater than 1 in 200 annual probability of flooding from the sea (>0.5% AEP) in any year. Developers and the local authorities should seek to reduce the overall level flood risk, relocating development sequentially to areas of lower flood risk and attempting to restore the floodplain and make open space available for flood storage. Water compatible and less vulnerable land uses are permitted in this zone. Highly vulnerable land uses are not permitted. More vulnerable and essential infrastructure are only permitted if they pass the Exception Test. All developments in this zone require an FRA.
Zone 3b	Functional Floodplain	<ul style="list-style-type: none"> This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone in discussion with the LPA and the Environment Agency. The identification of functional floodplain should take account of local circumstances. Only water compatible and essential infrastructure are permitted in this zone and should be designed to remain operational in times of flood, resulting in no loss of floodplain storage, no impediment to water flows and no increase in flood risk elsewhere. All developments in this zone require an FRA.

3.4 The Sequential Test

Firstly, land at the lowest risk of flooding and from all sources should be considered for development. A test is applied called the 'Sequential Test' to do this. Information contained in this SFRA is used to assess potential development sites against the EA's Flood Map for Planning flood zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented, and evidence used to support decisions recorded.

In addition, the risk of flooding from other sources and the impact of climate change must be considered when considering which sites are suitable to allocate.

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

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

The District Council statement on the intended area of search for the Sequential Test is set out in Appendix D.

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

Table 3 of the PPG shows whether, having applied the Sequential Test first, that vulnerability of development is suitable for that Flood Zone and where further work is needed. Table 3-2 below shows how site allocation is determined by the flood zone.

Table 3-2 Local Plan Sequential Approach to Site Allocation

Development location	Appropriateness for site allocation
Flood Zone 1	Appropriate for allocation.
Flood Zone 2	Appropriate for allocation if highly vulnerable development can be located in Flood Zone 1.
Flood Zone 3a	Appropriate for allocation if: <ul style="list-style-type: none"> highly vulnerable development is located in Flood Zone 1 or 2. can demonstrate that there are wider strategic planning objectives for the development in high risk areas. can demonstrate that that development would remain safe and not increase the flood risk elsewhere.
Flood Zone 3b	Not appropriate for development (except water compatible infrastructure such as amenity, biodiversity and public open space, and essential infrastructure passing the Exception Test).

3.5 The Exception Test

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

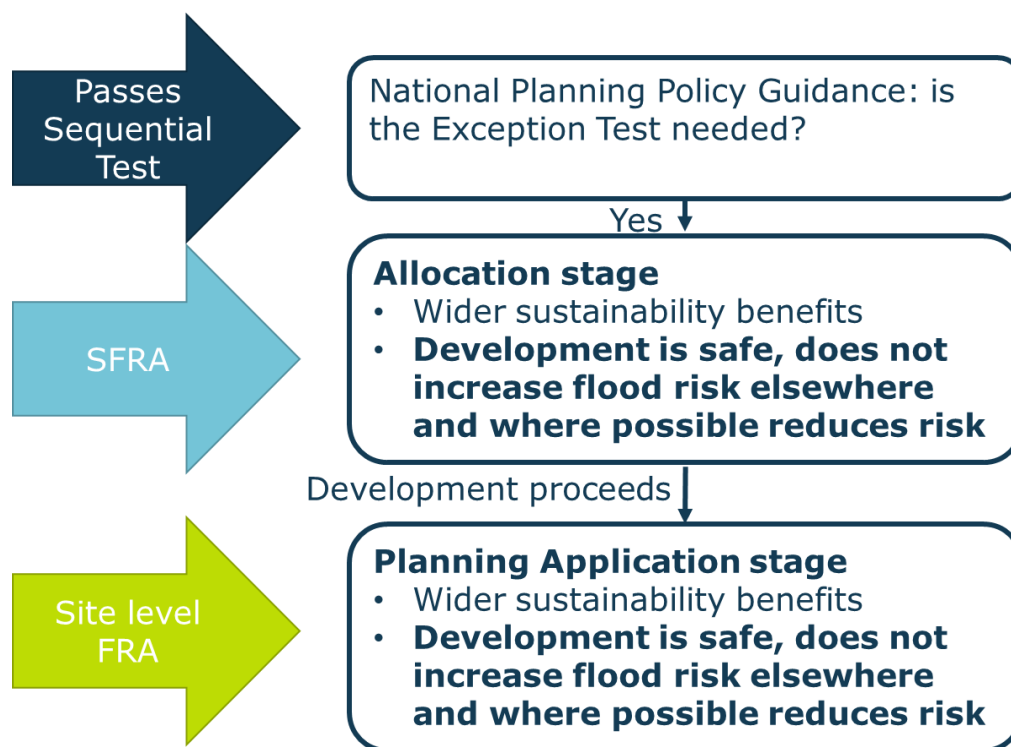
The Exception Test should only be applied following the application of the Sequential Test. It applies in the following instances:

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

Figure 3-1 below shows what the Exception Test informs at each level of assessment. For sites allocated within the Local Plan, the Local Planning Authority should use the information in this SFRA to inform the Exception Test. At planning application stage, the Developer must design the site such that is appropriate flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. This should demonstrate that the site will still pass the flood risk element of the Exception Test based on the detailed site level analysis.

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

Figure 3-1 The Exception Test



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

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

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

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

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

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

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

3.6 Making a Site Safe from Flood Risk over its Lifetime

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

- The actual risk is the risk to the site considering existing flood mitigation measures. The fluvial 1% AEP chance flood in any year event (and 0.5% AEP chance for tidal) is a key event to consider because the National Planning Policy Guidance refers to this as the 'design flood' against which the suitability of a proposed development should be assessed and mitigation measures, if any, are designed.
- Safe access and egress should be available during the design flood event. Firstly, this should seek to avoid areas of a site at flood risk. If that is not possible then access routes should be located above the design flood event levels. Where that is not possible, access through shallow and slow flowing water that poses a low flood hazard may be acceptable.

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

- Residual risk is the risk that remains after the effects of flood defences have been considered and/ or from a more severe flood event than the design event. The residual risk can be:
- The effects of an extreme 0.1% AEP chance flood in any year event. Where there are defences this could cause them to overtop, which may lead to failure if this causes them to erode, and/ or
- Structural failure of any flood defences, such as breaches in embankments or walls.

Flood resistance and resilience measures should be considered to manage any residual flood risk by keeping water out of properties and seeking to reduce the damage it does, should water enter a property. Emergency plans should also account for residual risk, e.g. through the provision of flood warnings and a flood evacuation plan where appropriate. These plans should consider requirements of the ADEPT guidance on the preparation of the Flood Emergency Plans. Where emergency plans are required, suitability of the site and appropriate use of the site should be considered.

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

3.7 The Sequential Test and Exception Test and Individual Planning Applications

3.7.1 The Sequential Test

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

- A strategic allocation and the test has already been carried out by the LPA, or
- A change of use (except to a more vulnerable use), or
- A minor development (householder development, small non-residential extensions with a footprint of less than 250m²), or
- A development in Flood Zone 1 unless there are other flooding issues in the area of the development (i.e. surface water, ground water, sewer flooding).

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

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

The sources of information on reasonably available sites may include:

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

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

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

3.7.2 The Exception Test

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

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

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

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

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

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

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

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

- Flood warning and evacuation procedures, including whether the developer would increase the pressure on emergency services to rescue people during a flood event; and
- Any funding arrangements required for implementing measures.

4 The Impact of Climate Change

4.1 Introduction

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 how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. NPPF and PPG describe how FRA's should demonstrate how flood risk will be managed over the lifetime of the development, taking climate change into account.

The Environment Agency's River Idle model has recently been updated to a full 1D-2D model with outputs which include the latest Climate Change allowances based on the latest UK guidance. Bassetlaw District Council has undertaken modelling for the Retford Beck which also includes Climate Change outputs based on the latest available guidance. Additional modelling for the Tidal Trent and River Idle along North Road was undertaken by JBA as part of this study.

For other models, Climate Change uplifts have not been applied and instead Flood Zone 2 has been used as a proxy. Both defended and undefended scenarios have been modelled and the undefended scenarios have been used to assess the risk of flooding.

4.2 Revised Climate Change Guidance

The Environment Agency published **updated climate change guidance** in July 2020 on how allowances for climate change should be included in both strategic and site-specific FRAs. The guidance adopts a risk-based approach considering the vulnerability of the development. Whilst the guidance was updated in 2020, fluvial allowances are still to be updated from those in the original 2016 guidance.

In 2018, the government published new UK Climate Projections (UKCP18). The Environment Agency are currently using these to further update their climate change guidance for new developments with regards to updated fluvial and rainfall allowances. Developers should check on the government website for the latest guidance before undertaking a detailed Flood Risk Assessment. At the time of writing this report, this was likely to be due in mid-2021, but is not yet released.

Note that the method in the SFRA was based on the Environment Agency climate change guidance update from December 2019. In late July 2020 the Environment Agency updated their guidance to say that the sensitivity of significant urban extensions and new settlements to the extreme H++ scenario should be considered in SFRAs. The H++ scenario has not been considered for sites within this study; however, this scenario should be modelled as part of a site-specific FRA for the proposed Bassetlaw Garden Village.

Within each site-specific summary table, sensitivity to climate change has been assessed and recommendations for future site-specific assessments made. Associated interactive mapping also shows how climate change could impact the flood extents and depths across each site, and we have also included the Higher Central (30%) allowance for 1% AEP in the mapping. The council are also advised to encourage developers to account for the H++ scenario for significant urban extensions and new settlements for the 1% AEP design event when master planning and ensure a development is resilient to flooding in the extreme 0.1% AEP event with the H++ scenario.

4.3 Applying the Climate Change Guidance

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

- The vulnerability of the development – see the **PPG**
- The likely lifetime of the development – in general 75 years is used for commercial development and 100 for residential, but this needs to be confirmed in an FRA
- The River Basin that the site is in – Bassetlaw is situated in the Humber River Basin District.

- Likely depth, speed and extent of flooding for each climate change allowance 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

4.3.1 Relevant Allowances for Bassetlaw

Table 4-1 shows the peak river flow allowances and Table 4-2 shows the peak rainfall intensity allowances that apply to Bassetlaw.

Table 4-1 Peak River Flow Allowances by River Basin District

River Basin District	Allowance category	Total potential change anticipated for '2020s' (2015 to 39)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Humber	Extreme (H++)	20%	35%	65%
	Upper end	20%	30%	50%
	Higher central	15%	20%	30%
	Central	10%	15%	20%

Table 4-2 Peak Rainfall Intensity Allowance in Small and Urban Catchments

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

4.4 Representing Climate Change in a Level 2 SFRA

Appendix C summarises the flood modelling work used in the Level 2 SFRA and how the latest climate change allowances have been applied. To take account of rising sea levels, appropriate increases to the tidal level along the Tidal Trent reach was considered alongside increases in fluvial flows.

It is recommended that the impact of climate change on a proposed site is considered as part of a detailed Flood Risk Assessment, using the percentage increases which relate to the proposed lifetime and the vulnerability classification of the development as described in this Chapter.

4.5 Adapting to Climate Change

The PPG sections on climate change contain information and guidance for how to identify suitable mitigation and adaptation measure in the planning process to address the impacts of climate change. Examples of adapting to climate change include:

- Considering future climate risks when allocating development sites to ensure risks are understood over the development's lifetime.
- Considering the impact of and promoting design responses to flood risk and coastal change for the lifetime of the development.

- Considering availability of water and water infrastructure for the lifetime of the development and design responses to promote water efficiency and protect water quality.
- Promoting adaptation approaches in design policies for developments and the public realm for example by building in flexibility to allow future adaptation if needed, such as setting new development back from watercourses; and
- Identifying no or low-cost responses to climate risks that also deliver other benefits, such as green infrastructure that improves adaptation, biodiversity and amenity, for example by leaving areas shown to be at risk of flooding as public open space.

5 Sources of Information Used in Preparing the Level 2 SFRA

5.1 Data Used to Inform the SFRA

This chapter discusses all the datasets used in the Level 2 SFRA to assess the sites against flood risk. Several different sets of data may have been used to inform the extent, depth, hazard and velocity for each site. Appendix C contains a summary of the modelling data used in the Level 2 SFRA.

Table 5-1 Overview of data used for the Bassetlaw Level 2 SFRA

Flood Source	Data Description	Data Source
Historic (All Sources)	Historic Flood Map and Recorded Outlines	Environment Agency
Historic (All Sources)	Bassetlaw District Level 1 SFRA - 2019	Bassetlaw District Council JBA Consulting
Historic (All Sources)	Historic flood incidents/records	Nottinghamshire County Council LLFA Severn Trent Water Anglian Water
Fluvial	Flood Map for Planning Risk of Flooding from Rivers and Sea	Environment Agency
Fluvial	River Ryton Model (2008) River Idle Model (2020)	Environment Agency
Fluvial	River Ryton 1d-2d Model (2009) Retford Beck Model (2019)	Bassetlaw District Council
Tidal	Trent Tidal Model (2015)	Environment Agency
Fluvial	Bassetlaw Level 2 SFRA strategic modelling (North Road)	Bassetlaw District Council
Surface Water	Risk of Flooding from Surface Water dataset	Environment Agency
Groundwater	Areas Susceptible to Groundwater Flooding dataset Bedrock geology/superficial deposits dataset	Environment Agency
Sewer	HFRR Register Historic flooding records	Anglian Water Severn Trent Water
Reservoir	Risk of Flooding from Reservoirs dataset	Environment Agency

5.2 Flood Zones

The data used to prepare the fluvial mapping for this study is based on the results from hydraulic models, either provided by the Environment Agency or prepared for the purposes of this SFRA.

Fluvial and tidal mapping is described using annual exceedance probability (AEP). This is the probability of a flood event occurring in any year and is expressed as a percentage.

5.3 Climate Change

The mapping 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.

This would include the Central (1% AEP +20%), Higher Central (1% AEP +30%) and Upper End (1% AEP +50%) climate change allowances, for the Humber basin's 2080s epoch. The sensitivity to the extreme H++ scenario should be assessed for significant urban extensions and new settlements.]

For allowances relating to surface water, developers should refer to **Table 2** of the government's published climate change allowances.

Sea level rise allowances should be taken using the Upper End estimates from **Table 3** of the governments published climate change allowances.

5.4 Surface Water

Mapping of surface water flood risk in Bassetlaw District has been taken from the Environment Agency's Risk of Flooding from Surface Water (RoFfSW) mapping, which is a slightly more detailed resolution than that published online by the Environment Agency. Surface water flood risk is subdivided into the following four categories:

- **High:** A chance of flooding greater than 3.3% AEP (1 in 30 year).
- **Medium:** A chance of flooding between 1% AEP (1 in 100 year) & 3.3% AEP (1 in 30 year).
- **Low:** A chance of flooding between 0.1% AEP (1 in 1,000 year) & 1% AEP (1 in 100 year).
- **Very Low:** A chance of flooding of less than 0.1% (1 in 1,000 year).

The results should be used for high level assessments such as SFRA's 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.

5.5 Groundwater

Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater (AStGWF) dataset. The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and does not take account of the chance of flooding from groundwater rebound.

This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

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

5.6 River Networks

Main Rivers are represented by the Environment Agency's Statutory Main River layer. Ordinary Watercourses are represented by the Environment Agency's Detailed River Network 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. They should also be aware of easements that will affect development over and adjacent to watercourses which may affect the area of developable land.

5.7 Flood Warnings

Flood Warning and Flood Alert Areas are represented by the EA's GIS datasets.

5.8 Reservoirs

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

5.9 Sewer Flooding

Historical incidents of flooding are detailed by Anglian Water and Severn Trent Water in 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. This data was used to describe any sewer flooding in the Level 2 summary tables. Due to licencing and confidentiality restrictions, sewer data has not been represented on the mapping.

5.10 Historic Flooding

Historic flooding was assessed using the Environment Agency's Historic Flood Map and Recorded Flood Outlines datasets. In addition, historic flooding records have been supplied by Nottinghamshire County Council as LLFA and Local Highways Authority.

5.11 Canal Flooding

There is one canal within Bassetlaw District, the Chesterfield Canal. The 2011 Nottinghamshire Preliminary Flood Risk Assessment shows that there have been historic incidences of breach and overtopping on the Chesterfield Canal in Bassetlaw District. Breach modelling undertaken as part of the Level 1 SFRA has been used to inform this study.

5.12 Flood Defences

Flood defences are represented by Environment Agency's Asset Information Management System (AIMS) Spatial Defences data set. Their current condition and standard of protection are based on those recorded in the tabulated shapefile data. None of the sites being assessed are formally protected by a flood defence.

5.13 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.

Information on tidal breach modelling to be included in the final report.

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

5.14 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 and surface water 1% AEP and 0.1% AEP events. 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 or 1% AEP plus climate change events). Any development should be designed such that it is resilient to the extreme 0.1% AEP plus climate change event and this should be considered for a site-specific Flood Risk Assessment.

Depth, velocity and hazard information was derived from 2D generalised modelling, or detailed modelling where this exists.

The depth, hazard and velocity of the 1% AEP surface water flood event has 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 5-2.

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

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

As part of a site-specific FRA, developers may 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 as part of a site-specific FRA, using the relevant climate change allowance based on the type of development and its associated vulnerability classification. Not all information is known at the strategic scale. If tidal breach modelling is required, then the relevant 0.5% AEP plus climate change event would apply.

5.15 Note of SuDS Suitability

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

The assessment is based on catchment characteristics and additional datasets such as the AStGWF map and British Geological Survey (BGS) Soil maps of England and Wales which allow for a basic assessment of the soil characteristics on a site by site basis. LIDAR data was used as a basis for determining the topography and average slope across each development site. Other datasets were used to determine other factors and 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 Figure 5-3. This assessment should not be used as a definitive guide as to which SuDS would be suitable but used as an indicative guide of general suitability. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 5-3 Summary of SuDS Categories

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

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

Developers should investigate and consider all options for SuDS and should demonstrate that SuDS are not appropriate where they are not implemented.

6 Level 2 Assessment Methodology

6.1 Sites Taken Forward to Level 2 Assessment

There are 18 sites that are currently being considered for allocation within Bassetlaw District. As confirmed by Bassetlaw District Council Planning Policy team following a site screening exercise, 14 sites were taken forward for Level 2 assessment. Screening was based on the % area of sites within existing EA flood zones, surface water flood extents and proximity to existing watercourses.

Table 6-1 Summary of present day risk to sites at Level 2 Assessment

Site code	Site location	FZ3b (%)	FZ3a (%)	FZ2 (%)	FZ1 (%)	RoFSW (%) 30yr	RoFSW (%) 100yr	RoFSW (%) 1,000yr
HS9	Former Elizabethan School, W Furlong	0	0	0	100	0	2	31
HS7	Trinity Farm	0	10	11	89	1	3	8
HS12	Station Road	0	0	0	100	0	0	0
HS10	St. Michael's View, Hallcroft Road	0	0	0	100	0	0	12
HS8	Milnercroft	0	0	0	100	6	14	54
HS2	Former Bassetlaw Pupil Referral Centre	0	0	0	100	5	12	34
HS6	Former Knitwear Factory, Retford Road	0	0	11	89	3	5	34
EM008	High Marnham Power Station	12	13	14	86	3	6	18
Cottam Power Station	Cottam Power Station	18	44	74	26	1	2	10
NP04	Land south of Ollerton Road	0	0	0	100	0	0	2
Bassetlaw Garden Village	Bassetlaw Garden Village	0	0	0	100	0	0	2
HS13	Ordsall (South)	0	1	2	98	1	3	11
SEM01	Apleyhead	0	0	0	100	0	1	2
HS3	Radford Street	0	0	0	100	0	0	1

Flood Zones quoted are based on those currently published by the Environment Agency. Where more detailed modelling is available this has been used to inform site summary tables, including highlighting any areas where model results differ from the published Flood Zones

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. For example: If 50% of a site is in the Flood Zones, taking each Flood Zone individually, 50% would be in Flood Zone 2 but say only 30% might be in Flood Zone 3a and only 10% in Flood Zone 3b. This would be displayed as stated above, i.e. the total % of that particular Flood Zone in that site. Flood Zone 1 is the remaining area of the site outside of Flood Zone 2, so Flood Zone 2 + Flood Zone 1 will equal 100%.

6.2 Site Summary Tables and Mapping

As part of the Level 2 SFRA, detailed site summary tables have been produced for the sites listed above. Table 6-2 below sets out the information included in site summary tables and the sources of data. The site summary tables can be found in Appendix A.

To accompany each site summary table, there is an Interactive Geo-PDF map in Appendix A, with all the mapped flood risk outputs per site. This is displayed centrally, with easy-to-use 'tick box' layers down the right-hand side and bottom of the mapping, to allow navigation of the data. The Level 2 Geo-PDF mapping as well as the study area wide PDF maps from the Level 1 SFRA identify communities, features, structures and properties affected by flood risk.

To use the Interactive Geo-PDF mapping, maps should be downloaded and opened using a PDF reader. The Geo-PDFs will not work opened in an internet browser.

Table 6-2 Contents of Level 2 SFRA site summary tables and maps

Content	Table	Map
Site information	✓	
Location of the site within the catchment	✓	
Existing drainage features	✓	✓
Fluvial flood risk	✓	✓
Coastal/ tidal flood risk	✓	✓
Surface water flood risk	✓	✓
Reservoir flood risk	✓	
Canals flood risk	✓	
Groundwater flood risk	✓	✓
Sewers flood risk	✓	
Flood history	✓	
Flood risk defences and assets	✓	✓ (Areas benefiting from defences and location of key defences)
Flood warning	✓	✓
Access and egress		
Climate change	✓	✓

Content	Table	Map
Broad-scale assessment of possible SuDS	✓	
Opportunities for wider sustainability benefits and integrated flood risk management	✓	
Exception Test	✓	
Requirements and guidance for site-specific Flood Risk Assessment	✓	
Key messages	✓	

7 Flood Risk Management Requirements for Developers

7.1 Introduction

The report provides a strategic assessment of flood risk in Bassetlaw. 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 further hydrological and hydraulic assessments of the site to verify flood extent (including latest climate change allowances), to inform the sequential approach within the site and prove, if required, whether the Exception Test can be satisfied.

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

7.2 Principles for New Developments

Apply the Sequential and Exception Tests

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

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

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

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

Developers should consult with the Environment Agency, Nottinghamshire County Council as LLFA and Anglian Water as the sewerage company, at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design, including the proposed foul and surface water drainage strategy and details of the adoption and maintenance of any SuDS features.

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

The SFRA can be used by developers to scope out what further detailed work is likely to be needed to inform a site-specific Flood Risk Assessment. At a site level, developers will need to check before commencing on a more detailed Flood Risk Assessment that they are using the latest available datasets. Developers should apply the 2020 Environment Agency climate change guidance, until updated guidance is available later in 2021³, and ensure the development has considered climate change adaptation measures.

² 'Windfall sites' is used to refer to those sites which become available for development unexpectedly and are therefore not included as allocated land in a planning authority's development plan.

³ Latest guidance is available at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

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

The Level 1 SFRA 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.

Consider and contribute to wider flood mitigation strategy and measures in Bassetlaw 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 they are contributing towards this vision.

7.3 Requirements for Site-Specific Flood Risk Assessments

7.3.1 When is an FRA Required?

Site-specific FRAs are required in the following circumstances:

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

An FRA may also be required for some specific situations:

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

7.3.2 Objectives of Site-Specific FRAs

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

- whether a proposed development will be at risk of flooding, from all sources, both now and in the future, taking into account climate change.
- whether a proposed development will increase flood risk elsewhere.
- whether the measures proposed to deal with the effects and risks are appropriate.
- the evidence, if necessary, for the local planning authority to apply the Sequential Test; and
- whether, if applicable, the development will be safe and pass the Exception Test.

FRAs should follow the approach recommended by the NPPF (and associated guidance) and guidance provided by the Environment Agency, Nottinghamshire County Council and Bassetlaw District Council. Guidance and advice for developers on the preparation of site-specific FRA's include:

- **Standing Advice on Flood Risk** (Environment Agency).
- **Flood Risk Assessment for Planning Applications** (Environment Agency).
- **Site-specific Flood Risk Assessment: CHECKLIST** (NPPF PPG, Defra).
- **Nottinghamshire County Council's Guidance Note on the Validation Requirements for Planning Applications** (Nottinghamshire County Council)

Guidance for local planning authorities for reviewing flood risk assessments submitted as part of planning applications has been published by Defra in 2015 – **Flood Risk Assessment: Local Planning Authorities**.

7.4 Local Requirements for Mitigation Measures

The Level 1 SFRA for Bassetlaw provides details on the following mitigation measures in Section 10.6 of the SFRA Report and should be referred to alongside this report:

- Site Layout and Design (10.6.1)
- Modification of ground levels (10.6.2)
- Raised Floor Levels (10.6.3)
- Development and Raised Defences (10.6.4)
- Developer Contributions (10.6.5)

7.4.1 Flood Storage Compensation

For any development (both major and minor), that results in built volume below the design flood level (1% AEP plus climate change flood level), mitigation shall be required for loss in floodplain storage volume. Flood storage compensation should be on a level for level and volume by volume basis. Any variation to this approach would be as a result of detailed technical discussions with either the Environment Agency or the LLFA.

7.4.2 Resistance and Resilience Measures

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

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

7.4.2.1 Resistance measures

Permanent Barriers: Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

Temporary Barriers: Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale, temporary snap on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

Community Resistance Measures: These include demountable defences that can be deployed by local communities to reduce the risk of water ingress to a number of properties. The methods require the deployment of inflatable (usually with water) or temporary quick assembly barriers in conjunction with pumps to collect water that seeps through the systems during a flood.

7.4.2.2 Resilience Measures

Flood resilient buildings are designed and constructed to reduce the impact of flood water entering the building. These measures aim to ensure no permanent damage is caused, the structural integrity of the building is not compromised and the clean up after the flood is easier. Interior design measures to reduce damage caused by flooding can include electrical circuitry installed at a higher level, non-return valves to prevent wastewater from being forced up through bathrooms, kitchens, and lavatories, and water-resistant materials for floors, walls, and fixtures.

7.5 Reducing Flood Risk from other Sources

Section 10.9 of the Level 1 SFRA Report discusses how to reduce flood risk from other sources, such as groundwater, surface water and sewer flooding.

7.6 Duration and Onset of Flooding

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

- The position of the site within a river catchment, with those at the top of a catchment likely to flood sooner than those lower down. The duration of flooding tends to be longer for areas in lower catchments.
- The 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- upon failure of defences, 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).
- Catchment geology. Chalk catchments take longer to respond than typical clay catchments for example.

The position of the wider site area in an upper/ mid catchment location has been taken into account to develop the following guidelines for the duration and onset of flooding.

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

7.6.1 Flood Warning and Emergency Planning

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

The NPPF (paragraph 163) requires site level Flood Risk Assessments to demonstrate that:

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

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

Certain sites will need emergency plans:

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

Emergency Plans will need to consider:

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

The Environment Agency and the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) have produced joint guidance on **flood risk emergency plans for new development** aimed at local authority planners to help identify when they should be asking for planning applications to be supported by flood risk emergency plans, and what should be included in them. It encourages local planning authorities to produce their own guidelines and set up local consultation arrangements to ensure emergency plans are fit-for-purpose and receive proper scrutiny. It also provides a framework for them to appraise emergency plans in the absence of such local arrangements.

8 Surface Water Management and SuDS

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

In April 2015, Nottinghamshire County Council as LLFA was made a statutory consultee on the management of surface water and, as a result, provides technical advice on surface water drainage strategies and designs put forward for major development proposals.

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

It is essential that developers consider sustainable drainage at an early stage of the development process – ideally at the master-planning stage. This will assist with the delivery of well designed, appropriate and effective SuDS.

8.2 Sustainable Drainage Systems

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

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

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

8.3 Natural flood management (NFM)

Natural flood management can work alongside other techniques such as SuDS to manage surface water flood risk within the catchment. Whilst some sites will be too small for these techniques to be appropriate, some natural flood management techniques could, where appropriate, be used in open space settings within large developments with a significant proportion of land at flood risk. NFM aims to store water in the landscape and slow the rate of runoff through features such as wetland creation, soil management and leaky dams.

8.4 Sources of SuDS Guidance

8.4.1 C753 CIRIA SuDS Manual (2015)

The **C753 CIRIA SuDS Manual** (2015) provides guidance on planning, design, construction and maintenance of SuDS. The manual is divided into five sections ranging from a high-level overview of SuDS, progressing to more detailed guidance with progression through the document.

8.4.2 Non-statutory Technical Guidance, Defra (March 2015)

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

8.4.3 A Guide to SuDS and Drainage in Nottinghamshire

The [Nottinghamshire County Council Guidance Note on the Validation Requirements for Planning Applications](#) provides guidance for developers and relevant professionals on the SuDS requirements within the study area. The guidance the planning, design and maintenance requirements for SuDS schemes with the aim of producing benefits for the environment and communities whilst enabling developers to achieve compliance with LLFA SuDS requirements to gain SuDS approval.

The document is intended to be complementary to the National Standard for SuDS (2015) and The SuDS Manual (CIRIA C753).

8.4.4 Severn Trent Sewer Adoption Guidance

Severn Trent Water has produced a [Sewer Adoption Guidance](#) providing general information and guidance for developers and relevant professionals on the design, installation and maintenance of sewers. The document is not intended to provide legal/regulatory or technical advice.

8.4.5 Water UK Sewerage Section Guidance (Design & Construction Guidance)

In April 2020, new sewerage adoption arrangements came into effect through the publication of the [Sewerage Sector Guidance](#). The old industry guidance on the design of sewers for adoption by the water industry has subsequently been replaced by the Design and Construction Guidance. In addition to updated guidance around pipes, manholes and pumping stations, the new document now includes information on SuDS', not present in the previous guidance. SuDS features included within the Design and Construction Guidance can now be adopted by water companies under S104 of the Water Industry Act 1991.

8.5 Other Surface Water Considerations

8.5.1 Groundwater Vulnerability Zones

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

The groundwater vulnerability maps should be considered when designing SuDS. Depending on the height of the water table at the location of the proposed development site, restrictions may be placed on the types of SuDS appropriate to certain areas. Groundwater vulnerability maps can be found on [Defra's interactive mapping](#).

8.5.2 Groundwater Source Protection Zones (GSPZ)

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

The majority of Level 2 assessment sites are in a Groundwater Source Protection Zone, as the River Trent is classed as Zone III Total Catchment SPZ.

8.5.3 Nitrate Vulnerable Zones

Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. Nitrate levels in waterbodies are affected by surface water runoff from surrounding agricultural land entering receiving waterbodies. The level of nitrate contamination will potentially influence the choice of SuDS and should be assessed as part of the design process. The NVZ coverage can be viewed on the [Environment Agency's online maps](#).

The definition of each NVZ is as follows:

- Groundwater NVZ – water held underground in the soil or in pores and crevices in rock, which has or could have if action is not taken, a nitrate concentration greater than 50mg/l.
- Surface water NVZ – areas of land that drain into a freshwater water body which has or could have if action is not taken, a nitrate concentration greater than 50mg/l.
- Eutrophic NVZ – bodies of water, mainly lakes and estuaries, that are or may become enriched by nitrogen compounds which cause a growth of algae and other plant life that unbalances the quality of the water and to organisms present in the water.

There are 11 Nitrate vulnerable zones which cover the entirety of Bassetlaw District.

Of these, 8 are surface water NVZs. And cover the majority of the District between them.

There is one groundwater NVZ which covers an extensive area from Nottingham to Doncaster. This covers most of Bassetlaw east of Retford.

There are two Eutrophic NVZ that within Bassetlaw District, covering a large area in the south east of the district.

9 Cumulative Impact of Development & Strategic Solutions

9.1 Introduction

Under the revised 2019 NPPF, strategic policies and their supporting Strategic Flood Risk Assessments (SFRAs), are required to 'consider cumulative impacts in, or affecting, local areas susceptible to flooding' (para. 156).

When allocating land for development, consideration should be given to the potential cumulative impact of the loss of floodplain storage volume. Whilst the loss of storage for individual developments may only have minimal impact on flood risk, the cumulative effect of multiple developments may be more severe. Conditions imposed by the Council should allow for mitigation measures so any increase in runoff as a result of development is properly managed and should not exacerbate flood risk issues, either within, or outside of the Council's administrative borders.

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

As part of the Bassetlaw Level 1 SFRA, a CIA was undertaken, identifying those areas of the district at greatest risk from the impacts of cumulative development. This work builds upon the assessment undertaken as part of the Bassetlaw Level One SFRA.

9.2 Findings from the Level 1 SFRA

A Cumulative Impact Assessment (CIA) was undertaken for the Level 1 SFRA. Initially, the assessment was undertaken using catchments as defined for the implementation of the Water Framework Directive, however owing to the size of these catchments in comparison to the developments and settlements in the area a further assessment was undertaken at a parish level.

The assessment identified three broad areas at most sensitive to the cumulative impacts of new development for which specific recommendations were made. These were:

- New Settlements
- Retford Beck
- Worksop & Retford
- Rural villages at higher risk of flooding, consisting of:
 - Carlton in Lindrick CP
 - Walkeringham CP
 - Clarborough and Welham CP
 - North Leverton with Habblessthorpe CP
 - Harworth Bircotes CP
 - Beckingham CP
 - East Markham CP
 - Treswell CP

Full recommendations from the previous assessment are available in the [Bassetlaw Level 1 SFRA](#).

9.3 Update to Level 1 CIA

Since the Level 1 analysis was undertaken, new information has become available which is relevant to the CIA. Namely, sites for development have been identified and additional flooding events have occurred since the Level 1 Assessment.

There were two significant flood events affecting properties within Worksop in November 2019 and January 2020. The November 2019 event caused internal flooding to 128 residential properties and 180 businesses. As these additional events are within an area already identified as most sensitive to the cumulative impacts of new development these do not affect the categorisation.

Local plan development allocation proposals and preferred and reasonable sites have been identified since the Level 1 Analysis. This consists of 18 sites proposed for allocation and 5 preferred/reasonable sites. Of these:

- 6 allocated sites and 4 preferred/reasonable sites are within Retford
- 7 allocated sites and 2 preferred/reasonable sites are within Worksop
- 3 sites (outside of Worksop/Retford) are significant new developments

Given the high concentration of sites within these two towns previously identified as high risk, these two towns will be taken forward for further analysis. Worksop and Retford parish boundaries are taken as the town boundaries for the purpose of this assessment. Recommendations for the entire Bassetlaw study area and those from the Level 1 SFRA remain applicable to those parishes not taken forwards.

9.4 Cross Boundary Considerations

The topography of the district means that a number of major watercourses such as the River Trent and River Idle flow through the study area and into neighbouring authorities. As such, future development, both within and outside Bassetlaw District can have the potential to affect flood risk to existing development and surrounding areas, depending on the effectiveness of SuDS and drainage implementation. The Bassetlaw area has boundaries with the following Local Authorities:

- Bolsover District
- Doncaster District
- Mansfield District
- Newark and Sherwood District
- North Lincolnshire
- Rotherham District
- West Lindsey District

No significant planned developments were found in neighbouring authorities near watercourses that flow into the study area, although there are some minor developments planned in North Anston, Doncaster District, upstream of Worksop. All developments are required to comply with the NPPF and demonstrate they will not increase flood risk elsewhere. Therefore, providing developments near watercourses in neighbouring authorities comply with the latest guidance and legislation relating to flood risk and sustainable drainage, they should result in no increase in flood risk within Bassetlaw. Regardless Bassetlaw District Council should work closely with neighbouring authorities wherever there is the potential for downstream impacts.

Development control should ensure that the impact on receiving watercourses from development in Bassetlaw district has been sufficiently considered during the planning stage and appropriate development management decisions put in place to ensure there is no adverse impact on flood risk or water quality.

The impact of new development on downstream IDB watercourses also needs to be considered. Planners and developers should be aware of local conditions and requirements

set by the Water Management Consortium (WMC) (comprising Isle of Axeholme and North Nottinghamshire, Lindsey Marsh and Trent Valley IDBs). These are published on WMC's website:

- [Isle of Axeholme and North Nottinghamshire IDB](#)
- [Lindsey Marsh IDB](#)
- [Trent Valley IDB](#)

9.5 Approach to Level 2 Analysis

9.5.1 Impact of proposed development

To ascertain the impact of the proposed development on downstream flows, catchment descriptors from the FEH Webservice were downloaded for each catchment. These catchment descriptors were then amended to account for modification to the catchment boundaries based on topography data and for the proposed development in the catchment. The URBEXT (urban extent) value was increased in line with the total area of development proposed in the catchment. The imperviousness factor was assumed to be 0.4 across all catchments. This value assumes that 40% of built up areas in the catchment is covered by impermeable surfaces.

From this information hydrographs showing the flood response in both a pre-development and post-development scenario in each catchment were generated for the 100-year flood event. It should be noted that these hydrographs have been derived from ReFH2 using catchment descriptors only, a detailed hydrological assessment to obtain these hydrographs has not been undertaken.

The pre- and post-development hydrographs produced with REFH2 were compared to calculate the additional volume of storm water passing through the catchment as a result of increased impermeable surfaces from development. This value represents the volume of on-site storage required across the whole catchment to limit peak flow rates to the existing greenfield response. An additional scenario was calculated for each catchment hydrograph to show the potential impacts of the installation of SuDS across a catchment in a post-development scenario. Peak hydrograph flow was limited to pre-development levels and the additional volume generated in the post-development scenario was added onto the falling limb of the hydrograph. The results display how SuDS can limit the peak flow and release excess stormflows through the catchment at a lower rate, potentially reducing flood risk downstream.

9.5.2 Assessing the storage need at potential development sites

The UK SuDS Website provides a variety of tools for the design and evaluation of sustainable drainage systems. The surface water storage volume estimation tool was used to provide estimates of storage volume requirements needed to meet best practice criteria from Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory technical standards for SuDS (Defra, 2015). It should be noted that the estimates from this tool should not be used for the detailed design of drainage systems and sewer modelling is recommended when designing a drainage scheme.

The tool works by selecting a point on a map for the calculation and entering characteristics for the proposed development site. For this assessment, the most downstream point of each catchment was selected, the site area was entered, and a developable area/impermeable area was assumed based on council recommendations and similar values from neighbouring authority SHLAA methodologies. The impermeable area of the site was assumed to be 70% of the total site area for both residential and employment sites.

All other variables in the tool were left as default, to avoid a large number of assumptions. The REFH2 method to calculate surface water storage requirements was used to allow comparison to the catchment scale assessment.

These analyses are carried out for the purpose of developing strategic planning policy by highlighting the need for considering drainage amongst sites or groups of sites within a catchment. It is not intended at this stage to set out the absolute level of storage that must be provided at site level because specific information about development sites is not yet known, such as how much of the site will be developed and in what way, as well as information on underlying geological and soil conditions based on ground investigations. At a site-level, developers will need to undertake detailed drainage strategies to refine calculations of the amount of storage required on site. In line with national planning policy and national requirements for SuDS, storage will always be required for the 100-year plus applicable climate change event. Whether any additional storage would benefit downstream areas depends on where the site is located within the catchment.

9.6 Overview of Development in Bassetlaw District

There are 18 sites being considered for allocation as part of the Local plan, within Bassetlaw District, of which 14 lie or partially within those towns identified as high risk in the Level 1 SFRA.

Table 9-1 Summary of sites within high risk parishes, as identified in the Level 1 SFRA

Name	Ref.	Location	Area (ha)	Proposed Use
Former Elizabethan High School	HS9	Retford	1.3	46 homes
Trinity Farm	HS7	Retford	12.0	244 homes
Station Road	HS12	Retford	0.1	5 homes
St Michaels View	HS10	Retford	0.4	20 homes
Milnercroft	HS8	Retford	0.4	5 homes
Ordsall South	HS13	Retford	103.1	800+ plus a country park and some community facilities
Former Bassetlaw Pupil Referral Centre	HS2	Worksop	0.8	20 homes
Former Knitwear Factory	HS6	Worksop	1.9	54 homes
Peaks Hill Farm	HS1	Worksop	63.7	1100 homes and community space and facilities
Former Manton Primary School	HS4	Worksop	3.7	100 homes and open space
Radford Street	HS3	Worksop	3.5	120 homes
Talbot Road	HS5	Worksop	0.4	15 homes
Apleyhead	SEM01	Worksop	188.5	Employment
Fairygrove	HS11	Retford	2.7	61 homes

As new settlements/significant new developments, the Level 1 SFRA also makes recommendations relevant to Bassetlaw Garden Village, Cottam Power Station and High Marnham Power Station.

9.7 Retford

Retford is an urban area in central Bassetlaw, drained by the River Idle, which flows through the town. The River Idle catchment is very large, draining approximately 477km² at the downstream edge of Retford. The currently allocated developments do not represent a significant area in comparison to the whole River Idle catchment. The Retford Beck drains the east of the town before joining the River Idle. The Retford Beck is culverted for much of its run through Retford and there are known conveyance issues with the culvert.

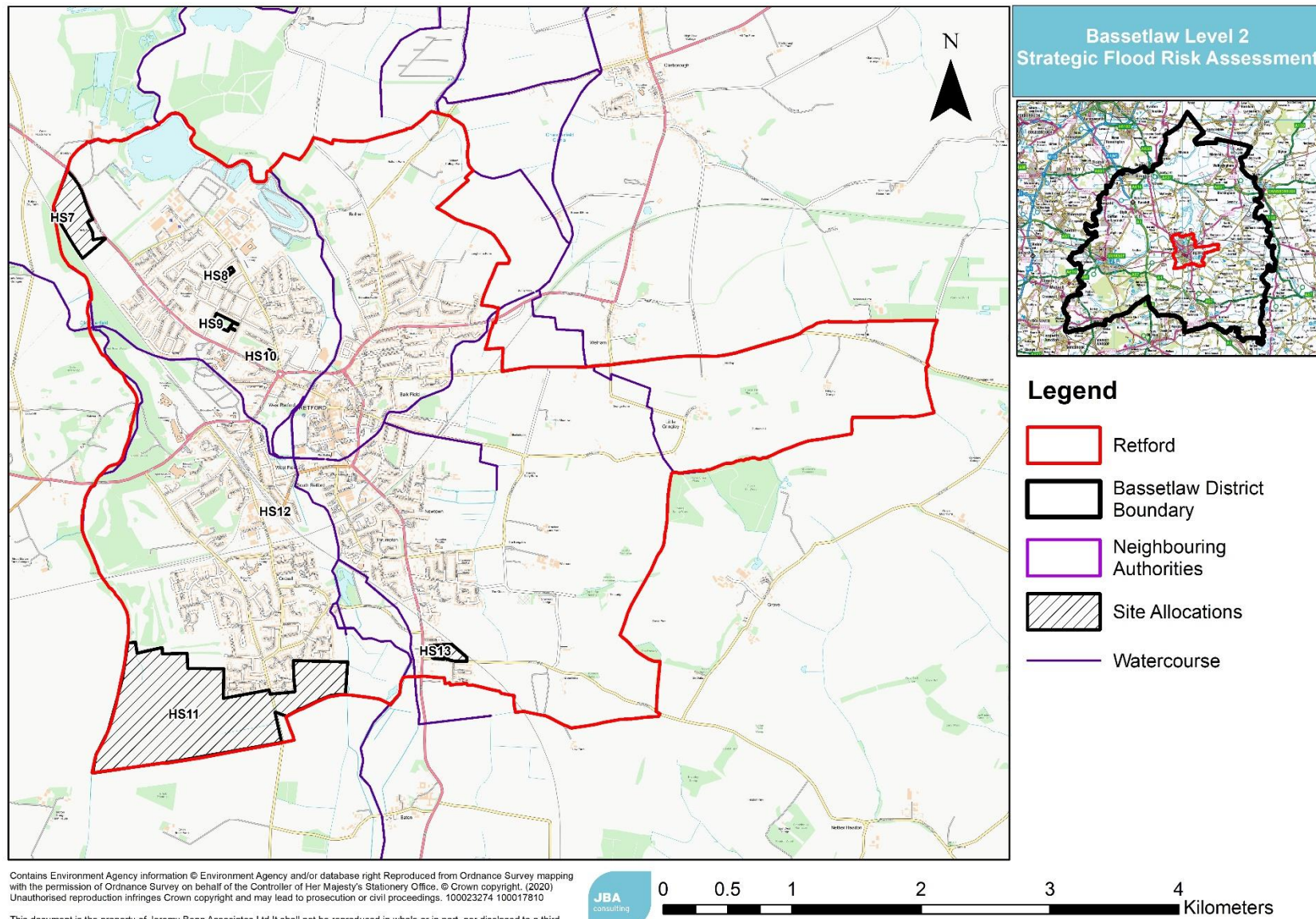


Figure 9-1 Map of development sites within Retford parish

There are seven currently allocated sites within the Retford area, of which one, HS11, drains into the Retford Beck. Two sites, HS7 and HS13 are large developments of over 200 and 800 homes respectively and site specific recommendations for these sites are made in section 9.10.4.

HS7 lies downstream of Retford and drains into the River Idle so development is unlikely to increase the risk to Retford. HS13 however lies on the southern edge of Retford and drains into the River Idle through the Ordsall area and a site-specific FRA should be undertaken to demonstrate that development on the site will not increase the risk to properties downstream. The remaining sites are small in size and represent a mixture of brownfield redevelopment and infill development.

As the sites are small in scale compared to the River Idle catchment hydrographs have not been calculated for the River Idle.

The UK SuDS website provides a tool for estimating the long-term and attenuation storage requirements for sites. Table 9-2 outlines the storage volumes that would be required for each of these sites.

Table 9-2 Long term and attenuation storage volumes for sites within Retford, calculated via the ReFH2 method

Name	Ref.	Long Term Storage Volume (m ³)	Attenuation Storage Volume (m ³)	Total
Former Elizabethan High School	HS9			46 homes
Trinity Farm	HS7			244 homes
Station Road	HS12			5 homes
St Michaels View	HS10			20 homes
Milnercroft	HS8			5 homes
Ordsall South	HS13			800+ plus a country park and some community facilities
Fairygrove	HS11			61 homes

****Storage Volumes to be provided in Final Report****

9.8 Worksop

Worksop is an urban area in the east of Bassetlaw District. Most of the town is drained by the River Ryton which flows eastward through the town, before turning north towards its confluence with the River Idle. The River Ryton's catchment is large, draining approximately 93km² at the point it leaves Worksop. As the sites are small in scale compared to the River Ryton catchment hydrographs have not been calculated for the River Ryton.

Several smaller watercourses drain through Worksop into the River Ryton.

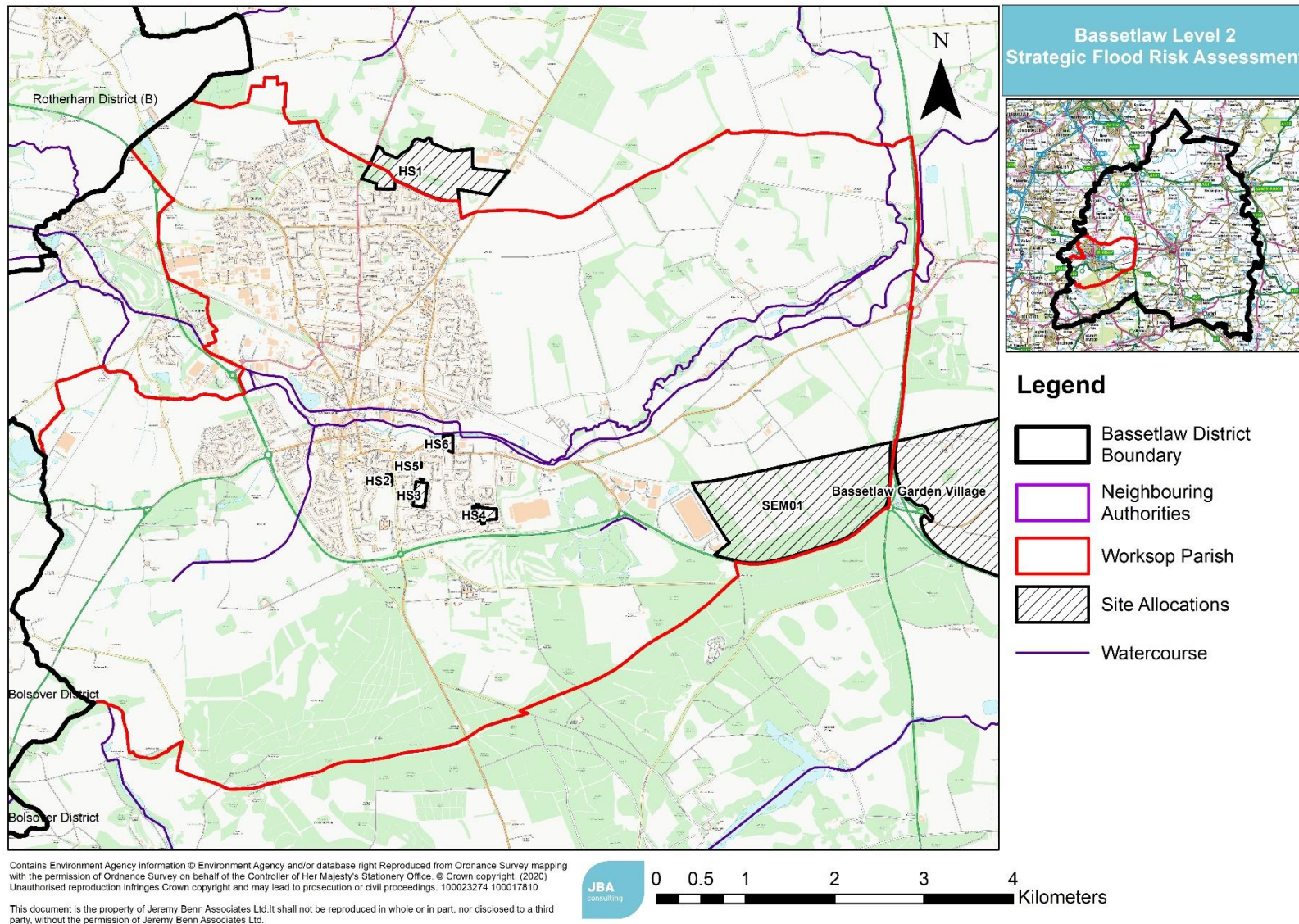


Figure 9-2 Map of development sites within Worksop parish

There are seven currently allocated sites within Worksop, of which six are within the catchment of the River Ryton. SEM01 is a large employment development to the east of Worksop, downstream of the main town. As such it is unlikely to impact flood risk to Worksop itself, however there may be an impact on flood risk to a number of properties alongside the river Ryton downstream of Worksop. The remaining five sites are all located in the southeast of Worksop around the Manton area. These represent a mixture of infill development and brownfield redevelopment. Owing to the size of the Ryton catchment compared to the size of development sites, hydrographs have not been calculated for these sites.

The remaining site, HS1, represents a significant new development of over 1,000 homes on greenfield land to the north of Worksop. This area drains into an unnamed tributary of the River Ryton which flows northwards and joins the River Ryton at Blyth. As the site drains away from Worksop, it is unlikely to increase flood risk within the town. The catchment is predominantly rural and drains towards the settlements of Wigthorpe and Carlton in Lindrick and may therefore increase risk in these areas. Recommendations for this site can be found in section 9.10.4.

The cumulative impact analysis for Worksop will be revisited for the Worksop Central DPD sites when further Level 2 SFRA work is undertaken later in 2021. This is unlikely to change the overall conclusions of this work as the town is already identified as being as sensitive to the cumulative impact of new development.

The UK SuDS website provides a tool for estimating the long-term and attenuation storage requirements for sites. Table 9-3 outlines the storage volumes that would be required for each of these sites.

Table 9-3 Long term and attenuation storage volumes for sites within Worksop, calculated via the ReFH2 method

Name	Ref.	Long Term Storage Volume (m ³)	Attenuation Storage Volume (m ³)	Total
Former Bassetlaw Pupil Referral Centre	HS2			20 homes
Former Knitwear Factory	HS6			54 homes
Peaks Hill Farm	HS1			1100 homes and community space and facilities
Former Manton Primary School	HS4			100 homes and open space
Radford Street	HS3			120 homes
Talbot Road	HS5			15 homes
Apleyhead	SEM01			Employment

****Storage Volumes to be provided in Final Report****

9.9 New settlements and larger strategic sites (Including Bassetlaw Garden Village, Cottam Power Station, HS1, HS7, and HS13)

There are several developments of significant size proposed within Bassetlaw District, namely Bassetlaw Garden Village, Cottam Power Station, HS1, HS7, and HS13. As these developments are large in size, 5 of which are on greenfield land, and represent a significant change to their respective catchments. Each of these sites have specific considerations that are outlined in the relevant site summary tables, however the hydrograph below uses the catchment of Bassetlaw Garden Village to demonstrate the potential changes to hydrology as a result of such development.

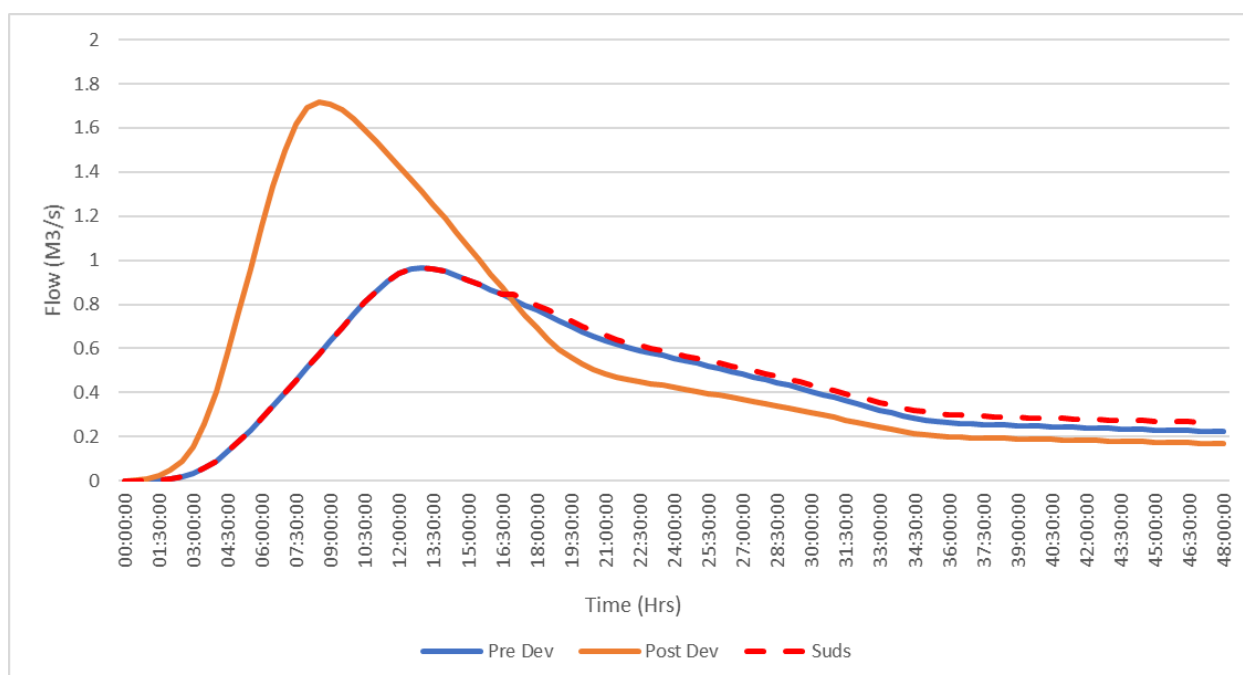


Figure 9-3 Pre- and post-development and SuDS hydrographs in the catchment of the unnamed watercourse draining Bassetlaw Garden Village

Figure 9-3 Pre- and post-development and SuDS hydrographs in the catchment of the unnamed watercourse draining shows the hydrograph of the catchment draining Bassetlaw Garden Village in a pre and post development scenario. Without mitigation, peak flows in the unnamed watercourse could increase by up to 70% in the 100-year event, a very significant increase. SuDS can help to reduce flood risk by storing excess runoff caused by urbanisation and discharging it slowly. The hydrograph above demonstrates how SuDS applied appropriately to development in the catchment could limit peak flows to their current levels and ensure there is no increase in risk downstream as a result of development.

The UK SuDS website provides a tool for estimating the long-term and attenuation storage requirements for sites. Table 9-4 outlines the storage volumes that would be required for each of these sites.

Table 9-4 Long term and attenuation storage volumes for the significant new developments within Bassetlaw District, calculated via the ReFH2 method

Name	Ref.	Long Term Storage Volume (m ³)	Attenuation Storage Volume (m ³)	Total
Cottam Power Station	-			Up to 1400 homes and community facilities
Bassetlaw Garden Village	HS6			4000 homes, transport and community infrastructure and 15 hectares of employment land
Peaks Hill Farm	HS1			1100 homes and community space and facilities
Trinity Farm	HS7			244 homes
Ordsall South	HS13			800 homes plus a country park and community facilities

****Storage Volumes to be provided in Final Report****

9.10 Policy Recommendations

From analysing the results of the CIA, high-level recommendations for flood storage and betterment have been proposed for Bassetlaw district and sites in each of the high-risk areas. These recommendations should be considered by developers as part of a site-specific assessment, but more detailed modelling must be undertaken by the developer to ascertain the true storage needs and potential at each site at the planning application stage. Developers should also include a construction surface water management plan to support the Construction Drainage Phasing Plan. This should provide information to the LLFA and the LPA regarding the proposed management approach during the construction phase to address surface water management during storm events.

9.10.1 Bassetlaw District Wide Recommendations

The cumulative impact analysis has highlighted the importance of managing both the rate and volume of surface water runoff from new developments to mitigate the impact of flood risk along watercourses. In line with guidance published by Nottinghamshire County Council as LLFA, where reasonably practical, all new development should control both the rate and volume of runoff to greenfield characteristics. Where the developer can demonstrate it is not reasonably practical, runoff must be discharged at a rate that does not adversely affect flood risk. For brownfield sites, developers should aim for a 30% reduction in runoff.

The size of development sites and their location within a catchment will impact the effect that it will have on catchment response to storm events. In line with national planning policy and the national requirements for SuDS, storage will always be required for the 100-year plus applicable climate change allowance event. Whether any additional storage would benefit downstream areas depends on where the site is located within the catchment.

In rural catchments draining towards urban areas, particularly those upstream of Retford, LPA's should work closely with the Environment Agency and LLFA to identify any areas of land that should be safeguarded for the future use of natural flood management features and flood storage.

It is also important to note that in rural catchments, farming practices can also have a significant impact on runoff rates and flood risk downstream, and Local Authorities should consider promoting Catchment Sensitive Farming and Natural Flood Management techniques within rural upstream catchments.

9.10.2 Retford

Retford is a town in central Bassetlaw, drained by the River Idle which flows through the town. This is a very large catchment, draining approximately 477km² where it leaves Retford. Several small tributaries flow through the town into the River Idle, including the Retford Beck, where there are existing known conveyance issues with the culverted watercourse.

One currently allocated site, HS11 is located within the catchment of the Retford Beck. For this site, it is recommended that a site-specific FRA be undertaken to ensure that risk will not be increased by increased runoff as a result of development. As the site is currently greenfield, runoff should be limited current greenfield rates through the use of SuDS techniques and attenuation features, such as rainwater harvesting. Bassetlaw District Council and the Environment Agency are currently exploring a flood alleviation scheme for the Retford Beck- Bassetlaw District Council should consider requiring developers in this area to contribute towards the scheme.

It is recommended that a site-specific flood risk assessment be required for all developments regardless of size to ensure there is no increase to flood risk as a result of development. The Council should also consider requiring additional betterment of runoff rates for brownfield sites above the 30% reduction specified by Nottinghamshire County Council.

The remaining sites are smaller developments, representing a mixture of greenfield infill development and brownfield redevelopment. Greenfield developments should limit runoff to the existing greenfield rates, whilst brownfield rates should aim for a 30% reduction in runoff.

For brownfield sites within areas with known drainage issues, such as the catchment of the Retford Beck, the LPA should consider requiring additional betterment of runoff rates.

9.10.3 Worksop

Worksop is a town in the east of Bassetlaw, drained by the River Ryton, which flows through the town. The north of the town is drained by a tributary of the Ryton which flows north before joining the River Ryton at Blyth.

Sites SEM01 and HS1 represent significant new development and additional recommendations for these sites are detailed in section 9.10.4.

Worksop Town Centre has witnessed increased flooding events over the past 20 years with the most recent being large-scale events that affected a large part of the lower town centre in November 2019 and January 2020. The Local Plan and the Worksop Central DPD seek to improve the environmental and social landscape within the town centre through carefully considered redevelopment and addressing infrastructure and flooding issues, where practicable.

The Section 19 Report following the 2019 Worksop floods highlighted a need for better communication with the community around flooding and recommended a number of initiatives to improve flood resilience in the area. It is recommended that the Council consider requiring developers to contribute to community flood resilience schemes and explore opportunities to deliver features such as flood signage, community sandbag stores and flood monitoring cameras as part of new development.

Given the known frequent flooding issues in the town centre, it is recommended that a site-specific flood risk assessment be required for all developments regardless of size to ensure there is no increase to flood risk as a result of development. The Council should also consider requiring additional betterment of runoff rates for brownfield sites above the 30% reduction specified by Nottinghamshire County Council.

To manage the proposed growth within Worksop Town Centre more effectively, the Council is producing a separate Development Plan Document. This document requires its own evidence base and will form part of the Local Plan once adopted. As part of the evidence base for this, a Strategic Flood Risk Assessment for Worksop will be undertaken later in 2021 which will provide more detailed recommendations for developments. A statement from Bassetlaw District Council around the Worksop DPD is included as Appendix D.

To facilitate regeneration in Worksop Town Centre, a carefully considered flood risk and sustainable drainage strategy covering all the sites in the Worksop Central DPD Area must support early master planning and feasibility work. This work should be undertaken alongside and in support of the work led by the Environment Agency to develop a flood alleviation scheme for the town. This may involve sacrificing some areas as functional floodplain and increasing flood storage to allow other areas of sites to be defended against fluvial flooding. There should be no overall loss of floodplain storage and the risk of flooding should not be increased up or downstream of the sites.

The Council are working closely with the Environment Agency around a potential Worksop Flood Alleviation Scheme and opportunities for development to support the viability and deliverability of such a scheme will be investigated as part of the Worksop Central DPD Level 2 SFRA.

Developers should enter into conversations with the District Council at pre-application stage to understand the latest position with regards to the Environment Agency led Worksop scheme. Betterment may be required:

- In the form of additional storage for surface water runoff from development sites on site,
- In the form of 'in kind' works, such as additional floodplain storage on site, works to reprofile land and/ or the construction of defences on a site and/ or
- In the form of a contribution towards wider community flood alleviation works within the catchment.

Depending on the form a flood alleviation scheme for Worksop takes, there may be a requirement to safeguard a specific area of land upstream of the town for future flood storage purposes.

9.10.4 New Settlement and larger strategic sites (Including Bassetlaw Garden Village, Cottam Power Station, HS1, HS7, and HS13)

These settlements/ sites represent large developments on greenfield land, and as new settlements, any proposal should be accompanied by an overall Surface Water Management Masterplan and Strategy (SWMMS) which should cover:

- 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. This should be used to develop and implement appropriate drainage sub catchments and specific runoff rate and volume requirements for each phase of the development.
- The risk of flooding from all sources, including for rainfall events greater than the design standard of the surface water drainage system should be taken into account to ensure there is no flood risk to new properties and that exceedance flows in extreme events are safely routed around those properties.
- The consideration of how SuDS, natural flood management techniques, green infrastructure and green-blue corridors can be designed into the development master plan to facilitate drainage flood risk management and ensure wider benefits such as biodiversity, amenity, water quality and recreation are realised.
- Based on the above, a Drainage Phasing Plan should be developed, based on the SuDS train method (considering firstly how water can be infiltrated/stored at a plot level, then conveyed through the site and any regional storage needs at a settlement level).
- The provision of drainage during the building phase shall be based on the Drainage Phasing Plan to ensure adequate drainage is provided and implemented throughout the development life.
- The LLFA, Environment Agency and LPA should be consulted during the development of the Surface Water Management Masterplan and Strategy.

Where sites are currently greenfield, it is important that any development limits runoff to the current rate. Any SuDS proposals should take account of existing watercourses and surface water flow paths and where possible integrate them into blue-green infrastructure.

Given the significant change to land-use, a site-specific FRA should be undertaken to inform the SWMMS and quantify the risk in a post development scenario and demonstrate that residents will not be at risk in the future as a result of climate change. This should be undertaken at a strategic level across the whole development, especially where parts of the site are developed by different developers. Any significant surface water flows should be identified and incorporated into blue-green infrastructure.

Development of the site should not increase flood risk downstream. Where catchments drain towards urban areas, such as Bassetlaw Garden Village towards Retford, it is recommended the LPAs work closely with the Environment Agency and LLFA to identify any areas of land that should be safeguarded for any future flood alleviation and natural flood management features.

Developers should refer to the site summary tables for site specific recommendations for these large developments.

10 Summary of Level 2 Assessment

10.1 Assessment Methods

As part of the Level 2 SFRA, detailed site summary tables have been produced for the 14 sites identified as being at high risk. As part of the site screening assessment, these sites were found to be at risk from fluvial and/or surface water flooding.

The summary tables in Appendix A summarise flood risk to each site based on a range of flood risk datasets and the strategic or detailed modelling completed as part of this study. Climate change mapping has also been produced, either through the broadscale 2D modelling completed in the Level 1 SFRA or as part of the strategic and detailed modelling completed for the Level 2 SFRA. Each table sets out the NPPF requirements for the site as well as guidance for site-specific FRAs. The tables consider requirements for passing the Exception Test where this is relevant and possible. A broadscale assessment of suitable SuDS options has been provided, giving an indication where there may be constraints to certain types of SuDS techniques.

To accompany each site summary table, there is an Interactive GeoPDF map, with all the mapped flood risk outputs per site. This includes fluvial flood zone extents, depths and velocities as well as hazard mapping where modelling has been completed. Interactive mapping in Appendix B, should be viewed alongside the detailed site summary tables.

10.2 Summary of Key Site Issues

The following points summarise the Level 2 assessment:

- The majority of the sites assessed as part of this Level 2 SFRA are not currently at significant at fluvial flood risk. The exceptions are:
 - Cottam Power station- 74% of the site within Flood Zone 2
 - High Marnham power- 14% of the site within Flood Zone 2
 - HS6 & HS7- 11% of the site within Flood Zone 2.

Sites significantly affected by fluvial and tidal flooding will require more detailed investigations to inform a sequential approach to site layouts, SuDS possibilities, safe access and egress etc, as part of a site-specific Flood Risk Assessment taken forward by a developer. Specific recommendations for sites can be found in the site summary tables, Appendix B.

- The majority of sites are also a risk from surface water flooding, with significant flows and ponding in the higher return period events across some sites and the access roads surrounding them. Furthermore, for most of the sites within Retford and Worksop, there is a significant increase on the extent of surface water flooding between the 1% AEP and 0.1% AEP events, indicating a high sensitivity to climate change. Surface water tends to follow topographic flow routes, for example along the watercourses or isolated pockets of ponding where there are topographic depressions. The impact of surface water flooding at sites such as this will need more detailed investigations undertaken as part of a site-specific Flood Risk Assessment at a later stage.
- Climate change allowances were applied to the existing Tidal Trent model and 2D generalised modelling completed as part of this SFRA. For the 3.3% AEP, 1% AEP and 0.1% AEP events, the 2080s period was used, and all three allowance categories were modelled (20%, 30% & 50%). Sea level rise allowances were made using the Upper End estimates from [Table 3](#) of the governments published climate change allowances. Modelling indicates that flood extents will increase as a result of climate change and therefore, the depths, velocities and hazard of flooding are also seen to increase. Some sites are more sensitive to climate change increases than others. Site-specific Flood Risk Assessments (FRAs) should confirm the impact of climate change using latest guidance.
- For some sites, there is the potential for safe access and egress to be impacted by fluvial, tidal and/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. Where there is no safe access of egress, shelter in situ should be provided.

- 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 to understand which SuDS option would be best.
- Sites which have areas designated by the Environment Agency as being a historic landfill site will require site ground investigations to determine the extent of the contamination and the impact this may have on SuDS.
- The Cumulative Impact Assessment (CIA) identified two areas as at a high risk of increased risk as a result of development in the future. These are:
 - Retford
 - Worksop

Additionally, there are 7 sites of significant size, 5 on greenfield land, that will need careful consideration of downstream impacts, including a Surface Water Management Strategy and Masterplan.

The full CIA and recommendations are found in section 9.

- Several proposed sites within Worksop are at significant risk from fluvial and surface water flooding and any development within the town centre has the potential to exacerbate these existing issues. To facilitate regeneration in Worksop Town Centre, a carefully considered flood risk and sustainable drainage strategy covering all the sites in the Worksop Central DPD Area must support early master planning and feasibility work. This work should be undertaken alongside and in support of the work led by the Environment Agency to develop a flood alleviation scheme for the town. This will be explored further in a specific Level 2 SFRA for Worksop Town Centre later in 2021.

Developers should enter into conversations with the District Council at pre-application stage to understand the latest position with regards to the Environment Agency led Worksop scheme.

- Cottam Power Station is at a particularly high risk of fluvial flooding from the River Trent and major reprofiling and mitigation works are likely to be required to allow development of such a vulnerable site. The main risk to the site is fluvial flooding from the River Trent. Embankments on the Trent currently defend against a 1% AEP flood event, although there remains a risk from a breach or a severe 0.1% event if the defences overtop. The risk will increase from climate change and during the lifetime of the development, the modelling shows that the defences would overtop in a future 1% fluvial event (upper end scenario), which means the standard of protection will be lower than the 1% design event for fluvial flooding.

To ensure the users of this site would be safe from flooding over the lifetime of the development, either the defences along this stretch of the Trent would need to be raised (over a considerable distance to account for water reaching the site across the floodplain) or site level mitigation would be required. Any work undertaken on site would need to be undertaken cautiously, to ensure there was no overall loss of floodplain or displacement of water onto other areas. The feasibility of this level of site mitigation needs to be taken into account when considering if the site would pass the Exception Test. It is possible that the overall capacity of the site for the required level of the development could be affected by the need for flood mitigation measures.

At the planning application stage and as part of an FRA, developers will need to undertake detailed hydrological and hydraulic assessments of watercourses and tidal flooding, to verify flood extent, depth, velocity and hazard (including considering the 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 such that is appropriately flood resistant and resilient in line with the recommendations in National and Local Planning Policy and supporting guidance and those set out in this SFRA. The Exception Test must be reapplied at this stage even where it has been undertaken for the Local Plan as a further check on the suitability of the site for development. The Level 1 SFRA can be used to scope the flooding issues that a site-specific FRA should look into in more detail to inform the Exception Test for windfall sites.

It is recommended that as part of the early discussions relating to development proposals, developers discuss requirements relating to site-specific FRA and drainage strategies with both the Local Planning Authority and the LLFA, to identify any potential issues that may arise from the development proposals. The Developer should also consider surface water drainage in the construction phase of any developments to prevent increasing flood risk during the construction phase.

10.3 Considering the Exception Test for the Proposed Sites

The site tables contain key messages that are specific to each site regarding the extent of flood mitigation work that is likely to be necessary to enable the development to be made from safe from flooding and such that it does not increase flood risk elsewhere.

When making a decision on the Exception Test, the LPA will need to weigh up the costs and implications of the scale of the work on site viability when determining if the site can pass the Test, alongside considering the relative importance of wider planning reasons for allocating in high flood risk areas.

10.4 Planning Policy Recommendations

A flood resilience policy is recommended for development in flood risk areas in Bassetlaw District, that is adaptive to latest climate change science. Development must be resilient and adaptable to the impact of climate change on flood risk. To achieve this:

- Development layout and form must be designed using the latest climate change guidance on development and flood risk.
- There are several sites which represent significant areas of new development. For these sites, any mitigation measures should be integrated into the overall development masterplan and designed such that they protect users of the development and ensure there is no increase in flood risk elsewhere. Opportunities should be sought to reduce downstream flood risk as part of new developments through the use of green infrastructure.
- Residual risk from an extreme flood is carefully considered to ensure that further users of a development can be kept safe.
- An integrated sustainable drainage approach to green infrastructure, water quality and flood risk should be taken. Betterment in flood risk terms should be sought from development identified in areas draining into those areas most sensitive to changes in flood risk due to new development in the Level 2 SFRA. Those are Retford and Worksop. Policy recommendations for these areas may be found in section 9.10.
- Bassetlaw District Council should work closely with the Environment Agency and neighbouring authorities to identify any areas upstream of vulnerable areas, particularly Worksop, that should be safeguarded for future flood alleviation via upstream storage.
- The Council are working closely with the Environment Agency around a potential Worksop Flood Alleviation Scheme and opportunities for development to support the viability and deliverability of such a scheme will be investigated as part of the Worksop Central DPD Level 2 SFRA.

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 Bassetlaw District Council, Nottingham County Council, Severn Trent Water, Anglian Water and the Environment Agency. Such information may be in the form of:

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

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

Appendices

- A Level 2 Assessment – Site Summary Tables**
- B Level 2 Assessment – Interactive Mapping**
- C Modelling Summary**

D Bassetlaw District Council's Statement on Workso Development Plan Document

Update on the Sequential Test and the Workshop Town Centre Development Plan Document April 2021

Statement provided by Bassetlaw District Council for the SFRA

The Local Plan, through its site selection and sustainability appraisal process, has used this approach to steer development away from areas of increased flood risk. The majority of the Districts proposed growth is located in Flood Zone 1 and only a small proportion is located within higher flood zones. For development being proposed within higher flood risk areas, the Level 2 Strategic Flood Risk Assessment assessed these for their impact and required mitigation to reduce the flood risk.

Within Bassetlaw the identified 'Priority Regeneration Areas' are shown on the Policies map, these being

Workso Town Centre;

Former Cottam Power Station

It is acknowledged that there is a degree of flood risk in both of these areas which will require appropriate mitigation to ensure the safety of future users of the developments and ensure there is no increase in flood risk elsewhere.

Policy ST54 within the November 2020 draft Local Plan requires new development to be located to minimise flood risk, mitigating any such risk through design and implementing sustainable urban drainage schemes where appropriate.

The Level 2 Strategic Flood Risk Assessment has assessed the necessary flood mitigation required to bring forward development in Flood Zones 2 and 3. Development in higher flood risk areas with suitable flood mitigation, will be necessary in order to achieve the required housing targets set out in the Local Plan. Such development will also help to address the social and economic needs of the District, promoting essential regeneration of existing brownfield sites especially within Workso Town Centre. This regeneration will help to retain the vitality of Workso as the most accessible and sustainable location in the District. To manage the proposed growth within Workso Town Centre more effectively, the Council is producing a separate Development Plan Document (DPD). This document requires its own evidence base and will form part of the Local Plan once adopted.

Application of the Sequential and Exception Tests Borough Wide

Other than in Workso Town Centre DPD boundary, the search area for the Sequential Test for reasonable alternatives for locating proposed development in a zone of lower flood risk will extend to the whole of Bassetlaw as per national guidance. However, where sites are specifically shown for development on the Local Plan Policies Map, the principle of development is already established because the Sequential Test has been undertaken during the plan making process. The required risk assessments will already have been undertaken as part of the plan-making and sustainability appraisal process, to show that the form of development proposed for the site concerned is appropriate and justified in the context of flood risk.

Prospective developers therefore need not re-apply the sequential test for any proposal which falls within an allocated development site in the Local Plan or Workso Town Centre DPD and is in accordance with the applicable plan policy for that site. However, the detailed design of schemes should still follow a sequential approach to ensure that flood vulnerable uses and activities occupy areas of lowest flood risk within the site, where appropriate. A site specific Flood Risk Assessment will also be required for these sites.

The Level 2 Strategic Flood Risk Assessment for the Local Plan provides information for the Council to apply the Exception Test during the Local Plan making process, which will primarily apply to residential and mixed use developments.

The Exception Test needs to be applied to any development that comes through at planning application stage even if it has already been carried out during the Local Plan making process. This is because it needs to be informed at the planning application stage by a site specific Flood Risk Assessment that will set out the flood mitigation and resilience measures required to bring that development forward in detail.

Regeneration sites in Worksop Town Centre

For Worksop Town Centre, the Local Plan sets out the importance of mixed use development and regeneration to enhance its regional role, including the redevelopment of brownfield sites, long-term vacant land and environmental improvements to the Chesterfield Canal and River Ryton waterfronts.

Worksop Town Centre has witnessed increased flooding events over the past 20 years with the most recent being large-scale events that affected a large part of the lower town centre in November 2019 and January 2020. In addition to its flooding constraints, the town centre has continued to decline economically with a large number of vacant shops and vacant or derelict sites. The Local Plan and the Worksop Central DPD seek to improve the environmental and social landscape within the town centre through carefully considered redevelopment and addressing infrastructure and flooding issues, where practicable.

Due to its flood risk vulnerability, new development within Worksop Town Centre will be subject to its own Strategic Flood Risk Assessment that will be produced later in 2021. The assessment will analyse the extent to which development in Flood Zones 2 and 3, with suitable flood mitigation, will be necessary in order to achieve the housing targets set out in the Local Plan and the necessary regeneration. The River Ryton lower catchment is identified as a high-risk surface water flood area and the Council is in discussions with the Environment Agency about the potential for a 'Worksop Flood Alleviation Scheme'.

Although in its early stages, this scheme will likely benefit the wider Ryton catchment and reduce the risk of flooding across the town centre and support its planned growth and regeneration. Due to its complexity, cost and the need for social and economic regeneration in Worksop, the Council believe that the level of development - identified for the town centre - could support the schemes viability and deliverability – in direct partnership with the Environment Agency.

Last year, the Council were informed, by the Environment Agency, that the baseline model of the River Ryton through Worksop was being updated as part of a larger study exploring flood reduction options connected to the flood alleviation scheme. Unfortunately, this modelling has been delayed and the emerging baseline River Ryton model will not be available until the end of May/June 2021, at the earliest. As this falls outside of the committed timescales for the Local Plan, the current Level 2 SFRA uses the existing 1D-2D modelling of the River Ryton produced for the 2009 Level 1 SFRA for the Core Strategy. This provides an indication of the flood risk to sites through Worksop for the Local Plan and its draft submission.

Applying the Sequential and Exception Test within Worksop Town Centre

Because of the fundamental importance of Worksop Town Centre regeneration in the Local Plan and the emerging Worksop Central DPD, it has been proposed (subject to the agreement of the Environment Agency) that a smaller search area can be used for reasonable alternatives to new development which is within the identified Regeneration Area, the principle being that this area has already been identified and subject to prior testing of alternative development scenarios through the plan making and sustainability appraisal process, during the preparation of the Local Plan. Accordingly, it is not expected that the search for alternative sites for any proposal within Worksop Town Centre would need to extend outside the boundary of the identified Regeneration Area.

For development sites within the Regeneration Area at increased risk of flooding (outside Zone 1), the Worksop DPD Level 2 Strategic Flood Risk Assessment will focus on addressing how the flood risk can be managed and mitigated with or without the wider flood alleviation scheme.

Where development is proposed other than in these specific locations or on sites which are specifically allocated in the Local Plan and the identified DPD boundary, the policy follows Environment Agency advice that in carrying out the sequential test, the search for reasonable alternatives should look across the whole of Bassetlaw.

The Exception Test needs to be applied to any development that comes through at planning application stage even if it has already been carried out during the Local Plan making process. This is because it needs to be informed at the planning application stage by a site specific Flood Risk Assessment that will set out the flood mitigation and resilience measures required to bring that development forward in detail.

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