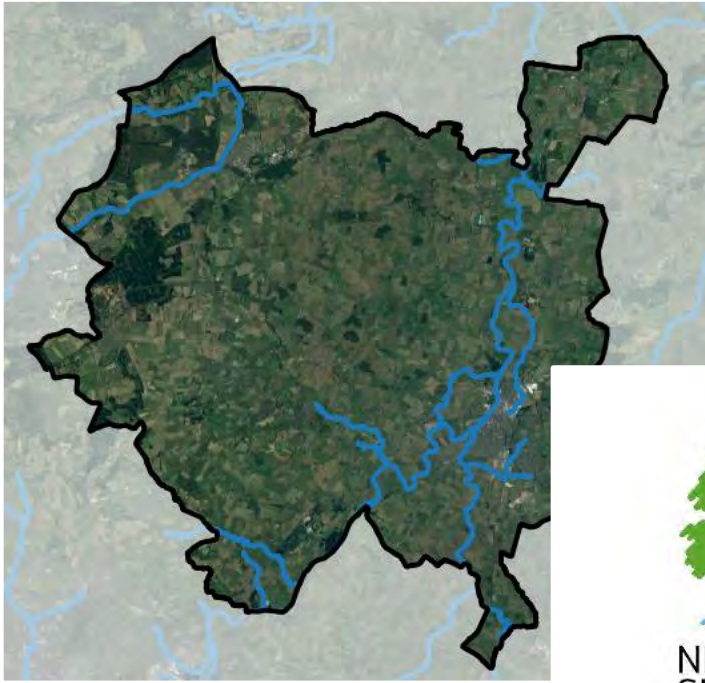


# SFRA Update 2022

784-B041524



## SFRA Level 1 Update



## Final Report

Newark and Sherwood District Council

13/12/2022

Document prepared on behalf of Tetra Tech Limited. Registered in England number: 01959704



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Appendix E – Development Site Locations
Appendix F- Archived Maps

## ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AEP	Annual Exceedance Probability
CFMP	Catchment Flood Management Plan
CRT	Canal and River Trust
EA	Environment Agency
FRA	Flood Risk Assessment
FRAP	Flood Risk Activity Permit
FRCC-NPPG	Flood Risk and Coastal Change – National Planning Practice Guidance
FRM	Flood Risk Management
IDB	Internal Drainage Boards
LLFA	Lead Local Flood Authority
LPA	Local Planning Authorities
N&SDC	Newark and Sherwood District Council
NCC FRMS	Nottinghamshire County Council Flood Risk Management Strategy
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PFRA	Preliminary Flood Risk Assessment
RoFSW	Risk of Flooding from Surface Water
SFRA	Strategic Flood Risk Assessment
SuD	Sustainable Drainage Systems

## 1.0 INTRODUCTION

### 1.1 OVERVIEW

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The Level 1 Strategic Flood Risk Assessment (SFRA) Update 2022 is provided to Newark and Sherwood District Council (N&SDC), the designated Local Planning Authority (LPA). The Level 1 SFRA updates the previous Level 1 assessment produced by WSP in July 2009 and reviewed in December 2016 by WYG. Sections of the SFRA where there has been no change reproduce parts of the preceding Level 1 SFRA.

Current guidance from the National Planning Policy Framework 2021<sup>1</sup> (NPPF) and Flood Risk and Coastal Change - National Planning Practice Guidance 2022<sup>2</sup> (FRCC-NPPG) underpins this Level 1 SFRA update. The aim of the report is to provide comprehensive evidence base to support to N&SDC in their Local Plan Review. The SFRA is a tool to inform the spatial planning process and guide safe development from a flood risk perspective.

A Level 1 SFRA is an assessment on flood risk at the LPA scale which is required by the NPPF. It collects data on all known sources of flooding that may occur presently or in the future, taking account of climate change. Sources of flooding include river (fluvial), surface water (pluvial), tidal, sewers and groundwater.

An SFRA allows for the Sequential Test to be applied when determining land use allocation, and to steer development within areas of lowest flood risk now and into the future. Where it is not possible to place development within the low risk areas and developments are to be placed within flood risk areas, it triggers the need for Level 2 SFRA. Section 5 of this document details the preliminary site screening undertaken for sites put forward by N&SDC highlighting those sites that will be forwarded into the Level 2 SFRA update (2022), available in a separate document.

An SFRA is a live document that is intended to be periodically updated, therefore information already publicly available in previous SFRA's have been limited unless new information or guidance requires them to be updated. Where a duplication of information has been made it should be assumed that the 2022 version is to be used. The assessment has been created in accordance with the information available at time of publishing. When new guidance and or data is made available, the user should endeavour to use that. When available the version number of data products used are mentioned. Updating of an SFRA is recommended by the Environment Agency (EA) every 3 -4 years unless there is a substantial change in guidance or a significant flood event.

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<sup>1</sup> <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

<sup>2</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

## 1.2 REPORT STRUCTURE

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A SFRA has multiple end users, including but not limited to the LPA, EA, Developers, and Flood Risk Consultants. Therefore, the report structure is set out below to aid navigation and use.

- Section 1- Overview and User Guide
- Section 2 -Flood Risk and Planning Policy
- Section 3- Overview of Flood Risk
- Section 4- Developer Guidance
- Section 5- Site Screening
- Section 6- Summary and Recommendations
- Appendix A- Fluvial and Coastal Flood Risk
- Appendix B- Risk of Flooding from Surface Water
- Appendix C- Historic Flooding
- Appendix D- Other Sources of Flooding
- Appendix E- Development Site Locations
- Appendix F- Archived Maps

## 1.3 STAKEHOLDER ENGAGEMENT

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For the assessment, and in accordance with guidance set out by the EA, a stakeholder engagement process was undertaken to facilitate this update to the Level 1 SFRA. Stakeholders from organisations that have responsibilities for flood risk management or those who hold additional details of historic flooding within the area were identified.

The identified key stakeholders, consistent with those approached for the 2016 Level 1 SFRA, along with their flood risk management responsibilities are listed here:

- Environment Agency
  - Main Rivers, Flood Defences and Regulator
- Lead Local Flood Authority-Nottinghamshire County Council
  - Managing risk from surface water, groundwater and ordinary watercourses.
- Trent Valley Internal Drainage Board
  - Drains and smaller watercourses
- Upper Witham Internal Drainage Board
  - Drains and smaller watercourses
- Canal and River Trust
  - Navigable canals and rivers, with infrastructure
- Severn Trent Water
  - Drains and sewerage

Additional stakeholders are identified as Isle of Axholme and North Nottinghamshire Internal Drainage Board (IDB) and Anglian Water who were not deemed key to the SFRA as outlined in the relevant sections.



## **1.4 DATA POLICY**

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Within the SFRA data is utilised under the following data agreements:

- Contains OS data © Crown copyright and database right 2022.
- Contains Environment Agency information © Environment Agency copyright and/or database right 2022. All rights reserved.

## **1.5 LIMITATIONS OF THIS REPORT**

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This report has been prepared by Tetra Tech on behalf of Newark and Sherwood District Council in connection with the scope of the report as described in Section 1 and takes into account the particular instructions and requirements set out in our fee proposal and the acceptance.

It is not intended for and should not be relied on by any third party and no responsibility is undertaken to any third party.

Tetra Tech accepts no duty or responsibility (including in negligence) to any party other than Newark and Sherwood District Council and disclaims all liability of any nature whatsoever to any such party in respect of this report.

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## 2.0 FLOOD RISK AND PLANNING POLICY

### 2.1 CONTEXT

Intended as an update to help facilitate N&SDC in their Local Plan Review, this SFRA update supersedes previous assessments. Updates required to the SFRA have been identified and amendments have been made as per the EA guidance on “How to prepare a strategic flood risk assessment”. As stated this SFRA is a live document, therefore there are sections that will require updating more frequently than others, either proactively, or reactionary to events. The scope of the update is dated up until November 2022. Where relevant the locations of where updated data can be secured at a later date is highlighted.

### 2.2 NATIONAL PLANNING POLICY

#### National Planning Policy Framework

The NPPF was revised in July 2021 and sets out the government’s planning policies for England and how they are expected to be applied. Since the 2016 SFRA review the following revisions have been made:

- Paragraph 160 states “Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards. “
- Paragraph 161 continues with these revisions:
  - “Safeguarding land from development that is required, or likely to be required, for current or future flood management” from “Safeguarding land from development that is required for current and future flood management”
  - “Using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management)” from “Using opportunities offered by new development to reduce the causes and impacts of flooding”
  - “Where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.” from “where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.”

- Paragraph 162 expands on the definitions from the sequential test with “risk of flooding from any source” and “known at risk now, or in the future from any form of flooding”.
- Paragraph 163 is a new addition to the NPPF which includes a Flood Risk Vulnerability Classification system to be used in conjunction with the sites potential vulnerability. Examples of these classifications are given, with the full list available in the NPPF:
  - Essential Infrastructure (Essential transport/ utility infrastructure, wind turbines and solar farms)
  - Highly Vulnerable (Emergency services stations used in flooding, Basement dwellings, caravan, mobile homes and park homes intended for permanent residential use...)
  - More Vulnerable (Hospitals, residential institutions, short-let caravans and camping, subject to specific warning and evacuation plan)
  - Less Vulnerable (Shops, offices, general industry forestry...)
  - Water-compatible development (Flood control infrastructure, water/ sewage transmission infrastructure, amenity open space...)
- Paragraph 166 is a new addition which sets out that on sites where a sequential test was applied on sites allocated in a development plan, then applicants need not apply it again. An exceptions test may need to be carried out if circumstances have changed from the first time.
- Paragraph 167 adds details on when a development can be situated in areas at risk of flooding where:
  - “In the event of a flood, it could be quickly brought back into use without significant refurbishment”
  - “Incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate”
  - “Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.”
- Paragraph 168 sets out that for some minor developments and changes of use that they should not be subject to sequential or exception testing providing that:
  - “A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.”

## National Planning Practice Guidance

The National Planning Practice Guidance (NPPG) was updated in August 2022 and advises how to take account and address flooding in the planning process. With changes to the NPPF, there have been several adjustments to definitions and processes which are listed below.

- Paragraph 2 adds to the “what is meant by a “design flood””
  - Surface water flooding likely to occur with a 1% annual exceedance probability (a 1 in 100 chance each year)
- Paragraph 3 adds that when assessing flood risk, that sources of uncertainty are identified and accounted for in mitigation strategies.
- Paragraph 9 includes additional details for what a SFRA is to be used for:
  - Inform the allocation of land to safeguard it for flood risk management infrastructure.
  - Determine the acceptability of flood risk in relation to emergency planning capability.
  - Help demonstrate how the adaptation to climate change has been met.
- Paragraph 9 aligns with the NPPF Paragraph 161, adding:
  - “This is a collaborative, catchment-based approach delivering coordinated management of water storage, supply, demand, wastewater, flood risk, quality of water and the wider environment. It can help to identify the most effective and efficient approaches to addressing too much or too little water, enabling sustainable and climate resilient development in a way which reduces flood risk whilst delivering multiple wider benefits.”
- The Sequential Test has been updated in Paragraphs 23-25, reflecting the changes to the NPPF Paragraph 162, requiring all sources of flooding to be taken into account along with climate change and that development is steered to the lowest risk areas. With the Sequential Test being used to compare available sites in medium risk areas and when other sites aren’t reasonably available, low/medium risk areas within larger high-risk areas. Rather than relying on Flood Zone mapping, the SFRA is to now be used to inform and trigger future Sequential Tests.
- An initial Sequential Test in which the scenario of “no flood defences” is to be tested first, taking into account the aim of the NPPF for having a life long development, and if that flood defences aren’t renewed or maintained. Failure of flood defences are to not be included since they are too uncertain to predict.
- It is noted that for the Exceptions Test, there are no fundamental changes, however, in Paragraph 31 adds the following:
  - “taking account of the vulnerability of its users”
- Further changes to definitions are to what makes a “functional floodplain” in Paragraph 78, with a 3.3% Annual Exceedance Probability (AEP), or 1 in 30 year event. With an SFRA clearly showing these boundaries.

## Flood Zone Definition

Flood Zones are defined within the NPPG. The current Flood Zone definitions are listed below in Table 2-1, with these definitions used throughout the SFRA.

The probability of a flood occurring is expressed in terms of Annual Exceedance Probability (AEP), which is the inverse of the annual maximum return period. For example, the 1 in 100 year flood can be expressed as the 1% AEP flood, which has a 1% probability of being exceeded in any year.

Table 2-1- Flood Zone definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	<p>This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:</p> <p>Land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or</p> <p>Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).</p> <p>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)</p>

## Flood Zone Compatibility

The NPPG also defines flood risk vulnerability and flood zone compatibility. Table 2-2 reproduces NPPG Table 2<sup>3</sup> indicating where development is permitted or requires an Exception Test according to the development type vulnerability<sup>4</sup> and flood zone.

Table 2-2- Flood Risk Vulnerability

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required	X	Exception Test required	✓	✓
Zone 3b*	Exception Test required*	X	X	X	✓*

✓ Development permitted and Exception Test is not required

X Development should not be permitted

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

\* In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- Remain operational and safe for users in times of flood
- Result in no net loss of floodplain storage
- Not impede water flows and not increase flood risk elsewhere.

<sup>3</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

<sup>4</sup> <https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification>

### Sequential and Exception Test

The SFRA is designed to inform both the Sequential and Exception Test as set out in the NPPF to steer development away from areas at heightened risk of flooding. The sequential approach is to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change. The design life of the development needs to be considered with reference to climate change allowances. Design life to be considered for a residential development and commercial sites is 100 years and 75 years respectively.

Figure 1 reproduces the Sequential Test outlined within the FRCC-NPPG.

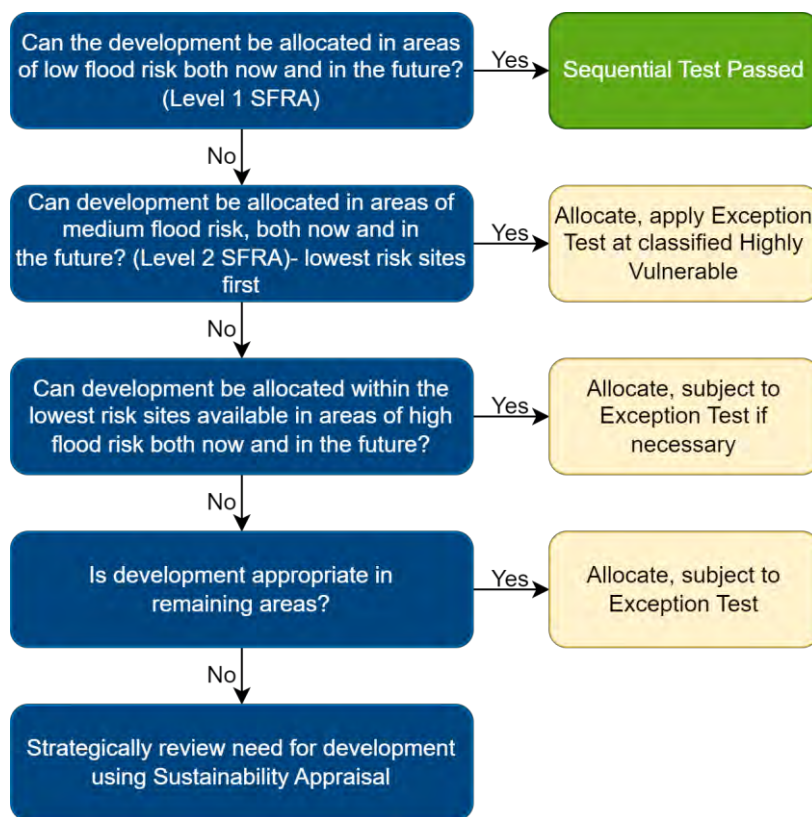


Figure 1- Application of the Sequential Test for plan preparation<sup>5</sup>

After the Sequential Test it may be necessary to apply the Exception Test. The Exception Test aims to safeguard land from development that is required for current and future flood management; use opportunities afforded by new development to reduce the causes and impacts of flooding and where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long term, seeking opportunities to facilitate the re-location of development, including housing, to more suitable locations. The process is shown in Figure 2.

<sup>5</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

To pass the Exception test it should be demonstrated that:

- development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and
- 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.

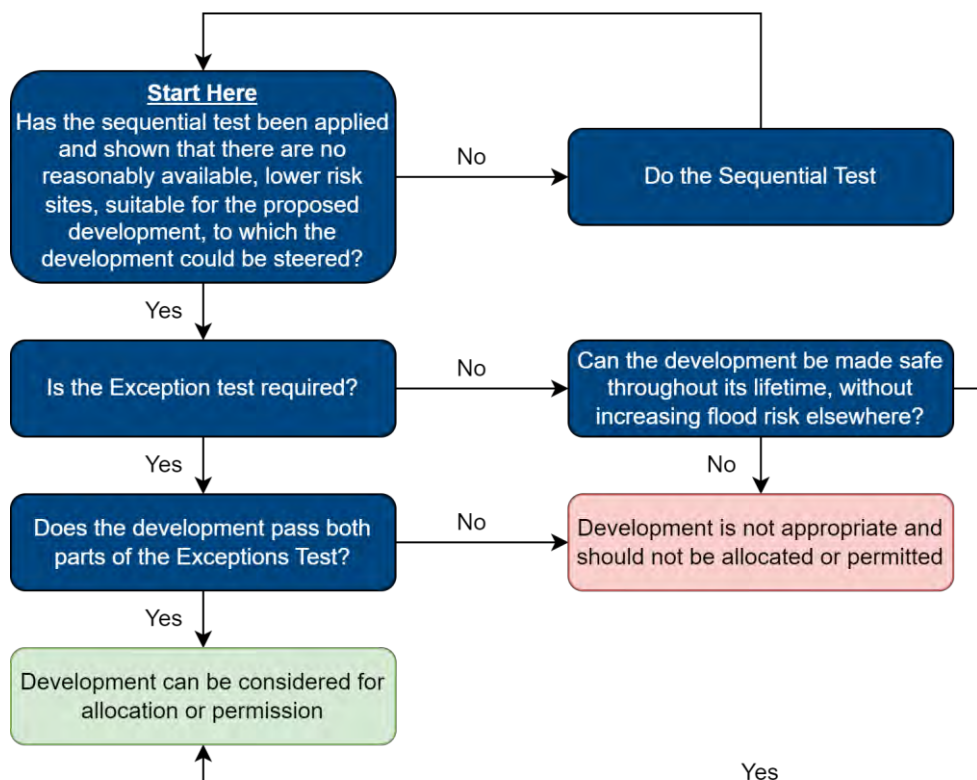


Figure 2- Application of the Exceptions Test<sup>6</sup>

FRCC-NPPG also states “The Exception Test is not a tool to justify development in flood risk areas when the Sequential Test has already shown that there are reasonably available, lower risk sites, appropriate for the proposed development. It would only be appropriate to move onto the Exception Test in these cases where, accounting for wider sustainable development objectives, application of relevant local and national policies would provide a clear reason for refusing development in any alternative locations identified.”

<sup>6</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change>



## Summary

The updates to the NPPF and NPPG now highlight the SFRA as a key document, stating it should:

- Factor in flooding from any source from any known or potential future risk.
- Rate a site vulnerability based upon their classification.
- Include surface water flooding with a 1% AEP probability within a design flood.
- Indicate a “no flood defences” scenario for a sequential test.
- Indicate the functional floodplain.

## 2.3 FLOOD RISK AUTHORITY MANAGEMENT PLANS AND STRATEGIES UPDATES

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### River Trent Catchment Flood Management Plan

The River Trent Catchment Flood Management Plan (CFMP) covers the entirety of the River Trent catchment and the majority of the N&SDC administrative area. The large Trent catchment is divided into ten sub catchments of which the Shelford to Gainsborough sub catchment covers the Trent within the N&SDC administrative area and the Sherwood sub catchment covers the western part of the N&SDC administrative area that is drained by the River Maun and its tributaries which in turn drain into the River Idle. No changes to River Trent Catchment Flood Management Plan since publication in December 2010. The following current policies of significance are noted.

Each sub-catchment was assigned a policy for management of flood risk. The Shelford to Gainsborough sub catchment was assigned Policy 4. Policy 4 is described as “areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change”. The CFMP states “this policy will tend to be applied where the risks are currently deemed to be appropriately managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be an increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options”.

The Sherwood sub catchment was assigned Policy 3. Policy 3 is described as “areas of low to moderate flood risk where we (the EA) are generally managing existing flood risk effectively”. The CFMP states “this policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood risk management actions to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term”.

## **River Witham Catchment Flood Management Plan**

An area of land to the southeast of Newark is drained by the River Witham and therefore lies in the River Witham CFMP rather than the Trent CFMP. The Witham has eight policy sub catchments and the part of the N&SDC administrative area that lies within the Witham CFMP is in the 'Upper Witham, Berlings, Bain and Upper Till' sub area where Policy 2 is applicable.

Policy 2 is described as “areas of low to moderate flood risk where we can generally reduce existing flood management actions”. The CFMP states Policy 2 “will tend to be applied where the overall risk to people and property is low to moderate. It may no longer be value for money to focus on continuing levels of maintenance to existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management action being taken so that they are proportionate to the level of risk”.

## **Nottinghamshire County Council Local Flood Risk Management Strategy (NCC FRMS)**

The NCC FRMS was formally published in December 2016 which scaled back some of the measures proposed in Objective 4 that was quoted in the 2016 Level 1 SFRA. The following measures were kept:

- “As Lead Local Flood Authority (LLFA) we are a statutory consultee in the planning process. This means that each of the Local Planning Authorities (LPAs) consults with us on the proposed management of surface water for major planning applications. We provide our comments for the LPAs consideration in their decision making process.”
- “We encourage and promote the use of sustainable drainage systems (SuDS) in all new developments and provide bespoke responses to all major application consultations.”
- “We engage with our LPAs to ensure as far as possible that they take full account of flood risk in Local Plan policies and allocations and supplementary planning documents.”

## **2.4 EA CLIMATE CHANGE ALLOWANCES UPDATE**

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### **EA Climate Change Guidance**

In July 2021 the EA Guidance “Flood risk assessments: Climate Change allowances” was updated. Peak river flow allowances and peak rainfall allowances were changed from river basin districts to management catchments based upon UKCP18 (UK Climate Projections 2018) (Table 2-3 and Table 2-4). UKCP22 is underway with any updates to allowances needing to be updated in the future.



Figure 3- EA Management Catchment boundaries

Table 2-3: EA Peak River Flow allowances

Management Catchment	Allowance category	Total change anticipated for the 2020s	Total change anticipated for the 2050s	Total change anticipated for the 2080s
Idle and Torne	Central	9%	12%	27%
	Higher	14%	19%	39%
	Upper	27%	37%	69%
Lower Trent and Erewash	Central	13%	17%	29%
	Higher	18%	23%	39%
	Upper	29%	38%	62%
Witham	Central	9%	8%	21%
	Higher	14%	15%	32%
	Upper	27%	32%	57%

Table 2-4- EA Peak Rainfall allowances

Management Catchment	Allowance category	Total change anticipated for the 2050s 3.3% AEP	Total change anticipated for the 2070s 3.3% AEP	Total change anticipated for the 2050s 1% AEP	Total change anticipated for the 2070s 1% AEP
Idle and Torne	Central	20%	35%	20%	25%
	Upper	35%	35%	40%	40%
Lower Trent and Erewash	Central	20%	25%	20%	25%
	Upper	35%	35%	40%	40%
Witham	Central	20%	25%	20%	25%
	Upper	35%	35%	40%	40%

Guidance has also been updated as to when to apply these climate change allowances based upon the flood risk vulnerability (see Paragraph 163 of NPPF). For an SFRA, both central and higher allowances are used. Depending on the vulnerability of the development the following allowances should be used in Flood Zone 2 or 3a:

- Essential Infrastructure- Higher
- Highly Vulnerable- Central
- More Vulnerable- Central
- Less Vulnerable- Central
- Water Compatible- Central

## 3.0 OVERVIEW OF FLOOD RISK

Section 3 of the assessment is split into four sections related to the various sources elements of flood risk: Fluvial and Coastal; Surface Water; Historic and Other sources.

### 3.1 FLUVIAL AND TIDAL FLOOD RISK

#### Watercourses

The following EA designated main rivers intersect with N&SDC administrative area:

- River Trent (Fluvial and Tidal)
- River Maun
- River Meden
- The Fleet
- Grassthorpe Beck
- River Devon
- River Smite
- River Witham
- Shire Dyke

Many of these only intersect with small areas of the N&SDC area along its boundary. The River Trent, River Maun and River Meden are the watercourses which intersect with the largest area of the district.

In addition to the EA designated main rivers there are a number of other minor ordinary watercourses within the district, the majority located through the centre of the district.

An overview of main rivers and ordinary watercourses in the N&SDC area is shown in Appendix A Map 1.

#### Flood Zones

The EA Flood Map for Planning for the district (at the time of publishing) has been reproduced in Appendix A Map 2. The Flood Map for Planning includes Flood Zones 2 and 3, and highlights “Areas Benefitting from Flood Defences”. The EA regularly review and update Flood Zones in light of new data, modelling or changes to defence infrastructure. Therefore, these maps are for a snapshot in time. It is recommended to use the Flood Map For Planning<sup>7</sup> website for up to date flood zone mapping.

Within the district the main flood risk is from the River Trent from fluvial and tidal flooding. Flood Zone 3 takes most of the area around the River Trent and into sub-catchments of the

<sup>7</sup> <https://flood-map-for-planning.service.gov.uk/> (accessed October 2022)

River Greet, The Beck, Grassthorpe Beck and the River Devon. To the north of the district, the River Maun and Meden are a mix of Flood Zone 2 and 3, with Flood Zone 3 found mainly in the town of Ollerton. Given the high topography of the district, away from rivers the majority of the land falls within Flood Zone 1.

This supersedes the 2009 Level 1 SFRA Appendix D and E in their entirety, and the 2016 Level 1 SFRA Drawing 27 and 28.

## Flood Defences

Since the 2016 SFRA there have been newly completed flood defence schemes built within the area, with additional proposed schemes and schemes currently being built. These are listed in Table 3-1 below and added to Appendix A Map 2.

Table 3-1- Planned and ongoing Flood Defence schemes

Project Name	River	Timeframe
Caythorpe Embankment Reprofilng and wetland	Dover Beck	2023
Fiskerton Flood Cell	River Greet	Planning
Fiskerton De-silting and embankment reprofiling	River Greet	Ongoing 2017-2023
Hoveringham Property Level Protection	River Trent	Planning
Lowdham Flood Alleviation Scheme	Cocker Beck	Ongoing Planning (Partially complete in 2021)
Lowdham recovery works (Steel sheet wall piling)	Cocker Beck	Completed 2021

The Lowdham Cocker Beck Flood Alleviation scheme has been designed to protect up to 195 properties with a 1% AEP standard of protection when it comes online (planned Spring 2024). Any proposed developments within the Cocker Beck catchment should consult with the EA to determine any interactions there may be with the scheme and the level of protection to new development within the area.

Land planned to be, or already being, used for flood storage or flood alleviation schemes (e.g. Lowdham and Fiskerton) is to be protected from future development and designated as functional floodplain.

In addition to these schemes routine internal maintenance for assets and river conveyance, repairs to public safety assets (for example, fencing) have been provided by Trent Valley IDB, Upper Witham IDB and Ground Control contractors.

This supersedes the 2009 Level 1 SFRA Appendix C and 2016 Level 1 SFRA Drawing 27.

## **Flood Warning Areas**

As part of the update, flood warning areas have been added in Appendix A Map 3. There are 37 alert areas. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater. Specifically, Flood Warning Areas define locations within the Flood Warning Service Limit that represent a discrete community at risk of flooding. The main flood warning areas are found across the River Trent, both in the fluvial and tidally controlled regions. Other flood warning areas are found on the River Maun, and partially on the River Meden around Budby. Flood warning areas located on the River Witham enter the district near to urban development. To receive updates for the flood warning service via phone, text or email, then this can be setup on 'Sign up for flood warnings'<sup>8</sup>.

## **Fluvial Modelling and Functional Floodplain**

### ***River Trent***

The Trent model was supplied by the EA. It was last updated in 2011 and was used in the 2016 Level 1 SFRA. The model includes the River Trent and its tributaries, the Cocker Beck, Dover Beck, River Greet, Lower River Devon/ Middle Beck and Slough Dyke. For this SFRA the defended model has been updated to include more recent LiDAR topography data and has been run for the most up-to-date climate change allowances (29% - Central 2080s and 39% Higher Central 2080s). Appendix A Map 4 shows the new defended modelled extents. The Trent model has been run in three separate model domains given the size of the Trent model, overlap between the model domains is shown on Map A4. The hydrology associated with the Trent model has not been updated and therefore it is not possible to run the suggested 3.3% AEP functional floodplain event. Therefore, for the purposes of spatial planning the defended 2% AEP event has been run through the model and it is suggested that this more conservative event be adopted as the functional floodplain for the purposes of this SFRA.

This supersedes all previous modelled outputs.

The functional floodplain shows a greater extent around the River Devon and the upstream boundary of the N&SDC area. There is limited urban development in that area and is predominantly farmland. Villages such as Gibsmere are found within the functional floodplain.

### ***River Maun, River Meden, River Smite, Shire Dyke and River Witham***

The River Maun (2007), River Meden (2008), River Smite (2012) and River Witham Upper/Lower (2015) model extents were supplied by the EA and are present in Map A4 and A5. Where different models meet, there may be discontinuities with them, therefore is

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<sup>8</sup> <https://www.gov.uk/sign-up-for-flood-warnings>

recommended to take this into consideration when using modelled data in these areas. The climate change runs undertaken for these models to date are for an outdated climate change allowance of 20%. Therefore, any development in the vicinity of these flood extents will need to be assessed in detail at the FRA stage including an assessment of climate change using the most up to date climate change allowance for the area.

The EA is in the process of updating the River Maun and River Meden models, these updates will include runs using the latest climate change allowances. The data was not available at the time of writing but can be accessed in the future through a data request to the EA.

### ***Upper River Devon, Upper River Greet, The Fleet and Grassthorpe Beck***

As of publication, there are no models available for these Main Rivers from the EA. The EA are in the process of modelling the Upper River Devon. The data was not available at the time of writing but can be accessed in the future through a data request to the EA.

### **Tidal Modelling**

The tidal limit of the River Trent is Cromwell Weir shown in Appendix A Map 1. As per the 2016 Level 1 SFRA the tidal section of the River Trent has not been rerun with climate change allowances as none of the sites being put forward for site screening as part of the SFRA are in this area, so it does not justify the associated expenditure. For now the Flood zones should be used for spatial planning purposes, with Flood Zone 2 acting as a Proxy for the future Flood Zone 3. If development is proposed in areas downstream of Cromwell Weir a detailed Flood Risk Assessment will be required, and the Environment Agency should be consulted regarding tidal flood risk along the River Trent. It is possible that additional tidal modelling including of climate change scenarios will be required to support an FRA in this area.

The 2009 Level 1 SFRA Appendix D<sup>9</sup> presented Tidal flood extents (reproduced in Appendix F) the Flood Zones in this area will also take account of Tidal Flood Risk.

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<sup>9</sup> <https://www.newark-sherwooddc.gov.uk/sfral1/>



## Climate Change

Climate change allowances supplied by the EA are detailed in Table 2-3. The Trent model has been run for the Central 29% and Higher 39% uplifts for the 2080s epoch. For all other Main Rivers where modelling has been undertaken by the EA an uplift of 20% has been applied. The modelled climate change extents (where available) are shown in Appendix A Map 5.

For watercourses where no detailed modelling of climate change exists, the Flood Zone 2 should be used as a proxy for a future Flood Zone 3 with climate change in lieu of any detailed model data for the purposes of spatial planning only. If development is proposed in the vicinity of those watercourses not remodelled using the latest climate change allowance additional modelling using the new climate change allowances would need to be undertaken to support the FRA.

Compared to the 0.1% AEP flood there are further areas of inundation located to the north of Fiskerton and from South Muskham, with a potential abandoned channel being utilised by the Trent. The extent of this crosses the A1 at SK 79874 60651 flowing along an unnamed channel.

## 3.2 SURFACE WATER FLOOD RISK

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### Risk of Flooding from Surface Water

The risk of flooding from surface water (RoFSW) extents provided by the EA are reproduced for the 3.3% AEP, 1% AEP and 0.1% AEP events in Appendix B Map 1. The 1% AEP is the “design event” for assessing surface water flood risk.

This supersedes the 2009 Level 1 SFRA Appendix D and E in their entirety.

### Climate Change

Making allowances for climate change is necessary to understand the risk of flooding for a development’s lifespan. There is not a future surface water flood risk map therefore for this SFRA the EA RoFSW 0.1% AEP extent has been used as a proxy for climate change to inform local planning and the sequential test. Areas vulnerable to surface water flooding with climate change is in Appendix B Map 2.

## 3.3 HISTORIC FLOODING

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Historic flooding events are those which have been recorded within the N&SDC area, either from a Main River, Ordinary Watercourses, Surface Water, Groundwater and Sewerage/ Drains. The data presented was gathered from the relevant Risk Management Authorities (RMAs) for this update and is shown in Appendix C Map 1. Additional historic flooding data

can be found in the 2009 and 2016 Level 1 SFRA and in the Local Flood Risk Management Strategy (LFRMS) Maps A7a and A7b (2015), which is reproduced in Appendix F.

## Environment Agency

Based upon available flood data there have been no additional main river flood events within the district area since the previous SFRA. Extents are shown from 1745 therefore changes to infrastructure and flood defences may have changed in the affected areas. Notable events that have taken place in the area are shown in Table 3-2.

Table 3-2 Flood History

River	Notable Events
River Trent (Fluvial)	1932/1947/1977/2000
River Trent (Tidal)	1932/1947/1977/2000
River Maun/ Meden	1947/1977
River Devon	1950/1977/1978/1979
River Greet	2012
Cocker Beck	2007

Historic main river flooding shows the active nature of the River Trent floodplain and how during bankfull events will spill over and affect large areas. The River Trent has experienced both fluvial and tidal flooding historically. The River Devon also experiences these overspill events, predominantly across its floodplain. Historic flood extents to the River Maun/ Meden shows limited out of bank flooding.

The EA historic flood records for the River Trent do not extend beyond the year 2000, even though anecdotal evidence suggests flooding has occurred. To be added to the EA historic flooding record the following criteria for inclusion has to be met:

- Photographic/video evidence with the location referenced
- Recorded flood levels with the location referenced
- Evidence that the outline represents the time of peak water level (for example date / time stamped photo)
- Evidence that the source of flooding is from rivers, the sea or groundwater and not surface water/overland runoff.

## Nottinghamshire County Council (LLFA)

Data from relating to historic flooding within the N&SDC is provided by the LLFA under Section 19<sup>10</sup> of the Flood and Water Management Act (2010). Historic flooding from ordinary watercourses, groundwater and sewerage is included. To avoid data replication and for up to date information, those reports should be utilised. Where relevant in developer guidance, any requirements to indicate historic flooding will be highlighted. Locations of previous historic flooding is also available in the Preliminary Flood Risk Assessment

<sup>10</sup> <https://www.nottinghamshire.gov.uk/planning-and-environment/flooding-help-and-advice/the-councils-role>

(PFRA) which was last published in 2017, with an update expected to this document in late 2022/ early 2023. A heatmap is provided in Figure 4 which shows the distribution of flooding events in the district, this is a preliminary drawing provided which when updated can be found in the PFRA.

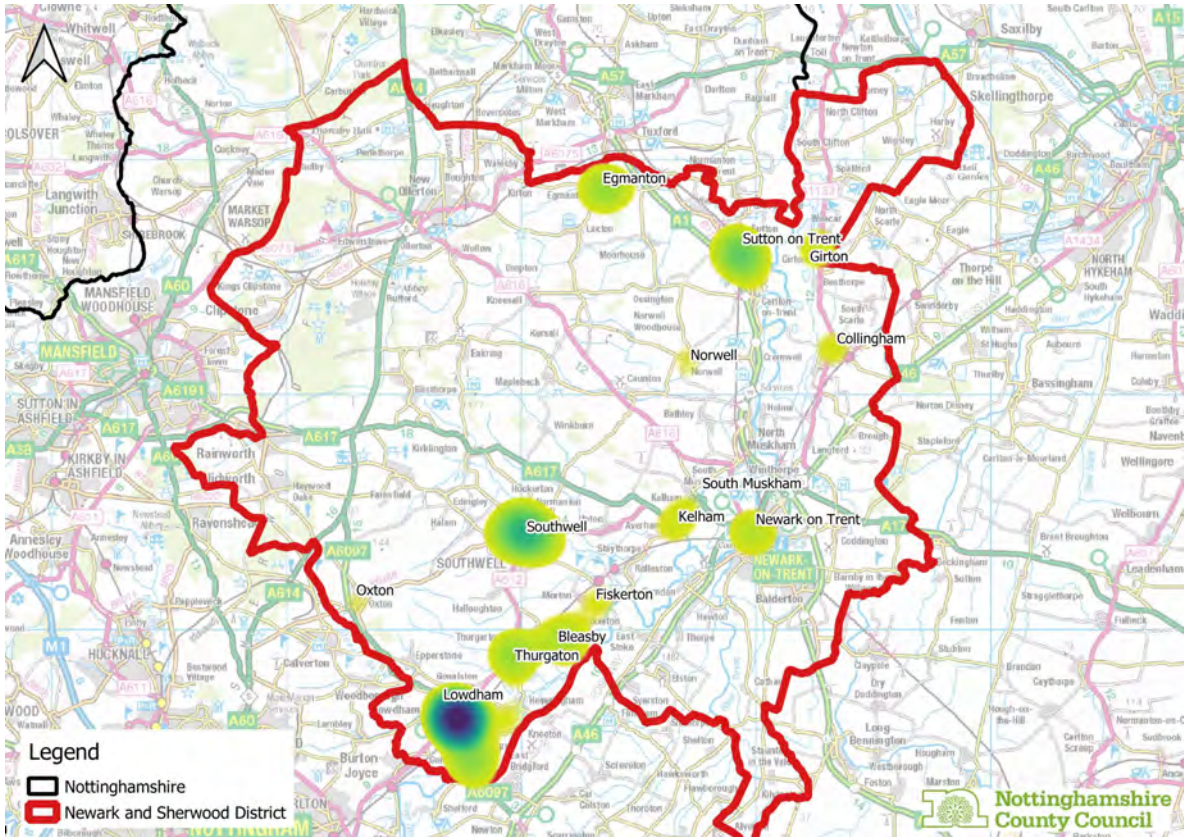


Figure 4- Historic flooding heatmap. Darker colours indicate more flooding incidents.

### Southwell

Southwell was subjected to severe flooding in July 2013 of up to 300 properties at a < 0.1% AEP, which led to the LLFA carrying out a detailed investigation into the causes of the flooding and the possible ways of mitigating the risk of flooding to the community. Output from the investigation has led to flood mitigation planning within the area. Areas of significance are around Potwell Dyke and Hallam Hill. Modelled outputs from this investigation were not supplied by the LLFA for this SFRA update. But, any proposed development in the Southwell region should liaise with the LLFA to obtain detailed information about the flood risk and associated mitigation requirements in this area at the outset. The scheme includes property flood resilience (flood doors, airbrick covers, flood barriers), natural flood management (NFM), retrofit sustainable drainage systems (SuDs), super road gullies and retention ponds.

### **Water Companies**

The majority of the N&SDC area is within the jurisdiction of Severn Trent Water, with a small area in the northeast falling within Anglian Water area as shown in Figure 5. Both companies were contacted for data relating to historic flood events, but this is yet to be

received at the time of writing. It is noted that Anglian Water area is predominantly rural with no major urban areas, therefore historic flooding data in that area is likely to be less significant to future development.

### Internal Drainage Boards

Smaller watercourses and drains form the IDBs, with Trent Valley and Upper Witham IDB shown in Figure 5. There is an additional IDB at Isle of Axholme and North Nottinghamshire, which is less than 7 ha and has not been included in the SFRA. The IDBs were contacted for comment on historic flooding with no flooding found. The Trent Valley IDB covers most of the River Trent which is classed a main river by the EA and therefore included in the historic EA flood data available in Appendix C Map 1.

### Canal and River Trust

There are no purpose built canals within the district area, but the River Trent is partially canalised as a navigable watercourse and these sections managed by the CRT shown in Figure 5. The 2009 and 2016 SFRA did not consult with the Canal and River Trust (CRT), and therefore additional data has been provided from them around the River Trent. Historical flooding at one site near Averham has been identified from a partially breached weir.



Figure 5- Water Company, IDB and CRT boundaries

## 3.4 OTHER SOURCES OF FLOODING

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### Groundwater

Data was provided by the EA for the 2009 Level 1 SFRA describing groundwater levels within the area. Within towns such as New Ollerton, Edwinstowe and Rainworth, the average groundwater depth was greater than 15 m below the surface. The LFRMS Figure A5<sup>11</sup> reproduces the susceptibility to groundwater flooding map, reproduced in Appendix F. Across the N&SDC area there is a >75% susceptibility to groundwater flooding around the River Trent and its floodplain through alluvial gravels. Areas with a lower susceptibility of <75% fringe the Trent and towns such as Ollerton and Southwell have a <25% susceptibility to groundwater flooding. Further details of susceptibility to groundwater flooding can be found in the updated PFRA<sup>12</sup> provided by the LLFA.

### Reservoirs

The area of the N&SDC area at risk of reservoir flooding is shown in Appendix D Map 1 for both a dry (river levels are at a normal level) and wet day (river is experiencing an extreme natural flood).

Reservoirs are maintained to a high level and regularly inspected and therefore the likelihood of a reservoir failing is extremely low. Nevertheless, even though the likelihood of reservoir failure is extremely low, it is still required to be considered as part of the local planning process to inform strategic decisions.

### Canals

There are no purpose built canals within the district area, but the River Trent is partially canalised. But flood risk from these sections is assessed as part of the fluvial flood risk from the River Trent.

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<sup>11</sup> <https://www.nottinghamshire.gov.uk/media/119303/figure-a5.pdf>

<sup>12</sup> <https://www.nottinghamshire.gov.uk/planning-and-environment/flooding-help-and-advice/the-councils-role>

## 4.0 DEVELOPER GUIDANCE

### 4.1 FLOOD RISK ASSESSMENT REQUIREMENTS

The EA provide guidance in conjunction with the NPPF and PPG setting out when a Flood Risk Assessment (FRA) is required to support a planning application. However, a further check should be made against the Newark & Sherwood Development Plan, and supporting information, to ensure that the proposed development is not located in area where, on account of known local flood risk issues, a more extensive approach to support a planning application applies. A FRA is required when development is planned in a flood zone following the criteria set out in Table 4-1.

Table 4-1- When a FRA is required<sup>13</sup>

FRA Criteria	FRA Required	Scope
> 1 ha in Flood Zone 1	✓	Requirements of NPPF
< 1 ha in Flood Zone 1 if there is an increase in Flood Vulnerability Class	✓	Requirements of NPPF
Area in Flood Zone 1 with critical drainage problems	✓	Requirements of NPPF
Flood Zone 2	✓	Requirements of NPPF
Flood Zone 3a	✓	Requirements of NPPF
Flood Zone 3b (Functional Floodplain)	✓	Requirements of NPPF

Guidance on how to produce a FRA for sites within Flood Zone 1<sup>14</sup> and Flood Zone 2/3<sup>15</sup> is available online (links provided in the footnotes).

Some developments may also require further investigation in addition to a FRA, these are outlined in Table 4-2.

<sup>13</sup> <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

<sup>14</sup> <https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>

<sup>15</sup> <https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zones-2-and-3>

Table 4-2- Alternative development requirements

Further Investigation	Requirement	Further Investigation
Greater than 0.25 ha	Drainage impact assessment required	Refer to NPPF
Within 8 m of the bank top of a main river or 16 m of a tidal main river	Consult EA	EA Flood Risk Activity Permit required
Within 8 m of a flood defence of a main river, or 16 m of a tidal main river	Consult EA	EA Flood Risk Activity Permit required
Minor extensions (less than 0.025 ha) in Flood Zone 2 or 3	Consult EA	Refer to NPPF
Change of use that increases vulnerability	Consult LPA	Refer to NPPF

## 4.2 FLOOD RISK MANAGEMENT

Following the application of the sequential test, and in line with the NPPF vulnerability matrix (Table 2-2) some development may be located in areas of flood risk and therefore decisions on what mitigation measures can be adopted to manage and mitigate the flood risk will be required. Development in areas of flood risk need mitigation measures to ensure the development is safe, does not increase flood risk elsewhere and where possible reduces flood risk overall. The design of a development and mitigation measures will need to be assessed in a site-specific FRA. It is imperative that climate change allowances are met in the design of the development for its lifespan.

Mitigation measures should be considered using the following hierarchy:

- Flood avoidance: risk of flooding to building and/or surrounds is avoided through:
  - Sequential site design;
  - raising ground or floor levels
  - landscaping
  - local bunds
- Flood resistance: preventing water ingress to buildings through:
  - Property level protection measures.
- Flood resilience and repairability: ensuring that when water enters its impact is reduced through:
  - use of resilient construction methods and materials that are easily cleaned, dried and / or repairable if impacted.



Further elements of guidance can be found on the “Preparing a FRA: standing advice”<sup>16</sup>. Additionally, the UK government document “Improving the Flood Performance of New Buildings Flood Resilient Construction” published in 2007<sup>17</sup> aims to provide guidance to developers and designers on how to improve the resilience of new properties.

### 4.3 SUSTAINABLE DRAINAGE SYSTEMS

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SuDs can be used to control surface water within the area that it falls, reducing the outflow from the area into more at risk sections. By trying to mimic natural drainage, natural and built landscapes can achieve a reduction in runoff potential on a site. For developments identified as having a risk of flooding from surface water, it is particularly prudent that SuDs are considered as it may reduce the risk subject to site specific work undertaken.

Various SuDS techniques are available, however the techniques operate on two main principles: Infiltration and Attenuation.

Infiltration SuDS rely on discharging to ground, where suitable ground conditions allow. Infiltration methods include the use of permeable surfaces such as soakaways and other techniques that are generally located below ground such as geocellular systems. Where site ground conditions are deemed unsuitable for the widespread implementation of infiltration techniques, surface water runoff will need to be attenuated using on-site attenuation storage. On site ‘above ground’ storage measures include basins and ponds, with ‘below ground’ facilities generally following the more engineered forms of underground storage. In many cases a combination of both infiltration and attenuation methods may be applied. The underlying ground conditions of a site will need to be determined through ground investigations; these assess the permeability of the underlying soil.

In the design of any drainage system and SuDS approach, consideration should be given to site-specific characteristics and where possible be based on primary data from site investigations. The information presented is provided as a guide and should not be used to accept or refuse SuDS infiltration techniques.

SuDs applicability related to the superficial and bedrock geology was examined in the 2009 Level 1 SFRA<sup>18</sup>. It shows that the area to the north is identified as being applicable to SuDs with most of the River Trent and its floodplain being unrealistic for SuDs.

Further advice must also be sought on the application of SuDS in terms of information relating to water resources, contaminated land, archaeology, and ecology.

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<sup>16</sup> <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>

<sup>17</sup> <https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/improving-the-flood-performance-of-new-buildings-in-flood-risk-areas>

<sup>18</sup> <https://www.newark-sherwooddc.gov.uk/media/newark-and-sherwood/images-and-files/planning-policy/pdfs/flooding-and-water-infrastructure/strategic-flood-risk-assessment-level-1/appendix-c/SuDS-Infiltration-Feasibility-Plan.pdf>

## 4.4 NATURAL FLOOD MANAGEMENT

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Where permissible NFM can be used to restore the natural processes within a catchment, helping to dictate the flow paths of flood water. Types of NFM can be used in conjunction with SuDS such as removing impermeable surfaces and creating areas where flood water is going to collect. The restoration of rivers, helping to restore a natural morphology can increase channel capacity compared to if they were contained within a culvert / concrete drainage path. Reducing the flow entering larger watercourses by naturalising the banks and beds to reduce the flow of the water can help to minimise risk. A site specific assessment will be required to determine if NFM would deliver benefits. Guidance on identifying whether NFM can be accommodated within a catchment can be found in the FRCC- NPPG <sup>19</sup>.

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<sup>19</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#para65>

## 5.0 SITE SCREENING

Sites from the ‘Amended Core Strategy’<sup>20</sup> (2019) and ‘Allocations and Development Management DPD’<sup>21</sup> (2013) have been provided by N&SDC. Those sites which have either been built/ partially built or with planning permission have been excluded. The remaining sites have been screened to determine their strategic flood risk and are shown in Appendix E Map 1. The sites have been grouped in terms of vulnerability of development, the screening assessment for each development grouping is detailed in section 5.1 to 5.5... The screening assesses each site against the Flood Zones maps, Risk of Flooding from Surface Water mapping, and the modelled 2% AEP event (where available). The modelled fluvial flooding 2% AEP is being used as a proxy for the ‘functional floodplain’ in lieu of any modelling of the 3.3% AEP. The screening then concludes with whether the site is required to be passed onto a Level 2 SFRA assessment. (the Level 2 SFRA report is available separately).

### 5.1 HOUSING (MORE VULNERABLE)

Housing developments are classified as “More Vulnerable” in terms of flood risk. Table 5-1 summarises the screening assessment.

Table 5-1 – Housing development sites

Development Area	Percentage of Site at risk of surface water flooding (%)			Percentage of Site in Flood Zone (%)			Percentage of Site at risk of modelled fluvial flooding (%)	Passed to Level 2 SFRA
	3.3% AEP	1% AEP	0.1% AEP	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b (2% AEP)	
NUA/Ho/2	6	15	34	39	61	0	0	✓
NUA/Ho/5	0	0	4	100	0	0	0	✓
NUA/Ho/6	8	8	38	100	0	0	0	✓
NUA/Ho/9	1	4	18	100	0	0	0	✓
NUA/Ho/10	1	3	14	99	1	0	0	✓
So/Ho/5	2	5	20	100	0	0	N/A	✓
So/Ho/7	0	0	12	100	0	0	N/A	✓

<sup>20</sup> <https://www.newark-sherwooddc.gov.uk/amendedcorestrategy/>

<sup>21</sup> <https://www.newark-sherwooddc.gov.uk/adm/>

## 5.2 GYPSY AND TRAVELLER SITES (HIGHLY VULNERABLE)

Caravans, mobile homes and park homes intended for permanent use are classified as “Highly Vulnerable”. Table 5-2 summarises the screening assessment. Table 5-1

Table 5-2- Gypsy and Traveller development sites

Development Area	Percentage of Site Area at risk of surface water flooding (%)			Percentage of Site Area in Flood Zone (%)			Percentage of Site at risk of modelled fluvial flooding (%)	Passed to Level 2 SFRA
	3.3% AEP	1% AEP	0.1% AEP	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b (2% AEP)	
NUA/GRT/12	0	0	0	100	0	0	0	X
NUA/GRT/15	1	3	27	100	0	0	0	✓
OB/GRT/1	3	5	15	100	0	0	N/A	✓
OB/GRT/BL/1	2	11	39	100	0	0	N/A	✓
OB/GRT/2	0	0	0	100	0	0	N/A	X
OB/GRT/3	0	0	0	100	0	0	N/A	X
OB/GRT/4	2	43	82	100	0	0	N/A	✓
OB/GRT/5	1	24	77	100	0	0	N/A	✓
NUA/GRT/13	1	1	12	100	0	0	0	✓
NUA/GRT/14	0	0	21	0	100	0	0	✓
NUA/GRT/1	0	1	18	0	0	0	100	✓
NUA/GRT/2	5	12	37	0	0	0	100	✓
NUA/GRT/10	0	0	0	0	0	0	100	✓
NUA/GRT/3	0	0	6	0	95	5	0	✓
NUA/GRT/4	0	0	2	0	53	45	2	✓

NUA/GRT/11	0	0	2	0	98	2	0	✓
NUA/GRT/6	0	0	0	0	100	0	0	✓
NUA/GRT/5	0	1	6	0	57	33	0	✓
NUA/GRT/7	0	1	8	0	33	57	0	✓
NUA/GRT/8	0	0	0	0	100	0	0	✓
NUA/GRT/9	0	0	0	0	94	6	0	✓

### 5.3 EMPLOYMENT (LESS VULNERABLE)

Singular employment developments are classified as “Less Vulnerable” in terms of flood risk. In Table 5-3 summarises the screening assessment.

Table 5-3- Employment development sites

Development Area	Percentage of Site at risk of surface water flooding (%)			Percentage of Site in Flood Zone (%)			Percentage of Site at risk of modelled fluvial flooding (%)	Passed to Level 2 SFRA
	3.3% AEP	1% AEP	0.1% AEP	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b (2% AEP)	
NUA/E/2	2	5	15	100	0	0	0	✓
NUA/E/3	1	20	60	100	0	0	0	✓
NUA/E/4	0	3	3	0	66	34	0	✓
So/E/2	6	23	53	86	14	0	N/A	✓
OB/E/1	3	7	27	96	1	3	N/A	✓
OB/E/2	2	4	16	97	0	3	N/A	✓
OB/E/3	2	4	15	95	1	4	N/A	✓
Bi/E/1	33	48	81	100	0	0	N/A	✓

Ra/E/1	4	7	15	92	1	7	N/A	✓
Bl/E/1	8	8	8	100	0	0	N/A	✓

## 5.4 MIXED USE (MORE VULNERABLE)

Mixed-use developments of housing and employment are classified as “More Vulnerable” in terms of flood risk. Table 5-4 summarises the screening assessment.

Table 5-4- Mixed Use development sites

Development Area	Percentage of Site at risk of surface water flooding (%)			Percentage of Site in Flood Zone (%)			Percentage of Site at risk of modelled fluvial flooding (%)	Passed to Level 2 SFRA
	3.3% AEP	1% AEP	0.1% AEP	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b (2% AEP)	
NUA/MU/1	0	0	16	100	0	0	0	✓
OB/MU/2	1	1	7	100	0	0	N/A	✓
CI/MU/1	2	5	19	96	2	2	N/A	✓

## 5.5 RETAIL (LESS VULNERABLE)

Retail developments are classified as “Less Vulnerable” in terms of flood risk n. Table 5-5 summarises the screening assessment.

Table 5-5 - Retail development sites

Development Area	Percentage of Site at risk of surface water flooding (%)			Percentage of Site in Flood Zone (%)			Percentage of Site at risk of modelled fluvial flooding (%)	Passed to Level 2 SFRA
	3.3% AEP	1% AEP	0.1% AEP	Flood Zone 1	Flood Zone 2	Flood Zone 3a	Flood Zone 3b (2% AEP)	
OB/RE/1	6	6	6	100	0	0	N/A	✓

## 6.0 SUMMARY AND RECOMMENDATIONS

### 6.1 SUMMARY

The update to the N&SDC Level 1 SFRA has been based on the best available most up to date data and information at the time of publishing. This SFRA has produced an updated collection of maps and data describing the flood risk from all sources within the district area with the aim of informing the N&SDC local plan. A SFRA is a live report and will need to be updated regularly to ensure the information contained within it is up to date.

The SFRA can be used to inform the selection of development sites within the N&SDC area and guide them through the Sequential and Exceptions tests. It has been identified within the Level 1 SFRA that there are sites at risk of flooding as they cannot be located fully in Flood Zone 1 and require progression into a Level 2.

### 6.2 SUMMARY OF MAPS

#### **Appendix A-** Fluvial and Coastal Flood Risk

1. River Overview
2. Flood Zones/ Flood Defences/ Areas Benefitting from Flood Defences
3. Flood Warning Alert areas/ Hydrometric Sites
4. Fluvial Modelling
5. Climate Change

#### **Appendix B-** Risk of Flooding from Surface Water

1. RoFSW (3.3%,1% and 0.1% AEP) Extents
2. RoFSW Climate Change

#### **Appendix C-** Historic Flooding

1. Historic flood extents

#### **Appendix D-** Other Sources of Flooding

1. Reservoir inundation

#### **Appendix E-** Development Site Locations

1. Development Areas and Key

#### **Appendix F-** Archived Maps

1. Groundwater Susceptibility
2. Historic Flood Records Pre- 2011
3. Historic Flood Records 2012-2015
4. Tidal Flood Extent 2009

Note all mapped flood extents contain an element of uncertainty arising from underlying modelling assumptions, especially climate change.

## 6.3 RECOMMENDATIONS

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It is recommended that a Level 1 SFRA is reviewed every 3-4 years in its entirety to ensure that it complies with current regulations and that flood risk data is up to date.

Sites identified as not requiring progression onto the Level 2 SFRA comply with the current regulations. Those that require further assessment should be assessed in detail in a Level 2 SFRA.



## APPENDIX A- FLUVIAL AND TIDAL FLOOD RISK

## APPENDIX B- RISK OF FLOODING FROM SURFACE WATER

## APPENDIX C – HISTORIC FLOODING

## APPENDIX D- OTHER SOURCES OF FLOODING

## APPENDIX E – DEVELOPMENT SITE LOCATIONS

## APPENDIX F- ARCHIVED MAPS