



# **North Somerset Council Level 1 Strategic Flood Risk Assessment**

674946CH-L1-SFRA | 04

June 2020



## North Somerset Council Level 1 Strategic Flood Risk Assessment

Project No: 674946CH  
 Document Title: Level 1 Strategic Flood Risk Assessment  
 Document No.: 674946CH-L1-SFRA  
 Revision: 04  
 Date: June 2020  
 Client Name: North Somerset Council  
 Client No: -  
 Project Manager: Graham Dean  
 Author: Maria Koulouri  
 File Name: \\crofil01\Projects\674946CH NSC Level 1 SFRA\900 Deliverables\v04\North Somerset Council Level 1 SFRA v04.docx

Jacobs U.K. Limited

Cottons Centre  
 Cottons Lane  
 London  
 SE1 2QG

[www.jacobs.com](http://www.jacobs.com)

© Copyright 2020 Jacobs U.K. Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Limitation: This document has been prepared on behalf of, and for the exclusive use of Jacobs' client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this document by any third party.

### Document history and status

| Revision | Date       | Description       | By         | Review    | Approved |
|----------|------------|-------------------|------------|-----------|----------|
| 01       | 10/06/2019 | For client review | M.Koulouri | M. Symons | G. Dean  |
| 02       | 16/12/2019 |                   | M.Koulouri | M.Symons  | G.Dean   |
| 03       | 17/01/2020 |                   | M.Koulouri | M.Symons  | G.Dean   |
| 04       | 05/06/2020 |                   | M.Koulouri | M.Symons  | G.Dean   |
|          |            |                   |            |           |          |
|          |            |                   |            |           |          |

## Contents

|  |           |
|--|-----------|
| <b>Glossary and Abbreviations .....</b>                      | <b>v</b>  |
| <b>Executive Summary .....</b>                               | <b>1</b>  |
| <b>1. Introduction .....</b>                                 | <b>2</b>  |
| 1.1 Overview .....   | 2         |
| 1.2 Aims and Objectives .....                                | 3         |
| 1.3 The Need for an Updated SFRA.....                        | 3         |
| 1.4 Outputs.....   | 4         |
| <b>2. Planning Policy Framework and Other Guidance .....</b> | <b>5</b>  |
| 2.1 National Planning Policy .....                           | 5         |
| 2.2 Local Development Planning Policy .....                  | 6         |
| 2.3 Additional Guidance.....                                 | 6         |
| 2.4 Flood Risk Management Strategies.....                    | 8         |
| 2.5 Flood Zone Classification.....                           | 9         |
| 2.6 The Sequential Test.....                                 | 9         |
| 2.7 The Exception Test.....                                  | 10        |
| <b>3. Study Area Information .....</b>                       | <b>12</b> |
| 3.1 Description of Physical Characteristics.....             | 12        |
| <b>4. Data and Mapping .....</b>                             | <b>18</b> |
| 4.1 Data Collection.....                                     | 18        |
| 4.2 Data Quality .....                                       | 18        |
| 4.3 Supporting Figures.....                                  | 19        |
| <b>5. Types of Flooding .....</b>                            | <b>20</b> |
| 5.1 General Information .....                                | 20        |
| 5.2 Historic Flooding .....                                  | 20        |
| 5.3 Fluvial Flood Risk.....                                  | 24        |
| 5.4 Tidal Flood Risk .....                                   | 26        |
| 5.5 Surface Water Flood Risk .....                           | 26        |
| 5.6 Reservoir Flood Risk.....                                | 28        |
| 5.7 Groundwater Flood Risk .....                             | 28        |
| 5.8 Sewer Flooding .....                                     | 29        |
| 5.9 Climate Change .....                                     | 31        |
| <b>6. Flood Risk in North Somerset .....</b>                 | <b>33</b> |
| 6.1 Current Levels of Flood Risk .....                       | 33        |
| 6.2 Current Flood Risk in Steep Holm Island.....             | 34        |
| 6.3 Climate Change Mapping .....                             | 35        |
| <b>7. Flood Risk Management.....</b>                         | <b>37</b> |
| 7.1 Sustainable Flood Risk Management.....                   | 37        |

|  |  |           |
|--|--|-----------|
| 7.2  | Responsibilities for Flood Risk Management.....                        | 37        |
| 7.3  | Flood Defences.....  | 38        |
| 7.4  | Flood and Coastal Erosion Risk Management (FCERM) Capital Schemes..... | 39        |
| 7.5  | Surface Water and Sustainable Drainage Systems (SuDS).....             | 39        |
| 7.6  | Emergency Planning.....  | 42        |
| 7.7  | Flood Warning.....   | 44        |
| 7.8  | Residual Risk of Flooding .....  | 45        |
| <b>8.</b>  | <b>Recommendations and Policy for the Planning Authority .....</b>     | <b>46</b> |
| 8.1  | Revisions to Local Planning Policy Regarding Flooding .....            | 46        |
| 8.2  | Site Allocations .....   | 46        |
| 8.3  | Relocation of Unsuitable Existing Development.....                     | 46        |
| 8.4  | Safeguarding.....  | 47        |
| 8.5  | North Somerset Critical Drainage Areas.....                            | 47        |
| 8.6  | Securing New Infrastructure .....                                      | 47        |
| 8.7  | Naturalisation of Watercourses.....                                    | 47        |
| 8.8  | Opportunities to Reduce Flooding .....                                 | 48        |
| 8.9  | Planning Applications – NSC and Applicants .....                       | 50        |
| 8.10   | Restriction of Permitted Development Rights.....                       | 51        |
| 8.11   | Development Management Recommendations .....                           | 52        |
| <b>9.</b>  | <b>Reviewing and Updating this SFRA.....</b>                           | <b>53</b> |
| <b>Appendix A. Supporting Figures.....</b>             |  | <b>55</b> |
| <b>Appendix B. Development Management Advice .....</b> |  | <b>56</b> |

## List of Figures

|   |    |
|---|----|
| Figure 2—1: Application of the Sequential Test and Exception Test for Local Plan Preparation..... | 11 |
| Figure 3—1: Hydrological Catchments and Coastline Areas within North Somerset.....                | 13 |

## List of Tables

|  |    |
|--|----|
| Table 2.1: Flood Zones Definition .....  | 9  |
| Table 2.2: Flood Risk Vulnerability and Flood Zone Compatibility .....   | 10 |
| Table 3.1: Designated City, Town and District Centres within North Somerset .....  | 12 |
| Table 3.2: Catchments in the Study Area .....  | 14 |
| Table 3.3: Coastline sections across North Somerset.....   | 16 |
| Table 5.1: Significant Recorded Historic Flood Events.....   | 21 |
| Table 5.2: Key Flooded Locations in 2012.....  | 23 |
| Table 5.3: Flood Zone 3b Delineation Data .....  | 25 |
| Table 5.4: Wessex Water Property Sewer Flooding Records .....  | 30 |
| Table 6.1: Sea level rise allowances for the South West region.....  | 35 |
| Table 6.2: Current and future (with climate change) average tide levels for the five North Somerset coastline sections ..... | 36 |

|  |    |
|--|----|
| Table 7.1: Benefits of using SuDS .....  | 41 |
| Table 7.2: The six functions of SuDS components .....                          | 42 |
| Table 7.3: Environment Agency Flood Warning Stages .....                       | 44 |
| Table 8.1: Sustainable surface water drainage requirements <sup>38</sup> ..... | 49 |
| Table 8.2: Requirements of Flood Risk Assessments .....                        | 50 |

## Glossary and Abbreviations

| Term   | Definition  |
|--|---|
| AEP  | Annual Exceedance Probability e.g. 1% AEP is equivalent to 1 in 100 (1%) probability of flooding occurring in any one year (or, on average, once in every 100 years).   |
| Areas of Critical Drainage                   | Areas which are likely to be most at risk of flooding from local sources (surface water, groundwater and ordinary watercourses) and where sustainable drainage solutions should be a priority.<br>These areas have been termed Areas of Critical Drainage to differentiate them from Critical Drainage Areas that can be designated by the Environment Agency. The Environment Agency has not designated any Critical Drainage Areas in North Somerset. |
| AStGWF                                       | Areas Susceptible to Groundwater Flooding   |
| Climate Change                               | Long term variations in global temperature and weather patterns caused by natural and human actions.  |
| Cumulative Impacts                           | <i>"Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project."</i> (Hyder, May 1999, Guidelines for the Assessment of Indirect and Cumulative Impacts and Impact Interactions, European Commission)   |
| Development                                  | The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.   |
| Flood & Water Management Act (FWMA)          | Part of the UK Government response to Sir Michael Pitt's Review on the Summer 2007 floods, the aim of which (partly) is to clarify the legislative framework for managing surface water flood risk in England.  |
| Flood Map for Planning (Rivers and Sea)      | Nationally consistent delineation of 'high', 'medium' and 'low' probability of fluvial and tidal flooding, published on a quarterly basis by the Environment Agency.  |
| Flood Risk Assessment (FRA)                  | A site-specific assessment of flood risk, undertaken as part of the planning application process for new development or change of use of existing development.  |
| Flood Storage Area                           | Land which provides a function of flood conveyance and/or storage, either through natural processes, or by design.  |
| Flood Zone 1 Low Probability (FZ1)           | NPPG Flood Zone, defined as areas outside Zone 2 Medium Probability. This zone comprises land assessed as having a less than 1 in 1,000 annual exceedance probability of river or sea flooding (<0.1%) in any year.   |
| Flood Zone 2 Medium Probability (FZ2)        | NPPG Flood Zone which comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual exceedance probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1,000 annual exceedance probability of sea flooding (0.5% - 0.1%) in any year.   |
| Flood Zone 3a High Probability (FZ3a)        | NPPG Flood Zone which comprises land assessed as having a 1 in 100 or greater annual exceedance probability of river flooding (>1%) or a 1 in 200 or greater annual exceedance probability of sea flooding (>0.5%) in any year.   |
| Formal Flood Management Asset                | A feature or structure built and maintained specifically for the purpose of flood risk management.  |
| Functional Floodplain (Flood Zone 3b) (FZ3b) | NPPG Flood Zone, defined as areas in which water <i>has</i> to flow or be stored in times of flood.   |
| Groundwater Flooding                         | Emergence of groundwater at the ground surface or the rising of groundwater into underground infrastructure (such as basements) under conditions where the normal range of groundwater level and flows is exceeded.   |

| Term                                       | Definition  |
|--|---|
| Informal Flood Management Asset            | A feature or structure that provides a flood defence function, however has not been built and/or maintained for this purpose (e.g. boundary wall).  |
| Level 1 and Level 2 SFRA                   | There are two levels of Strategic Flood Risk Assessment. All local planning authorities need to carry out a Level 1 assessment at least and it may be necessary to expand the scope of this assessment to a more detailed Level 2 assessment. A Level 1 SFRA should provide sufficient detail to apply the Sequential Test. A Level 2 SFRA should build on the information in the Level 1 assessment and include sufficient information for the Exception Test to be applied. Where a Level 2 SFRA is produced, the Sequential Test should also be applied to identify sites with the lowest risk of flooding within Flood Zones 2 and 3. |
| Local Plan                                 | A plan for the future development of a local area, drawn up by the local planning authority in consultation with the community. In law this is described as the development plan documents adopted under the Planning and Compulsory Purchase Act 2004. A local plan can consist of either strategic or non-strategic policies, or a combination of the two.  |
| Main River                                 | A watercourse shown as such on the Main River Map, and for which the Environment Agency has responsibilities and powers. N.B. Main River designation is not necessarily an indication of size, although it is often the case that they are larger than Ordinary Watercourses.   |
| National Planning Policy Framework (NPPF)  | National planning policy published by the Government, most recently in February 2019. It replaces most of the previous Planning Policy Statements, including that regarding flood risk (PPS25).   |
| National Planning Practice Guidance (NPPG) | Supporting guidance to the NPPF, published by the Government in March 2014 and updated since as an online resource, available at: ( <a href="http://planningguidance.planningportal.gov.uk/">http://planningguidance.planningportal.gov.uk/</a> ). It replaces previously published Government guidance, including that regarding flood risk.   |
| NSC  | North Somerset Council  |
| Ordinary Watercourse                       | All watercourses that are not designated Main Rivers, and which are the responsibility of Local Authorities or, where they exist, Internal Drainage Boards. Note that Ordinary Watercourse does not imply a “small” river, although it is often the case that Ordinary Watercourses are smaller than Main Rivers.   |
| Planning Policy Statement (PPS)            | A series of statements issued by the Government, setting out policy guidance on different aspects of planning. The majority of PPSs have now been replaced by the National Planning Policy Framework, including PPS25 regarding flood risk.   |
| PPS25                                      | Planning Policy Statement 25: Development and Flood Risk – previous Government planning policy regarding flood risk, which has now been replaced by the National Planning Policy Framework and NPPG.  |
| Residual Risk                              | A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the design process.   |
| Riparian Owner                             | Landowner who has any watercourse within or adjacent to any boundary of their property. Responsible for maintaining the river bed and banks within their section of the watercourse. It is their duty to work towards minimising pollution and preventing obstruction to the water flow.  |
| RoFSW                                      | Risk of Flooding from Surface Water: Environment Agency surface water flood maps that give an indication of the areas likely to be at risk of surface water flooding. This includes flooding that takes place from the surface runoff generated by rainwater (including snow and other precipitation) and is on the surface of the ground (whether or not it is moving) and has not yet entered a watercourse, drainage system or public sewer.   |

| Term                                     | Definition   |
|--|--|
| Strategic Environmental Assessment (SEA) | A procedure (set out in the Environmental Assessment of Plans and Programmes Regulations 2004) which requires the formal environmental assessment of certain plans and programmes which are likely to have significant effects on the environment. <i>(NPPF definition)</i>            |
| Sustainability Appraisal (SA)            | Appraisal of plans, strategies and proposals to test them against broad sustainability objectives. The SEA forms part of the SA.   |
| Sustainable Development                  | “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” <i>(The World Commission on Environment and Development, 1987)</i> .  |
| Sustainable Drainage System (SuDS)       | Term covering the whole range of sustainable approaches to surface drainage management. These are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible. <i>(Definition based on NPPG: Flood risk and coastal change)</i> |

## Executive Summary

This document presents a Level 1 Strategic Flood Risk Assessment (SFRA) for North Somerset Council (NSC). It provides part of the evidence base for the North Somerset Local Plan and strategic flood risk guidance for consideration when determining planning applications.

Flooding can result in costly damage to property and also pose a risk to life and livelihood. The likelihood and consequences of flooding are predicted to increase with climate change. It is a requirement of the National Planning Policy Framework that future development is planned carefully, steering it away from areas that are most at risk of flooding, taking into account potential cumulative effects of development, ensuring that it does not exacerbate existing flooding problems. This SFRA is an important step in informing choices on where future development should be located and is an essential part of the evidence base for the North Somerset Local Plan.

This Level 1 SFRA updates the 2008 published SFRA and provides a robust depiction of flood risk across North Somerset by:

- Providing information on the publication of new local and national planning policy that will underpin decision making in North Somerset, particularly within areas that are affected by (and/ or may adversely impact upon) flooding;
- Assisting in the development management process by providing a more informed response to development proposals within North Somerset which may be affected by flooding;
- Mapping areas that have a 'low', 'medium' and 'high' probability of flooding, based on the Environment Agency Flood Map for Planning and latest modelling data available;
- Mapping Areas of Critical Drainage, which are located in areas at 'low' risk of flooding based on the Environment Agency Flood Map for Planning, but are likely to be at risk from surface water flooding;
- Supporting NSC in its role as Lead Local Flood Authority; and
- Providing general advice on managing flood risk, including property protection, emergency planning and site-specific Flood Risk Assessments.

As a Level 1 SFRA, this document addresses the requirements of the Sequential Test, which will assist the Council to guide development to areas of lower risk. It also sets out a number of recommendations, in Section 8, for adoption by NSC when considering development and flood risk. Supporting figures (described in Section 4.3 and included in Appendix A) illustrate the fluvial and tidal Flood Zones, as well as other sources of flood risk, in order to classify the risk of flooding throughout North Somerset. Section 9 includes guidance on how the SFRA should be monitored and reviewed to ensure it remains current.

# 1. Introduction

North Somerset Council (NSC) is preparing a new Local Plan which will provide detailed policies and identify additional housing, employment and other land allocations. This Level 1 Strategic Flood Risk Assessment (SFRA) forms part of the evidence base for the Local Plan and provides information on the probability and likelihood of flooding within North Somerset. This information will be used to inform the policies of the Local Plan; in particular the location of development sites. The new Local Plan is intended to be produced for consultation in spring 2020.

This SFRA has been prepared in accordance with the National Planning Policy Framework (NPPF)<sup>1</sup>, February 2019.

## 1.1 Overview

Flooding is an important environmental hazard for communities. The impacts on property and businesses can be devastating and the fear of the repeated risk of flooding can affect wellbeing. Therefore, it is essential that the risk of flooding is considered at all stages of the planning process, in order to ensure sustainable development. Organisational responsibilities for managing flood risk have changed substantially in the last decade with Local Authorities now taking a greater lead on managing local flood risk through the introduction of the Flood and Water Management Act (FWMA, 2010)<sup>2</sup>.

A SFRA is an overview of current and future flood risk to a particular local authority jurisdiction. It provides details of where flooding has occurred, where there is existing risk and where there could be risk in the future. It also provides details of the existing defences and procedures in place to reduce that risk.

The NPPF requires that local planning authorities prepare a SFRA, taking account of advice from the Environment Agency and other stakeholders. The primary purpose of a Level 1 SFRA is to determine the variation in flood risk across an area, based upon data from a variety of sources. Robust information on flood risk is essential to inform and support the flood risk policies in the NSC Local Plan and to inform the decision-making process in the allocation of sites for development. This SFRA also provides guidance to developers on planning requirements and recommendations for Council policy.

This report (and the supporting mapping) should be used by NSC to inform the application of the Sequential Test (see Section 2.6). Following the application of the Sequential Test, it may be necessary to develop a more detailed Level 2 SFRA if any proposed allocations fall within flood affected areas of North Somerset. This would only be necessary if the proposed land use allocations are required to pass the Exception Test (see Section 2.7) in accordance with the NPPF, based on their vulnerability classification and the Flood Zone they are situated within. Essentially, the two parts to the Exception Test require proposed development to demonstrate that it will provide wider sustainability benefits to the community that outweigh flood risk and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

The following provides definitions of the principal local sources of flooding that are referred to throughout this SFRA.

<sup>1</sup> National Planning Policy Framework. Available from: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

<sup>2</sup> Flood and Water Management Act (2010). Available from: [http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga\\_20100029\\_en.pdf](http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf)

### Local Flood Risk

North Somerset Council and its partners have responsibilities for managing local flood risk, i.e. flood risk from sources other than Main Rivers and reservoirs, principally meaning surface runoff, groundwater and ordinary watercourses.

**Surface runoff** – rainwater (including snow and other precipitation) which is on the surface of the ground (whether it is moving or not), and has not entered a watercourse, drainage system or public sewer. Note that the term 'surface water' is used generically to refer to water on the surface and is often associated with periods of intense rainfall.

**Groundwater** – water which is below the surface of the ground and in direct contact with the ground or subsoil. It is most likely to occur in areas underlain by permeable rocks, called aquifers. These can be extensive, regional aquifers, or may be more local sand or river gravels in valley bottoms underlain by less permeable rocks.

**Ordinary watercourse** – all watercourses that are not designated Main Rivers, and which are the responsibility of local authorities (outside of an IDB area).

## 1.2 Aims and Objectives

The primary objective of this SFRA is to inform the review and development of policies related to flood risk management, and also policies for the allocation of land for future development, within the NSC Local Plan. However, the SFRA has a broader purpose of providing a robust depiction of flood risk across North Somerset. It can:

- Inform the development of Council policy that will underpin decision making within North Somerset and particularly within areas that are affected by (and/or may adversely impact upon) flooding;
- Ensure that NSC meets its obligations under the latest flood related planning guidance;
- Update previous guidance to assist developers to mitigate flood risk when submitting planning applications;
- Assist the development management process by providing a more informed response to development proposals which may be affected by flooding, influencing the acceptability and design of future developments within North Somerset and offering a basis for requesting site-specific Flood Risk Assessments (FRAs), if necessary;
- Promote working partnerships between NSC, the Environment Agency and other flood risk management authorities (see Section 7.2) to develop best practice and data sharing regarding flood risk information and its application; and
- Support and inform the NSC emergency planning response to flooding.

## 1.3 The Need for an Updated SFRA

NSC is currently preparing the new Local Plan, which includes a review of existing Development Plan Documents and their supporting evidence base. This Level 1 SFRA is an update to the 2008 published SFRA<sup>3</sup>. In order for

<sup>3</sup> Strategic Flood Risk Assessment: Level 1 flood risk study of North Somerset (2008). Available from: <https://www.n-somerset.gov.uk/my-services/planning-building-control/planningpolicy/supplementary-planning-advice/guidance/strategic-flood-risk-assessment/>

this SFRA to successfully support the Local Plan, the 2008 SFRA should be updated to incorporate several changes since its publication in 2008, including:

- Publication (and update) of the NPPF and supporting National Planning Practice Guidance (NPPG)<sup>4</sup>;
- Introduction of the FWMA in 2010;
- Updated guidance from the Met Office<sup>5</sup> and the Environment Agency<sup>6</sup> for the consideration of climate change to reflect the United Kingdom Climate Projections 2009 (UKCP09) and potentially UKCP18;
- New tidal and fluvial flood risk data from the Environment Agency;
- Publication of Risk of Flooding from Surface Water (RoFSW) mapping by the Environment Agency. This updated information provides flood extents, depths, velocity and hazard for surface water for three events: the 1 in 30 (3.3%), 1 in 100 (1%) and 1 in 1,000 (0.1%) annual chance events.
- Publication of Reservoir flood risk mapping by the Environment Agency; and
- Details of post-2008 flood events within North Somerset.

At this stage, this SFRA does not consider climate change allowances for the delineation of Flood Zones. The SFRA will be updated following the publication of UKCP18 guidance (see Section 5.9). Please refer to Section 9 for further guidance on updating this SFRA.

### 1.4 Outputs

The following outputs have been produced as part of this SFRA:

- SFRA main report;
- Delineation of Flood Zones to comply with the Sequential Test (see Section 2.6);
- Flood risk mapping indicating areas at risk of flooding;
- Delineation of Areas of Critical Drainage (ACDs) in North Somerset;
- Suggested policies and guidance for the local planning authority on the management of flood risk;
- Emergency planning guidance; and
- Guidance for developers and NSC planning officers dealing with applications (see Appendix B).

<sup>4</sup> Planning Practice Guidance. Available from: <https://www.gov.uk/government/collections/planning-practice-guidance>

<sup>5</sup> UK Climate Projections. Available from: <https://www.metoffice.gov.uk/research/collaboration/ukcp>

<sup>6</sup> Environment Agency and climate change adaptation. Available from: <https://www.gov.uk/government/collections/environment-agency-and-climate-change-adaptation>

## 2. Planning Policy Framework and Other Guidance

This section provides a brief overview of the strategy and policy context relevant to flood risk in North Somerset.

The success of the SFRA is heavily dependent upon the ability of the Council to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning policies and development management recommendations. The NPPF provides guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish sound planning policies that will ensure future sustainability with respect to flood risk.

The policy framework informing the development of this Level 1 SFRA has changed significantly since the previous SFRA was published in October 2008. At a national level, Planning Policy Statement 25 (PPS 25) (regarding flood risk) and its supporting guidance have been replaced with the NPPF and its associated guidance.

This SFRA is intended to be used by planners and developers to assess the suitability of an area or site to support a particular type of development. This is subject to the level of flood risk, the vulnerability of the proposed development and the extent to which the combination of other factors and mitigation measures might exempt the development from the application of this guidance.

### 2.1 National Planning Policy

National planning policy is set out in the NPPF, which was published by the Government in March 2012 and last updated in February 2019. It forms a more succinct replacement for numerous topic-specific PPSs, including PPS25 on flood risk that has consequently been withdrawn. The NPPF is accompanied by the NPPG, first published in March 2014, which provides further guidance on specific issues, including flood risk, and replaces all previously published national planning guidance. The NPPF covers a full range of planning issues drawing on the central focus of sustainable development (refer to Paragraph 11 of the NPPF on applying the presumption in favour of sustainable development), including taking full account of flood risk from all sources. Central themes of the NPPF also include the re-use of previously developed (brownfield) land of low environmental value, promoting economic growth and high-quality design, and transitioning to a low carbon future.

The NPPF underpins the process by which local planning authorities are to account for flood risk as an integral part of the planning process. The overarching aims set out by the NPPF for the management of flood risk at a planning authority level are encapsulated in Paragraph 157 of the document:

*“All plans should apply a sequential, risk-based approach to the location of development – taking into account the current and future impacts of climate change– so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:*

- a) applying the sequential test and then, if necessary, the exception test as set out below;*
- b) safeguarding land from development that is required, or likely to be required, for current or future flood management;*
- c) using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques); and*
- d) 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.”*

The Sequential Test and Exception Test are further explained in Sections 2.6 and 2.7.

Paragraph 32 of the NPPF also states that:

*“Local plans and spatial development strategies should be informed throughout their preparation by a sustainability appraisal that meets the relevant legal requirements<sup>7</sup>. This should demonstrate how the plan has addressed relevant economic, social and environmental objectives (including opportunities for net gains). Significant adverse impacts on these objectives should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued. Where significant adverse impacts are unavoidable, suitable mitigation measures should be proposed (or, where this is not possible, compensatory measures should be considered).”*

The purpose of a Sustainability Appraisal (SA) is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans.

The NPPF (paragraph 167) also states that local plans should reduce risk from coastal change and identify Coastal Change Management Areas (CCMAs) where physical changes to the coast are expected to affect development. NSC may consider the need to identify CCMAs in the future.

NPPG provides specific guidance relating to the implementation of policies contained in the NPPF, including guidance on flood risk policies and the production of SFRA and site-specific FRAs. It sets out how these should be applied when considering the Sequential Test and Exception Test in preparing development plans and in determining planning applications.

## 2.2 Local Development Planning Policy

### 2.2.1 North Somerset Council Local Plan

NSC is currently preparing its new Local Plan which will provide detailed policies and additional housing, employment and other land allocations.

The Local Plan Issues and Options Document<sup>8</sup> was published in September 2018 and identifies key issues affecting North Somerset, including transport, environment and heritage protection, urban development and employment. These issues will need to be addressed through the Local Plan. The Document does not include detailed policies or site allocations. Consultation on the Issues and Options document ended on 10 December 2018 and the Local Plan is intended to be produced for consultation in spring 2020.

## 2.3 Additional Guidance

### 2.3.1 Severn River Basin District and South West River Basin District Flood Risk Management Plans

Flood Risk Management Plans (FRMPs) describe the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. FRMPs set out how risk management authorities will work together and with communities to manage flood and coastal risk. The Severn River Basin District FRMP<sup>9</sup> and the South West River Basin District FRMP<sup>10</sup> cover the North Somerset area.

<sup>7</sup> The reference to relevant legal requirements refers to Strategic Environmental Assessment. Neighbourhood plans may require Strategic Environmental Assessment, but only where there are potentially significant environmental effects.

<sup>8</sup> Local Plan Issues and Options Document, 2018. Available from: <https://www.n-somerset.gov.uk/>

<sup>9</sup> Severn river basin district flood risk management plan, March 2016. Available at: <https://www.gov.uk/government/publications/severn-river-basin-district-flood-risk-management-plan>

<sup>10</sup> South West river basin district flood risk management plan, March 2016. Available at: <https://www.gov.uk/government/publications/south-west-river-basin-district-flood-risk-management-plan>

Each river basin district also has a river basin management plan<sup>11</sup>, which considers how to protect and improve water quality and use water in a sustainable way. FRMPs and river basin management plans work to a six year planning cycle and form an important part of a collaborative and integrated approach to catchment planning for water.

### 2.3.2 Severn Estuary Shoreline Management Plan

The Shoreline Management Plan (SMP) is a high level non-statutory policy document designed to assist coastal flood and erosion risk management planning. It provides a large-scale assessment of the long-term risks associated with coastal erosion and flooding at the coast, and proposes policies to help manage these risks sustainably.

The SMP enables planners and regulators to plan for and manage the way that the coast will change. This could be by maintaining or improving defences, by enabling the natural processes to play a greater role, creating new natural habitat or by helping areas that are at risk of flooding at some point in the future to cope with and limit the impact of flooding events.

The SMP2 for the Severn Estuary<sup>12</sup> received final approval in February 2017 and updated the previous SMP1 (2001). It has been developed at a high level and at a large scale, taking account of the predicted changes to sea level rise caused by climate change, but is not intended to focus in detail on local differences regarding shoreline position in the future.

The SMP2 refers to a number of Policy Theme Areas, including 'Portishead and Clevedon' and 'Kingston Seymour to Sand Bay'. Part B of the main report summarises the policy options for each policy unit within the theme areas and for three epochs. However, it is highlighted that these policy options should not be read in isolation, but with reference to the paragraphs of the report that explain the focus of each policy option and the interactions with other policy options or flood management plans.

A refresh to the SMP2 is expected in 2020.

### 2.3.3 West of England Sustainable Drainage Developer Guide

The West of England Sustainable Drainage Developer Guide<sup>13</sup> is primarily intended for use by developers, planners, designers and consultants who are seeking guidance on the requirements for the design and approval of Sustainable Drainage Systems (SuDS) in this sub-region of the West of England and Somerset.

Section 1 of the Sustainable Drainage Developer Guide provides an overview for the sub-regional approach with an introduction to SuDS, an explanation of the application process and technical assistance signposting to design guidance and practical help with applications. Section 2 sets out the character of each authority, the authority-specific technical and procedural requirements and key contacts for each of the four unitary authorities in the West of England, including NSC.

Further guidance on SuDS, in line with the Sustainable Drainage Developer Guide, is included in Section 7.5.

<sup>11</sup> River basin management plans:2015. Available at: <https://www.gov.uk/government/collections/river-basin-management-plans-2015>

<sup>12</sup> Severn Estuary Shoreline Management Plan. Available from: <https://www.severnestuarycoastalgroup.org.uk/shoreline-management-plan/>

<sup>13</sup> West of England Sustainable Drainage Developer Guide, March 2015. Available from: <https://www.bristol.gov.uk/documents/20182/34524/West+of+England+sustainable+drainage+developer+guide+section+1/864fe0d2-45bf-4240-95e2-a9d1962a0df9>

### 2.3.4 Creating Sustainable Building and Places in North Somerset, 2015

The Supplementary Planning Document (SPD)<sup>14</sup> was adopted by NSC in March 2015 and covers the measures required to achieve sustainable buildings and places in North Somerset. Section 8 of the SPD refers to SuDS and the Core Strategy CS2 policy requirement, as follows:

*“Require the application of best practice Sustainable Drainage Systems to reduce the impact of additional surface water run-off from new development, in-line with the requirements of the forthcoming national standards for SuDS. Such environmental infrastructure should be integrated into the design of the scheme and into landscaping features and be easily maintained.”*

## 2.4 Flood Risk Management Strategies

### 2.4.1 National Flood and Coastal Erosion Risk Management Strategy

The National Flood and Coastal Erosion Risk Management (FCERM) Strategy<sup>15</sup>, published in 2011, sets out a national framework for managing the risk of flooding and coastal erosion. It aims to help risk management authorities and communities to understand their different roles and responsibilities and is particularly relevant to Lead Local Flood Authorities (LLFAs) and their new responsibilities under the Flood and Water Management Act 2010.

Overall, the strategy encourages more effective risk management by enabling people, communities, businesses, infrastructure operators and the public sector to work together to:

- *ensure a clear understanding of the risks of flooding and coastal erosion, nationally and locally, so that investment in risk management can be prioritised more effectively;*
- *set out clear and consistent plans for risk management so that communities and businesses can make informed decisions about the management of the remaining risk;*
- *manage flood and coastal erosion risks in an appropriate way, taking account of the needs of communities and the environment;*
- *ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond effectively to flood forecasts, warnings and advice; and*
- *help communities to recover more quickly and effectively after incidents.*

### 2.4.2 Severn Estuary Flood Risk Management Strategy

The Environment Agency commissioned a strategic study for the Severn Estuary to examine the current and future coastal flood risk and habitat evolution and develop the Severn Estuary Flood Risk Management Strategy (SEFRMS)<sup>16</sup>. The three main objectives of the strategy are:

- Defining a 100-year plan of investment for flood defences;

<sup>14</sup> Supplementary Planning Document. Creating Sustainable Buildings and Places in North Somerset: Guidance for energy efficiency, renewable energy and the transition to zero carbon development. North Somerset Council, 2015. Available from: <http://www.n-somerset.gov.uk/wp-content/uploads/2015/11/Creating-sustainable-buildings-and-places-supplementary-planning-document.pdf>

<sup>15</sup> National flood and coastal erosion risk management strategy for England, May 2011. Available from: <https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england>

<sup>16</sup> Severn Estuary Flood Risk Management Strategy. Available from: <https://www.severn-estuary-coastal-group.org.uk/severn-estuary-frms/>

- Prioritising flood risk management measures, such as providing advice to utility companies to protect critical infrastructure; and
- Deciding where new inter-tidal wildlife habitats should be created, to compensate for losses of habitat caused by rising sea levels.

The strategy does not yet have approval from Defra and should be considered a working draft strategy.

### 2.4.3 North Somerset Local Flood Risk Management Strategy

The North Somerset Local Flood Risk Management Strategy<sup>17</sup> was published in December 2013 by NSC and focuses on managing flood risk to people and property from local sources of flooding, including surface water runoff, ordinary watercourses and groundwater. It provides insight on historic flooding events, identifies the communities that are most vulnerable to flooding from local sources and provides a number of actions that can reduce flood risk across North Somerset.

## 2.5 Flood Zone Classification

Table 2.1 sets out the Flood Zones classification according to the NPPG. This classification is used as the basis of the Sequential Test described in Section 2.6 of this SFRA. It identifies the probability of flood risk in each Flood Zone. Flood Zones 1, 2 and 3a are defined by the Environment Agency, ignoring the presence of defences and without taking account of the possible impacts of climate change to the future probability of flooding. Flood Zone 3b should be defined by local planning authorities in agreement with the Environment Agency and should consider the presence of defences.

**Table 2.1: Flood Zones Definition**

| Flood Zone                                    | Definition  |
|---|---|
| Flood Zone 1 - Low Probability of Flooding    | Land having a less than 1 in 1,000 Annual Exceedance Probability (AEP) of river or sea flooding.  |
| Flood Zone 2 - Medium Probability of Flooding | Land having between a 1 in 100 and 1 in 1,000 AEP of river flooding; or land having between a 1 in 200 and 1 in 1,000 AEP of sea flooding.  |
| Flood Zone 3a - High Probability of Flooding  | Land having a 1 in 100 or greater AEP of river flooding; or land having a 1 in 200 or greater AEP of sea flooding.  |
| Flood Zone 3b – Functional Floodplain         | This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRA, areas of functional floodplain and their boundaries accordingly, in agreement with the Environment Agency. |

## 2.6 The Sequential Test

The Sequential Test ensures that a sequential, risk-based approach is followed to direct new development to areas with the lowest probability of flooding. The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, reasonably available sites in Flood Zone 2 can then be considered, taking into account the flood risk vulnerability of land uses. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required (Section 2.7).

<sup>17</sup> North Somerset Local Flood Risk Management Strategy, November 2013. Available from: <http://consult.n-somerset.gov.uk/consult.ti/testest1/consultationHome>

Table 2 of the ‘Flood risk and coastal change’ Section of the NPPG<sup>18</sup> categorises different types of uses and development according to their vulnerability to flood risk. Table 2.2 maps these vulnerability classes against the flood zones set out in Table 1 of the NPPG to indicate where development is ‘appropriate’, where it should not be permitted and where the application of the Exception Test is required (refer to Table 3 of the ‘Flood risk and coastal change’ Section of the NPPG).

**Table 2.2: Flood Risk Vulnerability and Flood Zone Compatibility**

| Flood Risk Vulnerability Classification |    | Essential Infrastructure | Highly Vulnerable       | More vulnerable         | Less Vulnerable | Water Compatible |
|---|----|--------------------------|-------------------------|-------------------------|-----------------|------------------|
| Flood Zone                              | 1  | ✓                        | ✓                       | ✓                       | ✓               | ✓                |
|   | 2  | ✓                        | Exception test required | ✓                       | ✓               | ✓                |
|   | 3a | Exception test required  | x                       | Exception test required | ✓               | ✓                |
|   | 3b | Exception test required  | x                       | x                       | x               | ✓                |

This Level 1 SFRA provides the information for NSC to apply the Sequential Test when considering potential allocation sites in the Local Plan. Allocation sites may also have to pass the Exception Test subject to their vulnerability to flood risk.

According to the current Core Strategy<sup>19</sup> policy on environmental impacts and flood risk assessment, for the purposes of the Sequential Test, the area of search for alternative sites is normally North Somerset-wide. The policy also sets out the exceptions to this rule and defines when a site is considered ‘reasonably available’ for development.

## 2.7 The Exception Test

Following application of the Sequential Test, if it is not possible to locate development taking into account its flood risk vulnerability classification it becomes necessary to apply the Exception Test. The Exception Test is set out in paragraph 160 of the NPPF<sup>20</sup> and is a method to demonstrate that the flood risk to people and property is managed satisfactorily, while allowing necessary development to progress, if suitable sites at lower risk of flooding are not available.

There are two parts to the Exception test that need to be passed. Paragraph 160 of the NPPF states that:

*“The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:*

- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk;*
- and*

<sup>18</sup> Available from: <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Strategic-Flood-Risk-Assessment-be-prepared>

<sup>19</sup> Core Strategy. North Somerset Council, 2017. Available from: <https://www.n-somerset.gov.uk/my-services/planning-building-control/planningpolicy/core-strategy/corestrategy/>

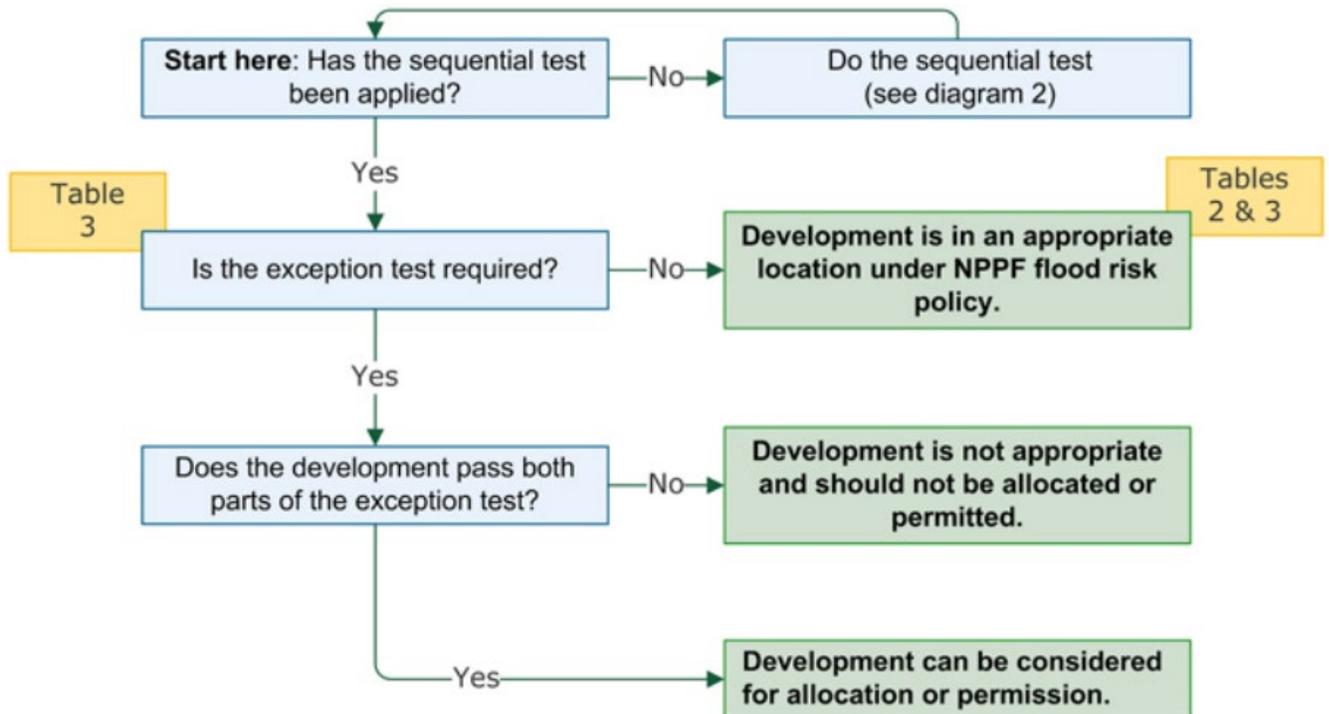
<sup>20</sup> Available from: <https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change#para160>

*b) 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.”*

For the first part, the assessment of wider sustainability benefits can be informed by the Local Plan’s Sustainability Appraisal which identifies key sustainability issues and objectives within North Somerset. The second part of the Exception Test includes a requirement to take account of the future risk from climate change over the lifetime of the development (see Section 5.9).

Figure 2—1 summarises how the Sequential Test and Exception Test would need to be applied to decisions relating to site allocations in the Local Plan based on the information supplied in this SFRA (Diagram 2 of the ‘Flood risk and coastal change’ Section of the NPPG), references to Tables 2 and 3 are to the tables in that guidance.

Figure 2—1: Application of the Sequential Test and Exception Test for Local Plan Preparation



### 3. Study Area Information

North Somerset is located in the southwest of England and borders the local authority areas of Bristol, Sedgemoor, Mendip and Bath & North East Somerset. NSC is a unitary authority, approximately 375km<sup>2</sup> in area. More than two thirds of North Somerset is rural. The majority of residents live in Weston-super-Mare, Portishead, Clevedon and Nailsea. This SFRA covers the entire NSC area.

Refer to **Figure 034** for a general location plan of North Somerset which also identifies Main Rivers and ordinary watercourses.

Key habitats within North Somerset include the coastline, inland wetlands (rivers, ponds, the extensive rhynes [waterways that link streams or ditches with Main Rivers] (which provide habitat for water voles), floodplain and grazing marsh of the North Somerset Levels and Moors); grazed pastures (notably cattle grazed as an important habitat for greater horseshoe bats); tall hedgerows, tree lines, and semi-natural deciduous woodlands.

Designated city, town and district centres within North Somerset are listed in Table 3.1.

**Table 3.1: Designated City, Town and District Centres within North Somerset**

| City/ sub-regional centre | Town centres                                       | District Centres  |
|---------------------------|--|---|
| Weston-super-Mare         | Clevedon (Triangle);<br>Nailsea; and<br>Portishead | Clevedon (Hill Road);<br>Locking Castle;<br>Queensway; and<br>Worle High Street |

#### 3.1 Description of Physical Characteristics

##### 3.1.1 Hydrological Catchments

North Somerset can be classified into five Main River hydrological catchments with nine sub-catchments, identified in Table 3.2 and illustrated in Figure 3—1. Additionally, the Oldbridge River catchment is an area of 40.4km<sup>2</sup> that discharges into the tidal reach of the Congresbury Yeo.

Most catchments drain westerly into the Severn Estuary with the exception of the Winford Brook and Chew Stoke Stream (i.e. the Chew Valley catchment) that flow easterly down the Chew Valley, eventually joining the River Avon and flowing into the Severn Estuary. The Markham Brook, Ashton Brook and Colliters Brook (i.e. the Bristol Avon catchment) drain towards Bristol and into the River Avon.

Figure 3—1: Hydrological Catchments and Coastline Areas within North Somerset

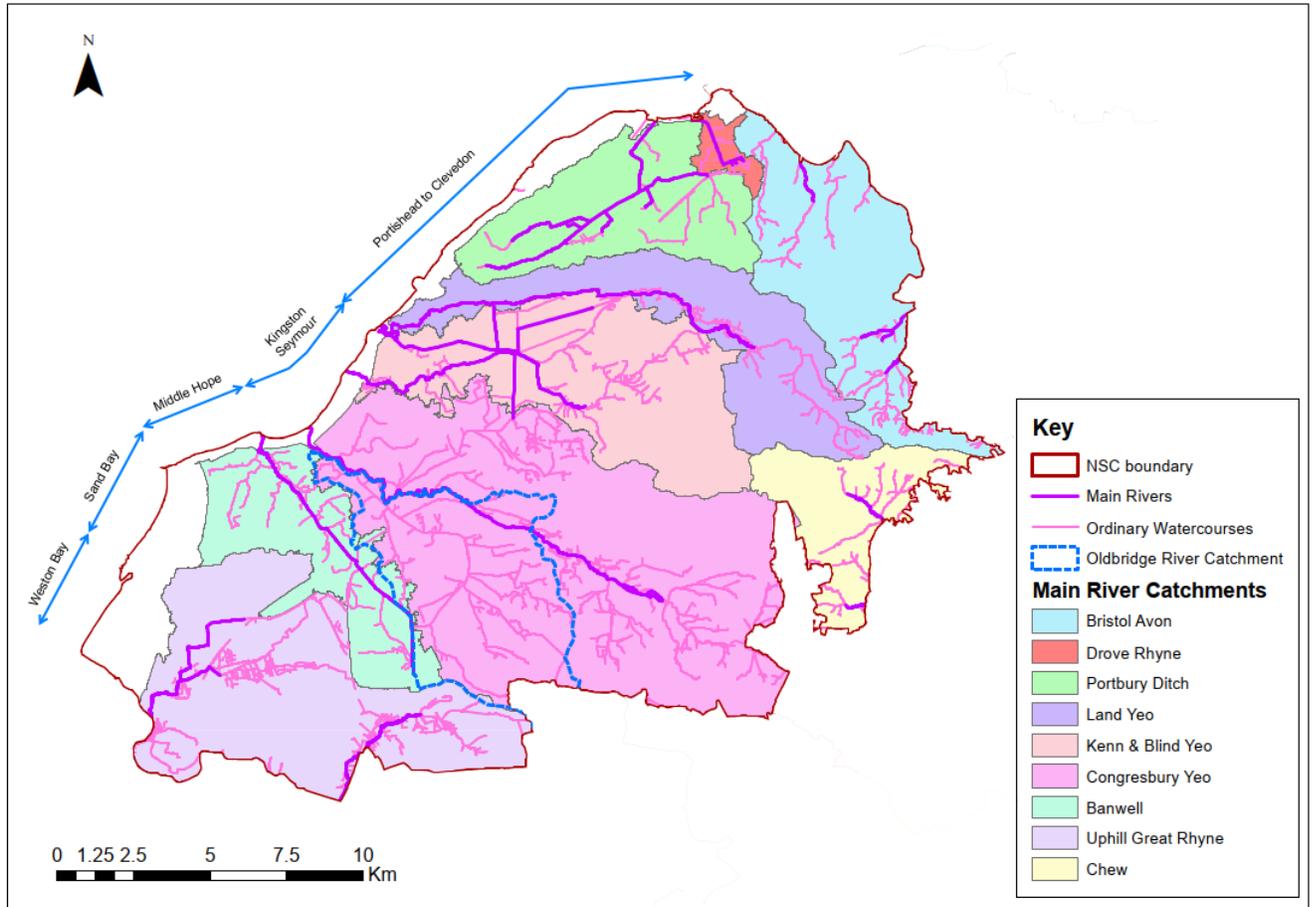


Table 3.2: Catchments in the Study Area

| Hydrological catchments                                   | Sub-catchments   | Total Area within North Somerset (km <sup>2</sup> ) | % of study area | Main River length (km) |
|---|--|---|-----------------|------------------------|
| <b>Bristol Avon</b>                                       | Colliters Brook<br>Ashton Brook<br>Markham Brook                 | 37.4  | 10              | 17                     |
| <b>Gordano Valley</b>                                     | Portbury Ditch & Sandy Rhyne (30km <sup>2</sup> )                | 33.1  | 8.8             | 19.1                   |
|   | Drove Rhyne (3.1km <sup>2</sup> )                                |   |                 |                        |
| <b>North Somerset</b>                                     | Land Yeo (33.8km <sup>2</sup> )                                  | 189   | 50.4            | 58                     |
|   | River Kenn<br>Blind Yeo (46.2km <sup>2</sup> )                   |   |                 |                        |
|   | Congresbury Yeo (109km <sup>2</sup> )                            |   |                 |                        |
|   | Oldbridge River (40.4km <sup>2</sup> )<br>(ordinary watercourse) |   |                 |                        |
| <b>River Axe</b>  | River Banwell (27.7km <sup>2</sup> )                             | 84.79   | 22.6            | 24                     |
|   | Uphill Great Rhyne (57.09km <sup>2</sup> )                       |   |                 |                        |
| <b>Chew Valley (drains to the Bristol Avon catchment)</b> | Winford Brook<br>Chew Stoke Stream                               | 19.6  | 5.2             | 3                      |

### **Bristol Avon catchment**

The Ashton Brook flows for approximately 2km before it reaches the NSC boundary and its confluence with the New Colliters Brook, which eventually flows into the Lower Avon. The Colliters Brook is located south of Ashton Brook and flows for approximately 1km before joining the New Colliters Brook. The Markham Brook flows between Ham Green and Pill for approximately 1.5km before flowing into the Lower Avon at Crockerne Pill.

Permeable uplands in this area consist of a wide range of limestones, sandstones and mudstones. Runoff rates are generally low within the catchment as water easily seeps into the ground via large fissures. Groundwater recharge in this area feeds springs at the base of the hills.

### **Gordano Valley catchment (Portbury Ditch)**

The Gordano Valley catchment area is located in the northwest of the North Somerset study area. The three Main Rivers included in the catchment are the Portbury Ditch, Sandy Rhyne and Drove Rhyne. The Portbury Ditch flows from the Clevedon hills, through Portishead, and outfalls into the Bristol Channel at Portishead Marina. Tributaries including the Walton Brook and Sandy Rhyne join the Portbury Ditch along its 9km length. The Drove Rhyne drains from the west of Easton-in-Gordano and flows northwest for 2.5km where it enters the Bristol Channel approximately 1km east of Portishead Marina.

### **North Somerset catchment**

The catchment is located between the Gordano Levels to the north and North Somerset Levels to the south. The water levels in the Levels and Moors are controlled and drained by a network of channels known as rhyne, and the use of sluices and weirs. The area is mainly used for grazing.

The Land Yeo, Blind Yeo and River Kenn rise from springs in the Mendip Hills. They are maintained by a complex system of penned water management and drainage rhyne (the retained water level varies between summer and winter). These rivers enter the Severn Estuary to the southwest of Clevedon. Historically the Land Yeo flowed through the town centre of Clevedon. It was diverted along the Blind Yeo in the 1970s to reduce fluvial flooding in Clevedon, but a small residual watercourse still flows through Clevedon town centre. At the same time, the capacity within the Blind Yeo was increased to accommodate the extra flow.

The source of the Congresbury Yeo is a spring in the centre of Compton Martin on the western slopes of the Mendip Hills. There are a number of small tributaries which enter the Congresbury Yeo in the upper catchments. The river flows through Ubley and enters Blagdon Lake which was created in the 1890s. Blagdon Lake is the most significant surface water feature in the Congresbury Yeo catchment, with a surface area of approximately 8% of the catchment draining to the spillway.

The Congresbury Yeo flows to the south of Wrington and then through Congresbury where a series of engineered structures control the flow. Up until 1940, when Phipps Sluice was constructed 7km downstream of the village, the river at Congresbury was tidal. In the 1970s the tidal limit was moved further downstream to Tutshill Ear to allow the M5 motorway to be built above high tide level. Following a report by the Wessex Water Authority (January 1981) a flood defence scheme was built to improve the standard of protection against fluvial flooding. The mouth of the river is in Woodspring Bay, west of the village of Kingston Seymour.

The Oldbridge River catchment is an area of some 40.4km<sup>2</sup>, of which 16.2km<sup>2</sup> is a permeable 'upland' catchment, with the remaining 'lowland' catchment (24.2km<sup>2</sup>) comprised of inland moors and coastal levels of estuarine alluvial clays. The drainage of the catchment is achieved via a network of minor rhyne and ditches which feed into the arterial watercourse system managed by the North Somerset Levels Internal Drainage Board (IDB). The catchment discharges into the tidal reach of the Congresbury Yeo at Sampson's Sluice. There are no other outfalls to the Congresbury Yeo catchment and the Congresbury Yeo does not provide any means of drainage within the Oldbridge River catchment.

### **River Axe catchment**

Uphill Great Rhyne and Cross Rhyne are approximately 4.5km in length and drain water from Uphill and the former Weston Airfield. The Uphill Great Rhyne runs from Hans Price Academy through the residential areas of southern Weston-super-Mare and discharges at Uphill Sluice. A 1.6km culvert feeds surface water into the head of Uphill Great Rhyne. A second major channel, Cross Rhyne joins the Uphill Great Rhyne upstream of the hospital site. The tidal sluice at Uphill prevents water entering the Uphill Great Rhyne at high tide and allows the Rhyne to drain at low tide. There are approximately four hours on each tide when Uphill Great Rhyne is tide locked and cannot drain by gravity.

The River Banwell is a largely artificial channel 9km in length and with a very shallow gradient, located to the east of Weston-super-Mare. The river rises as a spring in Banwell village, drains the surrounding agricultural land and part of Weston-super-Mare via the West Wick and St George's. The outfall is through New Bow Sluice, a tidal defence structure, located 0.8km upstream of the confluence with the Severn Estuary. Due to development within the catchment area it has been necessary to compensate for floodplain loss and additional surface water runoff from these new developments (Parklands) through construction of two storage facilities that counteract the increased flood risk. Phase 1 of construction is now complete and phase 2 is due for completion in the next 3 years.

**Chew Valley catchment**

On the very south eastern fringe of North Somerset, a relatively small area forms the Chew Valley catchment which eventually drains into the Bristol Avon catchment. Within the study area, the Winford Brook and Chew Stoke Stream are approximately 3km in length and therefore cover a minority of the NSC area.

**3.1.2 Coastline**

North Somerset includes 60km of coastline. The historical construction of coastal defences goes back at least 1000 years. Previous storm events have damaged the defences which has led to the reconstruction of the structures to provide a higher standard of protection.

The NSC coastline can be classified into five sections as summarised in Table 3.3 and illustrated in Figure 3—1.

**Table 3.3: Coastline sections across North Somerset**

| Coastline section                      | Description  | Design Standard of Protection                               |
|--|--|---|
| Portishead to Clevedon                 | Portishead to Clevedon is a north facing coastline, lined with limestone cliff. Properties along this section of the coastline are generally sparse and located outside areas of predicted tidal inundation. The cliffs are intersected by low lying alluvial areas such as Salthouse Bay. There are embankments and high ground protecting the residential area of Portishead from tidal flooding.  | 1 in 100 embankments and high ground<br>1 in 50 for cliffs  |
| Kingston Seymour and Wick St. Lawrence | Kingston Seymour and the southern area of Clevedon are defended by a system of embankments with salt marsh in front of the raised defences. The area is mainly agricultural with associated small residential pockets.   | 1 in 100  |
| Middle Hope                            | This section extends from St. Thomas Head to Sand Point. The area has steep cliffs interspersed with narrow intertidal areas. There are no low-lying areas in this section of the coastline.   | 1 in 100  |
| Sand Bay                               | The bay faces towards the west and is protected by seawalls and embankments. Residential development is situated behind the seawalls with agricultural land located inland of this development. The north-facing part of the coastline is protected by cliffs.   | 1 in 100 for seawalls and embankments<br>1 in 50 for cliffs |
| Weston Bay                             | The most southerly section of coastline within the NSC boundary extends from Anchor Head to Brean Down in the south. The bay is western facing with a sandy coastline defined by the hard rock headlands of Birnbeck in the north and Brean Down in the south. There is a wide mud inter-tidal area and sandy foreshore. Weston-super-Mare is the primary developed section of coastline with residential, commercial, recreational and tourist interests. It has a wide sandy beach with a seawall defence. Uphill lies to the south and is defended by an embankment, Uphill sluice and high ground. | 1 in 200 for seawall<br>1 in 50 for embankments             |

The design standards of protection included in Table 3.3 are based on information provided by the Environment Agency. It should be noted that these were estimated at the time of design and therefore may be subject to change over time due to revisions in the assessment of risk and as a result of the impact of climate change. A new tidal

model (Woodspring Bay Model) is currently being developed by the Environment Agency that will provide further information on the accuracy of standards of protection for coastal defences. The model is due to be released during 2020.

## 4. Data and Mapping

### 4.1 Data Collection

This Section details the data used to develop this SFRA and the methodology used to analyse the flood risk within North Somerset. Data has been collected from a number of sources including NSC, Environment Agency and Wessex Water.

Data collected from the Environment Agency include:

- Environment Agency Flood Zone mapping;
- Risk of Flooding from Surface Water mapping (RoFSW);
- Flood defences;
- Environment Agency Areas Benefiting from Flood Defences;
- Environment Agency Historic Flood Map;
- Environment Agency Reservoir Flood Risk Mapping;
- Environment Agency Main Rivers;
- Environment Agency Detailed River Network;
- LiDAR DTM Data;
- Outputs of hydraulic models;
- Environment Agency Flood Storage Areas
- Environment Agency Flood Alert Areas; and
- Environment Agency Flood Warning Areas.

Data collected from NSC includes:

- Ordnance Survey Background mapping;
- NSC Boundary;
- Parish Boundaries;
- Emergency Management Data; and
- Known flooding problems, observations and events.

Data collected from Wessex Water includes:

- Sewer flooding records 2005-2015.

### 4.2 Data Quality

Best available data has been used at the time of writing of this SFRA. Where data has not been available for the SFRA, it has been necessary to make assumptions based on professional experience and local knowledge. Where this is the case, the assumptions made are clearly stated.

It should be noted that information on flood risk is continually changing as new flooding events occur and further modelling and analysis is undertaken. Therefore, whilst the datasets used are the best available at the time of publication, the SFRA should be reviewed periodically, with NSC contacted in the meantime for the latest information.

Whilst flood risk information is shown on the produced maps in a relatively precise way, it is not possible to be completely certain from the outputs of this SFRA that any individual property, especially those near the boundaries of Flood Zones, is within a particular Flood Zone. In particular, the locations of flooding provided by Wessex Water are only general and should not be considered as property specific. The Environment Agency Flood Map for Planning should not be used for individual property planning guidance and a site-specific FRA should be completed where appropriate, according to relevant planning guidance.

### 4.3 Supporting Figures

The following maps accompany this SFRA (included in Appendix A):

**Figures 001-033** focus on the delineation of Flood Zones and include Flood Zones 1, 2, 3a and 3b. These maps are part of a strategic analysis of the flood risk within North Somerset and can only provide an initial indication of the probability of flooding at a proposed allocation site. The flood zones may overlap in which case in these figures they have been presented in order of highest (i.e. most frequent) risk i.e. FZ3b is given prominence. They should not be used to make decisions regarding flood risk to individual properties;

**Figure 034** is a general location plan of North Somerset which also indicates Main Rivers and ordinary watercourses;

**Figure 035** provides a summary of historic flood risk locations recorded by the Environment Agency, including fluvial and tidal flood extents, as well as local hotspots for incidents of properties and highways flooding recorded by NSC;

**Figure 036** identifies areas at risk of flooding from surface water. This is based on the RoFSW mapping produced by the Environment Agency;

**Figure 037** indicates the maximum reservoir flooding extents, as published by the Environment Agency;

**Figure 038** indicates Areas Susceptible to Groundwater Flooding;

**Figure 039** indicates ACDs and Flood Zones;

**Figure 040** identifies the location of flood defences within North Somerset. It also indicates the Areas Benefiting from Defences (ABDs), in other words the areas subject to tidal/coastal flood risk that would flood under a 1 in 200 (0.5%) annual chance tidal flood event without the defences;

**Figure 041** indicates the standard of protection of the flood defences identified in North Somerset.

**Figure 042** indicates the Environment Agency Flood Warning and Flood Alert areas within North Somerset; and

**Figures 043 and 044** identify pre-development and post-development extents for Flood Zones 3a and 3b, for the Weston Villages area, where strategic allocations have been made.

**Figure 045** indicates the predicted extent of Tidal Flood Zone 3a as a result of sea level rise to 2125.

## 5. Types of Flooding

### 5.1 General Information

The flood risk knowledge within North Somerset includes:

- Experience of Council engineers and staff, local councillors and others;
- Records and information on past flooding from all sources (primarily coastal, river, surface water, groundwater and sewers);
- Environment Agency data including the Environment Agency Flood Map for Planning (Rivers and Sea)<sup>21</sup>, RoFSW<sup>22</sup> mapping, indicating areas most susceptible to surface water flooding, Areas Susceptible to Groundwater Flooding (AStGWF) and reservoir flood risk data; and
- Previous studies and hydraulic modelling undertaken within North Somerset.

### 5.2 Historic Flooding

Flooding of homes, businesses, agricultural land and roads has occurred in North Somerset from tidal events, Main Rivers and local sources. Local sources include surface water generated by intense rainfall, groundwater and/ or ordinary watercourses. Many areas affected by flooding are situated outside Flood Zones 2 and 3. This is an important reminder that the risk of flooding from all sources must be carefully considered when planning future development, irrespective of the proximity of the site to the coast or a watercourse. Development management decisions must consider all forms of potential flooding to the site, including cumulative impacts. They must also be made with due consideration to the potential impact that future development may have upon known existing flooding problems if not carefully managed.

Information on previous flooding incidents within North Somerset has been collated from a variety of sources. A number of tidal and fluvial flood events have been identified dating back to 1607. Data on previous flood events has been sourced from:

- Previous SFRA for North Somerset (2008) where data was obtained from:
  - NSC Engineers and Parish Councillors; and
  - North Somerset Levels Internal Drainage Board (IDB), part of the Somerset Drainage Boards Consortium, and prior to that the North Somerset and West Mendip IDBs;
- NSC flood records; and
- Environment Agency flood records.

Historic flood records have been collated along with consultee responses to ensure as many flood events as possible have been included in **Figure 035**.

A summary of flood history is also included in Table 5.1.

<sup>21</sup> Flood Map for Planning. Available from: <https://flood-map-for-planning.service.gov.uk/>

<sup>22</sup> Risk of Flooding from Surface Water. Available from: <https://data.gov.uk>

Table 5.1: Significant Recorded Historic Flood Events

| Date         | Flooding Mechanism                               | Description   | Location   | Source of information   |
|--------------|--|---|--|---|
| January 1607 | Tidal  | This was known as the 'Great Flood' which killed approximately 2,000 people across Somerset and has been described as one of the worst natural disasters to hit Britain. There is no accurate record, however, it was estimated that the tide level at Kingston Seymour was 8.9mAOD (metres above ordnance level). It is estimated that water covered 520 km <sup>2</sup> of land.  | Several flooded areas across North Somerset  | NSC Local Flood Risk Management Strategy (2013)   |
| 1885         | Tidal  | In Wick St. Lawrence there was a breach at 'Isleton Farm' which caused 2-3 feet of flooding.  | Wick St. Lawrence  | NSC Local Flood Risk Management Strategy (2013)   |
| July 1968    | Fluvial / Surface Water and Ordinary Watercourse | <p>A low-pressure event caused severe flooding throughout the South West after 5 inches of rain fell within 24 hours, including a major storm over the Mendip Hills.</p> <p>The flooded areas included Banwell Moor to the north of Banwell Village, part of St. Georges Village and an area between St. Georges and West Wick. It is known that the River Banwell continued to rise for approximately six days after the storm had passed. It is important to note however that the catchment and watercourses themselves were considerably different at that time in both alignment and cross-section to the current situation. Furthermore, St. Georges had experienced very little development prior to 1968 and the M5 Motorway had yet to be built.</p> <p>In Wrington there were several reports of flooding in the 1968 event. Silver Street was flooded, caused by surface water from Clements Field and Riding Farm. The Congresbury Yeo flooded 125 properties in Main Street, with flood depths of up to 2 metres and extensive damage to the A370 road bridge recorded. Parts of Weston-super-Mare were cut off due to flooding and landslides and areas of Clevedon were under 0.6m of water.</p> | Banwell Moor;<br>St. Georges Village;<br>Wrington;<br>Weston-super-Mare;<br>Clevedon | Environment Agency Historic Flood Extents / NSC Local Flood Risk Management Strategy (2013) |

| Date          | Flooding Mechanism                     | Description   | Location  | Source of information   |
|---------------|--|---|---|---|
| 1981          | Tidal                                  | <p>The failure of the old Uphill tidal sluice during a storm led to tidal inundation and extensive flooding in Uphill village. At the same time, sea defences were also breached in Uphill. However, the inner flood banks prevented further flooding.</p> <p>In Clevedon, large waves broke over the sea wall and parts of the crest slabs and grouted stone rear facing were ripped off resulting in flooding to 12 properties. At Wick St. Lawrence there was a breach in the defences on the seaward side at Woodspring Bay with other sections of the defences affected and water levels reaching the top of the inner embankment. Properties were evacuated and at Kingston Seymour water collected in Middle Lane with flooding extended to Laurel Farm.</p> | Uphill;<br>Clevedon;<br>Wick St. Lawrence;<br>Kingston Seymour            | Environment Agency Historic Flood Extents / NSC Local Flood Risk Management Strategy (2013) |
| 1989-1990     | Tidal                                  | Tidal inundation on a lesser scale to 1981 occurred in Weston-super-Mare, Kingston Seymour, Wick St. Lawrence and Clevedon following a storm event.   | Weston-super-Mare;<br>Wick St. Lawrence;<br>Kingston Seymour;<br>Clevedon | Environment Agency Historic Flood Extents / NSC Local Flood Risk Management Strategy (2013) |
| Summer 2007   | Surface Water and Ordinary Watercourse | Evidence suggests surface water runoff from surrounding fields was the cause of garage and gardens flooding in South Meadow, Wrington. The Glebe and Garstons Close also flooded in 2007 and anecdotal evidence suggests properties experienced internal flooding for two hours before waters receded. Apart from fluvial flooding, Wrington was affected by the local springs which exacerbated the surface water problem.   | Wrington  | Environment Agency Historic Flood Extents / NSC Local Flood Risk Management Strategy (2013) |
| January 2008  | Surface Water and Ordinary Watercourse | The Avon Fire and Rescue service recorded more than 200 flooding incidents in one afternoon. Within the NSC boundary there were two call outs. In Winford they rescued three people from a car trapped in flood water. At St. Georges Hill two pumps were used to remove flood water in properties. In Wrington roads were flooded and cars had to be abandoned.  | Winford;<br>St. George's Hill;<br>Wrington                                | Environment Agency Historic Flood Extents / NSC Local Flood Risk Management Strategy (2013) |
| February 2008 | Surface Water and Ordinary Watercourse | Station Road (A370) at Flax Bourton became impassable and the railway line was temporarily closed with trains cancelled.  | Flax Bourton  | Environment Agency Historic Flood Extents / NSC Local Flood Risk Management Strategy (2013) |

| Date                             | Flooding Mechanism                     | Description   | Location  | Source of information   |
|----------------------------------|--|---|---|---|
| 2012                             | Surface Water and Ordinary Watercourse | Significant flooding across North Somerset in August, September and November 2012. Summer Lane ponds at Weston Village caused flooding to residential streets, properties narrowly avoided internal flooding. Improvement works are planned to reduce risk. | Several flooded areas across North Somerset (See Table 5.2) | NSC Local Flood Risk Management Strategy (2013)<br><br>North Somerset 2012 Flood Investigations <sup>23</sup> |
| Winter 2013-2014 and Summer 2014 | Surface Water and Ordinary Watercourse | Rainfall totals were significantly higher than average during winter 2013-2014 and August 2014, however these events did not result in the same level of property flooding reports as 2012.   | Several flooded areas across North Somerset                 | NSC Addendum to the Preliminary Flood Risk Assessment (2017) <sup>24</sup>                                    |
| 2016                             | Surface Water and Ordinary Watercourse | During Storm Angus in November 2016, 22 properties were reported to have flooded internally and 143 flooded externally across North Somerset. Additional flooding was prevented by the deployment of temporary defences in Summer Lane, Weston-Super-Mare   | Several flooded areas across North Somerset                 | NSC Addendum to the Preliminary Flood Risk Assessment (2017)  |

As indicated in Table 5.1, in 2012, a combination of high rainfall totals and saturated ground brought widespread flooding to many parts of the UK; North Somerset experienced higher rainfall than the long-term national average. A total of 25 communities were affected by these events; 474 properties were reported to have flooded internally and 428 flooded externally across North Somerset. A summary of flooded locations within North Somerset where more than ten properties suffered internal flooding, according to the North Somerset Local Flood Risk Management Strategy (2013), is provided in Table 5.2.

**Table 5.2: Key Flooded Locations in 2012**

| Location          | Estimated no. internal flooding incidents | Estimated no. external flooding incidents |
|-------------------|---|---|
| Clevedon          | 20-30                                     | 5-10                                      |
| Congresbury       | 10-20                                     | 10-20                                     |
| Langford          | 10-20                                     | 10-20                                     |
| Locking           | 10-20                                     | 5-10                                      |
| Nailsea           | 20-30                                     | 40-50                                     |
| Weston-super-Mare | 20-30                                     | 20-30                                     |
| Winscombe         | 20-30                                     | 10-20                                     |
| Wrington          | 80-90                                     | 140-150                                   |

<sup>23</sup> North Somerset – 2012 Flood Investigations. Available from: <https://www.n-somerset.gov.uk/my-services/environmentalprotection/flood/flood-investigations/about-flood-investigation/>

<sup>24</sup> Available from: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/698524/PFRA\\_North\\_Somerset\\_District\\_Council\\_2017.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698524/PFRA_North_Somerset_District_Council_2017.pdf)

### 5.3 Fluvial Flood Risk

Fluvial Flood Zones have been defined in accordance with NPPG requirements. The delineation of Flood Zones (refer to **Figures 001-033**) is based on the Environment Agency Flood Map for Planning (from Rivers and the Sea) which defines the Flood Zones as follows:

#### 5.3.1 Flood Zone 1 – Low Probability

Flood Zone 1 – Low Probability comprises land assessed as having a less than 1 in 1,000 AEP of river and sea flooding (<0.1%). For SFRA purposes, this incorporates all land that is outside Flood Zones 2 and 3. It is important to note that land within Flood Zone 1 may still be vulnerable to flooding from sources other than fluvial and/or tidal sources.

#### 5.3.2 Flood Zone 2 – Medium Probability

Flood Zone 2 - Medium Probability comprises land assessed as having between a 1 in 100 and 1 in 1,000 AEP of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1,000 AEP of sea flooding (0.5%-0.1%) in any year. In other words, land situated between Flood Zones 1 and 3a. Flood Zone 2 (Medium Probability of Flooding) is based on the most recent Environment Agency Flood Map for Planning (Rivers and Sea).

#### 5.3.3 Fluvial Flood Zone 3a – High Probability

Fluvial Flood Zone 3a - High Probability comprises land assessed as having a 1 in 100 or greater AEP of river flooding (>1%) in any year. Fluvial Flood Zone 3a (High Probability of Flooding) is based on the most recent Environment Agency Flood Map for Planning (Rivers and Sea). Tidal Flood Zone 3a is delineated separately (see Section 5.4.1).

#### 5.3.4 Fluvial Flood Zone 3b – Functional Floodplain

The NPPG defines Flood Zone 3b – Functional Floodplain as:

*“land where water has to flow or be stored in times of flood”. It is also stated that “the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood (such as a flood alleviation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point for consideration and discussion to identify the functional floodplain” (NPPG, SFRA guidance).*

Flood Zone 3b is therefore identified by local planning authorities.

National Guidance further clarifies that:

*“The area identified as functional floodplain should take into account the effects of defences and other flood risk management infrastructure. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain”.*

In addition, the guidance states that areas intended to flood, such as upstream Flood Storage Areas (FSAs) should also be identified as functional floodplain.

The Environment Agency knowledge of the floodplain is continually being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. The Environment Agency has an ongoing programme of improvement and updates to the published Flood Maps are made on a quarterly basis.

For the purposes of this Level 1 SFRA, functional floodplain is identified in a number of key areas within North Somerset to allow for Flood Zone 3 to be further classified into Zones 3a and 3b. Flood Zone 3b is delineated where the risk of flooding is predicted to be 1 in 20 (5%) AEP or greater, taking into account the presence of defences. As a conservative approach, where modelling results were not available for the 1 in 20 (5%) AEP event, higher return periods have been used to delineate Flood Zone 3b. If a defended scenario was not available and/or there are no formal flood defences within the modelled area, undefended scenarios have been used instead. Where detailed modelling was not available, for spatial planning purposes all land in Flood Zone 3 is considered as functional floodplain (Flood Zone 3b) until it can be demonstrated to the satisfaction of the Environment Agency that it can be considered otherwise. Table 5.3 includes an overview of the sources and information used to delineate Flood Zone 3b along Environment Agency Main Rivers. In addition to the information in Table 5.3, the published Environment Agency flood storage areas (FSAs) have also been included as mapped Flood Zone 3b. Tidal Flood Zone 3b is delineated separately (see Section 5.4.2).

**Table 5.3: Flood Zone 3b Delineation Data**

| Watercourse               | Catchment                             | Source of Data   | Available Scenario Used to Delineate Flood Zone 3b   |
|---------------------------|---------------------------------------|--|--|
| Markham Brook             | Bristol Avon                          | Detailed modelling completed by the Environment Agency | 1 in 25 (4%) annual chance event extent - defended scenario  |
| Portbury Ditch            | Gordano Valley                        | Detailed modelling completed by the Environment Agency | 1 in 20 (5%) annual chance event extent – baseline scenario (undefended); no defended scenario outlines available          |
| Congresbury Yeo           | North Somerset Levels                 | Detailed modelling completed by the Environment Agency | 1 in 20 (5%) annual chance event extent - defended scenario (1 in 30 (3.33%) annual chance event for the 2016 model rerun) |
| Land Yeo, Kenn, Blind Yeo | North Somerset Levels (Clevedon area) | Detailed modelling completed by the Environment Agency | 1 in 20 (5%) annual chance event extent – baseline scenario (undefended); no defended scenario outlines available          |
| Uphill Great Rhyne        | Axe                                   | Detailed modelling completed by the Environment Agency | 1 in 20 (5%) annual chance event extent – baseline scenario - undefended (no formal defences present)                      |
| River Banwell             | Axe                                   | Detailed modelling completed by Royal Haskoning DHV    | 1 in 20 (5%) annual chance event extent – baseline scenario - (no formal defences present)                                 |

Any development within Flood Zone 3b is likely to measurably impact upon the existing flooding regime, increasing the severity and frequency of flooding elsewhere. It is important to recognise that all areas within Flood Zone 3b are subject to relatively frequent flooding – on average, flooding once every 20 years. There are clear safety, sustainability and insurance implications associated with future development within these areas and informed planning decisions must be taken with care. Development in such areas is only likely to be appropriate for ‘Water Compatible’ developments and ‘Essential Infrastructure’ and would need to pass the Exception Test in accordance with the NPPF (see Table 2.2).

For this Level 1 SFRA, Fluvial Flood Zone 3b has been illustrated in Figures 001-033. However, the absence of Flood Zone 3b extent does not necessarily correspond to no risk of flooding for the 1 in 20 (5%) AEP event (e.g.

informal flood storage areas may be located outside of the delineated functional floodplain) and it is the responsibility of the developer to demonstrate that a proposed area is suitable for development.

## 5.4 Tidal Flood Risk

The study area is within the Severn Estuary and as such it is exposed to significant tidal conditions. The Severn Estuary has the second largest tidal range in the world and the northwest facing coastline exposes many of the local communities to combinations of extreme tides, surges, swell and wind waves.

Flooding to low-lying land from the sea and tidal estuaries is a principal flood risk source within North Somerset. Without defences in place approximately a quarter of the area of North Somerset is at risk of flooding. However, the tidal flood defence network across the study area is well developed and extensive; therefore, flooding rarely occurs due to high tidal levels alone. The dominant source of tidal flood risk is related to the coincidental occurrence of a high astronomical tide, the passage of a storm surge and the effects of wind related waves. Overall, the likelihood and severity of coastal flooding depends on a number of parameters including weather systems, wind and wave conditions, underlying topography, effectiveness of drainage systems, the condition of flood defences, in addition to the Standard of Protection they afford (which could change in future due to climate change). The rapid onset of tidal flooding often results in more significant impacts of flooding compared to flooding from rivers.

The delineated Tidal Flood Zones are listed below and are illustrated in **Figures 001-033**. Flood Zones 1 and 2 as described above (see Sections 5.3.1 and 5.3.2) are both fluvial and tidal in nature, therefore Tidal Flood Zones 1 and 2 have not been delineated.

### 5.4.1 Tidal Flood Zone 3a – High Probability

Tidal Flood Zone 3a - High Probability comprises land assessed as having a 1 in 200 or greater AEP of tidal flooding (>0.5%) in any year. Tidal Flood Zone 3a (High Probability of Flooding) is based on the most recent Environment Agency Flood Map for Planning.

### 5.4.2 Tidal Flood Zone 3b – Functional Floodplain

This Level 1 SFRA also delineates Tidal Flood Zone 3b, as tidal flood risk is the major source of flood risk within North Somerset. Tidal Flood Zone 3b functional floodplain should not occur inland of present coastal defences as the coastline is defended with a greater standard of protection than the 1 in 20 (5%) AEP event. Therefore, Tidal Flood Zone 3b has been indicated where tidal flooding (i.e. Tidal Flood Zone 3a) is predicted to occur on the seaward side of the raised coastal defences.

Flood defences within North Somerset are described in more detail in Section 7.3 and are illustrated in **Figures 040 and 041**.

## 5.5 Surface Water Flood Risk

Significant flooding from surface water runoff and from the blockages of drains and culverts has been experienced in recent years at a number of locations within North Somerset. Communities with several reported incidents of surface water flooding include Hutton, Wrington, Blagdon, Iwood, Yatton and Bleaddon. Property damage as a result of surface water flows has been recorded in a number of places. There are many surface water incidents in more rural locations where the frequency of flooding incidents can be relatively high.

Surface water flow paths are indicated by the Environment Agency RoFSW mapping indicating the extent of flooding from surface water that could result from a flood with a 1 in 1000 (0.1%), 1 in 100 (1%) and 1 in 30 (3.3%) annual exceedance probability. Please refer to **Figure 036** for RoFSW extents within North Somerset.

### 5.5.1 Delineation of Areas of Critical Drainage

Environment Agency guidance states that a Flood Risk Assessment (FRA) would be required to support a planning application if the development is located in Flood Zone 1 and in an area with critical drainage problems as notified by the Environment Agency. However, the Environment Agency has yet to identify any Critical Drainage Areas (CDAs) in North Somerset. Given the potential consequences of a flood event for proposed developments in Flood Zone 1, this SFRA defines Areas of Critical Drainage (ACDs) across North Somerset (refer to **Figure 039**). These include areas from the RoFSW mapping that are subject to surface water flooding for the 1 in 100 (1%) AEP event and lie within Flood Zone 1.

Although ACDs and CDAs both define areas with critical drainage problems, the variation in name has been adopted to differentiate between those areas delineated by this SFRA (ACDs) and those which may be notified by the Environment Agency (CDAs).

NSC considers that the planning requirements associated with ACDs are the same as if they were a CDA defined by the Environment Agency. According to the NPPG (Critical Drainage Areas Guidance<sup>25</sup>), planning applications that fall, either partly or wholly, within an ACD will need to be supported by a site-specific FRA demonstrating how the development will take local sources of flooding into account and provide:

- *an estimate of how much surface water runoff the development will generate;*
- *details on existing methods for managing surface water runoff, for example drainage to a sewer; and*
- *plans for managing surface water and for making sure there is no increase in the volume of surface water and rate of surface water runoff.*

The SFRA mapping of ACDs is intended to provide a strategic overview of areas that may be at greatest risk and does not provide site specific detail, e.g. flow direction. However, it is recognised that sources of local flooding (groundwater emergence and/or surface runoff) may be located outside the identified ACDs, resulting in water flowing downhill before ponding in an ACD.

In particular, the IDB areas (defined in **Figure 034**) include a network of rhynes<sup>26</sup> that contribute significantly to the drainage of that land. Development within the IDB areas has the potential to impact the function of rhynes and, as a result, increase local flood risk. Therefore, drainage issues within these areas should be given particular prominence. The Somerset Drainage Boards Consortium is a non-statutory consultee in the planning process.

The design of proposed developments should also carefully consider the impact that local flooding and raised groundwater levels may have upon the operation of SuDS, also considering potential cumulative effects. SuDS should be designed in accordance with guidance included within the SuDS Manual (see Section 7.5).

Overall, for ACDs, areas within the IDB districts and other areas that might be susceptible to local flooding; the volume of runoff and sufficiency of the existing drainage capacity, ordinary watercourses, hydraulic structures, culverts and sewer systems are critical to determining the degree of flood risk within North Somerset. It is therefore essential that a more detailed (site based) review is carried out by the developer as part of the planning application and design process (i.e. site-specific FRA) to ensure the development is safe for its lifetime and does not increase flood risk elsewhere.

<sup>25</sup> Flood risk assessment in flood zone 1 and critical drainage areas, NPPG. Available from: <https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>

<sup>26</sup> Water Levels and Watercourses, Somerset Drainage Boards Consortium. Available online: <https://somersestdrainageboards.gov.uk/operations/water-levels-telemetry/>

## 5.6 Reservoir Flood Risk

The Environment Agency Risk of Flooding from Reservoirs dataset has been utilised to assess the risk of flooding from reservoir failure throughout North Somerset.

A small number of reservoirs has been identified within North Somerset, including the Barrow Gurney reservoirs and Blagdon Lake. Following a recommendation in the Pitt Review, the Environment Agency has provided Reservoir Flood Maps for those reservoirs which it regulates under the Flood & Water Management Act 2010. These show the predicted extent of flooding resulting from a dam breach which could be caused by extreme rainfall or structural failure and can be found in **Figure 037**.

It should be noted that there may be other reservoirs that are not of sufficient size to fall under the auspices of the Reservoirs Act and consequently regulation by the Environment Agency. A site-specific Flood Risk Assessment would need to consider the risk of failure of such features on proposed development.

## 5.7 Groundwater Flood Risk

Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from ephemeral springs. This tends to occur after long periods of sustained rainfall; the areas most at risk are often low-lying where the water table is more likely to be at shallow depths. Groundwater flooding is known to occur in areas underlain by major aquifers.

The 'AStGWF 2010' dataset has been used to determine groundwater flood risk within North Somerset and is illustrated in **Figure 038**. This dataset was created as a high-level screening tool for assessing groundwater flood risk at a national level. It is a 1km square grid that identifies, at a broad scale, areas susceptible to flooding from groundwater on the basis of geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring and therefore is a hazard, not risk-based, dataset.

The dataset does not take account of areas where groundwater is likely to pond or flow but simply considers where groundwater might emerge. Hazard is represented by one of four area categories showing the proportion of each 1km grid square that is susceptible to groundwater flood emergence:

- >25%;
- ≥25% and ≤50%;
- ≥50% and ≤75%; and
- ≥75%.

Absence of a value means that no risk of emergence is anticipated.

The river floodplains to the south and east of Nailsea and to the east of Banwell, all exhibit stoneless, mostly reddish clayey soils formed from the river alluvium, which are affected by groundwater. Most of the river valleys and the lower slopes of the ridges have brown earths and reddish fine loam over clayey soils with permeable subsoils which are subject to slight seasonal waterlogging. The Gordano Valley is also bounded by reddish fine loamy soils overlying clayey subsoils, with a tendency for slight seasonal waterlogging.

Historic waterlogged areas have been included in Figure 035.

## 5.8 Sewer Flooding

In urban areas, rainwater frequently drains into surface water sewers or combined sewers (sewers containing both surface and wastewater). These sewers can be surcharged due to heavy rainfall, inadequate capacity or blockages, resulting in flooding of the surrounding area until the water can drain away.

Wessex Water has provided information on the number of properties that have experienced sewer flooding in North Somerset for this updated SFRA. Sewer flooding may be internal or external (to property curtilages or highways); internal flooding is generally considered more disruptive than external or curtilage flooding. The information provided includes flooding incidents during a ten year period (May 2005 – January 2015). This information needs to be regularly updated to reflect assessments and works completed by Wessex Water and any subsequent flooding incidents. The majority of sewer flooding is caused by blockages and it is important to only dispose of flushable items into the sewer network.

The total number of properties flooded from sewers in North Somerset are summarised by postcode in Table 5.4. The highest risk areas are in postcode areas BS40 (Wrington), BS24 (Bleadon, Hutton, Locking, Lympsham and Weston-super-Mare), BS22 (Kewstoke, Weston-super-Mare and Wick St Lawrence) and BS49 (Congresbury and Yatton).

Any new development must address the impact on the existing capacity of the sewer system and any associated sewage treatment works. Increases in discharge may lead to the overloading of receiving sewers and consequently an increase in flood risk and pollution. There must be no surface water connections to foul sewers. Developers must consult sewerage undertakers prior to discharging into existing systems.

Bristol Water was also consulted for potential flooding incidents due to water supply system failures. There were no formal records to be provided; however, their response indicates there is an area that is considered to be at risk of flooding between Banwell and Winscombe, which lies within Flood Zone 2.

Table 5.4: Wessex Water Property Sewer Flooding Records

| Postcode     | Internal Flooding | External Flooding | Total      |
|--------------|-------------------|-------------------|------------|
| BS20 0       | -                 | 11                | 11         |
| BS20 6       | 2                 | 4                 | 6          |
| BS20 7       | 1                 | -                 | 1          |
| BS20 8       | -                 | 4                 | 4          |
| BS21 6       | 1                 | 6                 | 7          |
| BS21 7       | 1                 | 1                 | 2          |
| BS22 6       | 3                 | 8                 | 11         |
| BS22 7       | -                 | 1                 | 1          |
| BS22 8       | 4                 | 15                | 19         |
| BS22 9       | -                 | 11                | 11         |
| BS23 2       | -                 | 3                 | 3          |
| BS23 4       | 1                 | -                 | 1          |
| BS24 0       | 5                 | 5                 | 10         |
| BS24 6       | 9                 | -                 | 9          |
| BS24 7       | -                 | 17                | 17         |
| BS24 8       | 5                 | 14                | 19         |
| BS24 9       | 4                 | 1                 | 5          |
| BS25 1       | 3                 | 9                 | 12         |
| BS25 5       | -                 | 3                 | 3          |
| BS29 6       | -                 | 2                 | 2          |
| BS40 5       | 15                | 44                | 59         |
| BS40 8       | -                 | 1                 | 1          |
| BS41 8       | 2                 | -                 | 2          |
| BS41 9       | 1                 | 1                 | 2          |
| BS48 1       | -                 | 2                 | 2          |
| BS48 2       | 3                 | 9                 | 12         |
| BS48 3       | 1                 | 4                 | 5          |
| BS48 4       | -                 | 2                 | 2          |
| BS49 4       | 1                 | 15                | 16         |
| BS49 5       | 5                 | 5                 | 10         |
| <b>Total</b> | <b>67</b>         | <b>198</b>        | <b>265</b> |

## 5.9 Climate Change

There is clear scientific evidence that global climate change is happening now and cannot be ignored. Changes in the extent of inundation due to climate change are likely to be negligible in well-defined valleys but could be dramatic in very flat areas. Increases in rainfall depth due to climate change will increase the probability of a given flood. This means that a site currently located within a lower risk zone (Flood Zone 1 or 2) could in the future be re-classified as lying within a high-risk zone (Flood Zone 3a or 3b). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding (see Section 2.6).

Climate change has the potential to significantly increase the impact of flooding within North Somerset due to the presence of low-lying land along the coastline, Somerset Levels and Moors. Therefore, the assessment of flood risk should account for changes in rainfall leading to an increase in fluvial flood risk due to higher river levels and an increase in tidal flood risk due to increased sea levels, offshore wind speed and wave height.

This SFRA is intended to be used as a long-term planning document. It is therefore necessary to consider the potential impacts of climate change in terms of fluvial and tidal flood risk. Of particular relevance to this SFRA is the current climate change guidance on peak river flow, peak rainfall intensity and sea levels.

UKCP18, (launched in November 2018), is a set of new climate change projections that replace the previous set: UKCP09. It is expected that the new projections will be used to update current guidance<sup>27</sup> from the Environment Agency as to how the predicted impact of climate change should be considered as part of the spatial planning process. It is anticipated that new guidance will be published in 2020. UKCP18 results include land and marine projections that are described in Environment Agency guidance as follows:

- Projections over land: *“General climate change trends projected over UK land for the 21<sup>st</sup> century are broadly consistent with earlier projections (UKCP09) showing an increased chance of milder, wetter winters and hotter, drier summers along with an increase in the frequency and intensity of extremes.”*
- Marine Projections: *“A new set of marine projections show that sea level around the UK will continue to rise in 2100 under all emission pathways.”*

The headline results in UKCP18 are broadly consistent with UKCP09, although there are some differences (e.g. temperature and rainfall) that may be important for climate risk assessments. The differences between UKCP09 and UKCP18 depend on the relevant season, location and greenhouse gas emission scenario. UKCP18 will provide the most up-to-date assessment of how climate in the UK is expected to change over the coming century and will be used to inform the next Climate Change Risk Assessment (CCRA), due in 2022.

The climate change allowances published in February 2016<sup>27</sup> (last updated in February 2019) are still the best national representation of how climate change is likely to affect flood risk for peak river flow and peak rainfall intensity, at the time of publication of this SFRA. The climate change allowances for sea level rise were updated in December 2019. Refer to Section 6.3 for relevant climate change guidance and mapping.

At this stage, this SFRA does not consider climate change allowances for the delineation of fluvial flood risk zones. Additional mapping and assessment of flood risk within NSC will be incorporated into this study when the guidance<sup>27</sup> from the Environment Agency is updated. However, current climate change allowances should always be considered for future development and reference should be included in site-specific FRAs.

It is essential that developers consider the possible change in flood risk over the lifetime of the development as a result of climate change. According to the NPPG, residential development should be considered to have a minimum lifetime of 100 years, unless there is specific justification for considering a shorter period. The lifetime of

<sup>27</sup> Adapting to Climate Change: Advice for Flood and Coastal Risk Management Authorities, Environment Agency, 2016

a non-residential development should depend on the characteristics of that development and developers would be expected to justify why they have adopted a given lifetime for the development.

In the absence of detailed hydraulic modelling, the anticipated extent for Fluvial Flood Zone 3a (i.e. 1 in 100 (1%) AEP event) after the next 100 years can be expected to be approximated by the current Flood Zone 2 (i.e. 1 in 1000 (0.1%) AEP event) extent due to the predicted impacts of climate change. Similarly, those areas (and properties) that are currently at risk of fluvial flooding for the 1 in 100 (1%) AEP event (i.e. situated within Flood Zone 3a), may be susceptible to more frequent flooding in future years, corresponding to Fluvial Flood Zone 3b. Furthermore, there could be an increase in localised surface water flooding incidents due to the predicted impact of climate change on rainfall. It is therefore essential that the development management process carefully accounts for and mitigates against the potential impact that climate change may have upon the risk of flooding within North Somerset.

Finally, the design standards of protection for coastal flood defences in North Somerset were estimated at the time of design and therefore, may be subject to change over time due to climate change. A new tidal model (Woodspring Bay Model) is currently being developed by the Environment Agency that will provide further information on the accuracy of standards of protection for coastal defences. The model is due to be released during 2020.

## 6. Flood Risk in North Somerset

### 6.1 Current Levels of Flood Risk

The low-lying land of the Somerset Levels and potential threat of tidal inundation make flood risk a key issue within North Somerset. Approximately one third of the properties across North Somerset are located in areas at risk of flooding from rivers and the sea. The rapid onset of tidal flooding often results in more significant impacts of flooding compared to flooding from rivers.

A summary of key flood risk sources across several populated areas of North Somerset is included below. Flood Zone delineation, surface water mapping and identifications of ACDs across North Somerset can be found in **Figures 001-033, 036 and 039**.

#### **Weston-super-Mare**

Much of the existing urban area is located in Flood Zones 2 and 3, mostly on account of tidal flood risk. Exceptions are the Worlebury Hill area and the banks of higher ground behind the seafront. There are also areas of functional floodplain related to the Uphill Great Rhyne and Cross Rhyne. Surface water flood risk is particularly associated with the areas around Worlebury and Bleadon Hill. The northern part of this area (Worlebury) is generally free of fluvial and tidal flood risk, which increases again towards the east, near the River Banwell.

Please refer to **Figures 043-044** for pre-development and post-development flood extents (Flood Zones 3a and 3b) in the area of the Weston Villages, located southeast of Weston-super-Mare, where strategic allocations have been made.

Parts of the Weston-super-Mare area, mainly along the coastline, have been indicated as being susceptible to groundwater flooding. Also, several events of sewer flooding have been recorded in Weston-super-Mare between 2005 and 2015 (see Section 5.8).

#### **Banwell**

The village and most of its immediate surroundings lie within Flood Zone 1. However, there is an extensive area of Fluvial and Tidal Flood Zone 3 to the north, related to the River Banwell, as well as the Severn Estuary and Somerset Levels. There are areas of surface water flood risk to the north of the village associated with local watercourses and rhynes.

#### **Clevedon**

The southern part of the area falls entirely within Fluvial and Tidal Flood Zone 3, with tidal flooding from the Severn Estuary being the dominant flood risk to the town. There are narrow corridors of functional floodplain along the Land Yeo and Blind Yeo, giving way to a larger area of functional floodplain in the east towards Nailsea. Areas of high surface water flood risk exist along the Land Yeo corridor and towards Nailsea. Surface water flooding within the town is a result of the high proportion of impermeable areas and steep slopes to the north. Parts of Clevedon, mainly along the coastline, have also been indicated as being susceptible to groundwater flooding.

#### **Nailsea**

The town itself is located in Flood Zone 1, however it is surrounded by large areas of Fluvial and Tidal Flood Zone 3. The area to the west of Nailsea is also in the functional floodplain for the Land Yeo, River Kenn and their surrounding tributaries and rhynes. There are also extensive areas of surface water flood risk that partly lie within the town boundary and have been indicated as ACDs.

Areas around Nailsea would be at risk of flooding should the Barrow Gurney reservoirs fail. However, the town itself, including all residential areas, is not within the zone predicted to flood.

### **Yatton and Congresbury**

The area partly falls within Tidal and Fluvial Flood Zone 2 and 3, however most of the residential areas lie within Flood Zone 1. There are nearby locations that lie within functional floodplain along the Congresbury Yeo and River Kenn, as well as an informal flood storage area ('Gang Wall') for over-spilling from the Congresbury Yeo. There are also large areas at risk from surface water flooding at Yatton and Claverham, south of the railway, in the Stowey Rhyne catchment and also south of Yatton in the valley of the Congresbury Yeo. The area mostly falls within 1km grid squares with 25% of their area susceptible to groundwater flooding.

Part of Congresbury and a small area of Yatton would be at risk of flooding if Blagdon Lake failed. Also, there have been 16 sewer flooding events recorded within Yatton between 2005 and 2015, almost all of them being cases of external flooding. More than 50 sewer flooding events have been recorded in Wrington during the same period.

### **Portishead**

A large area of the town, including the marina and area south to it, lies within Tidal Flood Zone 3a. The area of flood risk extends northeast to Portbury Wharf, where some areas around the seafront and the Royal Portbury Dock Flood Storage Area (FSA) are included in Tidal Flood Zone 3b. Also, Tidal Flood Zone 3a extends southwest through the Gordano Valley as far as Walton, parts of which are also fluvial in nature. Areas of Fluvial Flood Zone 3a and corridors of functional floodplain follow the Main Rivers. Areas of surface water flood risk exist mainly around the Portbury Ditch. Portishead is considered to be susceptible to groundwater flooding (<25% of 1km grid squares around Portishead and 25 to >75% of 1km grid squares around Portbury are susceptible to groundwater flooding).

### **Long Ashton**

There are areas in Fluvial Flood Zones 2 and 3, locally around the Ashton Brook, southeast of Long Ashton. Those areas in Flood Zone 3 also form part of the functional floodplain, as detailed hydraulic modelling results for the catchment were not available at the time of publication of this SFRA. Additional corridors of Fluvial Flood Zone 3 follow the Land Yeo to the west.

There are also areas of surface water flood risk within Long Ashton and around the Ashton Brook and Land Yeo that mostly fall within Flood Zones 2 and 3 but with sections lying in Flood Zone 1. These sections have been indicated as ACDs. The area is considered to be susceptible to groundwater flooding. Finally, areas around the urban area of Long Ashton and up to the edge of the residential area boundary, would be at risk of flooding in the event of the failure of Barrow Gurney reservoir.

### **Pill**

Large parts of the area lie within Flood Zone 1. Areas adjoining the River Avon fall within Fluvial and Tidal Flood Zone 3 and also form part of the functional floodplain. A narrow corridor of Fluvial Flood Zone 3a, which for a small area along the NSC boundary forms part of the functional floodplain, extends south from the River Avon along the Markham Brook. There are narrow areas of surface water flood risk associated with local watercourses and the area mostly falls within 1km grid squares with 25% of their area susceptible to groundwater flooding.

## **6.2 Current Flood Risk in Steep Holm Island**

The island of Steep Holm lies 9km off Weston-super-Mare and 5km from the tip of Brean Down within the Bristol Channel. It is owned and managed by the Kenneth Allsop Memorial Trust. According to available mapping and

aerial imagery, the island consists of steep, hard rock cliffs around its perimeter providing a level of protection against tidal flooding; freely available Light Detection And Ranging (LiDAR) data also indicates this. However, erosion around the seafront and cliffs is expected to affect the island, with climate change potentially increasing the rate of such phenomena.

Hydraulic modelling data for Steep Holm island was not available, at the time of publication of this Level 1 SFRA. According to the ‘AStGWF’ dataset (refer to **Figure 038**) parts of the island are considered to be susceptible to groundwater flooding.

### 6.3 Climate Change Mapping

Sea level rise allowances for the predicted impact of climate change were updated in December 2019 to reflect the latest climate change projections (UKCP18). A range of allowances have been published to allow assessment for a range of sea level rise scenarios. Table 6.1 includes the sea level rise allowances for the South West region for a range of epochs until 2125, using epoch from 1981 to 2000 as a baseline.

**Table 6.1: Sea level rise allowances for the South West region**

| Area of England | Allowance      | 2000 to 2035 (mm) |       | 2036 to 2065 (mm) |       | 2066 to 2095 (mm) |       | 2096 to 2125 (mm) |       | Cumulative rise 2000 to 2125 (m) |
|-----------------|----------------|-------------------|-------|-------------------|-------|-------------------|-------|-------------------|-------|----------------------------------|
|                 |                | /year             | total | /year             | total | /year             | total | /year             | total |                                  |
| South West      | Higher Central | 5.8               | 203   | 8.8               | 264   | 11.7              | 351   | 13.1              | 393   | 1.21                             |
|                 | Upper End      | 7                 | 245   | 11.4              | 342   | 16                | 480   | 18.4              | 552   | 1.62                             |

**Figure 045** shows the expected extents for Tidal Flood Zone 3a with an increase due to sea level rise predicted for 2125. Mapping is based on the cumulative rise from 2000 to 2125, for the Upper End allowance estimate. According to Table 6.1, the sea level rise allowance applied is 1.62m.

LiDAR data (Digital Terrain Model (DTM) at 1m resolution) have been used to identify existing tide levels and predicted tidal flood extents. Table 6.2 summarises the current and future average tide levels for the five North Somerset coastline sections.

For this SFRA, no detailed hydraulic modelling has been undertaken to assess the impact of climate change on sea level rise, therefore, predicted flood extents shown in **Figure 045** are intended as a guide. Developers should undertake site-specific FRAs to demonstrate that the proposed development is appropriate.

Table 6.2: Current and future (with climate change) average tide levels for the five North Somerset coastline sections

| Coastline Section                      | Current level (m AOD) | Sea level rise increase to 2125 (m) | Future level (with climate change) (m AOD) |
|--|-----------------------|-------------------------------------|--|
| Portishead to Clevedon                 | 8.36                  | 1.62                                | 9.98                                       |
| Kingston Seymour and Wick St. Lawrence | 7.61                  | 1.62                                | 9.23                                       |
| Middle Hope                            | 8.19                  | 1.62                                | 9.81                                       |
| Sand Bay                               | 8.22                  | 1.62                                | 9.84                                       |
| Weston Bay                             | 8.36                  | 1.62                                | 9.98                                       |

At this stage, this SFRA does not consider climate change allowances for the delineation of fluvial flood risk zones, in anticipation of updated guidance from the Environment Agency. Additional mapping and assessment of fluvial flood risk within North Somerset, with an allowance for climate change, will be incorporated into this report when updated guidance is published by the Environment Agency. In the interim, the planning and development process should follow current climate change allowances<sup>27</sup> and reference should be included in site-specific FRAs.

## 7. Flood Risk Management

### 7.1 Sustainable Flood Risk Management

This section highlights the role of various bodies in relation to flood risk management and offers recommendations for each to ensure that flood risk is managed in a sustainable manner in the future.

The risk of flooding can never be fully eliminated, but the likelihood and consequences of flooding can be minimised through good management. One of the key aims of the Environment Agency National Flood and Coastal Erosion Risk Management Strategy is to improve flood risk management in a sustainable way. In other words, the risk of flooding must be reduced now, in a way which does not compromise the interconnected needs of the economy, society and the environment in the future. Indeed, one of the defined roles of local authorities, according to the FWMA 2010, is that they aim to contribute towards the achievement of sustainable development.

The primary purpose of this SFRA is to inform decision making as part of planning policy and development management processes, taking due consideration of the scale and nature of flood risk affecting North Somerset. Responsibility for flood risk management resides with all tiers of Government, as well as individual landowners and developers, as outlined in Section 7.2.

### 7.2 Responsibilities for Flood Risk Management

There is no statutory requirement for the Government to protect property against the risk of flooding. Nevertheless, the Government recognises the importance of safeguarding the wider community and, in doing so, the economic and social wellbeing of the nation. Following the Pitt Review into the flooding of summer 2007 and subsequent Flood Risk Regulations 2009 and FWMA 2010, new responsibilities for managing flood risk have been assigned to local authorities, the Environment Agency and others.

A number of partners manage flood risk within North Somerset and the key responsibilities of the primary groups relevant to this SFRA are:

- **Environment Agency:** Provides a strategic overview of all sources of flooding. Under its permissive powers, it oversees flood risk management activities on Main Rivers, regulating reservoir safety, and working in partnership with the Met Office to provide flood forecasts and warnings. The Environment Agency is a statutory consultee for planning applications and assists the spatial planning and development management process through the provision of information and advice regarding flood risk and related issues.
- **North Somerset Council:**
  - As the **Lead Local Flood Authority (LLFA)**, NSC is responsible for the coordination of local flood risk management across its administrative area. This coordination covers development, asset maintenance, application and monitoring of a strategy for local flood risk management, a duty to maintain a register of flood risk assets and a duty to contribute towards the achievement of sustainable development.
  - NSC is also the **local planning authority** and is responsible for developing a SFRA which should consider the risk of flooding from all sources throughout North Somerset and inform the allocation of land for future development, development management policies and SAs. NSC is responsible for determining local planning applications and must consult with the Environment Agency, where appropriate, when making planning decisions.

- As a **Highway Authority**, NSC is responsible for providing and managing highway drainage and roadside ditches and must ensure that road projects do not increase flood risk.
- As an **Emergency Management Unit**, NSC duties fall under the Civil Contingencies Act 2004. Responsibilities include developing and maintaining emergency plans, making sure public information is available and conducting emergency exercises to ensure NSC's and partner organisations' emergency response.
- **Somerset Drainage Boards Consortium:** The SDBC manages the operations of three drainage boards in Somerset:
  - [Axe Brue Internal Drainage Board](#);
  - [Parrett Internal Drainage Board](#); and
  - [North Somerset Levels Internal Drainage Board](#).

Of these the North Somerset Levels Internal Drainage Board (IDB) and Axe Brue IDB fall within North Somerset.

Under the Land Drainage Act, 1991 the SDBC manages water levels to protect people, property and the environment. It undertakes maintenance and improvement works and grants land drainage consents. Planning applications are made available to the Board for comments; as a non-statutory consultee in the process the Board does not have the power to grant or reject a planning application but will advise that any proposed development will not increase flood risk, adversely affect water level management or restrict the Board's ability to maintain any watercourse.

- **Wessex Water and Bristol Water:** Sewerage and water undertakers are responsible for managing the risks of flooding from foul or combined sewer systems and water supply systems respectively.
- **Landowners and Developers:** Landowners and developers have the initial responsibility for protecting their land against the risk of flooding. They are also responsible for managing the drainage of their land such that they do not adversely impact upon adjoining properties.

### 7.3 Flood Defences

The Environment Agency Flood Map for Planning (Rivers and Sea) does not take account of the presence of raised defences. However, when determining the suitability of a development proposal, paragraph 163 of the NPPF requires that a planning application demonstrates that any residual risk (e.g. resulting from the failure or overtopping of a flood defence) can be safely managed. This consideration will be included when the Level 2 SFRA is developed for allocation sites, if appropriate. This aspect should also be considered when developing site-specific FRAs.

This Level 1 SFRA, has considered the presence of flood defences, in delineating Flood Zone 3b (functional floodplain). Fluvial Flood Zone 3b has been mapped based on the defended scenarios of hydraulic models, where these were available (see Table 5.3). Tidal Flood Zone 3b has been mapped where tidal flooding (i.e. Tidal Flood Zone 3a) is predicted to occur on the seaward side of the raised coastal defences.

In the complex urban and rural environments in which we live, both natural and manmade features can affect the routing of flood waters. Some may have been specifically constructed (i.e. known as 'formal') for the purpose of managing water flow and reducing flooding (e.g. flood embankments, culverts and sluices). Formal flood defences within North Somerset are indicated in **Figure 040**. The Figure additionally indicates the Areas Benefiting from Defences (ABDs), as published by the Environment Agency. This dataset shows those areas that benefit from the presence of defences in a 1 in 100 (1%) chance of flooding each year from rivers; or 1 in 200 (0.5 %) chance of

flooding each year from the sea. **Figure 041** indicates the standard of protection of defences within North Somerset.

Other structures may have been built for a different purpose (i.e. known as 'informal') but still affect overland flowpaths (e.g. buildings, garden walls, railway embankments) despite not being maintained for this specific purpose. These structures and features have not necessarily been included in the defended and undefended hydraulic modelling used to generate **Figures 001-033**. However, the impact of their failure would need to be considered by new development.

The Environment Agency has no statutory responsibility to maintain Main Rivers (and/or flood management assets) within the UK. This remains the responsibility of the riparian land owner. The Environment Agency retains 'permissive powers' however and using these powers may carry out a programme of monitoring and maintenance.

Other flood management assets (e.g. culverts) have also been identified across North Somerset. It is important to recognise the function of these assets and to ensure that their functionality is maintained. Assets should be carefully reviewed in a local context as part of detailed site-specific FRAs.

Within protected areas there will always be a residual risk of flooding. This may be due to an extreme event that exceeds the standard of protection of the asset, changing climatic conditions that increase the frequency and severity of flooding, a structural failure, or flooding behind the asset (e.g. due to elevated groundwater levels). It is incumbent on both NSC and developers to ensure that the standard of protection and good condition of flood risk management assets provided within new development can be assured for the lifetime of the developments. A new tidal model (Woodspring Bay Model) is currently being developed by the Environment Agency that will provide further information on the accuracy of standards of protection for coastal defences. The model is due to be released during 2020.

## 7.4 Flood and Coastal Erosion Risk Management (FCERM) Capital Schemes

The current 6-year flood and coastal erosion risk management (FCERM) investment programme runs from 1 April 2015 to 31 March 2021 and aims to reduce the risk of flooding and coastal erosion to at least 300,000 homes. This includes risk of flooding from rivers, the sea, groundwater and surface water. The Environment Agency regularly reviews the programme to take into account changes such as serious flooding, local partnership funding contributions and new flood risk information.

The asset management information online dataset<sup>28</sup> published by the Environment Agency, lists the schemes that form part of the 6-year FCERM capital investment programme, including information on their expected completion timeline and number of homes to be protected, and identifies the capital schemes that have already been completed.

## 7.5 Surface Water and Sustainable Drainage Systems (SuDS)

SuDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment, thereby providing multiple benefits. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings. The LLFA uses the standards set out in the West of England Guide when reviewing major applications; this enables a consistent approach to development management in the area. Section 8 of the SPD (see Section 2.3.4) refers to SuDS and offers advice on the implementation of sustainable drainage requirements.

Over and above this, additional requirements are required in the following areas:

<sup>28</sup> Asset management information and data (including FCERM investment programme 1 April 2015 to 31 March 2021), Environment Agency. Available online: <https://environment.data.gov.uk/asset-management/index.html>

- Cross Rhyne catchment details are assessed separately and require a 1 in 1 year runoff rate.
- Long term storage and drain down times requirements vary in the River Axe and North Somerset Catchments due to lack of conveyance.
- A legal consent is required to discharge any flows into the IDB districts, both directly and indirectly.

According to the West of England Sustainable Drainage Developer Guide (see Section 2.3.3):

*“A sustainable approach to drainage is to manage the surface water runoff from rainfall near to where it lands, at source, and to consider carefully where excess runoff is discharged by following a hierarchical approach. A sustainable drainage system (SuDS) is designed to reduce the potential impact of development with respect to surface water drainage discharge. SuDS regards rainwater as a natural resource to control whereas traditional piped surface water sewerage systems regard rainwater as wastewater to convey.”*

The benefits of using SuDS for surface water management according to the Sustainable Drainage Developer Guide are summarised in Table 7.1.

Table 7.1: Benefits of using SuDS

| Benefits of using SuDS                   |  |
|--|--|
| Managing Flood Risk                      | Less surface water entering sewers, therefore freeing capacity and reducing flood risk                                       |
|  | Flow control and dealing with surface water at a catchment level helps manage flood risk                                     |
|  | Allows adaption to a changing climate  |
|  | Making space for SuDS allows overland flow routing and management of flooding from extreme events (drainage exceedance)      |
| Managing Water Quality                   | Water quality will be managed to reduce the amount of pollution in runoff  |
|  | Assists with compliance with the Water Framework Directive <sup>29</sup>   |
| Contributing to amenity and biodiversity | SuDS can improve the quality of place  |
|  | Provides opportunities for multifunctional areas   |
|  | Provides wildlife habitat and ecological benefit   |
| Protecting water resources               | Some SuDS components can recharge underground aquifers   |
|  | Harvested rainwater can be used for toilet flushing, garden irrigation etc.  |
| Promoting communities and recreation     | SuDS can improve local quality of life and promote attractive surroundings and recreation                                    |
| Promoting education                      | Provides attractive environments for education   |
|  | Enables children to improve their understanding of the water and natural environment   |
| Encouraging developers                   | Reduced construction costs   |
|  | Reduced overall maintenance costs compared to many conventional drainage methods when carried out with landscape maintenance |
|  | Increased property values  |

Surface water management using SuDS can be implemented at all scales and in most urban settings, ranging from hard-surfaced areas to soft landscaped features, even if there is limited space available. Most techniques use infiltration but even if this area has little or no infiltration capacity, SuDS can be still used as attenuation features in the form of green roofs and ponds.

According to the SuDS Manual<sup>30</sup>, there are six interdependent functions provided by SuDS components which are summarised in Table 7.2. Each component can provide more than one function.

<sup>29</sup> EU Water Framework Directive. Available from: [http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)

<sup>30</sup> The SuDS Manual C753, CIRIA, 2015. Available from: <https://ciria.sharefile.com/share/view/83e6538a7efe4588>

Table 7.2: The six functions of SuDS components

| Functions of SuDS components |   |
|------------------------------|---|
| Infiltration systems         | Components that facilitate the infiltration of water into the ground. These often include temporary storage zones to accommodate runoff volumes before slowly releasing to the ground.  |
| Storage systems              | Components that control the flows and, where possible, volumes of runoff being discharged from the site, by storing water and releasing it slowly (attenuation). These systems may also provide further treatment of the runoff, e.g. ponds, wetlands and detention basins. |
| Rainwater harvesting systems | Components that capture rainwater and facilitate its use within a building or local environment   |
| Pervious surfacing systems   | Structural surfaces that allow water to penetrate, thus reducing the proportion of runoff that is conveyed to the drainage system, e.g. green roofs, pervious paving etc. Many of these systems also include some subsurface storage and treatment.                         |
| Conveyance systems           | Components that convey flows to downstream storage systems. Where possible, these systems also provide flow and volume control and treatment, e.g. swales.  |
| Treatment systems            | Components that remove or facilitate the degradation of contaminants present in the runoff.   |

SuDS need to be regularly maintained to ensure they operate efficiently and effectively. The SuDS Manual<sup>30</sup> includes standards for maintenance which developers should adopt. Depending on their type and design, maintenance regimes need to take account of the wider landscape context of amenity and biodiversity, as well as drainage requirements. According to the SuDS Manual, all maintenance regimes should consider the protection of habitats and associated ecology and be regularly assessed and updated.

The new Sewerage Sector Guidance<sup>31</sup> (SSG), effective from April 2020, adopts the definition of a sewer as a channel conveying surface water. This enables water companies to adopt a wider range of SuDS components. Appendix C of the SSG outlines standards required to enable water company adoption.

To prevent ground or groundwater contamination due to the operation of SuDS, as well as to ensure their effective operation, SuDS components should be periodically inspected. Monitoring of the level of sediment (and other debris) should take place regularly and the systems should be cleaned when appropriate. In cases where groundwater contamination is likely to be a problem, conveyance and storage SuDS should be properly lined.

## 7.6 Emergency Planning

NSC, as a local authority, is designated as a Category 1 Responder under the Civil Contingencies Act 2004<sup>32</sup> and as such has a legal duty to:

- assess the risk of emergencies occurring and use this to inform contingency planning;
- put in place emergency plans;
- put in place business continuity management arrangements;
- put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency;
- share information with other local responders to enhance co-ordination;
- co-operate with other local responders to enhance co-ordination and efficiency; and

<sup>31</sup> Sewerage Sector Guidance. Available at: <https://www.water.org.uk/sewerage-sector-guidance-approved-documents/>

<sup>32</sup> Civil Contingencies Act 2004. Available from: [http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga\\_20040036\\_en.pdf](http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga_20040036_en.pdf)

- provide advice and assistance to businesses and voluntary organisations about business continuity management.

The Environment Agency monitors river levels within the Main Rivers affecting North Somerset. Based upon an in-house forecasting computer model, the Environment Agency assesses the maximum water level that is likely to be reached during an anticipated flood event, which can extend from a few hours to several days. Where these predicted water levels are expected to result in the inundation of populated areas<sup>33</sup>, the Environment Agency will issue a series of Flood Warnings (see Section 7.7) within defined Flood Warning areas, encouraging residents to act to avoid damage to property in the first instance.

In addition to the Environment Agency Flood Warning service, the Flood Forecasting Centre (a partnership between the Environment Agency and the Met Office) forecasts for natural forms of flooding – river, surface water, tidal and groundwater. A daily Flood Guidance Statement provides information for Category 1 and 2 responders to help with emergency planning and resourcing decisions. It presents an overview of the flood risk across five days and identifies possible severe weather, which could cause flooding and significant disruption to normal life. These forecasts, combined with understanding of the areas at highest risk of local flooding through the ACD maps (see Section 5.5) can inform emergency planning for all sources of flooding.

In the context of emergency planning, a major emergency is any event (happening with or without warning) causing or threatening death or injury, damage to property or the environment or disruption to the community which, because of the scale of its effects, cannot be dealt with by the emergency services and local authority as part of their day-to-day activities. This may include severe flooding.

In the event of a severe flood emergency, the local authority will endeavour to keep its services operating normally whilst responding to requests for assistance from the emergency services. Requests may include the provision of:

- rest centres (temporary accommodation, usually a school, leisure centre or other community facility) for use by anyone affected by the incident;
- emergency transport;
- emergency feeding;
- public information;
- temporary mortuaries (in a mass fatalities incident);
- specialist advice, for example engineers, planners, surveyors, trauma and after care; and
- support for the police in terms of evacuating people, site clearance, road closures.

North Somerset Council will activate its Major Incident Response Plan and core response plans such as the NSC Evacuation & Transport Plan and NSC's Welfare & Shelter Plan to mitigate the impacts of an emergency occurring and are the lead organisation in respect of the recovery effort.

### **Evacuation – Key Considerations:**

Dry access (i.e. above flood level) should be sought wherever possible to ensure that all residents can be safely evacuated in times of flood. A Flood Evacuation Plan must be in place, suitable to the type of development, where there is no safe dry access to/from the site (i.e. access through Flood Zone 1).

Emergency Planners have a role through the planning approval process to assess the adequacy of safe access plans for new developments. This will be particularly important where developments pass the Exception Test and are located in a Flood Zone of higher flood risk than what is deemed 'appropriate' by Table 3 of the NPPG (also

<sup>33</sup> Restricted to those urban areas situated within Environment Agency flood warning zones

Table 2.2 of this SFRA). The emergency planners will have to take this into account to ensure the developer has considered this carefully in their proposals and that the plans are appropriate for future users.

## 7.7 Flood Warning

The Environment Agency Flood Warning Service<sup>34</sup> operates in areas at risk of flooding from rivers and the sea. In select locations, the Environment Agency provides a groundwater Flood Warning and alert service, targeted on communities that are known to be at risk or have previously experienced groundwater flooding. The areas within North Somerset where Flood Warnings and Flood Alerts operate are indicated in **Figure 042**.

The Environment Agency issues three Flood Warning codes referring to three different warning stages of flood risk. These are categorised in Table 7.3.

**Table 7.3: Environment Agency Flood Warning Stages**

| Flood Warning Stage         | Symbol  | Description                                      | What it means  | What to do   |
|-----------------------------|---|--|--|--|
| <b>Flood Alert</b>          |   | Flooding is possible. Be prepared.               | Possibility of flooding to low lying land and floodplain areas.    | Be alert, stay vigilant and make early preparations for flooding.  |
| <b>Flood Warning</b>        |  | Flooding is expected. Immediate action required. | Expected flooding to homes and/ or businesses.                     | Individuals and organisations should take immediate action to protect themselves and/ or their property. |
| <b>Severe Flood Warning</b> |  | Severe Flooding. Danger to life.                 | Expected severe flooding with extreme danger to life and property. | Act on your flood plan. Listen to emergency services. Follow evacuation procedures where applicable.     |

‘Flood Alert’ and ‘Flood Warning’ are used to pre-warn for different levels of impending flooding. ‘Severe Flood Warning’ is used when there is a significant risk to life or significant disruption to communities. There is also a ‘Flood Warning No Longer in Force’ message available for areas where ‘Flood Warning’ and ‘Flood Alerts’ have been removed during the last 24 hours.

The Flood Alert and Flood Warning Area datasets are published by the Environment Agency and available to download from [data.gov.uk](https://data.gov.uk). Flood Alert Areas are geographical areas where it is possible for flooding to occur from rivers, the sea and in some locations, groundwater. Flood Warning Areas are geographical areas where flooding is expected to occur and where a Flood Warning Service is provided; they generally contain properties that are expected to flood should a flood event occur.

<sup>34</sup> Flood Warnings for England. Available from: <https://flood-warning-information.service.gov.uk/warnings>

## 7.8 Residual Risk of Flooding

It is essential that the risk of flooding is minimised over the lifetime of a development in all instances. However, it is important to recognise that flood risk can never be fully eliminated and there will always be residual risk of flooding. This residual risk is associated with several potential risk factors including (but not limited to):

- a flood event that exceeds the standard of protection for which the flood risk management measures have been designed;
- failure of flood risk management infrastructure due to poor maintenance or neglect; and
- general uncertainties inherent in the predictions of flooding, including climate change projections.

The SFRA has completed a review of all sources of flood risk within North Somerset in order to apply the Sequential Test, identifying several areas that are associated with a high probability of flooding. However, there are limitations in the methodologies used for flood prediction and the models developed are reliant upon observed flow data and calibration. It is incumbent that developers carry out a detailed site-specific FRA as part of the design process. A review of uncertainty should be undertaken as an integral outcome of this detailed investigation.

## 8. Recommendations and Policy for the Planning Authority

### 8.1 Revisions to Local Planning Policy Regarding Flooding

Local planning policy detailed in Section 2 of this SFRA, including the new NSC Local Plan, is currently being developed.

**RECOMMENDATION:** NSC should review their planning policy in relation to flooding to ensure it is consistent with the NPPF and current Environment Agency Guidance, including in relation to FRAs, sustainable drainage, green infrastructure and flood resilience. New or revised policy should reflect findings and recommendations of this SFRA, including requiring applicants to consider the SFRA and its mapping taking into account the impacts of climate change, as a starting point for the assessment of flood risk in relation to development or redevelopment proposals. Later in this report, Section 8.8 focuses on the need to seek opportunities to reduce flood risk where possible.

### 8.2 Site Allocations

The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. where possible steer development towards the areas of lowest flood risk. The NPPF stipulates the application of a sequential approach to site allocation, utilising the Sequential Test. A flow diagram demonstrating the application of the Sequential Test for a local plan site allocation is provided in the NPPG (Diagram 2 in Flood Risk and Coastal Change, Paragraph 021). Development sites should be allocated within areas of lowest flood risk in the first instance – in Flood Zone 1 (which relates to flooding from river and sea), but the NPPG stipulates that other sources of flooding must be considered, so ACDs in Flood Zone 1 must be taken into account. Only if it can be demonstrated that there are no suitable sites within areas with the lowest flood risk (taking into account all sources of flooding) should alternative sites (i.e. within areas that may potentially be at greater risk of flooding – Flood Zones 2 and 3) be contemplated, taking account of the vulnerability of the proposed land use. Tables 2 and 3 in the NPPG stipulate ‘appropriate’ land uses for each Flood Zone. The Exception Test should be applied where necessary.

**RECOMMENDATION:** Any future site allocations must be determined via the application of the Sequential Test, and the Exception Test if required, in line with Government guidance. The evaluation of potential sites should be guided by the mapping and the findings presented within this Level 1 SFRA, including consideration of ACDs and, if necessary, supplemented by a more detailed Level 2 SFRA which covers all potential sources of flooding. Full account should be taken of all sources of flooding including from rivers, groundwater, sewerage and surface water, together with the potential effects of climate change on flood risk. The NPPG highlights that a Level 2 SFRA may be required to provide the information necessary for the application of the Exception Test, but a Level 2 SFRA may also be required to assess flood risk from non-fluvial sources on some sites where the information in this Level 1 SFRA provides insufficient detail to enable the allocation to be determined.

### 8.3 Relocation of Unsuitable Existing Development

Paragraph 157 of the NPPF recommends that, where climate change is expected to increase flood risk, some existing development may not be sustainable in the long-term. Local authorities should seek opportunities to facilitate the relocation of this development, including housing, to more sustainable locations.

**RECOMMENDATION:** NSC, working in partnership with the Environment Agency and others, should seek to identify existing development which is potentially at risk from future impacts of climate change and, if necessary, potential sites for relocating that development, taking into account the Sequential Test. More suitable alternative uses for such sites should be sought, taking account of Table 3 in the NPPG. The information contained in the SFRA can be used to assist this process.

## 8.4 Safeguarding

Paragraph 157 of the NPPF states that local authorities should safeguard land from development that is required for current and future flood management. Such land may take the form of multi-function green infrastructure.

**RECOMMENDATION:** In partnership with the Environment Agency, NSC should seek to identify land required for current and future flood management and, if justified, safeguard it through planning policy. This can include areas within or adjoining allocated development sites which are particularly suitable for flood management purposes. The information contained in the SFRA can be used to assist this process.

## 8.5 North Somerset Critical Drainage Areas

The NPPF requires a site-specific flood risk assessment for all development proposals “*in Flood Zone 1... land which has been identified by the Environment Agency as having critical drainage problems*”. The Environment Agency has not specified any CDAs in North Somerset. However, areas in Flood Zone 1 which are likely to be most at risk of surface water flooding have been identified as part of this SFRA. They have been termed ‘Areas of Critical Drainage’ (ACDs) to differentiate them from those areas which could potentially be notified by the EA.

**RECOMMENDATION:** NSC should retain a local policy requiring a site-specific flood risk assessment for all development on sites where drainage problems are identified by the Environment Agency or NSC, which would include development in the ACDs identified in this SFRA. FRAs are particularly important in such areas as they have known localised flooding problems which can cause significant damage.

## 8.6 Securing New Infrastructure

The NPPF requires local authorities to work with other policy-making authorities and relevant bodies to assess infrastructure needs in their area (Paragraph 26). After identifying infrastructure needs, the NPPF states that non-strategic policies should then be included within the Local Plan to deliver the infrastructure required (Paragraph 28). Section 106 agreements and Community Infrastructure Levy charges (under Section 106 of the Town & Country Planning Act 1990) provide potential sources of funding for new flood risk reduction infrastructure or contributions towards it. A further potential source of funding would be Partnership Funding from businesses. Should a business at risk of flooding benefit from future mitigation works as a result of new development they may be able to contribute to the cost of delivery.

**RECOMMENDATION:** In collaboration with other Risk Management Authorities, NSC should identify existing communities and businesses at risk of flooding that may benefit from the provision of new flood mitigation works and whether these could be delivered in collaboration with future allocations. NSC should also identify potential sources of Partnership Funding to contribute to the cost of new flood defence measures. The mapping of flood risk in the SFRA would assist the identification of areas at risk.

## 8.7 Naturalisation of Watercourses

The re-naturalisation of watercourses by introducing meanders can assist in the mitigation of flood risk by increasing capacity and decreasing velocities. In addition to flood risk benefits it can restore biodiversity, benefiting wildlife and people. The provision of culverts in new developments may increase the risk of flooding through a reduction in watercourse capacity and an increased risk of blockage, and adversely affect wildlife habitat<sup>35</sup>.

**RECOMMENDATION:** NSC should adopt a policy of opposition to the culverting of watercourses as part of a new development. In addition, they should work with developers to seek opportunities to remove existing culverts

<sup>35</sup> Environment Agency Policy Regarding Culverts, Explanation of Policy. March 1999

(watercourse daylighting) when within, or on, a development boundary. NSC should collaborate with developers to seek opportunities to re-naturalise modified watercourses.

## 8.8 Opportunities to Reduce Flooding

Paragraph 157 of the NPPF recommends that local plans should use opportunities provided by new development to reduce the causes and impacts of flooding, where appropriate through the use of natural flood management techniques. The NPPF also requires local authorities to work with other local authorities and providers to assess infrastructure needs in their area, including with regard to flood risk.

The NPPF (paragraph 167) also states that local plans should reduce risk from coastal change and identify Coastal Change Management Areas (CCMAs) where physical changes to the coast are expected to affect development. NSC may consider the need to identify CCMAs in the future.

### **RECOMMENDATION:** NSC should:

- Work with other authorities and bodies, as appropriate, to identify specific flood risk infrastructure required within North Somerset. The Local Plan and information contained within this SFRA can be used to assist this process, although more detailed studies are likely to be required. One possible framework for assessing flood risk and prioritising partnership working will be through the Drainage and Wastewater Management Plan framework co-ordinated by water companies;
- Work with other risk management authorities and landowners to identify opportunities for the implementation of upstream attenuation storage, natural flood management measures and changes to land management practices within a catchment-wide framework to reduce flood risk. This SFRA provides information for the Council and LLFA to take a catchment-based approach to flood risk mitigation and encourage the inclusion of such measures within new development that may also benefit other parties. NSC should encourage developers through a site-specific Flood Risk Assessment to include flood risk mitigation measures that benefit the wider community;
- In identifying and allocating potential development sites seek reasonable opportunities for flood risk reduction measures, taking into account a Level 2 SFRA if needed;
- Consider the need to identify CCMAs, define what type of development will be appropriate in such areas and make provision for their planned lifetime, or identify development that needs to be relocated away from CCMAs; and
- Give consideration to a suitable generic policy to be contained within the emerging Local Plan in respect of non-allocated sites where flood risk reduction measures should be sought.

### **RECOMMENDATION FOR PROPOSED DEVELOPMENT:**

- Proposed development should not result in a net loss of floodplain storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.
- Proposed development should not result in an increase in surface water runoff and, where possible, should demonstrate betterment in terms of rate of surface water runoff by a minimum of 50% against the existing situation.

- SuDS should be implemented to reduce and manage surface water, in accordance with the requirements of the 'Non-statutory technical standards for sustainable drainage systems'<sup>36</sup>. These include the requirements outlined in Table 8.1.

Table 8.1: Sustainable surface water drainage requirements<sup>38</sup>

|  | Greenfield site   | Previously developed site   |
|--|---|---|
| <b>Peak flow control</b>                 | For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 (100%) AEP event and the 1 in 100 (1%) AEP event should never exceed the peak greenfield runoff rate for the same event.  | For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 (100%) AEP event and the 1 in 100 (1%) AEP event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event. Where possible, new developments should seek to provide betterment of peak runoff rate by a minimum of 50% against the existing situation. |
| <b>Volume control</b>                    | Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 (1%) AEP, 6 hour event should never exceed the greenfield runoff volume for the same event.  | Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 (1%) AEP, 6 hour event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.  |
|  | Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with the above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.  |   |
| <b>Flood risk within the development</b> | The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 (3.33%) AEP event.  |   |
|  | The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 (1%) AEP event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development. |   |
|  | The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 (1%) AEP event are managed in exceedance routes that minimise the risks to people and property.   |   |

<sup>36</sup> Non-statutory technical standards for sustainable drainage systems. Defra, March 2015. Available from: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415773/sustainable-drainage-technical-standards.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf)

## 8.9 Planning Applications – NSC and Applicants

Planning applications can be submitted both for sites allocated within development plans and other sites, known as windfall sites. Flood risk at windfall sites may not have been previously considered in detail by the local planning authority.

The Environment Agency provides detailed Standing Advice, available online<sup>37</sup>, to assist with both the development and evaluation of FRAs. A site-specific FRA is required for developments which are:

- In Flood Zone 2 or 3, including minor development and change of use;
- More than 1ha in Flood Zone 1;
- Less than 1ha in Flood Zone 1, including a change of use in development type to a more vulnerable class (for example for commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs); or
- In an area within Flood Zone 1 which has critical drainage problems (in the case of NSC, no CDAs have been delineated by the Environment Agency, therefore the ACDs as defined by this SFRA determine the areas that have critical drainage problems within North Somerset).

Table 8.2 summarises NSC’s requirements for site-specific FRAs.

**Table 8.2: Requirements of Flood Risk Assessments**

| Zone 3b Functional Floodplain |                 | Zone 3a High Probability | Zone 2 Medium Probability   | Areas of Critical Drainage   | Zone 1 Low Probability |
|-------------------------------|-----------------|--------------------------|---|--|------------------------|
| Existing Development          | New Development |                          |   |  |                        |
| Detailed FRA required.        |                 |                          | FRA required (proportionate to level of risk), should focus on records of past flooding and SuDS. | FRA required (proportionate to level of risk) for all sites greater than 1ha in area, should focus on records of past flooding and SuDS. Recommend that sites of 1ha or less carry out an assessment of localised flood risks. |                        |

The site-specific FRA must follow the Sequential Test, and if required the Exception Test, as noted above and detailed in the NPPF and its accompanying NPPG. Paragraph 163 of the NPPF stipulates that *“When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated:*

<sup>37</sup> Flood risk assessments for planning applications. Available from: <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>

- *within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- *the development is appropriately flood resistant and resilient;*
- *it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- *any residual risk can be safely managed; and*
- *safe access and escape routes are included where appropriate, as part of an agreed emergency plan.”*

Paragraph 164 of the NPPF states that “*applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments*”, which are mentioned above.

The NPPF requirements are supplemented by planning policies in relation to flooding set out in local planning documents produced by NSC, including with regard to FRAs, sustainable drainage and flood resilience. Relevant policies at the time of writing are set out in Section 2 of this SFRA. In its role as a statutory consultee for planning applications, the Environment Agency will provide comment on applications for sites at higher risk of flooding.

A Site-Specific Flood Risk Assessment Checklist<sup>38</sup> is provided by the Government as part of the Planning Practice Guidance and should be used as the starting point for all site-specific FRAs. Developers should also be aware that the Environment Agency is continually refining and updating the flood zone mapping. They should therefore consult with the Environment Agency to ensure that the latest extents are used when assessing the risk of flooding.

**RECOMMENDATION:** Applicants should use the Government’s FRA checklist as the starting point for any flood risk assessment to be submitted with their planning application, utilising the information contained within this SFRA in both their FRA and design proposals; this will provide the evidence required to enable NSC to undertake the Sequential Test if necessary. Full account should be taken of all sources of flooding including from rivers, groundwater, sewerage and surface water, together with the potential effects of climate change on flood risk and impacts on and from existing flood management infrastructure. The SFRA mapping will be of particular use in identifying key information for the FRA, including Flood Zones, ACDs and flood management assets, but must be read in conjunction with the SFRA text. However, it is important to note that the SFRA provides the most up-to-date information at the time of writing, but the data could change with time.

Compliance with current planning policy in relation to flooding contained in the NPPF and local planning policy documents produced by NSC should be demonstrated by applicants in their planning applications and considered by planning officers in their determination of applications, including with regard to FRAs, sustainable drainage and flood resilience.

Further guidance relevant to requirements for applicants to undertake a drainage strategy can be found on the NSC website ([www.n-somerset.gov.uk](http://www.n-somerset.gov.uk)).

## 8.10 Restriction of Permitted Development Rights

Permitted Development (PD) rights allow for some minor development, such as certain sizes of building extension, without planning permission. The NPPG (Flood risk guidance, paragraph 047) states that minor developments,

<sup>38</sup> Site-specific flood risk assessment: Checklist. Available from: <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section>

some of which are covered by PD rights such as small extensions, are “*unlikely to raise significant flood risk issues unless:*

- *they would have an adverse effect on a watercourse, floodplain or its flood defences;*
- *they would impede access to flood defences and management facilities; or*
- *where the cumulative impact of such developments would have a significant effect on local flood storage capacity or flood flows”.*

Minor developments subject to PD rights, such as some extensions or paving over of gardens, therefore have the ability to raise flood risk and increase surface water runoff. Article 4 of the Town and Country Planning General Permitted Development Order provides a possible vehicle for the removal of PD rights in exceptional circumstances, which the NPPF (Paragraph 53) notes to be “*limited to situations where this is necessary to protect local amenity or the well-being of the area*”. This could include situations where minor permitted development has the potential to add to localised flood risk as highlighted above, such as from the cumulative impact of extensions within an area.

**RECOMMENDATION:** If there are areas within North Somerset where Permitted Development could lead to an increase in flooding, an Article 4 Direction could be explored. For example, the ACDs may be locations where this could be considered. An Article 4 direction would need to be strongly justified and therefore subject to further detailed investigation.

## 8.11 Development Management Recommendations

The table included in Appendix B summarises the recommendations made throughout this SFRA regarding spatial planning and development management. It is important to note that the table is designed as a summary of issues covered elsewhere in the SFRA, NPPF and other guidance documents. It should not be relied upon in isolation when writing or evaluating a FRA.

The table is not intended to replace current planning policies within existing development plans prepared by NSC, but it may be useful in preparing future planning policies regarding flood risk.

## 9. Reviewing and Updating this SFRA

This SFRA provides a strategic overview of the spatial variation of flood risk throughout North Somerset at a particular point in time, based on the best available information at that time.

The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within North Somerset; with data continually changing as new flooding events occur and further modelling is undertaken, this knowledge is continually evolving. In addition, Government policy on flood risk continues to change, with significant changes to national and local policy evident between the publication of the previous SFRA in 2008 and this update in 2019. Given that this is the case, a periodic review of this SFRA is imperative and it must be treated as a living document.

The following key questions should be addressed as part of the SFRA review process to determine if an update is necessary:

### Question 1

Has any flooding been observed within North Somerset since the previous review? If so, the following information should be captured as an addendum to the SFRA:

- Location of flooding (grid reference or street name);
- Date(s) of flooding;
- Source of flooding (e.g. surface water, main rivers, sewers etc.)
- Pathway of floodwaters (e.g. along particular streets);
- Receptors (e.g. properties flooded internally, roads, gardens etc.); and
- Frequency of flooding (e.g. once a year, during heavy rainfall etc.).

### Question 2

Have any amendments to the NPPF or NPPG or the Local Plan been issued since this document was published? If so, does this materially affect any relevant NSC policy or the assessment or recommendations of this SFRA?

### Question 3

Has the Environment Agency or NSC (as LLFA) issued any amendments to their flood risk mapping and/or guidance since the previous policy review? If so:

- Has any further detailed flood risk mapping been completed within North Somerset, resulting in a change to the 1 in 20 (5%), 1 in 100 (1%) or 1 in 1000 (0.1%) AEP flood outlines? If yes, then the Flood Zones 3b and 3a flood outlines should be updated accordingly;
- Has any further detailed or revised mapping been produced for the Council resulting in a change to the ACDs? If so, then relevant maps should be altered accordingly;
- Do the development management recommendations provided in the SFRA in any way contradict emerging Environment Agency advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques (SuDS)? If yes, then a

discussion with the Environment Agency is required to ensure an agreed suite of development management requirements is in place.

It is highlighted that the Environment Agency updates the Flood Map for Planning (Rivers and Sea) on a quarterly basis. If this has been revised within North Somerset, the updated Flood Zones will be automatically forwarded to NSC for their reference. These changes should be used to inform Flood Zones 3 and Zone 2 of the SFRA flood maps. Where Flood Zone 3 has changed, NSC will need to assign any additional area to Zone 3a or 3b.

**Question 4**

Has the implementation of the SFRA within the spatial planning and/or development management functions of the Council raised any issues or concerns that need to be reviewed as part of the SFRA process?

**Question 5**

Have the new UKCP18 climate change allowances for peak river flow and peak rainfall intensity been published? Are there new uplift factors that affect future flood risk within North Somerset?

# Appendix A. Supporting Figures

## Appendix B. Development Management Advice