Partnership for South Hampshire Level 1 Strategic Flood Risk Assessment

PART 2 – Test Valley Borough Council

Final Report

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	12th May 2022	Version 1 Draft Report	EC	Emily Craven	Associate Director
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Table of Contents

Figures

Tables

Acronymns

Acronym	Definition
AEP	Annual exceedance probability
BGS	British Geological Survey
CFMP	Catchment flood management plan
CMP	Catchment management plan
FCERM	Flood and coastal erosion risk management
FRA	Flood Risk Assessment
FSA	Flood storage area
GIS	Geographical information system
GWMP	Groundwater management plan
HCC	Hampshire County Council
LFRMS	Local flood risk management strategy
LLFA	Lead local flood authority
LPA	Local planning authority
NPPF	National planning policy framework
PCC	Portsmouth City Council
PFRA	Preliminary Flood Risk Assessment
PfSH	Partnership for South Hampshire
PPG	Planning practice guidance
SFRA	Strategic flood risk assessment
SOP	Standard of protection
SuDS	Sustainable drainage systems
RBD	River basin district
RFCC	Regional flood and coastal committee
WLMP	Water level management plan
WWNP	Working with natural processes

1. Introduction

1.1.1 AECOM has been commissioned by Portsmouth City Council (PCC) on behalf of ten planning authorities in South Hampshire (the ‘Partnership for South Hampshire’ (PfSH)) to prepare an updated Strategic Flood Risk Assessment (SFRA). The PfSH SFRA covers the administrative areas of Portsmouth City, Havant Borough, Gosport Borough, Fareham Borough, Eastleigh Borough, Southampton City, Winchester City, Test Valley Borough, New Forest District and New Forest National Park Authority.

1.1.2 This document should be read in conjunction with SFRA Report Part 1. Together with Part 1, this document forms the SFRA for Test Valley Borough Council (BC).

Table 1-1 SFRA User Guide

PART 1 MAIN REPORT	CONTENT
1 Introduction	Explains the need for the study and the objectives. Provides a user guide and identifies who has been consulted. Identifies when the SFRA may need to be updated in the future.
2 Legislation and Policy Framework	Provides an overview of the latest legislation and national and regional policies in relation to flood risk and coastal change.
3 Datasets	Identifies the datasets used to inform the SFRA and describes the approaches taken to use and update data as part of the SFRA.
4 Applying the Sequential Test	Describes how the sequential test should be applied using the SFRA.
5 Preparing Flood Risk Assessments	Describes how site specific FRAs should be prepared.
Appendix A: GIS Floodplain Analysis Methodology	Records the methodology applied for the GIS floodplain analysis to determine those areas that may be sensitive to changes in flood level in the future.
Appendix B: Coastal Modelling Technical Notes	East Solent Flood Inundation Model Re-Simulations Technical Note (Hayling Island, Portsea Island, Gosport to Warsash) Southampton Water Model Re-Simulation Technical Note

LPA SPECIFIC REPORTS	CONTENT
PART 2 TEST VALLEY **PART 3 WINCHESTER CITY** **PART 4 HAVANT** **PART 5 PORTSMOUTH CITY** **PART 6 GOSPORT** **PART 7 FAREHAM BOROUGH** **PART 8 EASTLEIGH BOROUGH** **PART 9 SOUTHAMPTON CITY** **PART 10 NEW FOREST DISTRICT AND NATIONAL PARK**	For each LPA, mapping of the flood risk datasets is provided as well as a report covering the following topics: 1 Introduction 2 Local policy and plans 3 Sources of flood risk and expected effects of climate change 4 Cumulative impacts of development and land use change 5 Current control, mitigation and management measures 6 Opportunities to reduce the causes and impacts of flooding 7 Recommendations of how to address flood risk in development

2. Local policies and plans

The SFRA Report Part 1 Section 2 provides a high level overview of the national and regional planning context for coastal change and flood risk management in the PfSH SFRA project area. This Section provides a summary of the local policy and guidance for Test Valley BC.

2.1 Catchment Flood Management Plans

2.1.1 The role of Catchment Flood Management Plans (CFMPs) is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. CFMPs are produced by the Environment Agency. The CFMP considers all types of inland flooding, from rivers, groundwater, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding), which is covered by Shoreline Management Plans (SMPs).

2.1.2 The Test Valley BC administrative area is covered by the Test and Itchen CFMP[1] and the Hampshire Avon CFMP[2]. The policies for the sub-areas within Test Valley are summarised in Table 2-1 and Figure 2-1, and Table 2-2 and Figure 2-2.

Table 2-1 Test and Itchen CFMP Policies

Sub-area & Preferred Policy	Summary of proposed actions
Andover Policy 4 Areas of low, moderate, or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change	Improve channel capacity and conveyance through Andover by seeking to remove constraints from urban development. Maximise storage potential in outlying villages. Ensure no increase in runoff from new development through implementation of SuDS. Influence land management within the unit, such as on the Pill Hill Brook, to reduce flood risk and instances of muddy flooding. Work with partners to promote greater resilience to groundwater fed river flooding through flood proofing and flood warning.
Romsey Policy 5 Areas of moderate to high flood risk where we can generally take further action to reduce flood risk	Improve channel capacity and conveyance through Romsey. Develop a flood risk management strategy to improve standard of defences and Tadburn Lake Stream storage or conveyance. Ensure no increase in runoff from new development through implementation of SuDS. Implement the River Test Water Level Management Plan to identify and agree water level management that meets the need of flood risk management and the enhancement of wetland.
Rural Chalk / Upper/Middle and Lower Test Policy 3 Areas of low to moderate flood risk where we are generally managing existing flood risk effectively	Reducing frequency of groundwater flooding is not always feasible, so actions need to be taken to reduce flood risk such as improving maintenance and drainage pathways, as well as flood resilience measures to reduce the consequences of flooding. Raise awareness of groundwater flooding and promote flood-proofing schemes where appropriate. This will include advice concerning development control. Develop a Land Management Plan to explore the potential for changes in land use and land management practices within sub catchments, such as the Bourne Rivulet, River Dever, Wallop Brook, Cheriton Stream and River Alre.
Dun and Test Policy 6 Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits	Maximise flood storage on the River Dun, improve the efficiency of floodplain connectivity and restore sustainable, natural river functions, to reduce flood risk downstream in Romsey. Implement the River Test Water Level Management Plan to identify and agree water level management that meets the need of flood risk management and the enhancement of wetland habitat. Develop a Land Management Plan in partnership with the agricultural industry, to explore the potential for changes in land use and land management practices. Reduce direct run-off into watercourses, which can introduce significant sediment and diffuse pollutants into the drainage network.
Monks Brook Policy 4 Areas of low, moderate, or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change	Improve conveyance along Monks Brook by removing constraints from urban development. Promote greater resilience to flooding through flood proofing and improved flood warning. Put in place policies that work towards long-term protection and re-creation of risk corridors through sustainable land use management. Seeks partnership opportunities in new development for open river corridors incorporating SuDS.

[1] Environment Agency, December 2009, Test and Itchen Catchment Flood Management Plan, Summary Report https://www.gov.uk/government/publications/test-and-itchen-catchment-flood-management-plan
[2] Environment Agency, June 2012, Hampshire Avon Catchment Flood Management Plan, Summary Report https://www.gov.uk/government/publications/hampshire-avon-catchment-flood-management-plan

Sub-area & Preferred Policy	Summary of proposed actions
Coastal urban Policy 5 Areas of moderate to high flood risk where we can generally take further action to reduce flood risk	Improve channel capacity and conveyance along Tanners Brook and Holly Brook by seeking to remove the constraints from urban development. Improve surface water management to reduce the risk both now and in the future. Work with local planning authorities to ensure that urban development does not increase flood risk. Work towards long term reduction of flood risk and the re-creation of river corridors through sustainable land use management. Consider redevelopment of more open river corridors through the coastal urban sub-area.
Clay Catchment Policy 2 Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions	Continue to protect the locations currently at risk within the sub-area but alter maintenance regimes to re-allocate resources to areas with greater risk. Implement the River Test Water Level Management Plan to identify and agree water level management that reduces flood risk and enhances wetland habitat. Consider reducing both maintenance and the number of assets within the system (though System Asset Management Plans (SAMPs)).

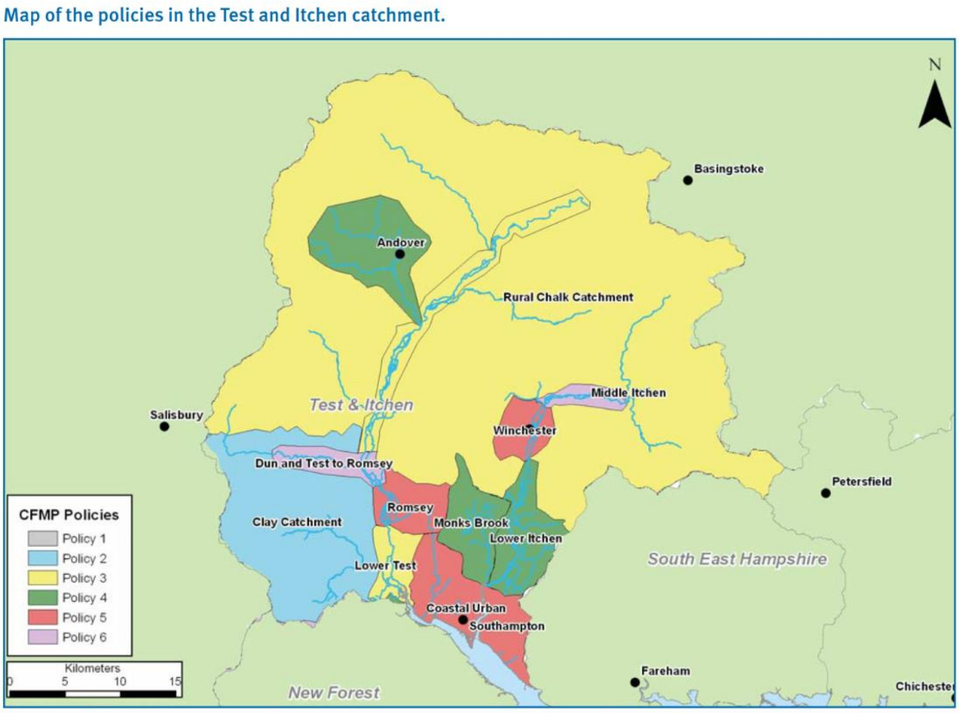

Figure 2-1 Map of the policies in Test and Itchen catchment, CFMP 2009

Table 2-2 Hampshire Avon CFMP Policies

Sub-area & Preferred Policy	Summary of proposed actions
River Bourne Policy 4 Already managing the flood risk effectively but may need to take further actions to keep pace with climate change	Work with the at risk communities including Shipton Bellinger to provide guidance and advice on reducing risk. Improve understanding of ground waterflooding mechanics to enhance the groundwater flood information service. Identify hydraulically critical structures and other pinch points and produce a programme of improvements to maintain current standards.

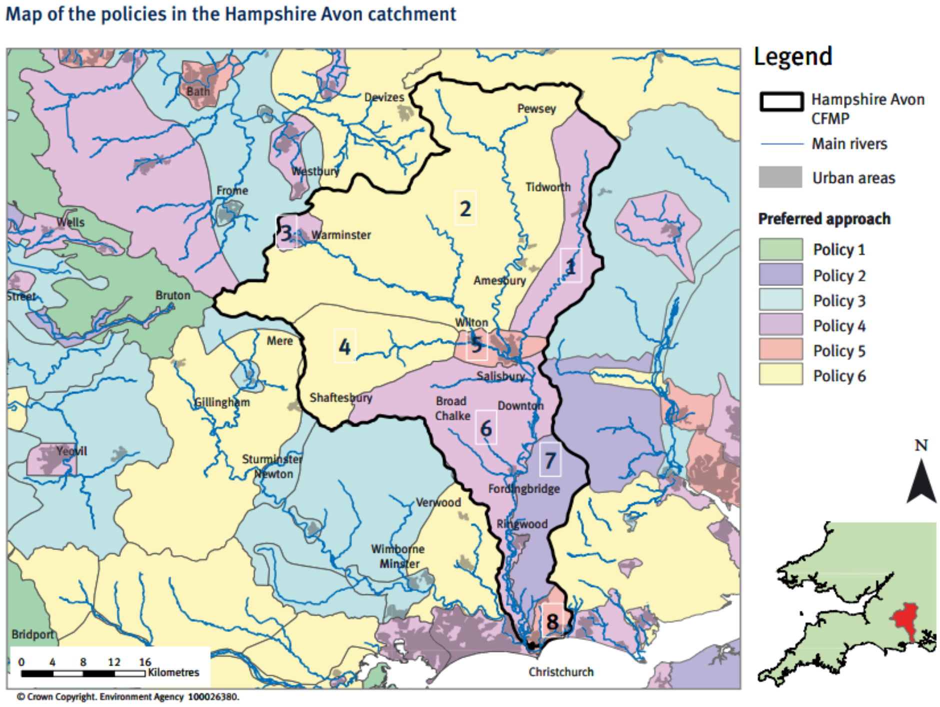

Figure 2-2 Map of the policies in Hampshire Avon catchment, CFMP 2009

2.2 Shoreline Management Plans

2.2.1 The role of Shoreline Management Plans (SMPs) is to establish flood risk management policies in relation to coastal change, addressing the risks in a sustainable manner. The Lower Test Valley in the southern part of the Test Valley BC administrative area is tidally influenced.

2.2.2 This area is covered by the North Solent SMP[3] (which extends from Selsey Bill (Chichester) to Hurst Spit (New Forest)) , for which a review is currently underway. The policy for the Lower Test Valley is no active intervention in the short, medium, and long term.

Table 2-3 North Solent SMP Policies

Location	Policies for the Short Term (0-20 yrs, Epoch 1), Medium Term (20-50 yrs, Epoch 2) and Long Term (50-100 yrs, Epoch 3)
Lower Test Valley	No active intervention in the short, medium, and long term.

2.3 Lead Local Flood Authority Plans

2.3.1 Hampshire County Council (HCC) are the Lead Local Flood Authority (LLFA) for the Test Valley BC administrative area. HCC have a number of plans in place to assess and manage flood risk in the study area:

- Preliminary Flood Risk Assessment
- Local Flood Risk Management Strategy
- Catchment Management Plans
- Groundwater Management Plan

[3] North Solent Shoreline Management Plan, 2010 https://www.northsolentsmp.co.uk/

Preliminary Flood Risk Assessment

2.3.2 Under the 2009 Flood Risk Regulations, HCC is required to prepare a Preliminary Flood Risk Assessment (PFRA) for the area, which compiles high level information on significant local flood risk from past and potential flood events. The PFRA[4] helps to identify areas that should be prioritised for Surface Water Management Plans, which will in turn form the Local Flood Risk Management Strategy.

2.3.3 The Environment Agency has set out a national methodology identifying areas with the highest risk of flooding in England. Those with populations in excess of 30,000 people at risk should be identified as 'Flood Risk Areas' and may require further assessment. Areas below this threshold should be assessed by each LLFA and used to identify areas for which Surface Water Management Plans or other similar plans are required. No Flood Risk Areas above the Environment Agency threshold were identified within Hampshire, and therefore the PFRA focuses on identifying local flood risk areas within the region.

2.3.4 The PFRA identifies eight areas within Hampshire that are considered to have substantial potential flood risk, including Andover within the Test Valley administrative area, where 2,279 people are potentially at risk. More detailed assessments will be carried out in these areas, incorporating local knowledge and information on areas that have experienced flooding previously. This information will inform the developing Flood Risk Management Strategy and will in turn be used to help determine where further assessment is required. This process may also lead to other areas, not been identified by the Environment Agency but for which substantial local information is available to justify the level of local flood risk, being included in these investigations.

Local Flood Risk Management Strategy

2.3.5 As an LLFA, Hampshire County Council (HCC) is required to investigate and manage flood risk from non-main river sources within the administrative area and develop a Local Flood Risk Management Strategy (LFRMS)[5] for the area. The priority of HCC is to protect people, homes, businesses, and key infrastructure by avoiding risks and managing water resources through effective planning and design; preventing future flooding, adapting to flood risk; enabling communities to be better prepared for flood events, and adopting sustainable and affordable effective practices.

2.3.6 The Hampshire LFRMS sets out seven policies that aim to bring about effective flood risk management in Hampshire with the support of the Hampshire Strategic Flood Risk Management Partnership:

- Undertake effective partnership working,
- Develop a catchment approach to better understand the risks associated with the movement of water,
- Understand risks and develop clear priorities to help protect communities most vulnerable to flooding,
- Support the planning process by encouraging sustainable and resilient development,
- Record, prioritise and investigate flood events to increase knowledge and understanding,
- Work with multi-agency groups to develop schemes to reduce flood risk in vulnerable areas, and
- Empower and support community resilience to improve adaptation to and recovery from flood events.

2.3.7 In 2017, Atkins developed a Geographical Information System (GIS) tool[6] for HCC which helped in prioritising catchments most at risk from flooding within Hampshire. The tool provides a robust, evidence-based approach to support strategic prioritisation of investment and informs discussions with key stakeholders and underpins HCC's LFRMS.

[4] Hampshire County Council, April 2011, Preliminary Flood Risk Assessment https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/preliminary-flood-risk-assessment
[5] Hampshire County Council, October 2020, Local Flood Risk Management Strategy https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/local-flood-risk-management-strategy
[6] Atkins, January 2017, Hampshire Catchment Prioritisation Tool.

Catchment Management Plans

2.3.8 Following the approach set out in the LFRMS, HCC is developing Catchment Management Plans (CMP) for 18 catchments that cover Hampshire[7]. The purpose of the CMPs is to identify areas within each catchment that are at high risk of flooding and that have experienced flooding in the past, identify the causes and mechanisms of flooding and support the introduction of a stepped approach to interventions and measures that will reduce the risk now and in the future.

2.3.9 The CMPs of relevance to Test Valley BC and the priority areas identified in each are:

- CMP5 Test (Lower) – priority area Romsey,
- CMP6 Test (Upper) – priority areas Central Andover, West Andover, Picket Twenty, Enham Alamein,
- CMP10 Test (Middle) – priority area Romsey,
- CMP11 Monks Brook – (no priority areas in Test Valley BC).

2.3.10 The CMPs set out policies and action plans for local flood risk management.

2.3.11 Previously HCC had begun to prepare Surface Water Management Plans (SWMP), which assess the risks posed by surface water flooding for specific areas and set out an action plan for who will do what to better manage these risks. These plans have now been superseded by the draft Catchment Management Plans which seek to provide a more holistic and joined up approach to managing flood risk. The Hampshire SWMP Strategic Assessment and Background Information report[8] highlights a number of areas potentially at risk from surface water (and other forms of) flooding, including Andover within the Test Valley administrative area.

Groundwater Management Plan

2.3.12 Hampshire has an established risk from groundwater flooding, with over 400 properties flooded and significant disruption and damage to infrastructure occurring during the winter of 2000/2001. The Groundwater Management Plan (GWMP)[9] for Hampshire has therefore been prepared in partnership with a number of other risk management authorities to gain a better understanding of where the risk of groundwater flooding is greatest and how to manage this risk. The GWMP builds on the work undertaken on the Local Flood Risk Management Strategy for Hampshire.

2.3.13 The areas identified as being at high risk from groundwater flooding include Appleshaw and the Bourne Rivulet Villages within the Test Valley administrative area. The GWMP highlights generic actions that could be applied across all high risk areas and suggests which organisation or body might be best places to deliver them, in addition to a more detailed assessment for each area in the form of an Action Plan. More information on the Action Plans is provided in Section 6.8.

2.4 Other relevant plans

Greenprint for South Hampshire

2.4.1 Since the COVID-19 pandemic, there has been a demand from the public for more permanent and sustainable change, focusing more on the wellbeing of people and environmental impact. The Greenprint for South Hampshire: The Opportunities Ahead[10] is a report written by members of the Green Halo Partnership, Future South, and the Southern Policy Centre. It sets out a possible way forward, embracing ideas and partners from within and beyond the immediate PfSH area. The

[7] Hampshire County Council, Catchment Management Plans https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/catchment-management-plans
[8] Hampshire County Council, March 2010, Surface Water Management Plan Strategic Assessment and Background Information https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/catchment-management-plans
[9] Hampshire County Council, October 2013, Hampshire Groundwater Management Plan https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/groundwater-management-plan
[10] Partnership for South Hampshire, September 2020, A Greenprint for South Hampshire: The Opportunities Ahead https://www.push.gov.uk/wp-content/uploads/2020/09/Item-6-Greenprint-for-South-Hampshire-30.09.20.pdf

Greenprint is a model for policy making which could reflect commitment to a green recovery, shaping plans and programmes across sectors to deliver a world class economy in a world class environment.

2.4.2 Many communities across South Hampshire face common economic, social, and environmental opportunities and challenges. Working together under a common planning framework to find shared solutions will be more effective and beneficial for all parties, rather than trying to solve problems individually and potentially exacerbating issues elsewhere, or developing inconsistent, incompatible approaches in different localities.

Southern Water DWMP

2.4.3 Water and sewerage companies must produce Drainage and Wastewater Management Plans (DWMPs) covering a minimum of 25 years, setting out how they intend to improve and maintain a robust and resilient drainage and wastewater system in the face of risks to the network such as climate change and population growth. Companies will need to produce final plans in 2023 and the production of plans will be made statutory through the Environment Act.

2.4.4 Southern Water has developed 11 DWMPs across their entire operational region[11]. The Test and Itchen Catchment DWMP covers the Test Valley BC administrative area and highlights that the main concerns for this river basin are nutrients, flooding in a 1 in 50 year storm event, storm overflow and annualised flood risk. Additional homes and businesses will increase the risks of non-compliance with Dry Weather Flow permits in 9 wastewater systems, including Millbrook, Chickenhall Eastleigh, Fullerton, and Ludgershall. New development will also mean that current permits for wastewater treatment quality might be exceeded by 2050 without further investment in 6 wastewater systems including Romsey, and Evans Close, Over Wallop.

2.4.5 Adaptation to the impacts of climate change will be vital in this area. This may require long term sustainable options such as reducing the volume of rainwater entering the sewer network, which will thereby provide capacity in the system for wastewater for future growth.

[11] Southern Water, Drainage and Wastewater Management Plans https://www.southernwater.co.uk/dwmp

3. Sources of flood risk and expected effects of climate change

This Section provides a description of the local geology and hydrology in the study area, and an assessment of the risk of flooding from all sources based on available datasets. Refer to Part 1 Main Report for details of the datasets.

3.1 Geology and Hydrology

Geology

3.1.1 Hampshire geology comprises a major syncline, or downward curving fold, in the Southern England Chalk Formation. The centre of the syncline is to the south of the Borough, with the result that the oldest surface rock type, which is the Cretaceous chalk, covers the entire north and centre of the Borough, and the youngest rocks, which are Eocene era clays and gravels, appear in the southern part.

3.1.2 The general fall of the land is north to south, with high ground at the edge of Salisbury Plain present along the western boundary.

Hydrology

3.1.3 The principal watercourses and catchments are shown in Appendix A Figure 1 and described in Table 3-1.

3.1.4 Several principal river systems within the Test and Itchen and the Avon Hampshire Management Catchments make up the Test Valley administrative area, along with a number of other smaller watercourses. The main river system serving the Borough is the Test, which flows through the Test Upper and Middle and Test Lower and Southampton Streams Management Catchments. The Test and its tributaries cover the majority of the Borough. The Test is a mainly chalk fed watercourse in the Upper and Middle Catchment, whilst the Lower and Southampton Streams Catchment lies on clays. The Test gains water from underlying chalk and several of its ephemeral tributaries and is designated a Site of Special Scientific Interest along with a section of the Dever. The Test is a highly managed and modified system, with many sections divided into main river and carriers, which historically served a network of mills and water meadow systems. Downstream of Romsey, historical channel modifications of the Test have resulted in flows being shared between several channels. There is a strong tidal influence on the Test from Southampton and Totton north to Romsey.

3.1.5 Two principal watercourses drain the southeast of the Borough near the borders with Southampton and Eastleigh; Tanner's Brook, also a tributary of the Test which discharges to its estuary Southampton Water, and Monk's Brook which is a tributary of the Itchen.

3.1.6 On the western edge of the Borough, the River Bourne flows south through Shipton Bellinger. This watercourse is a tributary of the Hampshire Avon river system which meets the sea at Christchurch.

3.1.7 The Test Valley BC therefore falls into four operational catchments as identified on the Catchment Data Explorer[12]; Test Upper and Middle, Test Lower and Southampton Streams, Itchen, and Avon Hampshire.

3.1.8 Table 3-1 provides a description of the watercourses and their study area and identifies the type of modelling and mapping that is available within the SFRA for each watercourse.

[12] Environment Agency Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning

Table 3-1 Watercourses in Test Valley BC

Test Upper and Middle Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Test (upper and middle)	The section of the Test located within this catchment is split into the Upper; Bourne Rivulet to confluence with Dever; confluence with Dever to confluence with Anton; and confluence with Anton to confluence with Dun, from where it joins with the Lower Test. The source of the Test is at Ashe, within the Basingstoke and Deane district, from where it flows down a gentle gradient through a broad flood plain flanked by mainly arable farmland with some grazing on the valley floor and joins the Lower Test at Kimbridge.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Bourne Rivulet	16km seasonal chalk stream that rises and falls with the water table and normally flows from Upton through Hurstbourne Tarrant, St Mary Bourne and Hurstbourne Priors before its confluence with the Test near Tufton. Also known as the Swift upstream of Hurstbourne Tarrant.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Dever	20km chalk stream which rises at West Stratton (Winchester) and meanders through a number of villages before joining the Test on Bransbury Common opposite Wherwell.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Anton	15km chalk stream split into the Upper Anton from Penton Grafton to Upper Clatford, and the Lower Anton from Upper Clatford to its confluence with the River Test near Chilbolton.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Pillhill Brook (and tributary Mullens Brook in Kimpton)	10km chalk stream and principal tributary of the Anton which rises near Fyfield and Kimpton and flows through rural floodplain and small villages and joins the Anton at Upper Clatford.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Somborne Stream	2.5km chalk stream that flows west through King's Somborne and discharges into the Test. The catchment covers Little Somborne, Up Somborne, Crawley and the western side of Sparsholt.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Wallop Brook	13km brook which meanders southeast through Over Wallop, Middle Wallop and Nether Wallop before joining the Test at Bossington.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

Test Lower and Southampton Streams Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Test (Lower)	The section of the Test located within this catchment is split into conf Dun to Tadburn Lake and Lower. This section joins with the Upper and Middle Test at Kimbridge and flows through a number of fields, through Romsey, and into the Lower Test Nature Reserve on the Test Valley-Southampton border, which discharges into Southampton Water.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines (for Test through Romsey) – Appendix A Figure 12. GIS Floodplain Analysis – Appendix A Figure 11.
Dun	18.5km river that rises to the south-east of Salisbury and flows east to join the Test at Dunbridge near Kimbridge. It is the route of the Salisbury to Southampton Canal and is marked as the Old Canal on maps (the Old Canal crosses the Test and then heads south through Romsey (Barge Canal)).	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

Tadburn Lake	7.5km river that rises in Hursley Forest, north of Ampfield, and flows south and then west through Romsey before joining the Lower Test south of the A3090. The upper part of the Tadburn Lake includes the Emer Bog and Baddesley Common Nature Reserve.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.
Fairbourne Stream to Fishlake Meadows	7km river that flows west from Pucknall towards the A3057, before turning south and thorough Romsey where is it highly constrained by the urban environment and adjoins Tadburn Lake in Romsey just north of the A27.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Luzborough Lane Stream	6km river that flows south from Romsey, parallel with the Lower Test and joins the Lower Test prior to the Lower Test Nature Reserve.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Blackwater	45km river with several branches, split into the Blackwater in its upper reaches, and the Blackwater (Test and Itchen) in its lower reaches. Rises east of Redlynch (Wiltshire) and flows east into Test Valley, and then turns south, passing under the M27 and past Broadlands Lake and the Testwood Lakes reservoirs, before joining the Lower Test between Totton and Redbridge.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Sherfield English Stream	4.5km river that flows southeast around Sherfield English village and joins the Blackwater at East Wellow.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Tanner's Brook	A 7km river that rises in North Baddesley and flows south to Southampton Water. Several smaller tributaries join the Tanner's Brook along its route, draining Chilworth and Lordswood. Holly Brook flows from Bassett to join Tanner's Brook between Wimpson and Shirley in Southampton.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.

Itchen Operational Catchment

Watercourse	***Description***	***SFRA Mapping***
Monks Brook	11.5km river that rises northeast of Ampfield and flows east out of Test Valley, through Chandlers Ford in Eastleigh and joins the River Itchen at Mansbridge in Southampton, just before the tidal limit of the Itchen where it flows into Southampton Water.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.

Avon Hampshire Operational Catchment

Watercourse	***Description***	***SFRA Mapping***
River Bourne	48km river which flows generally from Burbage in Wiltshire, across Salisbury Plain through Tidworth and Shipton Bellinger on the western edge of Test Valley BC. It joins the Avon in the eastern outskirts of Salisbury. In its upper reaches it is a chalk fed winterbourne, often dry in the summer.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.

3.1.9 In the Upper Chalk areas permanent watercourses are absent in all except the deepest valleys. Upper Chalk is a major aquifer capable of absorbing large amounts of rainfall and releasing it slowly over a long period. This buffering effect together with the mainly rural nature of the Upper Chalk area means that the Hampshire Avon, and the upper and middle parts of the Test and associated tributaries, which are mainly spring fed by the chalk aquifers, have relatively narrow ranges of flows in a normal year and generally do not flood in response to short to medium duration heavy rainfall.

3.1.10 After prolonged rainfall the water table in the Upper Chalk aquifer can rise to the ground surface causing springs to erupt in the valley floors and the creation of ephemeral watercourses. The upper reaches of many of the Test's tributaries have this characteristic. These effects can lead to "groundwater flooding" lasting for several months in the late parts of very wet winters. Public supply and agricultural water abstraction from the Upper Chalk tends to increase the Upper Chalk's buffering effect, thereby suppressing the frequency at which ephemeral watercourses and springs occur.

3.1.11 However, when the water table is sufficiently high for the aquifer to flow freely into the valleys, the runoff from the Upper Chalk can be similar to that from a generally impermeable catchment. Snow melt and rainfall on a frozen Upper Chalk catchment also can lead to rapid surface water run off to the river system and widespread valley flooding.

3.1.12 Rainfall on the Eocene geology in the southern part of the Borough together with the much denser development in that area produces relatively rapid runoff and gives the potential for flash flooding. Tadburn Lake catchment, to the east of Romsey, and the area to the west of Chandler's Ford, are affected by these conditions.

3.1.13 Emer Bog, in the southeast of the Borough, comprises a wetland area, adjacent wet woodlands and heathland and a smaller area of acid grassland. The open wetlands at Emer are transition mires and fens. The area is underlain by clays and clayey sands which give rise to heavy seasonally waterlogged soils that are difficult to work for agriculture. Sandier deposits occur on the higher land and give rise to springs which feed the wetlands. Water levels in the wetlands vary and this creates flooding in winter and drier conditions in the summer.

3.2 Historic flooding records

3.2.1 Information on previously recorded flood events is provided in this section. This information has been taken from the 2007 Test Valley SFRA, Hampshire Groundwater Management Plan, Southern Water Drainage and Wastewater Management Plan, Recorded Flood Outlines data published by the Environment Agency, and recorded highway flooding data provided by HCC.

Fluvial and groundwater flooding

3.2.2 A number of relatively widespread flooding events have occurred within the study area. These events are outlined below.

3.2.3 Romsey, Middle and Lower Test – 1852, 1876, 1877, 1981, 1894, 1903, 1913, 1928, 1929, October 1960, November 1974, November 1976, February 1990, 24 December 1990, April 1993, winter of 1995, 24 December 1999, April 1993, winter of 2000-2001.

3.2.4 Andover, Anton, Pillhill Brook, Bourne Rivulet – 1852, winter of 1913-1914, winter of 1927-1928, 1935, 1937, August 1938, March 1947 (snow melt on frozen ground), 1951, November 1974, April 1993, winter of 1995, July 1999, winter of 2000-2001, winter of 2002-2003.

3.2.5 In the winter of 2013/2014, the settlements of King's Somborne, Vernham Dean and Hurstbourne Tarrant were badly affected by groundwater flooding. In Romsey 36 homes and 44 commercial properties were reported as flooded from a mixture of groundwater, sewer, surface water and fluvial sources.

3.2.6 Groundwater flooding reports covering the 2000-2001 flooding were undertaken for:

- Appleshaw, Braishfield, Broughton, Hatherden, Chilbolton, Hurstbourne Tarrant, Kimpton, King's Somborne, Little Somborne, Monxton, Nether Wallop, Pitton, Romsey, Sherfield English, Stockbridge, Vernham Dean and Upton, West Tytherley, West Wellow, Weyhill Bottom.

3.2.7 The Environment Agency produced reports on flooding in 2002-2003 for the following places:

- Amport, Appleshaw and Redenham, Fullerton, Fyfield, Goodworth Clatford, Hatherden, Hurstbourne Tarrant, Kimpton, King's Somborne, Little Somborne, Nether Wallop, Penton Grafton, Pitton, Romsey, Vernham Dean and Upton, West Tytherley.

3.2.8 The Groundwater Management Plan reports that flooding in Appleshaw occurred every 6-7 years up until the 1960s. Serious flooding is reported to have occurred in 1919/20, 1928, 1947, 1951/52 and 1960/61. There was no further flooding until 1994/1995 – a lull in serious flooding of approximately 30 years. Despite this lull, the occurrence of groundwater flooding has been estimated as being a 1 in 25 year event.

3.2.9 As with other parts of Hampshire, the flood events of the winter of 2000/2001 are the most extreme experienced to date. During 2000/2001 in Appleshaw and Redenham, 4 properties were flooded internally, 7 properties experienced cellar flooding, and 1 of these properties and 1 other property suffered external sewage flooding. Additional properties were flooded externally, due to localised overflowing from the surface drainage system.

3.2.10 The Southern Water pumping station in Appleshaw was overwhelmed by the flow in the sewers, which apparently contained a significant floodwater component. Southern Water had to pump sewage into the surface water drainage network for a period of 5 months.

3.2.11 The winter rainfall and extreme groundwater levels led to exceptional spring flows within Appleshaw. Runoff from periodic episodes of heavy rainfall further increased surface flows.

3.2.12 A surface water bypass channel has been constructed around Appleshaw, although it is not clear how this has affected overall groundwater flood risk within the village it is understood that during the winter 2012/2013 it flowed for the first time in response to the extreme rainfall experienced.

3.2.13 The Bourne Rivulet Villages of Vernham Dean, Upton, Hurstbourne Tarrant, Stoke and St Mary Bourne have a history of groundwater flooding, with groundwater flooding recorded in all these villages in 1994/95, 2000/2001, 2002/3, and 2013/14. During 2000/2001 thirteen properties in the valley experienced internal flooding and a number of properties suffered from external flooding with (sewage) contaminated water.

3.2.14 Recorded Flood Outlines published by the Environment Agency, as seen in Appendix A Figure 2, show significant flooding around the Test and its tributaries spread across the administrative area. Most of this flooding occurred in January to April 1995, October 2000 to May 2001, December 2002 to March 2003, and February 2014.

Sewer flooding

3.2.15 Sewer flooding is defined by Southern Water as incidents caused by an escape of water and sewage from a public sewer due to a blockage, sewer collapse, rising main burst, equipment failure or from too much water entering the system. Sewer flooding does **not** include extreme storms with a probability of occurring of less than once in 20 years. In their Drainage and Wastewater Management Plans, Southern Water have recorded incidents of internal flooding between 2018-2020 within Stockbridge, Romsey, King's Somborne, Fullerton, Chilbolton and Barton Stacey. External flooding has also been recorded within West Wellow, Stockbridge, Romsey, King's Somborne, Fullerton, Dunbridge and Barton Stacey.

3.2.16 During the winter of 2000/2001 and during 2012/2013 the foul sewer network in a number of areas has experienced infiltration into the system which causes it to become overloaded with water. In some more sensitive locations this occurs on a frequent basis (for example and through the villages of the Bourne Rivulet such as Vernham Dean, Upton, Hurstbourne Tarrant, Stoke and St Mary Bourne). This has led to internal and external sewage flooding; some householders are unable to flush their toilets and manholes pop up.

3.2.17 It has also led Southern Water to apply emergency pumping of sewage into the Bourne Rivulet, exacerbating pollution problems.

3.2.18 There have been significant efforts in recent years by Southern Water to address the issue of sewer flooding, and the current infiltration reduction plan for the valley is well developed with implementation expected imminently. However until that time that these issues are resolved, the villages are identified as being at high risk.

3.2.19 Recorded highway flooding data was provided by HCC for use in this SFRA. This data shows 87 recorded events distributed throughout the area, with the largest flooded areas around Appleshaw, Upton and Hurstbourne Tarrant.

3.3 Flood mapping

River flooding

Flood Map for Planning Flood Zones

3.3.1 Appendix A Figure 1 shows Flood Zones 2 and 3 for the principal watercourses within the study area (see Table 3-1 in the Main Report for more information on Flood Zones). Most of the flood risk is concentrated around the Test and extends to cover many roads and several developments. Less extensive areas of Flood Zones 2 and 3 are also found around the Bourne Rivulet, Anton, Pillhill Brook, Bourne, Dever, Wallop Brook, Dun, Blackwater, Tanner's Brook, and Tadburn Lake. These Flood Zones also cover many roads and properties.

3.3.2 More information on flood defences is included in Section 5.1 and Appendix A Figure 2.

Functional floodplain

3.3.3 Flood Zone 3b functional floodplain is defined as land where water has to flow or be stored in times of flooding. This is identified by land having a 3.3% or greater annual probability of flooding (1 in 30 year), with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

3.3.4 Part 1 (Main Report) Table 3-3 identifies which watercourses have detailed modelling available for Flood Zone 3b functional floodplain. In some cases the 3.3% AEP (1 in 30 year) extent is available and in other cases the 4% (1 in 25 year) or 2% AEP (1 in 50 year) flood extents have been used instead.

3.3.5 Within the Test Valley administrative area, modelling of Flood Zone 3b is shown in Appendix A Figure 1 towards the south of the Test, as well as around the Anton, Pillhill Brook, Bourne, and Tadburn Lake. The functional floodplain interacts with several roads and a small number of properties.

3.3.6 **Where modelled information for the 3.3% AEP (or similar) event is not available to identify the functional floodplain, the extent of Flood Zone 3a should be used as a surrogate for Flood Zone 3b to ensure the risk isn't underestimated.** The Environment Agency guidance 'How to prepare a Strategic Flood Risk Assessment'[13] encourages the use of site specific flood risk assessments to determine whether a site is affected by functional floodplain. If sites are proposed for development in such areas in any of the LPA's Local Plans, it may be necessary to undertake additional assessment to map the location of the functional floodplain as part of a Level 2 SFRA.

Future flood risk

3.3.7 Climate change is expected to increase the frequency, extent, and impact of flooding, reflected in peak river flows. Wetter winters and more intense rainfall may increase fluvial flooding and surface water runoff and there may be increased storm intensity in summer. Rising river levels may also increase flood risk.

3.3.8 As detailed in Table 3-1, where available, hydraulic models have been run for the 1% AEP flood event for the central and higher central climate change allowances to provide an indication of the future flood risk. The maps in Appendix A Figure 12 show the risk of flooding from the Anton, Pillhill Brook and the Test through Romsey in the future as a result of climate change.

3.3.9 The results of the hydraulic modelling studies for the main rivers suggest that climate change will not markedly increase the extent of river flooding within most areas. However, it is important to note that these areas, as well as those areas that are currently at risk of flooding may be susceptible to more frequent, more severe flooding in future years. This is because the changes in climate patterns and physical conditions, as a result of climate change, can increase the volume and frequency of precipitation, leading to an increase in the frequency of flooding. It is essential therefore that the

[13] Defra, Environment Agency, How to prepare a strategic flood risk assessment Updated September 2020. https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment

measures are implemented during the development management process to carefully mitigate the potential impact that climate change may have upon the risk of flooding to a property.

3.3.10 For this reason, all of the development management recommendations set out in Section 7 require all floor levels, access routes, drainage systems and flood mitigation measures to be designed with an allowance for climate change; and the potential impact that climate change may have over the lifetime of a proposed development should be considered as part of a site-specific FRA. This provides a robust and sustainable approach to the potential impacts that climate change may have over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

3.3.11 Where detailed hydraulic models are not available, GIS floodplain analysis has been undertaken to identify those areas of floodplain that could be sensitive to increases in flood levels. Note that this mapping does **not** show the expected impacts of specific climate change predictions. For more information on the GIS floodplain analysis refer to Section 3.1 of the Main Report. The results of the analysis are presented in Appendix A Figure 11. The mapping shows that the floodplain of the Test is relatively well defined, but there are areas around Andover, Longparish, Bransbury, Wherwell, Longstock, Stockbridge, Houghton, Brook, Butts Green, Timsbury, Romsey, Ashfield and Chandlers Ford that could be sensitive to increases in water levels. Should development be proposed in these areas, it is recommended that hydraulic modelling is carried out to map the future risk of flooding more accurately.

Tidal flooding

3.3.12 Flood Zones provide an indication of the risk of flooding from rivers and the sea ignoring the presence of flood defences. (Refer to Table 3-1 in the Main Report for more information on Flood Zones). Appendix A Figure 1 shows Flood Zones 2 and 3 for the study area.

3.3.13 As part of this SFRA, coastal modelling has been updated, to determine the impact of predicted tidal flooding. Details of the modelling undertaken are presented in SFRA Part 1 Appendix B. Maps showing the outputs for some of the key model scenarios are presented in Appendix B of this Report. (The full set of outputs have been provided to the LPAs as GIS files).

3.3.14 The maps show the extent of flooding in the south of Test Valley administrative area, where the Lower Test is tidally influenced. Appendix B Figures 3 and 10 show that for the 0.5% AEP event for the year 2022, flooding is largely to the south of Mill Lane, with a small section of Low hazard flooding on Mill Lane. A review of Appendix B Figures 4 – 7 and 11 – 14 shows that the extent and depth of flooding in this floodplain increases in the future. The route along Mill Lane reaches Moderate hazard rating in 0.5% AEP event for 2122 (upper end allowance).

Groundwater flooding

3.3.15 The BGS dataset ‘Susceptibility to Groundwater Flooding’ is mapped in Appendix A Figure 5. This map does not show the risk of groundwater flooding, rather it identifies areas where geological conditions could enable groundwater flooding to occur. A suite of rules founded upon geological, hydrogeological, and topographic data were used to assign a class value indicating the susceptibility to groundwater flooding to each vector polygon. The three classes are as follows:

- A: Limited potential for groundwater flooding to occur
- B: Potential for groundwater flooding of property situated below ground level
- C: Potential for groundwater flooding to occur at surface

3.3.16 The remaining areas are not considered to be prone to groundwater flooding. The ‘Susceptibility to Groundwater Flooding’ should be used, in conjunction with other relevant information, to establish the relative risk of groundwater flooding, and is most suitable for informing land-use planning decisions at the strategic scale. The dataset shouldn’t be employed in isolation to inform land-use planning decisions at any scale and shouldn’t be utilised for this purpose at the site scale. The map shows a general pattern within the Test Valley administrative area of potential for groundwater flooding to occur at the surface around watercourses; potential for groundwater flooding of property situated below ground level slightly further away from the watercourses, and limited potential for groundwater flooding to occur even further away from the watercourses. Towards the south of the administrative area, the pattern still broadly follows with the vulnerability reducing further from watercourses but is less defined with some areas of higher vulnerability not close to watercourses and vice versa. There are also several areas, most notably towards the south, where there is not considered to be any potential for groundwater flooding to occur.

3.3.17 'Areas Susceptible to Groundwater Flooding' is a national dataset produced by the Environment Agency which shows the proportion of 1km squares where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring but provides a useful tool to identify where further studies may be useful. This dataset is mapped in Appendix A Figure 4.

Future flood risk

3.3.18 Most climate change models indicate we are likely to experience drier summers, albeit with more intense rainfall when it occurs, and wetter winters. As groundwater flooding occurs primarily as a response to extended periods of rain during late autumn and early winter, there may be an increased risk of groundwater flooding arising from these changing rainfall patterns. However the complex relationship between rainfall, recharge, groundwater storage and flow make the response to climate change uncertain.

Surface water

3.3.19 The Risk of Flooding from Surface Water (RoFSW) dataset is presented in Appendix A Figure 3. This map shows that the risk of surface water flooding is generally lower in the north and increases towards the south around watercourses and closer to the coastline. The risk also increases in urbanised areas, most significantly in Andover and Romsey.

Future flood risk

3.3.20 Section 3.2 of Part 1 Main Report describes the impact of climate change on surface water flood risk and summarises the peak rainfall intensity climate change allowances for the study area which range from 20% - 45% depending on the specific location and epoch under consideration.

3.3.21 The RoFSW does not include specific scenarios to determine the impact of climate change on the risk of surface water flooding and it is not within the scope of this SFRA to undertake such modelling. However a range of three annual probability events have been modelled, 3.3%, 1% and 0.1%, and therefore it is possible to use with caution the 0.1% outline as a substitute dataset to provide an indication of the implications of climate change on surface water flood risk in the future.

Reservoir flooding

3.3.22 Four Reservoir Act registered impoundments with the potential to cause flooding within the Test Valley administrative area have been identified: Awbridge Danes Lake at Lower Ratley, Kentford Lakes near East Wellow, Shrubbery Pond in North Stoneham, and Timsbury Lake between Timsbury and Abbotswood.

3.3.23 Appendix A Figure 6 shows the potential extent of flooding in the unlikely event of a failure of these water bodies when river levels are normal and when rivers are in flood. The mapping shows that the area at risk follows the floodplains of the Test and Blackwater respectively, with the majority of flooding only occurring if there is also flooding from rivers.

4. Cumulative impact of development and land use change

4.1 Cumulative impact assessment

4.1.1 The NPPF states that strategic policies should be informed by a strategic flood risk assessment, and should consider cumulative impacts in, or affecting, local areas susceptible to flooding (paragraph 160).

4.1.2 When allocating land for development consideration should be given to the potential cumulative impact on flood risk with a catchment. Development increases the impermeable area within a catchment, which, if not effectively managed, can cause increased rates and volumes of surface water runoff and changes to floodplain storage, thereby resulting in increased flood risk further downstream. Whilst individual development with appropriate site mitigation measures should not result in measurable local effects with respect to hydrology and flood risk, the cumulative effect of multiple development may be more severe at downstream locations in the catchment. Locations where there are existing flood risk issues will be particularly sensitive to cumulative effects.

4.1.3 As described in SFRA Part 1 Section 3.7, as part of this SFRA an assessment of the study area has been undertaken to identify those catchments where there is greater potential for cumulative effects on flood risk. For each catchment, consideration has been made of the:

i. The size and nature (rural or urban) of the catchment

ii. The risk of flooding in the catchment from rivers, surface water and groundwater, based upon data from the Hampshire Catchment Prioritisation Tool, and

iii. The scale of potential future development in the catchment, based upon a review of potential development sites and growth locations provided by the LPA.

4.1.4 Appendix A Figure 7 shows the outputs for Test Valley. A red, amber, green rating has been used to highlight those catchments where there is a higher, medium, and lower potential for cumulative effects on flood risk. This figure shows that due to the rural nature of the central part of the Borough, there is lower potential for cumulative effects on flood risk. Catchments with medium potential for cumulative impact of development on flood risk include the Pillhill Brook and Upper Anton catchments in Andover, the catchments along the eastern fringe of the Borough including the Somborne Stream, and the Test (from confluence with Dever to confluence with Anton), as well as the catchments around Romsey including Fairbourne Stream to Fishlake Meadows, Luzborough Lane Stream, Tanner's Brook, and Blackwater. Higher potential for cumulative impact of development on flood risk is found in the Monks Brook catchment in the southeast of the study area around Chandler's Ford.

4.1.5 In those areas with a medium and higher potential for cumulative impact on flood risk, it is recommended that Test Valley BC consider area specific policies or guidance for new development to help reduce the cumulative impact, and where possible, identify opportunities for new development to provide cumulative betterment with respect to flood risk. This may be achieved through implementing the types of measures described in Section 6.

4.2 Cross boundary considerations

4.2.1 The majority of the Test Valley administrative area is located within the catchment of the River Test and its tributaries and as a result the impact of actions within the northern and central part of the Borough have the potential to result in effects further down in Test Valley.

4.2.2 That having been said there are also areas with potential for cross boundary flows in and out of the Borough, including:

- The Test rises within Basingstoke and Deane BC, from where it flows through the Test Valley and into Southampton Water on the Test Valley-Southampton CC border.
- The Bourne Rivulet rises within the Test Valley BC, from where it flows through Basingstoke and Deane BC, and into the River Test on the Test Valley BC border.

- The Dever rises in West Stratton within Winchester CC, from where it flows into the River Test within the Test Valley BC.
- The majority of the Bourne is located within Wiltshire, with a small section flowing through Shipton Bellinger on the western border of Test Valley BC.
- The Dun flows into Test Valley BC from Wiltshire.
- The Blackwater has several branches, with some rising in Wiltshire and others in New Forest; the branches join into a single stream that flows along the New Forest-Test Valley border.
- The Cadnam River flows New Forest DC into the Blackwater on the Test Valley BC border.
- The Tanner's Brook flows into Southampton CC.
- The Monks Brook rises in Test Valley BC, close to the border of Winchester CC, from where it flows through Eastleigh BC and into Southampton Water in Southampton CC.

4.2.3 Where there are cross boundary flows, communication between LPAs is of high importance to ensure action in one does not negatively impact upon another.

4.2.4 Where watercourses border or have very small reaches within another district, the flood extents may significantly encroach into the other district and therefore cross boundary flows need to be considered.

5. Current control, mitigation, and management measures

5.1 Defences

5.1.1 Data provided by the Environment Agency from their Asset Information Management System (AIMS) is included in Appendix A Figure 2.

5.1.2 The mapping shows that the majority of the Upper Test and its tributaries (Bourne Rivulet, River Anton, Pillhill Brook, Dever), have high ground on either side of the watercourses. There are small stretches of river wall, for example on the Bourne Rivulet adjacent to the B3048 in Hurstbourne Tarrant, and along one channel of the River Dever at Bransbury. The River Anton has a small section of river wall at West Street in central Andover, and a stretch of embankment along the left hand bank of the River Anton north of Cottonworth.

5.1.3 The high ground either side of the upper reaches of the Test is recorded to have a design standard of protection (SOP) of approximately 10% AEP (1 in 10 year). There is a section of embankment at Wherwell with a design SOP of 4% AEP (1 in 25 year).

5.1.4 Further downstream along the Test, the design SOP of protection increases to 4% AEP with some sections of 2% AEP and 3.3% AEP around Stockbridge. There are sections of embankment south of Horsebridge, through Kimbridge, at Timsbury and south into Romsey along Barge Canal, Fairbourne Stream / Fishlake and the River Test. Through Romsey the Fairbourne Stream / Fishlake has several sections of river wall with design SOP of 1% AEP.

5.1.5 The Tadburn Lake Stream is largely lined by high ground, with some sections of river wall adjacent to the railway line and the A27.

5.2 Flood Alleviation Scheme, Romsey

5.2.1 In the winter of 2013/2014, Romsey was badly affected by flooding. 36 homes and 44 commercial properties were reported as flooded from a mixture of groundwater, sewer, surface water and fluvial sources. A scheme was developed to manage flooding from all sources in the area[14]. The scheme comprises three key areas of construction to reduce the risk of flooding:

- Works along the River Test to reduce the risk of river flooding including a control structure at the top of Fishlake Stream to restrict the amount of water going directly to through Romsey in future flood events. This enables floodwater to be directed to the floodplain to the west away from the Budds Lane area of Romsey. Two spillways along the Causeway enable improved drainage of the floodplain back to the main river south of the town.
- Highway works at Mainstone including improvement to the highway drainage network and additional points of discharge to the local ditch network to reduce the risk of surface water flooding.
- Improved drainage at Middlebridge Street including improvements to the highway drainage network and additional points of discharge to the River Test via Holbrook Stream to reduce the risk from surface water flooding.

5.3 Flood Warning Service

5.3.1 The Environment Agency operates a Flood Warning Service[15] in respect to main river (and tidal) flooding across England. Three different codes are issued depending on the type of flooding forecasted:

- Flood Alert – Flooding is possible, be prepared.

[14] Hampshire County Council Romsey Flood Alleviation Scheme. https://www.hants.gov.uk/transport/transportschemes/romsey-flood-alleviation-scheme
[15] Environment Agency, Check for Flooding in England https://check-for-flooding.service.gov.uk/

- Flood Warning – Flooding is expected, immediate action is required.
- Severe Flood Warning – Severe flooding, danger to life.

5.3.2 The Environment Agency's website offers up-to-date flood information, monitoring information of river and sea levels and latest flood risk forecast, as well as a page to sign up to warnings by phone, text, email, or fax[16].

5.3.3 There are 20 Flood Warning Areas in Test Valley BC which are shown in Appendix A Figure 9 and are as follows:

- River Bourne at Tidworth and Shipton Bellinger Village Centres
- River Bourne at Tidworth and Shipton Bellinger
- River Bourne from Parkhouse Corner to Porton
- Groundwater flooding in the Bourne Valley from North Tidworth to the A303
- Groundwater flooding in the Bourne Valley – The Winterbournes
- Bourne Valley
- Overton, Laverstoke and Whitchurch on the River Test
- Longparish to Longstoke on the Rover Test
- Micheldever to Bransbury on the River Dever
- Anna Valley on the Pillhil Brook
- Andover on the River Anton
- Stockbridge to Timsbury on the River Test
- Over Wallop to Broughton on the Wallop Brook
- Somborne Stream at King's Somborne
- West Dean to Durnbridge on the River Dun
- River Test at Romsey and Testwood
- Halterworth to Romsey Town Centre on the Tadburn Lake
- Landford to Wade Bridge on the River Blackwater
- Calshot, Hythe, Marchwood, Eling and Redbridge
- Chandlers Ford to Swaythling

5.3.4 The Environment Agency publishes 'Water situation: area monthly' reports for England'[17] for each of its areas. These reports identify monthly rainfall, soil moisture deficit, river flows, groundwater levels and reservoir levels. The Environment Agency also publishes 'Groundwater situation'[18] reports which provide the latest update on monitored groundwater levels and whether there are any groundwater alerts or warnings in force. These reports will give an indication as to when groundwater levels may be high and groundwater flooding may be imminent.

5.3.5 The Environment Agency also provide a targeted groundwater flood warning service through issue of groundwater "Flood Alerts" for specific locations and communities. As groundwater flooding rises more slowly than fluvial flooding, there is a lesser requirement for immediate action and there is unlikely to be a danger to life. On this basis the Environment Agency do not issue "Flood Warnings" or "Severe Flood Warnings" for this type of flooding and for groundwater flooding the Environment Agency only issue "Flood Alerts".

[16] Environment Agency, Sign up for Flood Warnings https://www.gov.uk/sign-up-for-flood-warnings
[17] Water situation: area monthly reports for England https://www.gov.uk/government/publications/water-situation-local-area-reports
[18] Groundwater: current status and flood risk https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk

5.4 Residual Risk

5.4.1 The risk of flooding can never be fully mitigated, and there will always be a residual risk of flooding that will remain after measures have been implemented to protect an area or a particular site from flooding. This residual risk is associated with a number of potential risk factors including (but not limited to):

- A flooding event that exceeds that for which the flood risk management measures have been designed e.g. flood levels above the designed finished floor levels,
- The structural deterioration of flood defence structures (including informal structures acting as a flood defence) over time, and/or,
- General uncertainties inherent in the prediction of flooding.

5.4.2 The modelling of flood flows and flood levels is not an exact science, therefore there are inherent uncertainties in the prediction of flood levels used in the assessment of flood risk. Whilst the Flood Map for Planning Flood Zones provide a relatively robust depiction of flood risk for specific conditions all modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response.

5.4.3 Steps should be taken to manage these residual risks through the use of flood warning and evacuation procedures, as described in Section 6.11.

6. Opportunities to reduce the causes and impacts of flooding

The NPPF appreciates that it may not always be possible to avoid locating development in areas at risk of flooding. This Section provides guidance on the range of measures that could be considered in order to control and mitigate flood risk. These measures should be considered both at a strategic scale, when planning development across the LPA, as well as at a site specific level.

6.1 Maintenance of watercourses

Main River

6.1.1 The Environment Agency is likely to seek an 8 metre wide undeveloped buffer strip alongside main fluvial rivers for maintenance purposes and would also ask developers to explore opportunities for riverside restoration as part of any development.

6.1.2 Under the Environmental Permitting (England and Wales) Regulations (2016)[19], an environmental permit is required if works are to be carried out:

- on or near a main river
- on or near a flood defence structure, or
- in a floodplain.

6.1.3 Since requirements of the consenting process in relation to flood risk, biodiversity and pollution may result in changes to development proposals or construction methods, the Environment Agency aims to advise on such issues as part of its statutory consultee role in the planning process. Should proposed works not require planning permission the Environment Agency can be consulted regarding permission to do work on or near a river, or a flood or sea defence by contacting enquiries@environment-agency.gov.uk.

6.1.4 **Policy Recommendation:** Safeguard an 8 metre wide undeveloped buffer strip alongside Main Rivers or flood defence structure and prioritise riverside restoration.

Ordinary watercourse

6.1.5 Ordinary watercourses are watercourses that are not part of a main river and include streams, ditches, drains, cuts, culverts, dykes, sluices, sewers (other than public sewers) and passages, through which water flows.

6.1.6 As the LLFA, HCC is responsible for the consenting of works to ordinary watercourses and has powers to enforce un-consented and non-compliant works. This includes any works (including temporary) that place or alter a structure within an ordinary watercourse or affect the flow or storage of water within an ordinary watercourse. HCC will seek a 5 metre wide undeveloped buffer strip to be retained alongside ordinary watercourses. Enquiries and applications for ordinary watercourse consent can be submitted to HCC on their website[20].

6.1.7 HCC intends to work with riparian owners (those living adjacent to an ordinary watercourse) who are responsible for maintaining ordinary watercourses to ensure that the effectiveness of the existing ditches is improved and ensure that future maintenance is undertaken at appropriate intervals. HCC have prepared a Flood Risk Management Guidance for Landowners document which provides information on the rights and responsibilities of riparian owners[21].

6.1.8 The CMPs note that in the priority areas of Romsey, Central Andover and West Andover, HCC will implement a more stringent approval process for all Ordinary Watercourse Consent applications. Each

[19] The Environmental Permitting (England and Wales) Regulations 2016 http://www.legislation.gov.uk/uksi/2016/1154/contents/made
[20] Hampshire County Council, Making changes to a watercourse https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse
[21] Hampshire County Council, 2020, Flood Risk Management Guidance for Landowners https://documents.hants.gov.uk/flood-water-management/HCCFloodRiskManagement-Landowners.pdf

application will be considered on a site-by-site basis where further information and additional requirements may be requested by HCC to ensure there will be no increase in flood risk.

6.1.9 **Policy Recommendation:** Safeguard an undeveloped buffer strip of at least 5 metre wide alongside ordinary watercourses for maintenance purposes. Developers should prioritise opportunities for riverside restoration as part of any development adjacent to ordinary watercourses.

6.2 River restoration

6.2.1 During the last century, many rivers were modified using hard engineering techniques to often straighten or canalise them. The disadvantages of these techniques have now become apparent which include the damage to the environment and ecosystems as well as an increase in flooding.

6.2.2 River restoration contributes to flood risk management by supporting the natural capacity of rivers to retain water. By re-connecting brooks, streams and rivers to floodplains, former meanders, and other natural storage areas, and enhancing the quality and capacity of wetlands, river restoration increases natural storage capacity and reduces flood risk. Excess water is stored in a timely and natural manner in areas where values such as attractive landscape and biodiversity are improved and opportunities for recreation can be enhanced.

6.2.3 Returning rivers to a more natural state can often include the removal of structures such as weirs or culverts which can have multiple benefits for biodiversity in addition to improving the flow regime[22]. Further guidance on river restoration is available from the Environment Agency[23].

River Test

6.2.4 The Test and Itchen River Restoration Strategy[24] sets out a way forward to appraise the geomorphological condition of the Sites of Special Scientific Interest (SSSI) units of the Test and Itchen. Although this report focuses on restoring the environment and habitats around the rivers, the strategy put forward also increases resilience to flooding and future pressures as a result of climate change.

River Anton

6.2.5 The River Anton is the subject of the 'River Anton Enhancement Strategy'[25], a partnership with several agencies and local organisations to improve the river. Steps to improve river environments for wildlife often also provide flood risk benefits.

River Dun

6.2.6 The policy within the CFMP for the River Dun sub-area, summarised in Section 2.1, is to improve the efficiency of floodplain connectivity and restore sustainable, natural river functions along the Dun to help alleviate flood risk downstream in Romsey.

Urban areas

6.2.7 The policies within the CFMP strongly encourage improvement of channel capacity and conveyance through urban areas such as Andover, Romsey, and along the Monks Brook and Tanners Brook. This may involve de-culverting sections and removing the constraints imposed by the urban environment to enable more adaptive response to changes in water levels.

6.2.8 **Policy Recommendations:**

- Where development is planned in urban areas, opportunities for de-culverting watercourse sections should be sought in order to bolster local channel capacity and conveyance. This is particularly applicable to the Andover and Romsey sub-areas within the Test and Itchen

[22] European Centre for River Restoration https://www.ecrr.org/River-Restoration/Flood-risk-management/Healthy-Catchments-managing-for-flood-risk-WFD/Environmental-improvements-case-studies/Remove-culverts
[23] Environment Agency, Fluvial Design Guidance Chapter 8 https://assets.publishing.service.gov.uk/media/60549ae1e90e0724c0df4619/FDG_chapter_8_-_Works_in_the_river_channel.pdf
[24] Atkins, 2013, Test & Itchen River Restoration Strategy Technical Report. https://www.therrc.co.uk/sites/default/files/files/Designated_Rivers/Test_Itchen/technical_report_issue_5_final.pdf
[25] Description of the River Anton Enhancement Scheme from Test Valley BC website https://www.testvalley.gov.uk/communityandleisure/parksandgreenspaces/river-anton-enhancement-scheme

CFMP[26]. For example, Appendix A Figure 1 shows that culverted sections of a watercourse are associated with Flood Zones 2 and 3 in Andover.

- In partnership with relevant risk management authorities (for example Environment Agency, Hampshire County Council and land owners) explore options for river restoration on the floodplain of the River Test upstream of the Romsey sub-area, to attenuate the fluvial flood risk to downstream receptors. The most suitable measures are likely to include, the addition of woody debris to increase the sinuosity of straightened floodplain channels; the removal of in-channel structures such as weirs; and converting the redundant channels of old tributaries into wetlands; all of which serve to bolster the storage capacity of the floodplain.

6.3 Flood storage

6.3.1 Flood Storage Areas (FSAs) are natural or man-made areas that temporarily fill with water during periods of high river level, retaining a volume of water which is released back into the watercourse after the peak river flows have passed. There are two main reasons for providing temporary detention of floodwater:

- To compensate for the effects of catchment urbanisation, and
- To reduce flows passed downriver and mitigate downstream flooding.

6.3.2 Providing flood storage within a development area or further upstream of a development can manage and control the risk of flooding. In some cases it can provide sufficient flood protection on its own; in other cases it may be chosen in conjunction with other measures. The advantage of flood storage is that the flood alleviation benefit generally extends further downstream, whereas other methods tend to benefit only the local area and may increase the flood risk downstream.

6.3.3 Further guidance on Flood Storage is provided within Chapter 10 of the Environment Agency's Fluvial Design Guide[27].

Andover

6.3.4 The policy within the CFMP for the Andover sub-area is to maximise the potential for storage in outlying villages in the Anton catchment to help reduce flood risk in Andover.

Romsey

6.3.5 Proposed actions in the CFMP for the River Dun and River Test to Romsey sub-area include investigating whether maximising storage on the River Dun will effectively reduce flood risk in Romsey.

Emer Bog, North Baddesley

6.3.6 Emer Bog, in the south-east of the Borough, comprises a wetland area, adjacent wet woodlands and heathland and a smaller area of acid grassland. The open wetlands at Emer are transition mires and fens. The area is underlain by clays and clayey sands which give rise to heavy seasonally waterlogged soils that are difficult to work for agriculture. Sandier deposits occur on the higher land and give rise to springs which feed the wetlands. Water levels in the wetlands vary and this creates flooding in winter and drier conditions in the summer.

6.3.7 A hydro-ecological appraisal[28] was undertaken for the area and identifies that discharge from land within the surface and groundwater catchment of the Emer Bog and Baddesley Common wetlands and streams should be limited. Developments requiring abstraction or discharges to streams or soakaways within the surface catchment of the upper Tadburn Lake Stream should also be given careful examination to ensure that adverse effects are avoided.

6.3.8 **Policy Recommendation:** Support relevant risk management authorities (for example Environment Agency, Hampshire County Council and land owners), to identify and appraise options for creating flood storage areas, either as part of proposed developments or as stand-alone flood risk management strategies, in the Dun and Test to Romsey sub-area, as well as along the River Anton in the Andover

[26] Environment Agency, December 2009, Test and Itchen Catchment Flood Management Plan, Summary Report https://www.gov.uk/government/publications/test-and-itchen-catchment-flood-management-plan
[27] Environment Agency, Fluvial Design Guidance Chapter 10 https://assets.publishing.service.gov.uk/media/60549b7a8fa8f545cf209a29/FDG_chapter_10_-_Flood_storage_works.pdf
[28] The Environmental Project Consulting Group, February 2017, Emer Bog and Baddesley Common Hydrological Desk Study, https://testvalley.gov.uk/planning-and-building/guidance/solent-southampton-water-special-protection-area

sub-area. This may be achieved through the removal of embankments, or the artificial lowering of natural high ground.

Floodplain compensation

6.3.9 Where proposed development results in a change in building footprint, land raising or other structures such as bunds, the developer must ensure that it does not impact upon the ability of the floodplain to store water and should seek opportunities to provide betterment with respect to floodplain storage.

6.3.10 Similarly, where ground levels are elevated to raise the development out of the floodplain, compensatory floodplain storage within areas that currently lie outside the floodplain must be provided to ensure that the total volume of the floodplain storage is not reduced.

6.3.11 Floodplain compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary. Where land is not within the site boundary, it must be in the immediate vicinity, in the applicant's ownership and linked to the site. Floodplain compensation must be considered in the context of the 1% AEP flood level including an appropriate allowance for climate change. When designing a scheme flood water must be able to flow in and out and must not pond. An FRA must demonstrate that there is no loss of flood storage capacity and include details of an appropriate maintenance regime to ensure mitigation continues to function for the life of the development. Guidance on how to address floodplain compensation is provided in Appendix A3 of the CIRIA Publication C624[29].

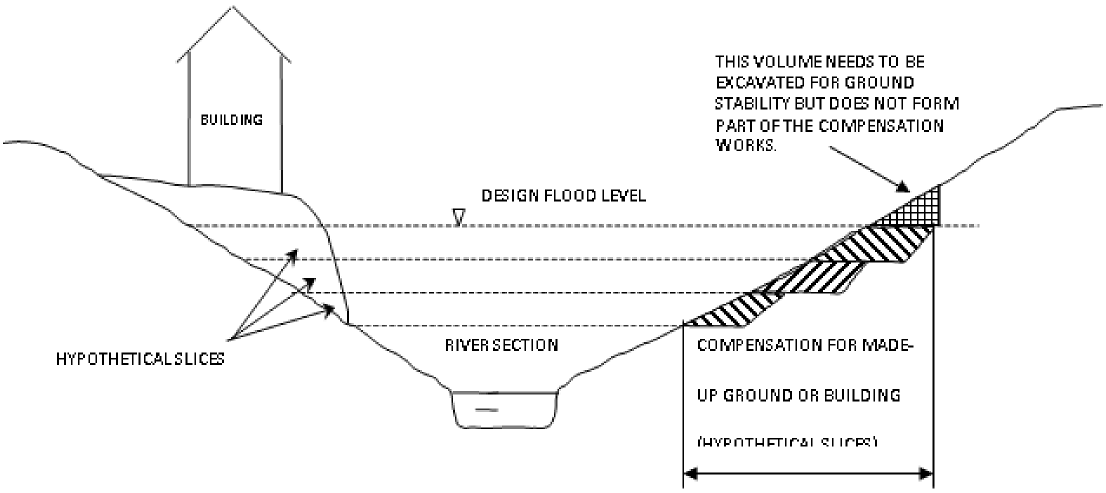

Figure 6-1 Example of Floodplain Compensation Storage (Environment Agency 2009)

6.3.12 The requirement for no loss of floodplain storage means that it is not possible to modify ground levels on sites which lie completely within the floodplain (when viewed in isolation), as there is no land available for lowering to bring it into the floodplain. It is possible to provide off-site compensation within the local area e.g. on a neighbouring or adjacent site, or indirect compensation, by lowering land already within the floodplain, however, this would be subject to detailed investigations and agreement with the Environment Agency to demonstrate (using an appropriate flood model where necessary) that the proposals would improve and not worsen the existing flooding situation or could be used in combination with other measures to limit the impact on floodplain storage.

6.3.13 Where car parks are specified as areas for the temporary storage of surface water and fluvial floodwaters, flood depths should not exceed 300mm given that vehicles may be moved by water of greater depths. Where greater depths are expected, car parks should be designed to prevent the vehicles from floating out of the car park. Signs should be in place to notify drivers of the susceptibility of flooding and flood warning should be available to provide sufficient time for car owners to move their vehicles if necessary.

6.3.14 **Policy recommendation:** Where proposed development results in a change in building footprint, land raising, or other structures that impact upon the ability of the floodplain to store water, floodplain

[29] CIRIA (2004) CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry

compensation must be provided on a level for level, volume for volume basis on land which does not already flood and is within the site boundary.

6.4 Flood and Coastal Erosion Risk Management (FCERM) schemes

6.4.1 The Government's programme of FCERM schemes[30] does not identify any proposed schemes in the Test Valley administrative area for the next 6 year period.

6.5 Working with natural processes

6.5.1 Natural flood management involves techniques that aim to work with natural hydrological and morphological processes, features, and characteristics to manage the sources and pathways of flood waters. Techniques include the restoration, enhancement and alteration of natural features and characteristics, but exclude traditional flood defence engineering that works against or disrupts these natural processes.

6.5.2 Appendix A Figure 8 provides information from the Environment Agency's 'Working with Natural Processes – Evidence Directory'[31] about where these measures could be applied. This map shows that although there are a lot of existing woodland constraints within the Test Valley administrative area, there are also a wide range of opportunities to implement natural processes to alleviate flooding. There are many potential opportunities for floodplain woodland planting and riparian woodland planting around the Test and its tributaries, as well as some wider catchment woodland opportunities towards the south of the administrative area. Further information about these datasets is included in SFRA Report Part 1. Riparian woodland planting also holds the potential to confer environmental benefits such as improved water quality, Biodiversity Net Gain, wildlife corridors, and carbon sequestration, in unison with natural flood management.

Green Infrastructure

6.5.3 Green Infrastructure (GI) is a strategically planned and managed network of natural and semi-natural green (land) and blue (water) spaces that intersperse and connect urban centres, suburbs and rural fringe, consisting of:

- Open spaces e.g. parks, woodland, nature reserves and lakes,
- Linkages e.g. river corridors, canals, pathways, cycle routes and greenways,
- Networks of 'urban green' e.g. private gardens, street trees, verges and green roofs.

6.5.4 The identification and planning of GI are critical to sustainable growth and flood risk management. GI can provide a wide range of ecosystem services, including climate mitigation and adaptation, and is central to climate change action. GI also provides additional green spaces for storm flows, freeing up water storage capacity in existing infrastructure and reducing the risk of damage to urban property, particularly in city centres and vulnerable urban regeneration areas. Additionally, GI can improve accessibility to waterways and water quality, supporting regeneration and improving opportunity for leisure, economic activity and biodiversity.

6.5.5 South Hampshire currently benefits from a strategic GI network that includes rivers, country parks, the coast, large tracts of woodland and an extensive public rights of way network. Many local areas also benefit from smaller scale GI features. Maximising the potential of GI across South Hampshire is a critical environmental priority for PfSH, and hence a GI Strategy and associated GI Implementation Plan have been developed to provide an ambitious long term framework for GI and set out the strategic GI projects for South Hampshire into the future.

6.5.6 **Policy Recommendation:** In partnership with relevant risk management authorities (for example Environment Agency, Hampshire County Council and land owners), explore options to extend and

[30] Programme of flood and coastal erosion risk management (FCERM) schemes https://www.gov.uk/government/publications/programme-of-flood-and-coastal-erosion-risk-management-schemes
[31] Working with Natural Processes – Evidence Directory https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681411/Working_with_natural_processes_evidence_directory.pdf

enhance existing GI within the borough through the implementation of floodplain and riparian woodland planting schemes in order to attenuate surface water runoff and groundwater recharge, both in, and preferably upstream, of areas that contain vulnerable receptors at risk of groundwater, surface water, and fluvial flooding. These strategies are most likely to be effective, and feasible in the riparian zones and floodplains of the River Anton, the River Dun, Pillhill Brook, Wallop Brook, and the River Test (both south and north of Romsey), which correspond to the Dun and Test to Romsey, Andover, Lower Test, and Rural Chalk Catchment sub-areas.

Nutrient Neutral Development

6.5.7 The water quality of rivers and coastal waters can be affected by excessive levels of nutrients. High levels of nitrogen and phosphorus in water environments can cause eutrophication, reducing available oxygen and harming aquatic insects, fish and wildlife as a whole. The nutrient inputs are largely from a combination of agricultural sources and from public and private wastewater systems.

6.5.8 The majority of the Test Valley area drains to the Solent Maritime Special Area of Conservation (SAC), Solent and Southampton Water Ramsar designation and Special Protection Area (SPA). It is important that new residential development and overnight accommodation is nutrient neutral and does not therefore lead to an increase in nitrogen loading which could lead to a significant adverse impact on these protected sites. Similarly, for the areas of Test Valley that drain into the River Avon SAC and the River Itchen SAC (for the wastewater element to Chickenhall Wastewater Treatment Works only), new development should not lead to an increase in phosphorus loading.

6.5.9 Some mitigation measures to achieve nutrient neutrality can also deliver further benefits in terms of managing surface water flooding. For example, mitigation of the increased nutrient load generated by new residential developments can potentially be achieved through the creation of new inception wetlands which strip nutrients from the wastewater, or natural buffer zones. Natural buffer zones increase the area of permeable surfaces, thereby increasing infiltration rates and reducing surface runoff. Reduced surface runoff reduces the probability of localised surface water flooding in urbanised areas, as well as the release of water during storm events into catchments. The creation of new wetlands can reduce the probability and severity of flooding downstream, by bolstering the water storage capacity of floodplains.

6.6 Surface water management

6.6.1 Development should be designed so that there is no increase in flood risk elsewhere and the development will be safe from surface water flooding. This must be the case during the 3.33% AEP and 1% AEP rainfall event including the relevant allowances for climate change (described in Part 1 Main Report Table 3-4) based on the lifetime of the development:

- For development with a lifetime beyond 2100, use the upper end allowances for the 2070s epoch.
- For development with a lifetime of between 2061 and 2100 use the central allowance for the 2070s epoch.
- For development with a lifetime up to 2060 use the central allowance for the 2050s epoch.

6.6.2 HCC will support only those developments which offer surface water management systems that ensure all runoff is restricted to greenfield runoff rates if the development area is in a greenfield site; or restricted to pre-existing runoff rates, with preference to greenfield runoff rates if reasonably practicable if the development area is in a brownfield site; all in accordance with best practice and industry standards (i.e., the SuDS Manual C753) for water quality and quantity.

6.6.3 The CMPs set out additional expectations for Romsey, Central Andover and West Andover. Where significant brownfield development is due to take place, HCC will make it best practice that a 50% betterment of surface water runoff rates is provided. Where significant greenfield development is proposed, HCC will make it best practice for LPAs to request hydraulic modelling of surface water exceedance flows. This will ensure developers are responsible for ensuring their developments do not flood on areas of previously undeveloped land and will help avoid surface water ponding of vulnerable areas during an exceedance event.

Sustainable Drainage Systems

6.6.4 Sustainable drainage systems (or SuDS) are designed to control surface water run off close to where it falls, combining a mixture of built and nature-based techniques to mimic natural drainage as closely as possible, and accounting for the predicted impacts of climate change.

6.6.5 Suitable surface water management measures should be incorporated into new development designs in order to reduce and manage surface water flood risk to, and posed by, the proposed development. This should ideally be achieved by incorporating Sustainable Drainage Systems (SuDS). Consideration of sustainable drainage systems early in the design process for development, including at the pre-application or master-planning stages, can lead to better integration, multi-functional benefits and reduced land-take.

6.6.6 SuDS are typically softer engineering solutions inspired by natural drainage processes such as ponds and swales which manage water as close to its source as possible. Wherever possible, a SuDS technique should seek to contribute to each of the four following goals:

- Reduce flood risk (to the site and neighbouring areas),
- Improve water quality,
- Provide biodiversity, wildlife benefits and,
- Provide amenity and landscape benefits.

6.6.7 Generally the aim should be to discharge surface water run-off as high up the following hierarchy of drainage options as reasonably practicable:

- Into the ground (infiltration),
- To a surface water body,
- To a surface water sewer, highway drain, or another drainage system, and,
- To a combined sewer.

6.6.8 SuDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e. natural watercourse or public sewer etc.). The SuDS Manual[32] identifies several processes that can be used to manage and control runoff from developed areas. Each option can provide opportunities for storm water control, flood risk management, water conservation and groundwater recharge. Refer to the non-technical standards[33] for guidance on the design, maintenance, and operation of SuDS.

6.6.9 The benefits of SuDS, both within new developments and retrofitted into existing development, were recognised in the River Anton Enhancement Strategy and are being considered in the proposal. They were recognised mainly for their water quality benefits here, however many of the characteristics of SuDS that lead to improved water quality also cause the flow of water to slow down, and hence they help to reduce flood risk.

6.6.10 HCC have outlined their stance towards SuDS in the Local Flood and Water Management Strategy (2020) document[34], which contains two policies specifically related to SuDS, namely that post development no greater volume of surface water leaves the site and/or no surface water leaves the site at a faster rate than occurred predevelopment, and that HCC will encourage LPAs to ensure that a formal adoption process and robust maintenance regime for SuDS is secured through the granting of the planning permission (e.g. Section 106 agreements where necessary). Although not a specific policy, the document also indicates that ideally all new developments, both major and minor, should utilise SuDS where applicable.

6.6.11 **Policy Recommendation:** Strengthen the surface water management policies for developments in the Andover and Romsey sub-areas given the high risk of surface water flooding and large number of flood-sensitive receptors in these sub-areas. As advocated by the CMPs, Test Valley BC are encouraged to

[32] CIRIA C697 SuDS Manual. Available from: https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS
[33] Sustainable drainage systems: non-statutory technical standards, 2015
https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[34] Hampshire County Council Local Flood and Water Management Strategy https://documents.hants.gov.uk/flood-water-management/local-flood-water-management-strategy.pdf

consider setting requirements in these sub-areas of a 50% betterment of surface water runoff rates for significant brownfield developments, and the provision of surface water exceedance flow generated by hydraulic modelling for significant greenfield developments.

Limiting urban creep

6.6.12 The CMPs set out that in residential parts of the priority areas, HCC will liaise with Test Valley BC to limit permitted development rights regarding the paving or covering of permeable surfaces with impermeable surfacing.

6.7 Flow routing

6.7.1 Redevelopment in areas at risk of flooding from surface water, river flooding or groundwater flooding has the potential to affect flood routing and increase flood risk elsewhere. For example redevelopment may give rise to backwater effects or divert floodwaters on to other properties.

6.7.2 Consideration should be given to configuring road and building layouts to preserve existing flow paths and improve flood routing, whilst ensuring that flows are not diverted towards other properties. Consideration should be given to the use of fences and landscaping walls so as to prevent causing obstruction to flow routes and increasing the risk of flooding to the site or neighbouring areas.

6.7.3 Opportunities should be sought within site design to make space for water, such as:

- Removing boundary walls or replacing with other boundary treatments such as hedges or fencing with gaps (for example post-and-rail or hit-and-miss).
- Considering alternatives to solid wooden gates or ensuring that there is a gap beneath the gates to allow the passage of floodwater.
- Create under-croft car parks or consider reducing ground floor footprint and creating an open area under the building to allow flood water storage.
- Where proposals entail floodable garages or outbuildings, consider designing a proportion of the external walls to be committed to free flow of floodwater.

6.7.4 **Policy Recommendation:** All new development should not adversely affect flood routing which could increase flood risk elsewhere. Opportunities should be sought within the site design to make space for water. Particular attention should be given to improving and preserving existing flow and flood paths within the Romsey, Andover, and the Dun and Test to Romsey sub-areas.

6.8 Groundwater Management Plan Action Plans

6.8.1 HCC has developed settlement specific Actions Plans for areas with the highest groundwater flood risk in Hampshire, including Appleshaw and the Bourne Rivulet villages within the Test Valley administrative area[35]. These Action Plans detail the measures that have been put in place since the floods of 2000/2001, as well as mitigation methods currently proposed and further measures required to reduce the risk in the future, which will be reviewed following consultation with and comments from local residents.

Appleshaw Action Plan

6.8.2 The measures that have already been put in place to reduce the risk of groundwater flooding in Appleshaw include:

- Improvements to the Environment Agency's Flood Warning Service,
- Preparation of a Foul Flooding Emergency Plan,
- Development of a Village Flood Plan,
- Creation of a Flood Action Group, and
- Repairs to leaking sewers.

[35] Hampshire County Council, 2013 Groundwater Management Plan. https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/groundwater-management-plan

6.8.3 Mitigation methods currently proposed to reduce groundwater flood risk include:

- Reviewing the maintenance and provision of the surface water drainage system and establishing a proactive maintenance schedule and flood incident reaction plan,
- Reviewing the need to install a pumping system to reduce groundwater cellar flooding in individual properties,
- Signing up to Parish Lengthsman initiative 2014-15, and
- Information gathering.

6.8.4 Further measures required to reduce risk include:

- Scoping out where viable increases in capacity of surface water ditches and the size of culverts,
- Routine inspection of surface water channels, drainage pathways culverts etc. to check for blockage and clear as necessary,
- Establishing and formalising a proactive maintenance response schedule in response to high groundwater levels,
- Ensuring that residents are aware of the risk of flooding and are registered with the Environment Agency flood alert service,
- Ensuring that residents are aware of advice on how to protect themselves and their property during flooding,
- Encouraging individuals to create a bespoke flood action plan, and
- Keeping accurate records of flood events as they occur.

Bourne Rivulet Villages Action Plan

6.8.5 The measures have already been put in place to reduce the groundwater flood risk of the Bourne Rivulet Villages include:

- Improvements to the Environment Agency's Flood Warning Service,
- Development of the St Mary Bourne Infiltration Reduction Plan,
- Development of the St Mary Bourne Foul Flooding Emergency Plan, and
- Inspection of flows in the St Mary Bourne wastewater system.
- Development of the Vernham Dean Emergency Plan.
- Establishment of Flood Action Groups in Vernham Dean and Hurstbourne Tarrant.

6.8.6 Mitigation methods currently proposed to reduce groundwater flood risk include:

- Reviewing the maintenance and provision of the surface water drainage system and establishing proactive maintenance schedule and flood incident reaction plan,
- Reviewing the need to install a pumping system to reduce groundwater cellar flooding in individual properties,
- Signing up to Parish Lengthsman initiative 2014-15, and,
- Information gathering.

6.8.7 Further measures required to reduce risk include:

- Continuation of work on developing and implementing the Infiltration Reduction Plan for St Mary Bourne,
- Routine inspection of surface water channels, drainage pathways culverts etc. to check for blockage and clear as necessary,
- Establishing and formalising a proactive maintenance response schedule in response to high groundwater levels,

- Creation of Village Flood Plans, ensuring communication between the two parish councils for the villages,
- Creation of Flood Action Groups, ensuring communication between the two parish councils for the villages,
- Ensuring that residents are aware of the risk of flooding and are registered with the Environment Agency flood alert service,
- Ensuring that residents are aware of advice on how to protect themselves and their property during flooding,
- Encouraging individuals to create a bespoke flood action plan, and,
- Keeping accurate records of flood events as they occur.

6.9 Risk of groundwater flooding

6.9.1 **Policy Recommendation:** New development should not result in an increased risk of groundwater flooding elsewhere. Where development is proposed that involves significant works below ground and/or changes in drainage, further assessment (for example through a Hydrogeological Risk Assessment (HRA)) may be required to determine the potential impact on groundwater and identify proposed mitigation measures.

6.9.2 The geology underlying Test Valley creates pathways for groundwater to flow through the subsurface and the potential for groundwater flooding to occur, which is exacerbated when water levels in the watercourses are elevated. Additional subsurface development or additional infiltration has the potential to modify groundwater flows, leading to potential flooding elsewhere and/or impacting on groundwater abstractions downstream.

6.9.3 In areas at risk of groundwater flooding, development proposals should be assessed to identify:

i. the depth and geometry of the penetration of works into the sub-surface from the construction of the proposed development (for example piled foundations, basements, excavation for services). These features can disrupt groundwater flow, alter groundwater levels, and therefore increase the risk of groundwater flooding at or around the site.

ii. any changes in drainage, for example impermeable surfaces or infiltration/SuDS systems which could alter groundwater flow patterns and the elevation of the water table.

6.9.4 If the assessment identifies works below ground and/or changes in drainage a Hydrogeological Risk Assessment (HRA) (sometimes called a Basement Impact Assessment) may be required. The scope and detail required for the HRA will vary depending on the scale of sub-surface construction proposed and the local geological and hydrogeological conditions.

6.9.5 The HRA should be used to determine the geological and hydrogeological setting and whether sub-surface development will reach the water table. The water table will move up and down depending on rainfall; the assessment should consider the highest level. If the development does extend down to the water table, it may disrupt groundwater flow in the aquifer by creating a barrier and increase the risk of flooding. The HRA should identify the impact and any required mitigation measures.

6.9.6 In some settings there may be an aquifer at depth and, depending on the proposed depth of the development, this may also have to be assessed. A site specific ground investigation (GI) with trial pits and boreholes should be obtained to inform the HRA if there is uncertainty over the geological or hydrogeological conditions at any proposed development site.

6.9.7 The HRA should also identify changes in drainage as these may create additional inflows to ground which can also exacerbate groundwater flood risk.

6.10 Consulting Water Companies

6.10.1 Southern Water are responsible for maintaining surface, foul and combined public sewers to ensure effective drainage of the area. If flows are proposed to enter public sewers, as part of their pre-application service, Southern Water will assess whether the public system has the capacity to accept the flows or provide a solution that identifies necessary mitigation if not.

6.10.2 As summarised in Section 2.4, there is a pressing need to reduce the volume of rainwater entering the sewer system, to enable capacity for wastewater processing and reduce discharges from storm overflows.

6.10.3 **Recommendation:** As part of their site allocation process, Test Valley BC should consult with Southern Water to determine any areas with sewer capacity issues. New development provides an opportunity to reduce the causes and impacts of flooding associated with sewer systems and local surface water runoff.

6.11 Emergency planning

6.11.1 Emergency planning can help manage flood related incidents. In the UK, emergency planning is performed under the direction of the 2004 Civil Contingencies Act (CCA), and seeks to prevent, or if not mitigate, the risk to life, property, business, infrastructure, and the environment.

6.11.2 Flood risk emergency planning involves developing and maintaining arrangements to reduce, control or mitigate the impact and consequences of flooding and to improve the ability of people and property to absorb, respond to and recover from flooding. In development planning, a number of these activities are already integrated in national building control and planning policies e.g. the NPPF.

6.11.3 Safety is a key consideration for any new development and includes the likely impacts of climate change and, where there is a residual risk of flooding, the availability of adequate flood warning systems for the development, safe access and egress routes and evacuation procedures. It is a requirement under the NPPF that a flood warning and evacuation plan is prepared for sites at risk of flooding.

6.11.4 The following existing plans and arrangements for managing flood emergencies are relevant to the Test Valley BC administrative area.

Test Valley Emergency Response Plan

6.11.5 Test Valley BC have prepared an Emergency Response Plan[36] which sets out the principles of an effective emergency response and provides a plan to enable the Council to respond to a wide range of emergencies, including a flood event.

6.11.6 Further flood advice can be found on Test Valley BC[37] and HCC[38] websites.

6.11.7 **Recommendation:** Test Valley BC should take account of this updated SFRA in future reviews of their emergency plan.

Emergency planning considerations for reservoirs

6.11.8 Test Valley BC will need to evaluate the potential damage to buildings or loss of life in the event of dam failure, compared to other risks, when considering development downstream of a reservoir. Test Valley BC is also advised to consult with the owners/operators of raised reservoirs, to establish constraints upon safe development.

6.11.9 Test Valley BC should also consider any implications for reservoir safety and reservoir owners and operators caused by new development located downstream of a reservoir, such as the cost of measures to improve the design of the dam to reduce flood risk, the operation of the reservoir, and general maintenance costs, by consulting with reservoir owners and operators on plan and development proposals. Local authorities, as category 1 responders, can access more information about reservoir risk and reservoir owners using the Resilience Direct system. Developers should be expected to cover any additional costs incurred, as required by the National Planning Policy Framework's 'agent of

[36] Test Valley Borough Council, 2018, Emergency Response Plan https://www.testvalley.gov.uk/aboutyourcouncil/emergencyplanning/test-valley-borough-council-emergency-response-pla
[37] Test Valley BC Emergency Planning Webpage https://www.testvalley.gov.uk/aboutyourcouncil/emergencyplanning
[38] Hampshire County Council Flooding Advice https://www.hants.gov.uk/community/emergencyplanning/whattoplanfor/floodingadvice

change' policy (paragraph 187). This could be through Community Infrastructure Levy or section 106 obligations for example.

7. Recommendations of how to address flood risk in development

*When allocating sites for development, LPAs must apply the Sequential Test to **avoid** flood risk and steer development towards those areas at least risk of flooding. The process for applying the Sequential Test is described in Part 1 Section 4.*

*Following the application of the Sequential Test, it may not always be possible to **avoid** locating development in areas at risk of flooding. This section builds on the findings of the SFRA to provide guidance on the range of measures that could be considered on individual development sites in order to **mitigate** and **manage** the risk of flooding. These measures should be considered when preparing a site-specific FRA. This section outlines the approach that Test Valley BC should consider in relation to flood risk planning policy and development management decisions.*

7.1 Sequential approach

7.1.1 **Policy Recommendation:** Apply a sequential approach to site planning.

7.1.2 Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. Most large development proposals include a variety of land uses of varying vulnerability to flooding. The sequential approach should be applied within development sites to locate the most vulnerable elements of a development in the lowest risk areas (considering all sources of flooding) e.g. residential elements should be restricted to areas at lower probability of flooding whereas parking, open space or proposed landscaped areas can be placed on lower ground with a higher probability of flooding.

7.2 Appropriate types of development

7.2.1 **Policy Recommendation:** Location of development must take into account the vulnerability of users.

7.2.2 Table 4-2 in SFRA Report Part 1 (reproduced from PPG Table 2) provides a compatibility matrix and determines which types of development are appropriate in areas of flood risk[39].

7.3 Flood resilience measures

7.3.1 **Policy Recommendation:** Where development or redevelopment is proposed in areas at risk of flooding, flood resilience measures should be implemented.

7.3.2 'Property Flood Resilience' is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice[40], which provides advice for both new-build and retrofit. It includes specific guidance for local authority planners.

7.3.3 Resistance and recovery measures are unlikely to be suitable as the only mitigation measure to manage flood risk, but they may be suitable in some circumstances, such as:

- Water Compatible and Less Vulnerable uses where temporary disruption is acceptable and the development remains safe.
- Where the use of an existing building is to be changed and it can be demonstrated that the avoidance measures are not practicable, and the development remains safe.

[39] Planning Practice Guidance Flood Risk and Coastal Change Table 2 https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2
[40] Kelly, D, Barker, M, Lamond, J, McKeown, S, Blundell, E and Suttie, E (2020) Guidance on the code of practice for property flood resilience, C790B, CIRIA, London (ISBN: 978-0-86017-895-8) https://www.ciria.org/CIRIA/Resources/Free_publications/CoP_for_PFR_resource.aspx

- As a measure to manage residual flood risk from flood risk management infrastructure when avoidance measures have been exhausted.

7.3.4 Flood resistance and recovery measures cannot be used to justify development in inappropriate locations.

7.3.5 Where historic buildings are involved, early consultation with Historic England should be undertaken and their guide[41] on flood resilience for historic properties provides additional information.

Flood Resistance 'Water Exclusion Strategy'

7.3.6 Flood resistant construction can prevent entry of water or minimise the amount that may enter a building where there is short duration flooding with water depth up to approximately 0.6 metres, depending on the building's characteristics. Where measures to exclude water in this way are proposed above this level, advice should be sought from a suitably qualified building surveyor, architect or structural engineer.

7.3.7 There is a range of flood resistance and resilience construction techniques that can be implemented in new developments to mitigate potential flood damage. Flood resistance measures, or dry-proofing, stops water entering a building up to a safe structural limit. Resistance measures can be passive, such as flood doors which are normally closed; or active, such as air brick covers or removable flood barriers. Passive measures are to be prioritised over active measures.

7.3.8 This form of construction needs to be used with caution and accompanied by measures that will speed-up flood recovery, as effective flood resistance can be difficult to achieve. Hydrostatic pressures exerted by floodwater can cause long-term structural damage, undermine the foundations of a building or cause leakage through the walls, floor or sub-floor, unless the building is specifically designed to withstand such stresses. In addition, temporary and demountable defences are not appropriate for new-build developments.

7.3.9 There is a range of property flood protection devices available on the market, designed specifically to resist the passage of floodwater. These include removable flood barriers and gates designed to fit openings, vent covers and stoppers designed to fit WCs. These measures can be appropriate for preventing water entry associated with fluvial flooding as well as surface water and sewer flooding. The efficacy of such devices relies on their being deployed before a flood event occurs. It should also be borne in mind that devices such as air vent covers, if left in place by occupants as a precautionary measure, may compromise safe ventilation of the building in accordance with Building Regulations.

Flood Recovery 'Water Entry Strategy'

7.3.10 Flood recoverability measures (or wet-proofing), accept that water will enter the building, but through careful design and changes to the construction will minimise damage and allow faster cleaning, drying, repairing and re-occupancy of the building after a flood. Measures are preferably passive, such as the use of resilient building materials, or active such as moving sensitive equipment or belongings to upper floors when flooding is expected.

7.3.11 Materials should be used which allow the passage of water whilst retaining their structural integrity and they should also have good drying and cleaning properties. Alternatively sacrificial materials can be included for internal and external finishes; for example the use of gypsum plasterboard which can be removed and replaced following a flood event. Flood resilient fittings should be used to at least 0.1m above the design flood level. Recovery measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.

7.3.12 A variety of flood recovery tools can be implemented, such as:

- Using materials with either, good drying and cleaning properties or, sacrificial materials that can easily be replaced post-flood.
- Design for water to drain away after flooding.

[41] Historic England, April 2015, Flooding and Historic Buildings. https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/

- Design access to all spaces to permit drying and cleaning.
- Raise the level of electrical wiring, appliances and utility metres.

7.3.13 Structures such as (bus, bike) shelters, park benches and refuse bins (and associated storage areas) located in areas with a high flood risk should be flood resilient and be firmly attached to the ground and designed in such a way as to prevent entrainment of debris which in turn could increase flood risk and/or breakaway posing a danger to life during high flows.

7.4 Finished floor levels

7.4.1 **Policy Recommendation:** More Vulnerable and Highly Vulnerable development within Flood Zones 2 and 3 should set Finished Floor Levels above the 1 in 100 annual probability (1% AEP) river flood level including an appropriate allowance for climate change and freeboard.

7.4.2 Where developing in Flood Zone 2 and 3 is unavoidable, the recommended method of mitigating flood risk to people, particularly with More Vulnerable (residential) and Highly Vulnerable development types (as outlined in Table 2 of the PPG), is to ensure internal floor levels are raised a freeboard level above the design flood level including an appropriate allowance for climate change. For fluvial flooding and surface water flooding, the design flood is the 1% AEP (1 in 100 year) event. Less Vulnerable development should also aim to raise floor levels. Where this is not achievable, flood resilience measures should be incorporated to make up the shortfall. These measures should be detailed within the FRA.

7.4.1 Guidance document “Accounting for residual uncertainty: an update to the fluvial freeboard guide – technical report”[42] explains how to determine the appropriate residual uncertainty allowances. The process involves identifying sources of uncertainty in the datasets upon which the assessment is based, estimating the magnitude of residual uncertainties, and determining the appropriate response. Section 3.2 focuses on applying the process for development planning. The resulting residual uncertainty allowances range from 300mm to 900mm. The majority of developments should use this guidance document to determine freeboard, the only exceptions to this being minor developments that fall under the standing advice for flood risk.

7.4.2 With reference to the ‘Flood risk assessment: standing advice for flood risk’[43], finished floor levels should be a minimum of whichever is higher, 300mm above the general ground level of the site or 600mm above the estimated river or sea flood level.

7.4.3 In certain situations (e.g. for proposed extensions to buildings with a lower floor level or conversion of existing historical structures with limited existing ceiling levels), it could prove impractical to raise the internal ground floor levels to sufficiently meet the general requirements. In these cases, the Environment Agency and/or Test Valley BC should be approached to discuss options for a reduction in the minimum internal ground floor levels provided flood resistance measures are implemented up to an agreed level.

7.4.4 There are also circumstances where flood resilience measures should be considered first. For both Less and More Vulnerable developments where internal access to higher floors is required, the associated plans showing the access routes and floor levels should be included within any site-specific FRA.

7.5 Protection against groundwater flooding

7.5.1 Although many of the measures used to provide resistance and resilience to surface water and fluvial flooding are also suited to groundwater flooding, many traditional methods of flood protection, such as sandbags, may not be effective against flooding from groundwater. This is because water can come up through the floor and remain for a long time.

[42] Accounting for residual uncertainty: an update to the fluvial freeboard guide https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/accounting-for-residual-uncertainty-an-update-to-the-fluvial-freeboard-guide?web=1&wdLOR=c7DCE6B52-35F0-469F-843D-3238FA827B79
[43] Preparing a flood risk assessment: standing advice https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

7.5.2 There are differences in impacts related to the long duration of groundwater flooding (weeks compared with days). These include potential structural impacts on foundations and impacts on sub surface drainage (both main sewer systems and local systems such as cess pits and soakaways).

7.5.3 Whilst the duration of groundwater flooding is problematic, as it generally takes some time to build up, there is generally a greater length of time to move valuable items or undertake a planned "evacuation".

7.5.4 *Resistance* measures are intended to limit entry of water to the building. Those that may be effective in a building include:

- Installing waterproof floors and sealing walls (including making good pointing, rendering etc.),
- Sealing (tanking) basements and using sump pumps for clearance if water ingress cannot be prevented,
- Covering susceptible ingress points such as airbricks (e.g. flood proof airbricks are available) and sealing weep holes,
- Installing one-way valves, toilet plugs and pipe bungs may prevent the entry of water from flooded sewers, and,
- 'Sump and pump' – the use of a drain around a property to intercept rising groundwater and direct it to a sump, from where it is pumped to disposal.

7.5.5 *Resilience* involves modifying the interior of a building, for example by using materials that are less prone to damage by floodwater and / or dry quickly so that the post-flooding clean-up will be easier, cheaper, and quicker. Any surface water / fluvial resilience measure will be equally suitable for groundwater flooding. Typical measures include:

- Mounting electrical sockets, fittings, and equipment at high level above expected flood water,
- Using solid or tile floors rather than fitted carpets,
- Having readily demountable equipment (such as TVs etc.) that can be moved to a safe location,
- Raising less easily demountable portable equipment (e.g., kitchen fittings) to high level, and,
- Using plaster and other building materials that are more resilient to long periods under damp conditions.

7.5.6 The Environment Agency provides advice on preparing properties for flooding in the following publications:

- Homeowners Guide to Flood Risk[44] – lists various measures that are applicable to flooding in general, and,
- Flooding from groundwater[45] - Practical advice to help homeowners reduce the impact of flooding specifically from groundwater.

7.6 Access / escape

7.6.1 **Policy recommendation:** New development must have safe access / escape during design flood conditions including an allowance for climate change.

7.6.2 For developments located in areas at risk of fluvial flooding safe access / escape must be provided for new development as follows in order of preference:

- Safe dry route for people and vehicles.
- Safe dry route for people.

[44] Homeowners guide to flood resilience. Know Your Flood Risk, July 2018. https://www.floodguidance.co.uk/wp-content/uploads/2018/07/KnowYourFloodRiskGuide_July18.pdf
[45] Environment Agency, 2011, Flooding from groundwater. https://www.gov.uk/government/publications/flooding-from-groundwater

- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause risk to people.
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles. However the public should not drive vehicles in floodwater.

7.6.3 Where access and escape are important to the overall safety of development in areas of flood risk, the local planning authority should consult with emergency planning staff and, where appropriate with the emergency services, unless local standards or guidelines have been put in place in lieu of consultation.

7.6.4 A safe access/escape route should allow occupants to safely enter and exit the buildings and be able to reach land outside the flooded area (e.g. within Flood Zone 1) using public rights of way without the intervention of emergency services or others during design flood conditions, including climate change allowances (i.e. 1% AEP fluvial flood event and surface water event including an appropriate climate change allowance). Where a dry route is not possible the FRA should provide an assessment of the flood hazard rating along the route and demonstrate that the route is a low hazard (as defined in the FD2320 Flood risk to people calculator[52]).

7.6.5 In exceptional circumstances, safe access above the 1% annual probability (1 in 100 year) flood level for river flooding and surface water flooding including climate change may not be achievable. In these circumstances the Environment Agency and the LPA should be consulted to determine whether the safety of the site occupants can be satisfactorily managed. This will be informed by the type of development, the number of occupants and their vulnerability and the flood hazard along the proposed egress route. For example, this may entail the designation of a safe place of refuge on an upper floor of a building, from which the occupants can be rescued by emergency services. It should be noted that sole reliance on a safe place of refuge is a last resort, and all other possible means to evacuate the site should be considered first. Provision of a safe place of refuge will not guarantee that an application will be granted.

7.6.6 The guidance document ‘Flood Risk Emergency Plans for New Development’ published by the Environment Agency and ADEPT[53] provides more detail on safe access and escape.

7.7 Emergency plans

7.7.1 **Evacuation** is where flood alerts and warnings provided by the Environment Agency enable timely actions by residents or occupants to allow them to get to safety unaided, i.e. without the deployment of trained personnel to help people from their homes, businesses, and other premises. **Rescue** by the emergency services is likely to be required where flooding has occurred and prior evacuation has not been possible.

7.7.2 For all developments (excluding minor developments and change of use) proposed in Flood Zone 2 or 3, an Emergency Plan should be prepared to demonstrate what actions site users will take before, during and after a flood event to ensure their safety, and to demonstrate that their development will not impact on the ability of the local authority and the emergency services to safeguard the current population.

7.7.3 For sites in Flood Zone 1 that are located on ‘dry islands’, it may also be necessary to prepare an Emergency Plan to determine potential egress routes away from the site through areas that may be at risk of flooding during the 1% annual probability (1 in 100 year) flood event including an allowance for climate change.

7.7.4 The Environment Agency has a tool on their website to create a Personal Flood Plan[54]. The Plan comprises a checklist of things to do before, during and after a flood and a place to record important contact details. Where proposed development comprises non-residential extension <250m^2 and

[52] Defra Environment Agency Flood and Coastal Defence R&D Programme, 2004, https://assets.publishing.service.gov.uk/media/602a9348e90e070559970f9d/Operations_and_Maintenance_Concerted_Action_Report_pdf.pdf
[53] ADEPT, Environment Agency, September 2019, Flood Risk Emergency Plans for New Development https://www.adeptnet.org.uk/floodriskemergencyplan
[54] Environment Agency Tool ‘Make a Flood Plan’. https://www.gov.uk/government/publications/personal-flood-plan

householder development (minor development), it is recommended that the use of this tool to create a Personal Flood Plan will be appropriate.

7.7.5 Emergency Plans should include:

- How flood warning is to be provided, such as:
  - Availability of existing flood warning systems,
  - Where available, rate of onset of flooding and available flood warning time, and,
  - How flood warning is given.
- What will be done to protect the development and contents, such as:
  - How easily damaged items (including parked cars) or valuable items (important documents) will be relocated,
  - How services can be switched off (gas, electricity, water supplies),
  - The use of flood protection products (e.g. flood boards, airbrick covers),
  - The availability of staff/occupants/users to respond to a flood warning, including preparing for evacuation, deploying flood barriers across doors etc., and,
  - The time taken to respond to a flood warning.
- Ensuring safe occupancy and access to and from the development, such as:
  - Occupant awareness of the likely frequency and duration of flood events, and the potential need to evacuate,
  - Safe access route to and from the development,
  - If necessary, the ability to maintain key services during an event,
  - Vulnerability of occupants, and whether rescue by emergency services will be necessary and feasible, and,
  - Expected time taken to re-establish normal use following a flood event (clean-up times, time to re-establish services etc.).

7.7.6 There is no statutory requirement for the Environment Agency or the emergency services to approve emergency plans. Test Valley BC is accountable via planning condition or agreement to ensure that plans are suitable. Should there be an expectation that development will be coming forward in flood risk areas with implications on emergency planning, Test Valley BC should consider working with their emergency planning officers to produce local guidelines setting out requirements for flood warning, evacuation and places of safety, against which individual planning applications can then be judged. These should avoid additional burdens on emergency services, explore opportunities for development proposals to address any shortfall in emergency service and infrastructure capacity, and minimise the need for further consultation at planning application stage.

7.8 Local Design Codes

Recommendation: It is recommended that Test Valley BC incorporate expectations for future development with respect to flood risk into any emerging local design codes. The local design code would need to accord with the National Model Design Code[55] (parts 1 and 2) requirements on water and drainage and follow the approach to flood risk management set out in PPG paragraphs 003 and 004 (Assess, Avoid, Control, Mitigate, Manage), ensuring all development will be appropriately flood resistant and resilient, with reference to the CIRIA Property Flood Resilience Code of Practice. The local design code should be prepared with input from the Environment Agency and the LLFA Hampshire County Council.

[55] https://www.gov.uk/government/publications/national-model-design-code

8. Next Steps

8.1 Next steps

8.1.1 Text Valley BC should use this SFRA and associated mapping to:

- Develop their Local Plan and associated strategic policies,
- Safeguard land for flood risk management and green infrastructure,
- Carry out the sequential test for potential allocation sites,
- Carry out the sequential test for individual planning applications,
- Make decisions about individual planning applications,
- Decide whether a development can be made safe without increasing flood risk elsewhere,
- Identify the need for local design guidance or codes,
- Aid discussions with emergency planning teams.

8.1.2 Where development must be allocated in areas at risk of flooding further assessment of the risk of flooding may be required, for example through the preparation of a Level 2 SFRA.

8.2 Future monitoring and update

8.2.1 This SFRA should be reviewed when there are changes to:

- The predicted impacts of climate change on flood risk,
- Detailed flood modelling - such as from the Environment Agency or Lead Local Flood Authority. **The Environment Agency have hydraulic modelling of the River Test and the Monks Brook in their programme of work for the next few years. Outputs from this modelling should be included in future updates of the SFRA.**
- Local Plans, spatial development strategies or relevant local development documents,
- Local flood management schemes,
- Flood Risk Management Plans,
- Shoreline Management Plans,
- Local Flood Risk Management Strategies, and,
- National planning policy or guidance.

8.2.2 The SFRA may also need to be reviewed after a significant flood event.

Appendix A Figures

1 Flood Zones

2 Recorded Flood Outlines

3 Risk of Flooding from Surface Water

4 Areas Susceptible to Groundwater Flooding

5 BGS Susceptibility to Groundwater Flooding

6 Risk of Flooding from Reservoirs

7 Potential for Cumulative Impact of Development on Flood Risk

8 Opportunities to Reduce the Causes and Impacts of Flooding

9 Flood Warning Areas

10 Flood Risk Management Policies

11 GIS Floodplain Analysis

12 Modelled Flood Extents including Effects of Climate Change

Appendix B Coastal Modelling Figures

1 Coastal Erosion Risk

2 Future Coastal Flood Zones

Maximum Flood Depth Figures

Defended

3 Maximum Flood Depth: Defended 1 in 200 Year (0.5% AEP) 2022

4 Maximum Flood Depth: Defended 1 in 200 Year (0.5% AEP) 2055 (Higher Central)

5 Maximum Flood Depth: Defended 1 in 200 Year (0.5% AEP) 2122 (Higher Central)

6 Maximum Flood Depth: Defended 1 in 200 Year (0.5% AEP) 2122 (Upper End)

7 Maximum Flood Depth: Defended 1 in 1000 Year (0.1% AEP) 2122 (Upper End)

Undefended

8 Maximum Flood Depth: Undefended 1 in 200 Year (0.5% AEP) 2122 (Upper End)

9 Maximum Flood Depth: Undefended 1 in 1000 Year (0.1% AEP) 2122 (Upper End)

Maximum Flood Hazard Figures

Defended

10 Maximum Flood Hazard: Defended 1 in 200 Year (0.5% AEP) 2022

11 Maximum Flood Hazard: Defended 1 in 200 Year (0.5% AEP) 2055 (Higher Central)

12 Maximum Flood Hazard: Defended 1 in 200 Year (0.5% AEP) 2122 (Higher Central)

13 Maximum Flood Hazard: Defended 1 in 200 Year (0.5% AEP) 2122 (Upper End)

14 Maximum Flood Hazard: Defended 1 in 1000 Year (0.1% AEP) 2122 (Upper End)

Undefended

15 Maximum Flood Hazard: Undefended 1 in 200 Year (0.5% AEP) 2122 (Upper End)

16 Maximum Flood Hazard: Undefended 1 in 1000 Year (0.1% AEP) 2122 (Upper End)

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