Partnership for South Hampshire Level 1 Strategic Flood Risk Assessment

PART 8 – Eastleigh Borough Council

Final Report (Version 2)

Project number: 60653132

November 2023

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
Phoebe Ruddock Graduate Engineer	Sarah Littlewood Principal Consultant	Sarah Kelly Regional Director	Sarah Littlewood Principal Consultant
Megan Beadle Graduate Engineer			
Tamara Provencher Consultant			

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	June 2023	Version 1: Draft for review by Eastleigh BC, Coastal Partners, and Environment Agency.	SK	Sarah Kelly	Regional Director
2	November 2023	Version 2: Updated following stakeholder comments.	EC	Emily Craven	Associate Director

Prepared for:

Portsmouth City Council on behalf of Eastleigh Borough Council

Prepared by:

AECOM Limited
Midpoint, Alencon Link
Basingstoke
Hampshire RG21 7PP
United Kingdom

T: +44(0)1256 310200
aecom.com

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
DWMP	Drainage and wastewater management plan
FCERM	Flood and coastal erosion risk management
FRA	Flood Risk Assessment
FSA	Flood storage area
GWMP	Groundwater management plan
LFRMS	Local flood risk management strategy
LLFA	Lead local flood authority
LPA	Local planning authority
NPPF	National planning policy framework
PFRA	Preliminary Flood Risk Assessment
PfSH	Partnership for South Hampshire
PPG	Planning practice guidance
SFRA	Strategic flood risk assessment
SMP	Shoreline management plan
SOP	Standard of protection
SuDS	Sustainable Drainage Systems
SWMP	Surface water management plan
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 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 Eastleigh Borough Council (BC).

1.1.3 Recommendations are made throughout this report for Eastleigh BC to consider when developing their Local Plan, drafting strategic polices, and establishing requirements for development management.

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 BOROUGH PART 3 WINCHESTER CITY PART 4 HAVANT BOROUGH PART 5 PORTSMOUTH CITY PART 6 GOSPORT BOROUGH 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 Assessing sources of flood risk and expected effects of climate change 4 Assessing the cumulative impact 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 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 Eastleigh BC.

2.1 Shoreline Management Plans

2.1.1 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. This area is covered by the North Solent SMP[1] (which extends from Selsey Bill (Chichester) to Hurst Spit (New Forest)), for which a review is currently underway. The policies for the Eastleigh BC administrative area are summarised in Table 2-1 and the policy units are shown in Appendix A Figure 10.

Table 2-1 North Solent SMP Policies

Policy Unit	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)
5C04	Bursledon Bridge to Curbridge to Botley to Satchell Marshes	No Active Intervention in the short, medium, and long term.
5C05	Satchell Marshes to Hamble Common Point	No Active Intervention in the short, medium, and long term. But Hold The Line for The Quay and Rope Walk in short, medium, and long term.
5C06	Hamble Common Point to Hamble Oil Terminal	No Active Intervention in the short, medium, and long term.
5C07	Hamble Oil Terminal to Ensign Industrial Park	Hold The Line in the short, medium, and long term.
5C08	Ensign Industrial Park to Cliff House	No Active Intervention in the short, medium, and long term.
5C09	Cliff House to Netley Castle	Hold The Line in the short and medium term (medium subject to further detailed studies of management of site), with No Active Intervention in the long term (but HTL for Netley Village).
5C10	Netley Castle to Weston Point	Hold The Line in the short, medium, and long term.

River Itchen to Hamble Coastal Study

2.1.2 The River Itchen, Weston Shore, Netley and Hamble Coastal Study[2] was completed in November 2011 with a focus on coastal erosion and flood risk. The study area includes the east bank of the River Itchen as far upstream as Woodmill Lane Bridge, the Weston, Netley and Hamble-le-Rice section, and both banks of the River Hamble as far upstream as the Bursledon Railway Bridge. It consists of 16 Policy Units, two along the eastern side of the River Itchen, six along Southampton Water and eight along the River Hamble.

2.1.3 Initially the project was designed to deliver a formal Coastal Defence Strategy (CDS), however due to the minimal need in the study area for schemes for either coastal erosion or flood defence it was not considered appropriate to take this study forward to a formal Coastal Defence or Coastal Flood and Erosion Risk Management Strategy.

2.1.4 The study provided technical input to the North Solent Shoreline Management Plan (2010) and will provide technical support for any future coastal projects and schemes.

[1] North Solent Shoreline Management Plan, 2010 https://www.northsolentsmp.co.uk/
[2] River Itchen, Weston Shore, Netley and Hamble Coastal Study, Mouchel, November 2011 https://www.southampton.gov.uk/environmental-issues/flood-risk-management/strategies-plans-studies/river-itchen-hamble-coastal-study/

2.2 Catchment Flood Management Plans

2.2.1 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).

2.2.2 The Eastleigh BC administrative area is covered by the Test and Itchen CFMP[3] and the South East Hampshire CFMP[4]. The policies for the sub-areas within Eastleigh are summarised in Table 2-2 and Table 2-3 and Figure 2-1 and Figure 2-2.

Table 2-2 Test and Itchen CFMP Policies

Sub-area & Preferred Policy	Summary of proposed actions
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.
Lower Itchen 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	Investigate opportunities to protect or improve the condition of the River Itchen SSSI/SAC. Work with local planning authorities to ensure that urban development does not increase flood risk. Implement the River Itchen 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. Seek partnership opportunities in connection with new development in the short to medium-term and consider options for redevelopment of more open river corridors such as the Lower Itchen restoration study.

Map of the policies in the Test and Itchen catchment.

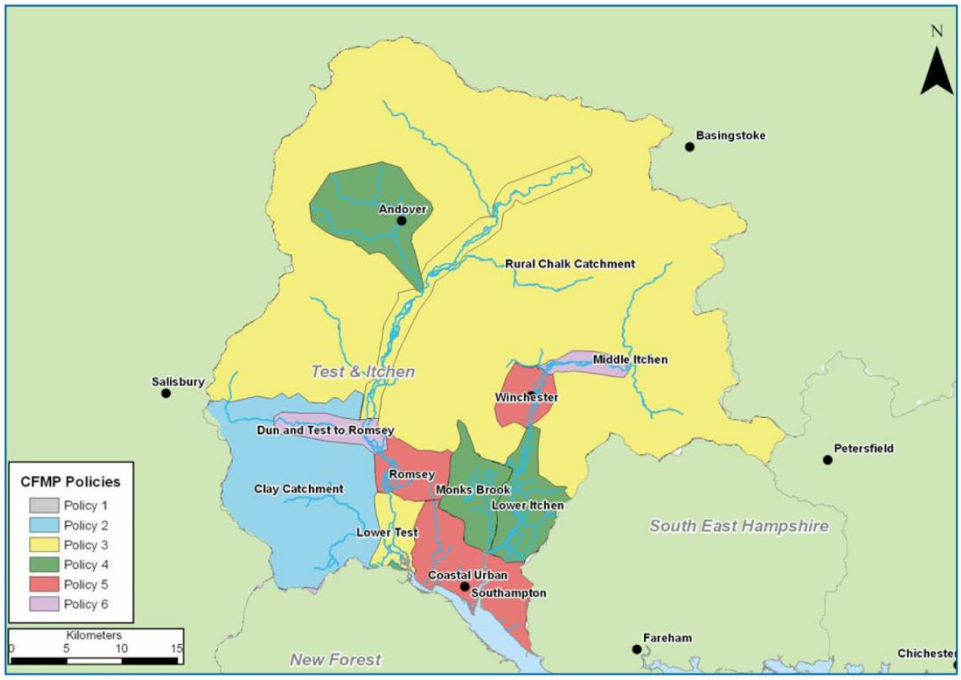

Figure 2-1 Map of the policies in Test and Itchen catchment, CFMP 2009

[3] 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
[4] Environment Agency, December 2009, South East Hampshire Catchment Flood Management Plan, Summary Report https://www.gov.uk/government/publications/south-east-hampshire-catchment-flood-management-plan

Table 2-3 South East Hampshire CFMP Policies

Sub-area & Preferred Policy	Summary of proposed actions
Hamble 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.	Surface water flooding will worsen with increased rainfall and more intense storms in the future. Mitigation measures against surface water flooding are required to reduce the flood risk to properties, including ensuring that drainage pathways are not blocked. New developments are expected to manage drainage so that there is no net increase in flood risk. Improve data mapping information and understanding of flood risk by undertaking S105 modelling, concentrating on Hedge End and Whiteley.
Lower Hamble and Lower Meon 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.	The sub-area has an environmentally important site which requires periodic controlled flooding and is subject to a water level management plan. Implement the Titchfield Haven Water Level Management Plan (WLMP) to meet the needs of flood risk management and the enhancement of wetland habitat. Undertake a pre-feasibility study to investigate maximising flood storage and habitat creation potential.

Map of the policies in the South East Hampshire catchment.

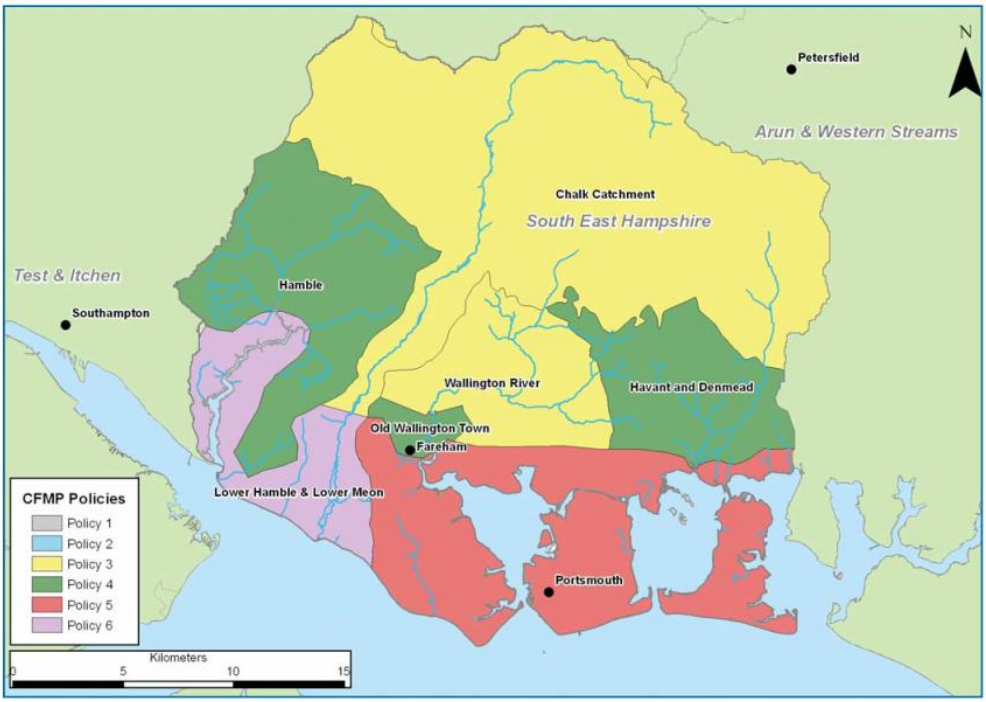

Figure 2-2 Map of the policies in South East Hampshire catchment, CFMP 2009

2.3 Lead Local Flood Authority

2.3.1 Hampshire County Council (HCC) are the Lead Local Flood Authority (LLFA) for the Eastleigh 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
- Surface Water Management Plan
- Groundwater Management Plan
- Local Flood Risk Management Strategy
- Catchment Plans

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[5] 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, however none are located within the Eastleigh Borough. More detailed assessments will be carried out in the areas identified, 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 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, HCC are required to develop a Local Flood Risk Management Strategy (LFRMS)[9] for the area. The priority of the council 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[10] 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.

Groundwater Management Plan

2.3.8 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

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

Groundwater Management Plan (GWMP)[11] for Hampshire has therefore been prepared in partnership with several 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.

2.3.9 No areas within the Eastleigh BC administrative area were identified as being at high risk from groundwater flooding in the GWMP.

Catchment Management Plans

2.3.10 Following the approach set out in the LFRMS, HCC have developed Catchment Management Plans (CMP) for 18 catchments that cover Hampshire[12]. 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.

2.3.11 The CMPs of relevance to Eastleigh BC and the priority areas identified in each are:

- CMP4 Itchen – priority areas Eastleigh East and West End,
- CMP8 Hamble – priority areas Hedge End and Hamble-le-Rice,
- CMP11 Monks Brook – priority areas Chandler's Ford and Eastleigh South.

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

2.3.13 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 CMPs which seek to provide a more holistic and joined up approach to managing flood risk.

2.3.14 **Recommendation:** Review and implement the catchment policies and priority area policies set out by HCC in the CMP.

Surface Water Management Plan

2.3.15 Prior to the preparation of the CMPs, HCC had undertaken a Surface Water Management Plan (SWMP) Strategic Assessment and Background Information Report[13] for the whole County as well as several Surface Water Management Plans (SWMPs). This Strategic Assessment and Background Information Report provides information on general matters related to surface water flooding and flood risk across Hampshire, including identification of different forms of surface water flooding and who has responsibility for addressing them.

2.3.16 The Eastleigh SWMP was produced in 2012[14]. This provides an overview of flood risk in each parish, identifying areas where floods have occurred and recommendations to alleviate flood risk where appropriate. Within the Eastleigh SWMP, three 'hotspots' were identified where the causes of flooding are complex, meaning they require additional investigation to understand the mechanisms of flooding and potential mitigation options. In order of highest risk, the hotspots identified include:

- Monks Brook Catchment (Chandler's Ford),
- Little Quob Lane / Baltic Road / Princess Close, West End, and
- Green Lane / Rope Walk, Hamble Le Rice.

2.3.17 An Action Plan was produced as part of the Eastleigh SWMP, which summaries the actions and recommendations made within the SWMP and the authority responsible for each action, as well as

[11] Hampshire County Council, October 2013, Hampshire Groundwater Management Plan https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/groundwater-management-plan
[12] Hampshire County Council, Catchment Management Plans https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/strategies/catchment-management-plans
[13] 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
[14] Hampshire County Council, 2012, Surface Water Management Plan for Eastleigh. https://documents.hants.gov.uk/flood-water-management/EastleighSWMPReport.pdf

information on those areas requiring a more detailed investigation. The Action Plan will only be effective if each stakeholder agrees to its responsibilities and commits to undertaking the actions within the specified timescales. Further information on the Action Plan can be found in Section 6.8 paragraph 6.8.17.

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[15] 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 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[16]. The East Hampshire Catchment DWMP and Test and Itchen DWMP are relevant to the Eastleigh BC administrative area.

2.4.5 The Test and Itchen Catchment DWMP highlights that flooding, pollution and water quality are the main concerns in the Chickenhall Eastleigh wastewater system which serves Eastleigh and Chandler's Ford. Southern Water are implementing the 'Improve' investment strategy, which means that the current performance of the drainage and wastewater system needs to be improved to reduce the impacts on customers and/or the environment. Further investment will be needed in the future to increase the capacity of the treatment works to accommodate flows from new homes and businesses.

2.4.6 The East Hampshire Catchment DWMP highlights that storm overflows, nutrients and pollution are the main concerns for this river basin. The Peel Common wastewater system serves Hamble-le-Rice, Netley, Hedge End. Additional homes and businesses may increase the risks of non-compliance with Dry Weather Flow permits from the Environment Agency. Further investment will be needed in the future to increase the capacity of the treatment works to accommodate flows from new homes and businesses. Future development may also put pressure on achieving favourable conditions in the designated habitat sites in the Solent. Local councils are working with Natural England to find suitable solutions to ensure that development is nutrient neutral. Future investment in the wastewater treatment process is also likely to be required.

2.4.7 The Peel Common system also has a storm overflow that discharge during periods of heavy rainfall. The risks from these discharges are currently very significant and climate change may increase the frequency of discharges unless measures are taken.

[15] 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
[16] Southern Water, Drainage and Wastewater Management Plans https://www.southernwater.co.uk/dwmp

3. Assessing 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 Much of the Eastleigh administrative area, and almost all of the centre, is covered by the Bracklesham Beds, which are a mixture of sands and clays[17]. London Clay Formation outcrops in the centre and north, where it has formed heavy and often poorly drained clay soils. The sandier members of the London Clay Formation and Bracklesham Group are secondary or minor aquifers capable of supporting water supplies at a local rather than strategic level, and in some cases forming an important base flow to rivers[18].

3.1.2 The superficial deposits have been influenced by Southampton Water to the south-west and several significant watercourses flowing towards the sea. The flanks of Southampton Water feature a succession of River Terrace Deposits, whilst the river valleys feature both Alluvium and River Terrace Deposits. Immediately adjacent to Southampton Water lie superficial Tidal Flat Deposits. The sandy and gravelly elements of the superficial River Terrace Deposits function as secondary or minor aquifers.

3.1.3 The Hocombe-Fair Oak Ridge dominates the northern part of the Fareham Borough and reaches elevations of over 60m AOD. Between Eastleigh town and Fair Oak, this ridge is cut through by the Itchen, and the land to the south rises to over 80m AOD around West End and Netley Hill with a very broad, low ridge extending northwards through Horton Heath. Further south the land gently plateaus and then becomes more irregular towards the coast.

Hydrology

3.1.4 Three principal river systems exist in the Eastleigh administrative area: the Itchen, Monks Brook, and Hamble. Several other smaller watercourses also flow through the area, including several tributaries of the Itchen. The Eastleigh BC therefore falls into two operational catchments as identified on the Catchment Data Explorer[19]; Itchen, and East Hampshire Rivers.

3.1.5 The principal watercourses and catchments are shown in Appendix A Figure 1. Table 3-1 provides a description of the watercourses and their catchments and identifies the type of modelling and mapping that is available within the SFRA for each watercourse.

Table 3-1 Watercourses in Eastleigh BC

Itchen Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Monks Brook	11.5km river which rises north east of Ampfield and flows east out of Test Valley, through Chandler's 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.
Itchen	The Itchen is an 88km chalk fed watercourse and a designated Site of Special Scientific Interest and a Special Area of Conservation. Most of the river is within the Winchester administrative area, from where it travels through Eastleigh, is joined by the Monks Brook at	Flood Zones – Appendix A Figure 1.

[17] Eastleigh Borough Council, 2011, The Landscape of Eastleigh Borough. https://www.eastleigh.gov.uk/planning-and-building/planning-policy-and-implementation/planning-policy-guidance/landscape-character-assessment
[18] Hampshire County Council, 2012, Eastleigh Surface Water Management Plan. https://documents.hants.gov.uk/flood-water-management/EastleighSWMPReport.pdf
[19] Environment Agency Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning

	Woodmill in Southampton, and then flows south to discharge into Southampton Water. The Itchen hydrology is largely dominated by groundwater flow due to the Chalk bedrock that underlies much of the area[20]. However, the project area, primarily in the Lower Itchen catchment and Horton Heath Stream catchment, lies largely over the London Clay member, and is considered to be within an area of 'Rocks with essentially no groundwater'. Nevertheless, there is also exposure to the sand formations which are considered to be Secondary A aquifers; permeable layers capable of supporting water supplies at a local level. Tributaries of the Itchen with the Eastleigh study area include Townhill Stream, Hatch Green Brook, Moorgreen Brook and Bow Lake (described below).	Modelled Climate Change Outlines – Appendix A Figure 12.
Bow Lake	4km stream which flows along the Winchester-Eastleigh border from north east of Crowdhill, through a series of fields, and joins the Itchen north east of Eastleigh town.	Flood Zones – Appendix A Figure 1. Modelled Climate Change Outlines – Appendix A Figure 12.

East Hampshire Rivers Operational Catchment

Watercourse	*Description*	*SFRA Mapping*
Hamble	The Hamble, which is fed by Horton Heath Stream, flows along a well-defined valley on the Winchester-Eastleigh border and is subject to tidal influence some miles inland[21]. It is flanked by mudflats and marshes and has a predominantly estuarine character. The upper half of the catchment which lies within Winchester is relatively rural and underlain by chalk, meaning few properties are at risk from flooding[22]. The lower half, within Eastleigh and bordering Fareham, has tidal influence and is highly urbanised. As a result, surface water flooding often occurs due to the tide locking of the drainage network when water levels in the watercourse are high. Pudbrook Lake and its tributaries (Shamblehurst Stream, Woodhouse Gully, Wildern Stream, Marl's Road Tributary) and Hedge End Stream flow through Hedge End and discharge to the Hamble at Botley. Further south the Hungerford Stream also flows to join the Hamble.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.
Horton Heath Stream	8.5km stream on the Winchester-Eastleigh border which flows from Lower Upham, through a series of fields, East Horton Golf Course, and joins the Main River Hamble south east of Boorley Park.	Flood Zones – Appendix A Figure 1. GIS Floodplain Analysis – Appendix A Figure 11.

3.1.6 There are also several watercourses that drain the southern part of the Borough and outfall to Southampton Water including Netley Stream, and Spear Pond Gully.

3.2 Flooding from the sea

3.2.1 Eastleigh Borough has 6km of coastal frontage, and the River Hamble is tidally influenced downstream of Botley.

[20] JBA Consulting, 2018, Eastleigh Hydrological Sensitivity Study. https://www.eastleigh.gov.uk/media/3407/itchen-hydrology-sensitivity-study.pdf
[21] LDA Design, 2017, Fareham Landscape Assessment. http://planningpdf.fareham.gov.uk/PDF/planning/local_plan/DraftLocalPlanEvidenceBase/EV40-FarehamLandscapeAssessment_FINAL.pdf
[22] Hampshire County Council, 2011, Preliminary Flood Risk Assessment. https://documents.hants.gov.uk/flood-water-management/watercourses/PFRAReportsavedJan2016.pdf

3.2.2 Tidal flooding can develop through a combination of factors coinciding, including spring (high) tides, strong coastal winds, and low atmospheric pressure.

3.2.3 High tide conditions can also lead to tide locking, when flap valves at surface water outfalls close to stop sea water entering the system. This prevents drainage channels from discharging and instead surface water accumulates upstream of the outfalls. During heavy rainfall events this can result in flooding from manholes and gullies. The combination of heavy rainfall events and high tides can therefore contribute to significant surface water flooding.

Flood Map for Planning

3.2.4 Flood Zones on the Flood Map for Planning (Rivers and Sea) 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).

3.2.5 Appendix A Figure 1 shows Flood Zones 2 and 3 for the study area and identifies that along the Southampton Water frontage there is relatively limited areas at risk of tidal flooding, with small areas at risk of flooding where watercourses outfall (e.g., Netley Stream, Spear Pond Gully). The eastern boundary of the Borough is formed by the River Hamble, and the following areas are within Flood Zone 3 'High probability of flooding'; Hamble Point, the eastern edge of Hamble-le-Rice and the eastern edge of Bursledon.

Historic flooding

3.2.6 Recorded Flood Outlines published by the Environment Agency, as seen in Appendix A Figure 2, show one tidal event to have previously taken place on the south east coast in Hamble-le-Rice in December 1999. This event was located within the mapped Flood Zone 3.

3.2.7 Regular tidal flooding is experienced along Rope Walk in Hamble-le-Rice and Blundell Lane in Bursledon.

Coastal Modelling

3.2.8 As part of this SFRA update, 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).

Flood Zone 3b Functional Floodplain

3.2.9 The Functional Floodplain is defined in the NPPF as 'land where water from rivers or the sea has to flow or be stored in times of flood'. The Functional Floodplain (also referred to as Flood Zone 3b), is not separately distinguished from Flood Zone 3a on the Flood Map for Planning. Rather the SFRA is the place where LPAs should identify areas of Functional Floodplain in discussion with the Environment Agency.

3.2.10 The PPG states that the identification of Functional Floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. With this caveat, Functional Floodplain will normally comprise land having a 3.3% AEP or greater annual probability of flooding (1 in 30 year), with existing flood risk management infrastructure operating effectively.

3.2.11 Coastal modelling of the 3.3% AEP event has been undertaken to identify areas at more frequent risk of flooding from the sea. (It is noted that this modelled scenario just applies the still water level and does not account for wave action). These areas are shown in Appendix A Figure 13 and include:

- Victoria Road, Netley
- Cliff House
- Hamble Point and Marina including access route along School Lane
- Western bank of the River Hamble on the outskirts of Hamble-le-Rice including Rope Walk
- Land south of the railway line between Wessex Manor and Bursledon

- North eastern edge of Bursledon along Blundell Lane.

3.2.12 Land is not needed to store tidal flood water given the proximity of the wider Solent. Therefore, a review of these areas has been undertaken in the light of these local circumstances and in agreement with the Environment Agency these areas will be included within the Flood Zone 3a definition and no Flood Zone 3b associated with the sea will be defined.

3.2.13 Where development is proposed within an area at 3.3% AEP or greater annual probability of flooding from the sea, particularly within the floodplains of tidal watercourses or constrained estuaries, further evidence may be required to confirm the assumption that the area at 3.3% AEP or greater annual probability of flooding does not provide a flood conveyance and/or storage function.

3.2.14 Appendix A Figure 13 should be used to identify areas which may be at risk of frequent tidal flooding.

3.2.15 In locations where there is existing development and the SMP policy is to hold or advance the line (such as The Quay and Rope Walk in Hamble-le-Rice, within policy unit 5C05, and Netley Village within policy unit 5C09), it may be appropriate for Eastleigh BC to consider redevelopment due to wider sustainability objectives. Should development be considered in these areas, it will need to pass the Sequential Test and the Exception Test where applicable. A site specific FRA will need to demonstrate that the development will be safe for its lifetime, and not increase flood risk elsewhere. It is considered that this can be implemented through the Flood Zone 3a designation, and it is not considered sustainable to apply the planning requirements of a Flood Zone 3b designation.

3.2.16 For much of the tidal frontage in Eastleigh, the SMP policies indicate no future maintenance or improvements to defences. Eastleigh BC should consider using the 3.3% AEP flood extent to define Coastal Change Management Areas (CCMA) to ensure prospective developers are made aware of the potential risks and inappropriate development is avoided. This includes the upper parts of the River Hamble (from Bursledon Bridge to Hamble Oil Terminal, policy units 5C04 – 5C06) and Ensign Industrial Park to Cliff House, (policy unit 5C08).

3.2.17 It is noted that areas close to defences and low lying areas behind defences may also be susceptible to flooding because of wave action which is not included in the 3.3% modelled scenario presented in Appendix A Figure 13. This should be considered as part of site specific FRAs.

Future flood risk

3.2.18 Climate change is expected to increase the frequency, extent, and impact of flooding in coastal areas, as a result of sea level rise. Coastal modelling scenarios have been undertaken to show predicted future changes in flood extent within the study area. This modelling was undertaken for the years 2055 and 2122. The Environment Agency's guidance on the application of climate change allowances[23] states that LPAs should assess both the higher central (70th percentile) and the upper end (95th percentile) allowances for SFRAs.

Defended Model Scenarios

3.2.19 Maps showing the maximum flood depths and maximum hazard ratings for some of the key defended model scenarios are presented in Appendix B of this Report.

3.2.20 **Present Day Flood Risk:** Appendix B Figures 3 and 10 show that for the 0.5% AEP event for the year 2022, flooding affects Bursledon, with Significant hazard rating along Blundell Lane. Hamble-le-Rice and Hamble Point are also shown to be at risk. Rope Walk and School Lane are shown to flood with Significant hazard rating. Flooding also occurs along the Southampton Water frontage within the low-lying areas where watercourses outfall; for example, where Spear Pond Gully outfalls to the south of Netley, the end of Victoria Avenue floods with Significant hazard rating.

3.2.21 **'Higher Central' Climate Change Allowance:** Appendix B Figures 4 and 11 show the 0.5% AEP event for the year 2055 (Higher Central), and Appendix B Figures 5 and 12 show the 0.5% AEP event for the year 2122 (Higher Central). By 2122, flooding extents increase in Bursledon affecting A27 and Station Road as well as Blundell Lane, with hazard ratings of Significant. Flooding increases in depth on the edge of Hamble-le-Rice and affects Crowsport. Flood extents on Hamble Point increase further and School Lane is entirely flooded to the south of Hamble-le-Rice.

[23] Flood risk https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#sea-level-allowances

3.2.22 **'Upper End' Climate Change Allowance:** Appendix B Figures 6 and 13 show the 0.5% AEP event for 2122 (Upper End) and Figures 7 and 14 show the 0.1% AEP event for 2122 (Upper End).

Undefended Model Scenarios

3.2.23 Model scenarios have also been undertaken without defences, to understand how the Flood Zones may alter in the future. Appendix A Figures 8 and 15 show the undefended 0.5% AEP event for 2122 (Upper End) and Figures 9 and 16 show the undefended 0.1% AEP event for 2122 (Upper End). These flood extents are also included on Appendix B Figure 2 as an indication of 'future flood zones' associated with flooding from the sea.

3.2.24 These figures show that the areas of Flood Zone 2 and 3 increase along the Southampton Water frontage and along the River Hamble floodplain. The most significant increase is on Hamble Point.

3.3 River flooding

Flood Map for Planning

3.3.1 Appendix A Figure 1 shows Flood Zones 2 and 3 for the principal watercourses within the study area, (in addition to the tidal and coastal flooding described in the previous section). The flooding around the Monks Brook and the smaller watercourses in the area generally does not extend very far laterally, in contrast to the more extensive flooding resulting from the Itchen. However much of the Itchen, especially towards the south, is not close to any existing development, whereas the less extensive Flood Zones from the Monks Brook and the smaller watercourses are within the existing urban area.

Flood Zone 3b Functional floodplain

3.3.2 The Functional Floodplain is defined in the NPPF as 'land where water from rivers or the sea has to flow or be stored in times of flood'. The identification of Functional Floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise land having a 3.3% AEP or greater annual probability of flooding (1 in 30 year), with 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). The Functional Floodplain (also referred to as Flood Zone 3b), is not separately distinguished from Flood Zone 3a on the Flood Map for Planning. Rather the SFRA is the place where LPAs should identify areas of Functional Floodplain in discussion with the Environment Agency. Within these mapped extents, existing infrastructure or solid buildings that resist water ingress are not providing a flood storage function and the definition of Flood Zone 3b may therefore not apply.

3.3.3 SFRA Part 1 Table 3-3 identifies which watercourses have detailed modelling available to inform designations of Flood Zone 3b functional floodplain. In some cases, the 3.3% AEP (1 in 30 year) extent is available; where it is not available an alternative AEP event has been selected instead. Within the Eastleigh BC administrative area, modelling of available flood extents can be seen in Appendix A Figure 1, using the following information:

- Upstream sections of Monks Brook, 4% AEP (1 in 25 year)
- Lower section of Monks Brook, 2% AEP (1 in 50 year)
- Itchen and Tributaries, 3.3% AEP (1 in 30 year)

3.3.4 These flood outlines are extensive within the urban area of Chandler's Ford, around the edge of Bishopstoke and through West End.

3.3.5 **Where modelled information for the 3.3% AEP 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 is not underestimated.** The Environment Agency guidance 'How to prepare a Strategic Flood Risk Assessment'[24] 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.

[24] Defra, Environment Agency https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment

Historic flooding

3.3.6 Recorded Flood Outlines published by the Environment Agency, as seen in Appendix A Figure 2, show recorded fluvial events and events of unknown source (assumed to be attributed to fluvial flooding) within Chandler's Ford, Eastleigh, Bishopstoke, Fishers Pond, Lower Upham, Hedge End, Botley, Bursledon and Hamble-le-Rice. Most of these events do not have dates and timescales recorded; for the events where this information is available the events occurred in November 1975, October to December 2000, December 2002 to March 2003, and February to March 2014.

3.3.7 HCC prepared a Flood Investigation Report[25] in accordance with Section 19 of the FWMA for flooding experienced in July 2021. This report describes flooding mechanisms in Botley, Fair Oak and Hedge End and the responses from the risk management authorities to the events. Most of the flooding incidents described in the report were concluded to be due to surface water runoff driven by intense rainfall, however river flooding was also a contributing factor. High water levels in receiving watercourses prevented surface water systems from discharging, there were records of debris blocking main river culverts, as well as records of a lack of maintenance on smaller watercourses. These factors all contributed to exacerbate flooding. Further detail is provided in Section 3.4.

Future flood risk

3.3.8 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.

3.3.9 As detailed in Table 3-1, where available, hydraulic model outputs for the 1% AEP flood event including climate change allowance have been mapped to provide an indication of the future flood risk. The maps in Appendix A Figure 12 show the risk of flooding from the Monks Brook, River Itchen, and Itchen tributaries (Bow Lake, Moorgreen Brook, Hatch Grange Brook, Townhill Stream). The mapping indicates that the risk of flooding will increase along these river floodplains in the future as a result of climate change.

3.3.10 As well as the potential for climate change to lead to new areas being at risk of flooding in the future, it is important to note that areas 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 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.

3.3.11 For this reason, all 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.

3.3.12 For the other fluvial watercourses in Eastleigh BC, detailed hydraulic models were not available to simulate climate change scenarios. 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.

3.3.13 The results of the analysis are presented in Appendix A Figure 11. The mapping shows that the floodplains associated with the unmodelled watercourses through West End and Hedge End 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.

[25] Hampshire County Council, September 2021, Winchester and Eastleigh Areas S.19 Flood Investigation Report 12th July 2021. https://documents.hants.gov.uk/flood-water-management/Winchester-Eastleigh-areas-July2021.pdf

3.4 Groundwater flooding

Flood mapping

3.4.1 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
- Elsewhere: Not considered to be prone to groundwater flooding
- Where this may have an impact, you are advised to check that this has not been a problem in the past at this location and/or that measures are in place to sufficiently reduce the impact of the flooding.

3.4.2 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 should not be employed in isolation to inform land-use planning decisions at any scale and should not be utilised for this purpose at the site scale. The map shows large areas to the north of the Eastleigh administrative area and to the south of Hedge End, as well as other smaller areas scattered around, where no potential for groundwater flooding has been identified. Much of the administrative area has limited potential for groundwater flooding to occur, however around watercourses and the coastline, there is potential for groundwater flooding of property situated below ground level and potential for groundwater flooding to occur at the surface.

3.4.3 '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.

Historic flooding

3.4.4 There have been some instances of historical groundwater flooding towards the northern boundary of the administrative area, marking the location where the South Downs chalk geology ends, and the Itchen meets less permeable bedrock. A groundwater flooding incident has occurred towards the south coast of Eastleigh in Hamble-le-Rice, following the course of Satchell Lane. This incident corresponds to an area with limited potential for groundwater flooding to occur within the 'Susceptibility to Groundwater Flooding' map.

3.4.5 Within the HCC Flood Investigation Report[25] there are suggestions of potential for high groundwater contributing to flooding in Summerlands Road in Fair Oak and Bursledon Road in Hedge End.

Future flood risk

3.4.6 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.

3.5 Surface water and sewer flooding

Flood mapping

3.5.1 The Risk of Flooding from Surface Water is presented in Appendix A Figure 3. This map shows the surface water flood risk to be relatively low towards the south of the Eastleigh administrative area, with few medium risk areas scattered around development and some higher risk areas surrounding watercourses (e.g., Spear Pond Gully, Hungerford Stream). The risk significantly increases towards the

north of the administrative area, especially around the Itchen and its tributaries and the Monks Brook. Surface water mapping shows notable areas of Chandler's Ford, Eastleigh, Fair Oak, West End and Hedge End to be susceptible to surface water flooding.

3.5.2 Within the Eastleigh SWMP, three 'hotspots' were identified where the causes of flooding are complex, meaning they require additional investigation to understand the mechanisms of flooding and potential mitigation options. In order of highest risk, the hotspots identified include:

- Monks Brook Catchment (Chandler's Ford),
- Little Quob Lane / Baltic Road / Princess Close, West End, and
- Green Lane / Rope Walk, Hamble Le Rice.

Historic flooding

3.5.3 HCC have provided GIS shapefiles of recorded highway flooding incidents and locations of flood investigations, and these are mapped in Appendix A Figure 3. Some of these locations are from combined sources of flooding, for example fluvial and surface water. Key locations shown to have experienced flooding include:

- Chandler's Ford (e.g., Winchester Road, Kingsway, Pine Road, Gordon Road).
- Eastleigh (Southampton Road, Passfield Avenue, Stoneham Lane)
- Fair Oak (Fair Oak Road, Mortimer Lane)
- West End (Swaythling Road, Botley Road, Chapel Road, Brookside Way, Hope Road, Quob Lane)
- Hedge End
- Botley
- Bursledon

3.5.4 The Eastleigh SWMP also includes maps of historic recorded flooding incidents in each Parish, which is broadly similar to the data presented in Appendix A Figure 2.

3.5.5 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.

3.5.6 In their Drainage and Wastewater Management Plans, Southern Water have recorded incidents of internal and external flooding between 2018-2020 within the Chickenhall catchment.

3.5.7 Southern Water have provided records of observed flood incidents, and these are mapped in Appendix A Figure 2. These show incidents throughout Chandler's Ford, Bishopstoke, Eastleigh, Fair Oak, West End, Netley and Hamble-le-Rice.

3.5.8 HCC prepared a Flood Investigation Report[25] in accordance with Section 19 of the FWMA for flooding experienced in July 2021. This report describes flooding mechanisms in Botley, Fair Oak and Hedge End and the responses from the risk management authorities to the events. Most of the flooding incidents described in the report were concluded to be due to surface water runoff, driven by intense rainfall. From 12th July overnight into 13th July, a slow-moving low-pressure weather system brought prolonged, intense rainfall to many parts of Hampshire. This resulted in exceptionally high river and surface water levels. A brief summary of the flooding mechanisms is provided below and includes flooding from rivers, surface water, overwhelmed drainage systems and groundwater.

Botley

3.5.9 HCC received reports of flooding on Winchester Street, Lake Road (Curdridge) and Botley Mills. The main source of flooding was surface water from Mill Hill, coupled with overtopping of the flood wall from the main river, and high water levels in the River Hamble preventing surface water systems from discharging. Southern Water were called out to the High Street, Marls Road, Orchard Close, Pern Drive and Maddoxford Lane. Flooding was the result of hydraulic overload from the significant rainfall event exacerbated by highway flooding and tide-locking of the surface water outfall.

Fair Oak

3.5.10 HCC received reports of flooding at Botley Road, Michaels Way, Freda Routh Gardens, Upper Mead Close, Reynolds Road and Allington Lane. Many reports were linked to debris washing into the main river channel from gardens and blocking culverts. Some reports referred to the highway drainage systems from Mortimers Lane being blocked.

3.5.11 The Environment Agency received reports of internal flooding at Summerlands Road, Fair Oak Road, Oakdene Gardens, Michaels Way and Ashlea Close. There were records of main river culverts blocked by debris, historic culverting without permission and lack of understanding regarding riparian responsibilities.

3.5.12 Highway drainage issues were reported in Yew Tree Close, and Botley Road, Horton Heath. No Southern Water assets were causing flooding issues at these locations. Hydraulic overload from the significant rainfall event caused sewer flooding issues at Fair Oak Road, Bishopstoke.

Hedge End

3.5.13 Reports of flooding were made on Yew Tree Close, and the following locations in Bursledon: Pylands Lane, Hill Place, Woodbury Bridge Road and Station Road.

3.5.14 Flooding was reported on Bursledon Road, Hobb Lane, Frensham Close (internal flooding), Nursery Grove, Berry Close, and Upper Northam Road. Hydraulic overload from the significant rainfall event caused the flooding issues, with some impact from surface water from the highway.

Future flood risk

3.5.15 Section 3.2 of the SFRA Part 1 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.

3.5.16 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.

3.6 Reservoir flooding

3.6.1 Two Reservoir Act registered impoundments with the potential to cause flooding within the Eastleigh administrative area have been identified: Fisher’s Pond between Brambridge and Crowdhill and Shrubbery Pond in North Stoneham.

3.6.2 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 areas at risk follow the floodplains of the Itchen and the Monks Brook, as well as extending beyond the floodplain around Itchen Valley County Park. The flooding around the Monk’s Brook is predicted to occur in the event of reservoir failure when river levels are normal, whilst the flooding around the Itchen is predicted to partly occur when river levels are normal, and partly only when there is also flooding from rivers.

4. Assessing the cumulative impact of development and land use change

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 the SFRA Part 1 Section 3.7, 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 Eastleigh BC. 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 the north of the administrative area, including the catchments of the Monks Brook and Itchen, has high potential for cumulative impact of development on flood risk. The potential towards the south, including the catchments of the Horton Heath Stream and Main River Hamble, is considered medium.

4.1.5 **Recommendation:** In those areas with a medium and higher potential for cumulative impact on flood risk, it is recommended that Eastleigh 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.

Cross boundary considerations

4.1.6 All watercourses located within Eastleigh cross borders between different administrative areas. It is important to consider how actions in one administrative area may impact upon another area. The cross boundary flows to consider within Eastleigh include:

- The Monks Brook rises in the Test Valley, close to the border of Winchester, from where it flows through Eastleigh and into Southampton Water at Southampton,
- The Itchen flows in and out of South Downs National Park (which has its own SFRA) and Winchester, before flowing through Eastleigh and into Southampton Water at Southampton,
- Bow Lake flows along the border between Winchester and Eastleigh,
- The Horton Heath Stream borders Winchester, and
- The Hamble flows through Winchester before bordering Eastleigh and flowing into Southampton Water in Fareham.

5. Current control, mitigation, and management measures

5.1 Defences

5.1.1 A summary of the coastal and tidal frontages and the presence of defences is provided in Table 5-1 and Figure 5-1, as described in the River Itchen, Weston Shore, Netley and Hamble Coastal Study[2].

Table 5-1 Defences in Eastleigh

Location	Description of Defences
NET1 Weston Point to Netley Castle	Undefended – soft cliff – shingle beach and bank – masonry sea wall.
NET2 Netley Castle to Netley Hard	Masonry sea wall – breached in one location – soft cliffs – ad hoc gabion defences – steel sheet pile wall
NET3 Netley Hard to Cliff House	Concrete wall – steel sheet pile wall – low cliffs
NET4 Cliff House to Ensign Industrial Park	Low cliffs
NET5 Ensign Industrial Park to Hamble Oil Terminal	Foreshore embankment – steel sheet pile wall
NET6 Hamble Oil Terminal to Hamble Common Point	Mixed shingle and sand beach – limestone rock revetment
HAM1 Hamble Common Point to Satchell Marshes	Rock embankment - seawall - steel sheet pile walls adjacent to the pontoons
HAM2 Satchell Marshes to Badnam Creek	Saltmarsh – steel sheet pile walls at marina
HAM3 Badnam Creek to Lands End Lane	Saltmarsh
HAM4 Lands End Lane to Swanwick Shore Road	Slipways, timber palisade and steel sheet pile wall masonry wall, gabions, masonry wall, masonry, and brick wall; rock revetment; sheet pile walls with a concrete capping beam

5.1.2 Data provided by the Environment Agency from their Asset Information Management System (AIMS) is included in Appendix A Figure 2. This data is the best available for the SFRA but is not a complete dataset of the flood defences present in the study area. The National Coastal Erosion Risk Mapping (NCERM) is presented in Appendix B Figure 2 and provides a useful indication of the type of frontage, e.g., embankment, gabions, natural, revetment, seawall, timber structure, other etc.

5.1.3 The mapping in Appendix A Figure 2 shows that most of the Itchen and its tributaries (Monks Brook and Bow Lake) have high ground on either side of the watercourses, and the recorded design standard of protection (SOP) is approximately 4% AEP (1 in 25 year). Along the Itchen in Bishopstoke there is a short section of wall. In between Chandler's Ford and the M3 along Monks Brook there is a small stretch of embankment and wall, and the reported design SOP increases up to 2% AEP (1 in 50 year).

5.1.4 The Hamble and its tributary, Horton Heath Stream, are also mainly lined by high ground on both sides. However, there are several stretches of embankments and walls downstream of M27 Hamble Bridge on the right bank of the River Hamble, mainly protecting the Marinas. The recorded design SOP along the hamble and its tributaries increases from around 20% AEP (1 in 5 year) in the upstream reaches to 1% AEP (1 in 100 year) in the downstream.

5.1.5 Spear Pond Gully in the south of the study area is lined by high ground with a 1% AEP design SOP.

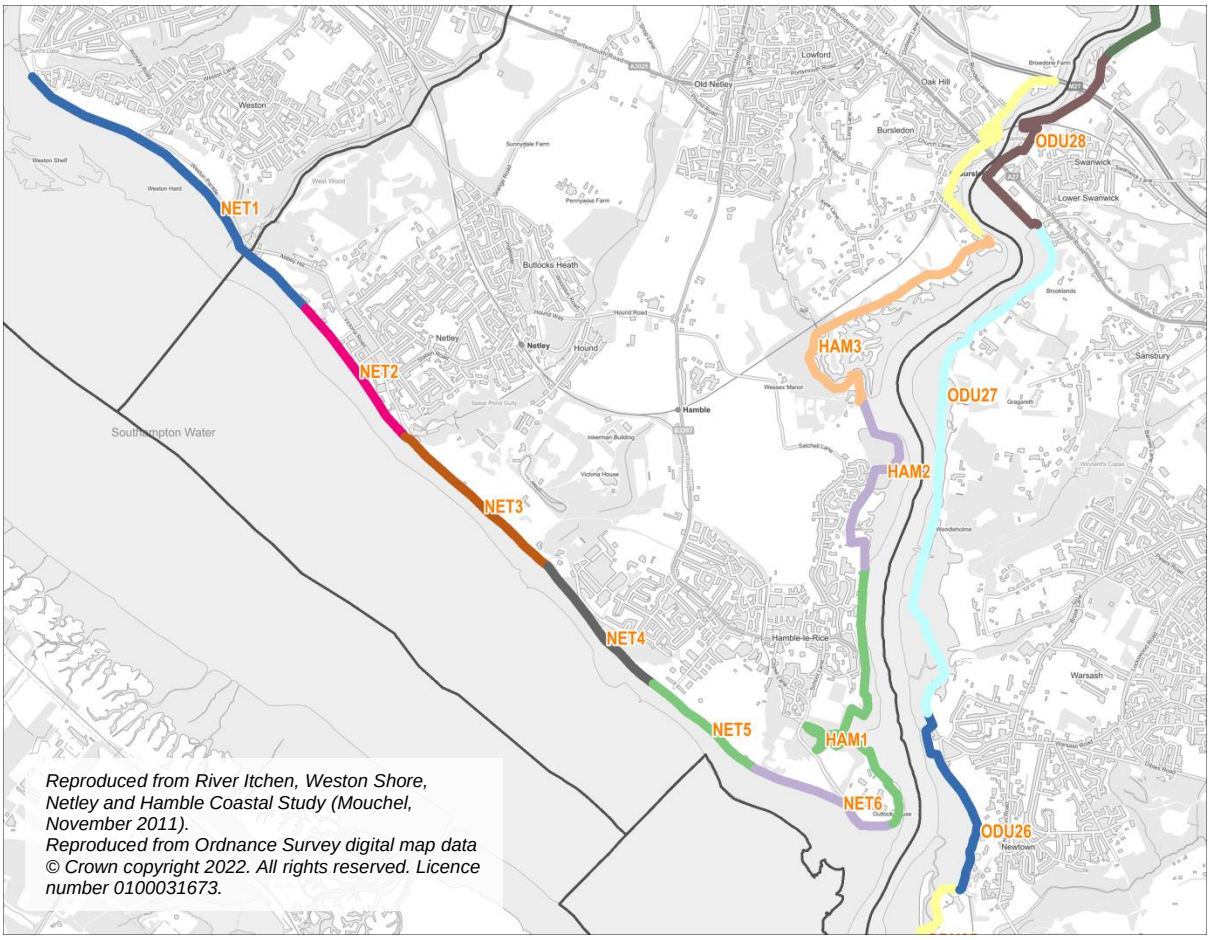

Figure 5-1 Policy Units from the River Itchen, Weston Shore, Netley and Hamble Coastal Study

5.2 Flood Warning Service

5.2.1 The Environment Agency operates a Flood Warning Service[26] 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.
- Flood Warning – Flooding is expected, immediate action is required.
- Severe Flood Warning – Severe flooding, danger to life.

5.2.2 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[27].

5.2.3 There are 6 Flood Warning Areas in Eastleigh BC which are shown in Appendix A Figure 9 and are as follows:

- Chandler's Ford to Swaythling
- Shawford to Bishopstoke on the River Itchen
- Mansbridge and Woodmill on the River Itchen
- Waltham Chase, Durley Mill and Botley on the River Hamble
- Hamble Estuary
- Itchen Estuary

[26] Environment Agency, Check for Flooding in England https://check-for-flooding.service.gov.uk/
[27] Environment Agency, Sign up for Flood Warnings https://www.gov.uk/sign-up-for-flood-warnings

5.2.4 The Environment Agency publishes 'Water situation: area monthly' reports for England'[28] 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'[29] 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.

5.2.5 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".

5.3 Residual Risk

5.3.1 The risk of flooding from 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 several 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.

5.3.2 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 and coastal modelling outputs 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.

5.3.3 Steps should be taken to manage these residual risks using flood warning and evacuation procedures, as described in Section 7.

[28] Water situation: area monthly reports for England https://www.gov.uk/government/publications/water-situation-local-area-reports
[29] Groundwater: current status and flood risk https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk

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 identifies opportunities to reduce the causes and impacts of flooding. 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 Safeguard land for defence improvements

6.1.1 As detailed in Section 2, the policy in the Shoreline Management Plan for much of Eastleigh is No Active Intervention. However, there are frontages with policy to 'Hold the Line' for the short, medium, and long term. The River Itchen, Weston Shore, Netley and Hamble Coastal Study[2] identifies the preferred options along the frontages. These include policies to maintain existing defences over the short and medium term, and in some locations to implement managed realignment in the long term. Land should therefore be safeguarded to enable either future flood defence maintenance and upgrades, and/or managed realignment (and construction of new set back defences where required).

6.1.2 Figure 5-1 in Section 5.1 shows the extents of the policy units. The following key areas are identified:

- NET1: Maintain existing defences in the short and medium term. Managed realignment in the long term.
- NET2: Maintain existing defences in the short and medium term.
- NET3: For defended frontages, beach recharge and profiling of materials. Relocation of infrastructure behind beach (access route, right of way, water pipes to be investigated and instigated in the short and medium term). For undefended frontages, monitor the rate of erosion / deposition to inform future decisions.
- NET5: Maintain existing defences in the short and medium term. In the long term, maintenance of existing defences to cease.
- HAM1: Managed realignment. Construction of new set back defences where required.
- HAM4: Maintain existing defences.

6.1.3 The Environment Agency will seek a 16 metre set back from flood defences for maintenance purposes. Permission is required for any activity within 16m of a sea defence structure, or within 16m of the bank of a tidal main river.

6.1.4 **Policy Recommendation:** Safeguard land for flood defence maintenance and future upgrades or managed realignment and construction of new set back defences within NET1 – NET3, NET5, HAM1, HAM4. Safeguard a 16 metre wide undeveloped buffer strip alongside flood defence structures. Development adjacent to the coastal frontage should facilitate the delivery of improvements to and maintenance of flood defences, through site design and financial contribution.

6.2 Emergency planning

6.2.1 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.

6.2.2 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.

6.2.3 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 an Emergency Plan is prepared wherever emergency flood response is an important component of making a development safe.

6.2.4 Eastleigh BC is designated as a coast protection authority, and therefore possesses the duties and powers as specified under the Coast Protection Act 1949[30].

6.2.5 The Hampshire County Multi Agency Flood Response Plan[31] is relevant to the Eastleigh BC administrative area.

6.2.6 **Recommendation:** Eastleigh BC should review the flood risk information within this SFRA with their emergency planning team. Proposals for development that are likely to increase the number of people living or working in areas of flood risk require particularly careful consideration, as they could increase the scale of any evacuation required. The tidal modelling shows that access routes are at risk of flooding with hazard ratings of Moderate and Significant during the design event (0.5% AEP) for the year 2055, increasing to Significant and Extreme during the design flood event (0.5% AEP) for the year 2122.

Emergency planning considerations for reservoirs

6.2.7 Eastleigh 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. Eastleigh BC is also advised to consult with the owners/operators of raised reservoirs, to establish constraints upon safe development.

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

6.3 Maintenance of watercourses

Main River

6.3.1 The Environment Agency is likely to seek an 8 metre wide undeveloped buffer strip alongside fluvial main rivers and 16m alongside tidal main rivers for maintenance purposes and would also ask developers to explore opportunities for riverside restoration as part of any development.

6.3.2 Under the Environmental Permitting (England and Wales) Regulations (2016)[32], 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.

6.3.3 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.

[30] Coast Protection Act 1949 https://www.legislation.gov.uk/ukpga/Geo6/12-13-14/74#:~:text=An%20Act%20to%20amend%20the,the%20Commissioners%20of%20Crown%20Lands%3B
[31] Gosport Borough Council, Flooding https://www.gosport.gov.uk/flooding
[32] The Environmental Permitting (England and Wales) Regulations 2016 http://www.legislation.gov.uk/uksi/2016/1154/contents/made

6.3.4 **Policy Recommendation:** Safeguard an 8 metre (or 16 metre) wide undeveloped buffer strip alongside fluvial (or tidal) Main Rivers or flood defence structures and prioritise riverside restoration.

Ordinary watercourse

6.3.5 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.

6.3.6 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[33].

6.3.7 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[34].

6.3.8 The CMPs note that in prioritised area, where land drainage incidents and excessive culverting are a cause for significant concern, HCC will implement a more stringent approval process for all Ordinary Watercourse Consent applications. Each 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.

6.3.9 **Policy Recommendation:** Safeguard an undeveloped buffer strip alongside ordinary watercourses for maintenance purposes. Developers should prioritise riverside restoration as part of any development adjacent to ordinary watercourses.

6.4 River restoration

6.4.1 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.

6.4.2 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.

6.4.3 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[35]. Further guidance on river restoration is available from the Environment Agency[36].

River Itchen

6.4.4 The Test and Itchen River Restoration Strategy[37] sets out a way forward to appraise the geomorphological condition of the Sites of Special Scientific Interest (SSSI) units of the Test and Itchen.

[33] Hampshire County Council, Making changes to a watercourse https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/changewatercourse
[34] Hampshire County Council, 2020, Flood Risk Management Guidance for Landowners https://documents.hants.gov.uk/flood-water-management/HCCFloodRiskManagement-Landowners.pdf
[35] 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
[36] Environment Agency, Fluvial Design Guidance Chapter 8 https://assets.publishing.service.gov.uk/media/60549ae1e90e0724c0df4619/FDG_chapter_8_-_Works_in_the_river_channel.pdf
[37] 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

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 Hamble

6.4.5 The River Hamble Soft Sediment Habitat Retention feasibility study[38] investigates opportunities for management and restoration of the saltmarsh in the lower Hamble, bringing it back to its natural form and in turn providing flood risk benefits.

Urban areas

6.4.6 The policies within the CFMP strongly encourage improvement of channel capacity and conveyance through urban areas such as along the Monks 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.

6.4.7 **Policy Recommendations:**

- Where development is planned in urban areas, opportunities for de-culverting watercourse sections should be sought to bolster local channel capacity and conveyance. This is particularly applicable to culverted sections of Monks Brook in Chandler's Ford and western Eastleigh, sections of Fair Oak Stream in Fair Oak, sections of Stoke Park Stream in Bishopstoke, and sections of Marl's Road Tributary, Hedge End Stream, and Woodhouse Gully in Hedge End.
- In partnership with relevant risk management authorities (for example Environment Agency, HCC and landowners) explore options for river restoration on the floodplain of the River Itchen downstream of Eastleigh. These are likely to include the removal of in-channel structures such as weirs and culverts, increasing the sinuosity of floodplain channels, and the reconnection of channels to natural storage areas on the floodplain.

6.5 Flood storage

6.5.1 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.

6.5.2 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.

6.5.3 Further guidance on Flood Storage is provided within Chapter 10 of the Environment Agency's Fluvial Design Guide[39].

Lower Hamble and Lower Meon

6.5.4 Proposed actions in the CFMP for the Lower Hamble and Lower Meon sub-area include investigating maximising flood storage in the area, primarily for the benefit of environmental habitat, but this will also help to alleviate flood risk.

Bursledon

6.5.5 The River Hamble flows into the Solent along the eastern border of Bursledon. There are two known flood issues within Bursledon: flooding on Church Lane from tidal influence, and runoff from land adjoining Long Lane exceeding the capacity of the drainage system. For the second issue, there is

[38] AHTI Group, 2016, River Hamble Soft Sediment Habitat Retention Feasibility Study. https://documents.hants.gov.uk/Hamble/RiverHambleSaltmarshandSoftSedimentHabitatRetentionFeasibilityStudy2016.pdf
[39] Environment Agency, Fluvial Design Guidance Chapter 10 https://assets.publishing.service.gov.uk/media/60549b7a8fa8f545cf209a29/FDG_chapter_10_-_Flood_storage_works.pdf

potential to carry out works to provide water storage within a nearby cat park, reducing the impact on the surface water system.

M27 Southampton Junctions

6.5.6 A Flood Risk Assessment (FRA) was completed by Jacobs[40] for a highway development scheme on the M27 Southampton Junctions, just north of Bursledon. This FRA has proposed to utilise a series of flood measures comprising a basin, underground tank and a pond, to manage the fluvial risk from two tributaries of the Bursledon Brook.

6.5.7 **Policy Recommendation:** In partnership with relevant risk management authorities (for example Environment Agency, HCC, and land owners), identify and appraise options for creating flood storage areas, either as part of developments or as stand-alone flood risk management strategies, through the removal of embankments, or the artificial lowering of natural high ground. The creation of flood storage areas is likely to be most effective, and feasible on the floodplains of the River Itchen downstream of Eastleigh, the Monks Brook west of Eastleigh, and along the tributaries of the River Hamble east of Hedge End.

Floodplain compensation

6.5.8 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.

6.5.9 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.

6.5.10 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[41].

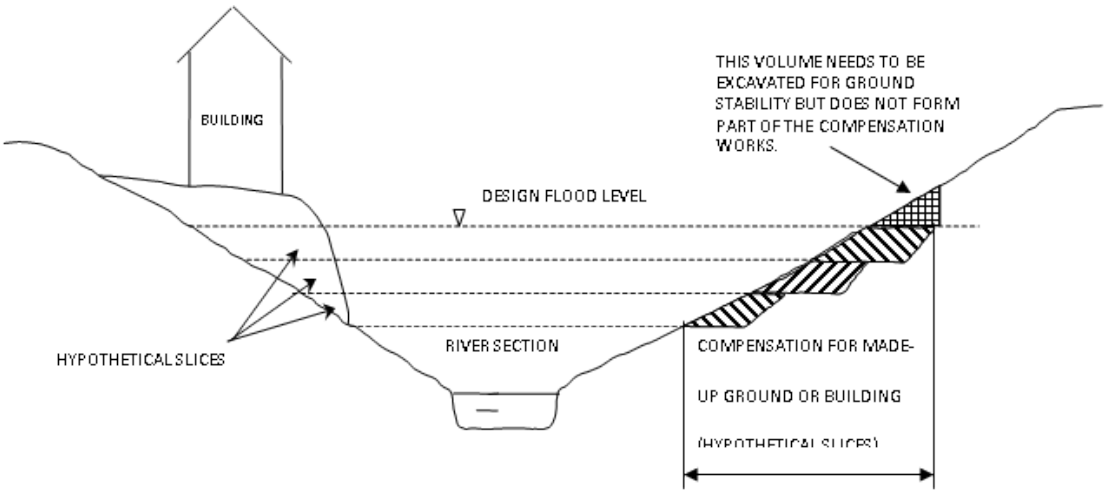

Figure 6-1 Example of Floodplain Compensation Storage (Environment Agency 2009)

6.5.11 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

[40] Jacobs, 2020, M27 Southampton Junctions Flood Risk Assessment. https://s3.eu-west-2.amazonaws.com/assets.highwaysengland.co.uk/roads/road-projects/M27+Southampton+junctions/Flood+Risk+Assessment.pdf
[41] CIRIA (2004) CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry

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.

6.5.12 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.

6.5.13 **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 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.

6.6 Flood and Coastal Erosion Risk Management (FCERM) schemes

6.6.1 The programme of FCERM schemes[42] does not identify any proposed schemes in the Eastleigh BC administrative area for the next 6 year period.

6.7 Working with natural processes

6.7.1 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.

6.7.2 Appendix A Figure 8 provides information from the Environment Agency's 'Working with Natural Processes – Evidence Directory'[43] about where these measures could be applied. This map shows that although there are a lot of existing woodland constraints within the Eastleigh administrative area, there are still a wide range of opportunities to implement natural processes to alleviate flooding. There are many potential opportunities for floodplain woodland planting potential, riparian woodland planting and wider catchment woodland across administrative area, as well as some smaller areas with opportunities for floodplain reconnection potential scattered around. 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.

6.7.3 **Policy Recommendation:** In partnership with relevant risk management authorities (for example Environment Agency, HCC, and land owners), seek opportunities to implement natural flood management techniques in the administrative area 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, or fluvial flooding. The primary opportunities for natural flood management techniques in the Eastleigh BC area are the planting of riparian and floodplain woodlands on the floodplain of the River Itchen and its tributaries downstream of Eastleigh, as well along the River Hamble and its tributaries east of Hedge End. There is also the potential for the planting of wider catchment woodland south of Hedge End, north of Bishopstoke, and in the vicinity of Crowdhill.

[42] 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
[43] 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

Green Infrastructure

6.7.4 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.

6.7.5 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.

6.7.6 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. May 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[44].

6.7.7 **Policy Recommendation:** In partnership with relevant risk management authorities (for example Environment Agency, HCC, and land owners), maximise the flood attenuation benefits of the borough's GI network through the enlargement of existing, and creation of new riparian and floodplain woodland areas on the floodplain of the River Itchen (and its tributaries) and the River Hamble (and its tributaries). Although significant constraints exist in Chandler's Ford, opportunities should also be sought to enhance the GI infrastructure here wherever possible, to alleviate the level of flood risk posed by Monks Brook and its tributaries.

Nutrient Neutral Development

6.7.8 The water quality of the coast 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. Areas of special interest within the Borough which need to be protected from these effects include:

- Solent Maritime Special Area of Conservation (SAC)
- Solent and Dorset Coast Special Protection Area (SPA)
- Solent and Southampton Water Ramsar and SPA

6.7.9 In response to the impact of nitrate pollutants, and to help ensure that developments achieve nutrient neutrality, Eastleigh BC has put a scheme in place so that developers can offset excess nutrient outputs against Council-owned land through the purchase of nitrate credits. Mitigation land is located in Bishopstoke, West End, Botley and Fair Oak. To date the nitrate credits being made available by Eastleigh BC are all through the cessation of farming practices and do not rely on any proactive interventions such as the creation of wetland, planting of woodland, or installation of nitrate retaining SuDS features.

6.7.10 **Policy Recommendation**: Supplement the offsetting of nutrients from new development at the sites in Bishopstoke, West End, Botley and Fair Oak, with the creation of natural buffer zones and wetlands in parts of the borough that are at greatest risk of surface water flooding.

[44] Partnership for South Hampshire, 2019, Green Infrastructure, Flooding and Water Management https://www.push.gov.uk/work/planning-and-infrastructure/green-infrastructure-flooding-water-management/

6.8 Surface water management

6.8.1 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 SFRA 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.

6.8.2 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.

6.8.3 The CMPs set out additional expectations for priority areas such as Chandler's Ford, Eastleigh East, Eastleigh South, West End, Hedge End and Hamble-le-Rice. 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

6.8.4 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.

6.8.5 Suitable surface water management measures should be incorporated into new development designs to reduce and manage surface water flood risk to, and posed by, the proposed development. This should 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.

6.8.6 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.

6.8.7 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.

6.8.8 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[45] 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[46] for guidance on the design, maintenance, and operation of SuDS.

6.8.9 The NPPF[47] currently states that major developments (10 dwellings or more; or 1,000sqm non-residential floor space) should incorporate SuDS unless there is clear evidence that this would be inappropriate[48]. Policy DM6 within the Eastleigh Borough Local Plan[49] states that new development (excluding extensions to dwellings and changes of use), will only be permitted if it incorporates SuDS.

6.8.10 HCC have outlined their stance towards SuDS in the Local Flood and Water Management Strategy (2020) document[50], 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.

6.8.11 When considering planning applications, Eastleigh BC should seek advice on the management of surface water from the relevant flood risk management bodies, principally HCC. This should ensure that the development's proposed minimum standards of operation are appropriate, and, using planning conditions or planning obligations, that there are clear arrangements for on-going maintenance over the development's lifetime.

6.8.12 At present, HCC as LLFA is a statutory consultee for matters relating to surface water management in new development. Schedule 3 of the FWMA places a duty on the local authority, likely to be the LLFA, to become a SuDS Approval Body (SAB). Schedule 3 will remove the automatic right to connect surface water to the public sewer network and will require all new development over a prescribed threshold (to be confirmed by secondary legislation) to use SuDS to manage surface water. In addition to the normal planning application process, developers will have to submit a SuDS application to the SAB, demonstrating compliance with National Standards. The SAB will approve applications and then adopt the SuDS for the lifetime of the development, with responsibility for maintenance.

6.8.13 At the time of writing Schedule 3 has not been enacted. However, the Jenkins Review[51] published in January 2023, made recommendations that Schedule 3 be enacted by Defra. The current indication by Defra is that Schedule 3 is likely to be enacted during 2024.

6.8.14 Multiple SuDS, including ponds and swales, have been included in the design of the North Stoneham Park Development[52]. Most SuDS features were completed in January 2020, and they have successfully reduced the runoff volume discharged to the Monks Brook, minimising flood risk in the neighbourhood area. This project sets an example and shows the possibilities and benefits of SuDS within the Eastleigh administrative area.

6.8.15 **Policy Recommendation:** Strengthen the existing surface water requirements for proposed developments in parts of the Eastleigh BC area that are at the greatest risk of surface water flooding such as Chandler's Ford, Eastleigh, Fair Oak, Bishopstoke, West End, and Hedge End. As advocated by the CMPs, Eastleigh BC are encouraged to consider setting requirements in these sub-areas of a 50% betterment of surface water runoff rates for significant brownfield developments, and the provision

[45] CIRIA C697 SuDS Manual. Available from: https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS
[46] https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[47] Ministry of Housing, Communities and Local Government, 2021, National Planning Policy Framework https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf
[48] Schedule 3 of the FWMA is due for implementation in 2024 and requirements for SuDS may therefore change.
[49] Eastleigh Borough Local Plan (2016-2036). Adopted April 2022 https://www.eastleigh.gov.uk/media/11806/to-be-published-final-local-plan-april-2022-v4.pdf
[50] Hampshire County Council Local Flood and Water Management Strategy https://documents.hants.gov.uk/flood-water-management/local-flood-water-management-strategy.pdf
[51] Defra, Updated July 2021, Surface water and drainage: a review of responsibilities https://www.gov.uk/government/publications/surface-water-and-drainage-review-of-responsibilities
[52] Susdrain, 2020, North Stoneham Park Development. https://www.susdrain.org/case-studies/case_studies/north_stoneham_park_stage_-_light_case_study.html

of surface water exceedance flow generated by hydraulic modelling for significant greenfield developments.

Limiting urban creep

6.8.16 **Recommendation:** In residential areas limit permitted development rights regarding the paving or covering of permeable surfaces with impermeable surfacing.

Surface Water Management Plan Action Plan

6.8.17 The Eastleigh SWMP outlines the causes and effects of flooding within Eastleigh and identifies measures to mitigate against flooding in the form of an Action Plan for mitigating these risks. The key general measures detailed within the Action Plan include:

- Ensure suitable communication with the public, key stakeholders and other bodies and organisations communication,
- Agree protocol for inclusion of new flooding sites into the SWMP,
- Create an asset and historic flooding database,
- Integrate the SWMP for works programmes,
- Establish a risk based approach to drainage maintenance,
- Use the SWMP to inform the development of, and support the implementation of, planning policies in the Local Plan,
- Consider practical measures that can be incorporated in planning and development control policies,
- Promote SuDS in all new development,
- Assess the environmental impact of the SWMP,
- Consider the impact of climate change, and
- Link the SWMP work with the Emergency Planning Unit and the Multi Agency Flood Plan.

6.8.18 As well as the key general measures described above, the Eastleigh SWMP Action Plan includes site specific actions for each Parish. Common actions include:

- Ensure future developments take into account potential flood risk and do not increase runoff rates within these areas,
- Ensure riparian landowners are aware of their maintenance responsibilities for ordinary watercourses,
- Promote the Environment Agency Flood Warning Service, and
- Investigate flooding in specific areas.

6.9 Flow routing

6.9.1 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.

6.9.2 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 to prevent causing obstruction to flow routes and increasing the risk of flooding to the site or neighbouring areas.

6.9.3 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.

6.9.4 **Policy Recommendation:** All new development should not adversely affect flood routing and thereby increase flood risk elsewhere. Opportunities should be sought within the site design to make space for water.

6.10 Risk of groundwater flooding

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

6.10.2 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.

6.10.3 If the assessment identifies works below ground and/or changes in drainage, a Hydrogeological Risk Assessment (HRA) (sometimes called a Basement Impact Assessment) will 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.

6.10.4 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.

6.10.5 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 FRA and HRA if there is uncertainty over the geological or hydrogeological conditions at any proposed development site.

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

6.11 Consulting with Water companies

6.11.1 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.

6.11.2 **Recommendation:** As part of their Site Allocation process, Eastleigh 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.

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 described in the SFRA 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 to **mitigate** and **manage** the risk of flooding. These measures, as well as the measures in Section 6, should be considered when preparing a site-specific FRA. This section outlines the approach that Eastleigh 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 4-1 in the SFRA Part 1 (reproduced from PPG Table 2) provides a compatibility matrix and determines which types of development are appropriate in areas of flood risk[55].

7.3 Finished floor levels

7.3.1 **Policy Recommendation:** All development within Flood Zones 2 and 3 should set finished floor levels above the design flood level (0.5% AEP for tidal flooding, 1% AEP for fluvial flooding) including an appropriate allowance for climate change and freeboard. In areas at risk of tidal flooding, More Vulnerable and Highly Vulnerable development should apply the upper end climate change allowance, and Less Vulnerable development should apply the higher central climate change allowance.

7.3.2 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, 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, the design flood is the 1% AEP (1 in 100 year) event, and for tidal flooding it is the 0.5% (1 in 200 year) AEP 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 (refer to Section 7.8). These measures should be detailed within the FRA.

7.3.3 Guidance document “Accounting for residual uncertainty: an update to the fluvial freeboard guide – technical report”[58] explains how to determine the appropriate residual uncertainty allowances. The

[55] Planning Practice Guidance Flood Risk and Coastal Change https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2
[58] 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

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. Most 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.

7.3.4 With reference to the 'Flood risk assessment: standing advice for flood risk'[59], 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.

7.3.5 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 Eastleigh 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.

7.3.6 There are also circumstances where flood resilience measures should be considered first. These are described further in Section 7.8. 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.

7.4 Protection against groundwater flooding

7.4.1 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.

7.4.2 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).

7.4.3 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".

7.4.4 *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.

7.4.5 *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,

[59] Preparing a flood risk assessment: standing advice https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

- 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.

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

- Homeowners Guide to Flood Risk[60] – lists various measures that are applicable to flooding in general, and,
- Flooding from groundwater[61] - Practical advice to help homeowners reduce the impact of flooding specifically from groundwater.

7.5 Access / escape

7.5.1 **Policy recommendation:** New development must have safe access / escape during the design flood (0.5% AEP for tidal flooding, 1% AEP for fluvial flooding) including an appropriate allowance for climate change. More Vulnerable and Highly Vulnerable development should apply the upper end climate change allowance. Less Vulnerable development should apply the higher central climate change allowance.

7.5.2 For developments located in areas at risk of flooding from rivers or the sea, 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.
- 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.

7.5.3 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.

7.5.4 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 or 0.5% tidal 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[62]).

7.5.5 In exceptional circumstances, safe access above the design flood event (1% AEP fluvial flood level or 0.5% AEP tidal flood level) 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

[60] Homeowners guide to flood resilience. Know Your Flood Risk, July 2018. https://www.floodguidance.co.uk/wp-content/uploads/2018/07/KnowYourFloodRiskGuide_July18.pdf
[61] Environment Agency, 2011, Flooding from groundwater. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf
[62] 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

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.

7.5.6 The guidance document 'Flood Risk Emergency Plans for New Development' published by the Environment Agency and ADEPT[63] provides more detail on safe access and escape.

7.6 Places of safety

7.6.1 **Policy recommendation:** New development must be designed to include a place of safety during extreme flood conditions (0.1% AEP) including an allowance for climate change.

7.6.2 Tidal flooding occurs during exceptionally high tides or storm surges. As a result, there is advance warning of such events. The Environment Agency aim to provide a minimum 6 hours warning time for tidal flooding. As a result, it would be possible to evacuate properties prior to any significant tidal flooding taking place.

7.6.3 However, places of safety play an important role where, for whatever reason, evacuation in advance of flooding is not achieved. Places of safety should be designed to facilitate rescue in case emergency care is needed or if it's unlikely to be safe for occupants/users to wait until flood waters have receded sufficiently.

7.6.4 Places of safety should be provided above the extreme flood level (0.1% AEP for tidal flooding) including an appropriate allowance for climate change.

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 **Policy Recommendation:** Where a FRA identifies that emergency flood response is an important component of making a development safe, 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 It should be noted that for some sites in Flood Zone 1 that are located on 'dry islands', it may be necessary to prepare an Emergency Plan.

7.7.4 The Environment Agency has a tool on their website to create a Personal Flood Plan[64]. 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 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,

[63] ADEPT, Environment Agency, September 2019, Flood Risk Emergency Plans for New Development https://www.adeptnet.org.uk/floodriskemergencyplan
[64] Environment Agency Tool 'Make a Flood Plan'. https://www.gov.uk/government/publications/personal-flood-plan

  - 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. Eastleigh 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, Eastleigh 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 Flood resilience measures

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

7.8.2 '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[65], which provides advice for both new-build and retrofit. It includes specific guidance for local authority planners.

7.8.3 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.
- As a measure to manage residual flood risk from flood risk management infrastructure when avoidance measures have been exhausted.

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

7.8.5 Where historic buildings are involved, early consultation with Historic England should be undertaken and their guide66 on flood resilience for historic properties provides additional information.

[65] 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
[66] Historic England, April 2015, Flooding and Historic Buildings. https://historicengland.org.uk/images-books/publications/flooding-and-historic-buildings-2ednrev/

Flood Resistance 'Water Exclusion Strategy'

7.8.6 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.

7.8.7 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.

7.8.8 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.

7.8.9 There are 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'

7.8.10 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.

7.8.11 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.

7.8.12 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.
- Design access to all spaces to permit drying and cleaning.
- Raise the level of electrical wiring, appliances, and utility metres.

7.8.13 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.

7.9 Local Design Codes

7.9.1 **Recommendation:** It is recommended that Eastleigh 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[67] (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 Hampshire CC in their capacity as the LLFA.

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

8. Next Steps

8.1 Next steps

8.1.1 Eastleigh BC should use this SFRA and associated mapping to:

- Aid discussions with emergency planning teams, particularly regarding the predicted risk of flooding posed to access routes to and from the Hamble Point area,
- Develop their Local Plan and associated strategic policies,
- Strengthen surface water management measures in partnership with LLFA HCC,
- 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.

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 are undertaking hydraulic modelling of the Monks Brook as part of 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 reviewed after a significant flood event.

Appendix A Figures

Appendix B Tidal Flood Risk Mapping

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)