East Hampshire Level 1 SFRA

East Hampshire District Council

Final Report
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Quality information

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Revision History

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Abbreviations

ACRONYM	DEFINITION
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
AIMS	Asset Information Management System
BGS	British Geological Survey
CFMP	Catchment Flood Management Plan
Defra	Department for Environment, Flood and Rural Affairs
DCLG	Department for Communities and Local Government
EHDC	East Hampshire District Council
FRA	Flood Risk Assessment
FWMA	Flood and Water Management Act 2010
GIS	Geographical Information System
GWMP	Ground Water Management Plan
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LRF	Local Resilience Forum
MLWL	Maximum Likely Water Level
PPG	Planning Practice Guidance
NPPF	National Planning Policy Framework
RoFfSW	Risk of Flooding from Surface Water
SA	Sustainability Appraisal
SDNPA	South Downs National Park Authority
SFRA	Strategic Flood Risk Assessment
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
SW	Southern Water
TWUL	Thames Water Utilities Limited

Glossary of Terms

GLOSSARY	DEFINITION
1D Hydraulic Model	Hydraulic model which computes flow in a single dimension, suitable for representing systems with a defined flow direction such as river channels, pipes and culverts
2D Hydraulic Model	Hydraulic model which computes flow in multiple dimensions, suitable for representing systems without a defined flow direction including topographic surfaces such as floodplains
Asset Information Management System (AIMS)	Environment Agency database of assets associated with Main Rivers including defences, structures and channel types. Information regarding location, standard of service, dimensions and condition.
Aquifer	A source of groundwater comprising water bearing rock, sand or gravel capable of yielding significant quantities of water.
Attenuation	In the context of this report - the storing of water to reduce peak discharge of water.
Catchment Flood Management Plan	A high-level plan through which the Environment Agency works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Climate Change	Long term variations in global temperature and weather patterns caused by natural and human actions. For fluvial events a 70% increase in river flow is applied and for rainfall events, a 30% increase. These climate change values are based upon information within the NPPF and Planning Practice Guidance as at 3rd February 2017.
Critical Drainage Area	Within the SWMP – A discrete geographic area (usually hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zone during severe weather thereby affecting people, property or local infrastructure. By the Environment Agency - discrete geographical area where multiple and interlinked sources of flood risk cause flooding during severe weather.
Culvert	A structure, often a channel or pipe that carries water below the level of the ground
Design flood	This is a flood event of a given annual flood probability, which is generally taken as: fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year) including an allowance for climate change, or; The suitability of a proposed development is assessed and mitigation measures, if any, are designed against the design flood. Both should contain a suitable allowance for climate change. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances .
DG5 Register	A water-company held register of properties which have experienced sewer flooding due to hydraulic overload, or properties which are 'at risk' of sewer flooding more frequently than once in 20 years. Refer to Map 9 included in Appendix A.
Evapotranspiration	The sum of evaporation and plant transpiration from the land and ocean surface to the atmosphere. Evaporation accounts for the movement of water to the air from sources such as the soil, canopy interception, and waterbodies.
Exception Test	The exception test should be applied following the application of the sequential test. The exception test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. Conditions need to be met before the exception test can be applied.

GLOSSARY	DEFINITION
Flood Defence	Infrastructure used to protect an area against floods, such as floodwalls and embankments; they are designed to a specific standard of protection (design flood) which is the largest flood that a given project is designed to safely accommodate.
Flood Resilience	Measures that minimise water ingress (e.g. to buildings) and promotes fast drying and easy cleaning, to prevent permanent damage.
Flood Resistant	Measures that prevent flood water entering a building or damaging its fabric. This has the same meaning as flood proof.
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption).
Flood Zone	Flood Zones refer to the probability of river and sea flooding ignoring the presence of existing flood defences (i.e. the natural floodplain). It should be noted that Flood Zones on the Environment Agency Flood Map for Planning do not take account of the potential impact of climate change. See Section 6 for further information on Flood Zones https://flood-map-for-planning.service.gov.uk/
Fluvial	Relating to the actions, processes and behaviour of a watercourse (river or stream).
Freeboard	A freeboard is used to account for residual uncertainty within design, often an extra 300mm or 600mm added to finished floor level above the design flood level to account for any uncertainty in flood levels. A safety factor. Refer to section 13.3 for further guidance.
Functional Floodplain	Land where water has to flow or be stored in times of flood.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Impounded Reservoir	A reservoir with outlets controlled by gates that release stored surface water as needed in dry months; may also store water for domestic or industrial use or for flood control. Also known as storage reservoir.
ISIS	A commonly-used 1D hydraulic modelling software package.
Lead Local Flood Authority (LLFA)	As defined by the Flood and Water Management Act, Hampshire County Council (Hampshire County Council) Forest as LLFA are responsible for developing, maintaining and applying a strategy for local flood risk management (flooding from surface water, groundwater and ordinary watercourses) in their areas and for maintaining a register of flood risk assets.
Light Detection and Ranging (LiDAR)	Airborne ground survey mapping technique, which uses a laser to measure the distance between the aircraft and the ground. Within this report, LiDAR has been used to map topography across the District as illustrated in Figure 1.
Local Flood Risk Zone	Discrete areas of flooding that do not exceed the national criteria for a 'Flood Risk Area' but still affect houses, businesses or infrastructure. A LFRZ is defined as the actual spatial extent of predicted flooding in a single location.
Local Planning Authority (LPA)	The public authority that is responsible for controlling planning and development through the planning system.
Main River	Watercourse defined on a 'Main River Map' designated by Defra. The Environment Agency has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Ordnance Datum	In the British Isles, an ordnance datum is a vertical datum used by an ordnance

GLOSSARY	DEFINITION
	survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD (Above Ordnance Datum), in this instance meaning above mean sea level at Newlyn in Cornwall.
Ordinary Watercourse	A watercourse that does not form part of a Main River. This includes "all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows" according to the Land Drainage Act 1991.
Pluvial	Pluvial refers to flood events occurring through the direct action of rain – i.e. surface water flooding. Rather than water overflowing the banks of a river which is considered fluvial flooding.
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account. An example of residual flood risk includes the failure of flood management infrastructure, or a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defences, or an intense rainfall event which the drainage system cannot cope with.
Return Period	Also known as a recurrence interval is an estimate of the likelihood of an event, such as a flood to occur.
Risk	Risk is a factor of the probability or likelihood of an event occurring multiplied by consequence: Risk = Probability x Consequence. It is also referred to in this report in a more general sense.
Sequential Test	Aims to steer vulnerable development to areas of lowest flood risk.
Sewer Flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Source Protection Zone (SPZ)	Defined areas in which certain types of development are restricted to ensure that groundwater sources remain free from contaminants.
Surface Water	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Sustainable drainage systems (SuDS)	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Topographic survey	A survey of ground levels.
TUFLOW	A modelling package for simulating depth averaged 2D free-surface flows that is in widespread use in the UK and elsewhere for 2D inundation modelling.

Executive Summary

A considerable proportion of the Planning Authority Area (the part of the East Hampshire District that is not located within the South Downs National Park authority area) is at risk of flooding from rivers, surface water and groundwater sources. Groundwater poses the most significant risk to the Planning Authority Area due to it not only being a direct cause of flooding but also a contributing factor to fluvial and surface water flooding events.

As the Local Planning Authority (LPA) East Hampshire District Council has the responsibility, in accordance with the National Planning Policy Framework (NPPF) Flood Risk and Coastal Change, to ensure that flood risk is understood and managed effectively through all stages of the planning process. As such, East Hampshire District Council is required to undertake a Strategic Flood Risk Assessment (SFRA) to form part of the evidence base for the preparation of their Local Plan. AECOM has been commissioned to review and update the former SFRA (2008).

The aim of this revised Level 1 SFRA is to identify the spatial variation in flood risk across the Planning Authority Area from all sources, facilitating a district-wide comparison of future development sites with respect to flood risk considerations.

The Environment Agency identifies the fluvial floodplains associated with main rivers across the Planning Authority Area, presented in the maps included in Appendix A. Potential risk of flooding from other sources exists throughout the District. As the Lead Local Flood Authority (LLFA), Hampshire County Council takes the lead in flood incident reporting from these sources and has compiled a database of significant flood events in the Planning Authority Area.

This revised Level 1 SFRA provides an overview of the risk of flooding from all sources across the Planning Authority Area, including flooding from rivers, surface water, groundwater, sewers and other artificial sources, and should be used to assist in the development of policy formulation, strategic planning, and application of the Sequential Test, development control and emergency planning.

1. Introduction

In its role as the Local Planning Authority (LPA), East Hampshire District Council (EHDC) is currently preparing documents that will form part of the Local Plan to guide future development from 2017 to 2036 and to set the vision for future development across parts of the District. As part of this process, evidence must be collated to inform key planning issues. Since the previous East Hampshire SFRA was published in 2008, a number of changes in planning policy have occurred. In addition to this, updated datasets have been made available which include improvements to flood mapping and modelling.

1.1 Approach to Flood Risk Management

The NPPF[1] and associated PPG[2] for Flood Risk and Coastal Change emphasise the active role LPAs should take to ensure that flood risk is assessed, avoided, and managed effectively and sustainably throughout all stages of the planning process. The overall approach for the consideration of flood risk set out in Section 1 of the PPG can be summarised as follows:

This has implications for LPAs and developers as described below.

1.1.1 Assess flood risk

The NPPF[1] outlines that Strategic Policies should be informed by a SFRA and should manage flood risk from all sources. Figure 1.1 reproduced from the PPG[2], illustrates how flood risk should be taken into account in the preparation of the Local Plan by EHDC. Certain sites will require a specific FRA as defined in the NPPF[1]. The FRA process is described in further detail in Section 12.

1.1.2 Avoid flood risk

EHDC should apply the sequential approach to site selection so that development is, as far as reasonably possible, located where the risk of flooding from all sources is lowest, taking account of current and future impacts of climate change and the vulnerability of future users and property to flood risk, where possible.

In plan-making this involves applying the Sequential Test, and where necessary the Exception Test to Local Plans, as described in Figure 1-1.

In decision-taking this involves applying the Sequential Test and if necessary the Exception Test for specific development proposals.

1.1.3 Manage and mitigate flood risk

Where alternative sites in areas at lower risk of flooding are not available, it may be necessary to locate development in areas at risk of flooding. In these cases, EHDC and developers must ensure that development is appropriately flood resilient and resistant, safe for its users for the lifetime of the development, and will not increase flood risk overall. EHDC and developers should seek flood risk management opportunities (e.g. safeguarding land), and to reduce the causes and impacts of flooding (e.g. through the use of sustainable drainage systems).

[1] Communities and Local Government. July 2018. *Revised National Planning Policy Framework*. Available at: https://www.gov.uk/government/collections/revised-national-planning-policy-framework
[2] Communities and Local Government. 6th March 2014. Planning Practice Guidance: Flood Risk and Coastal Change. Available at: http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

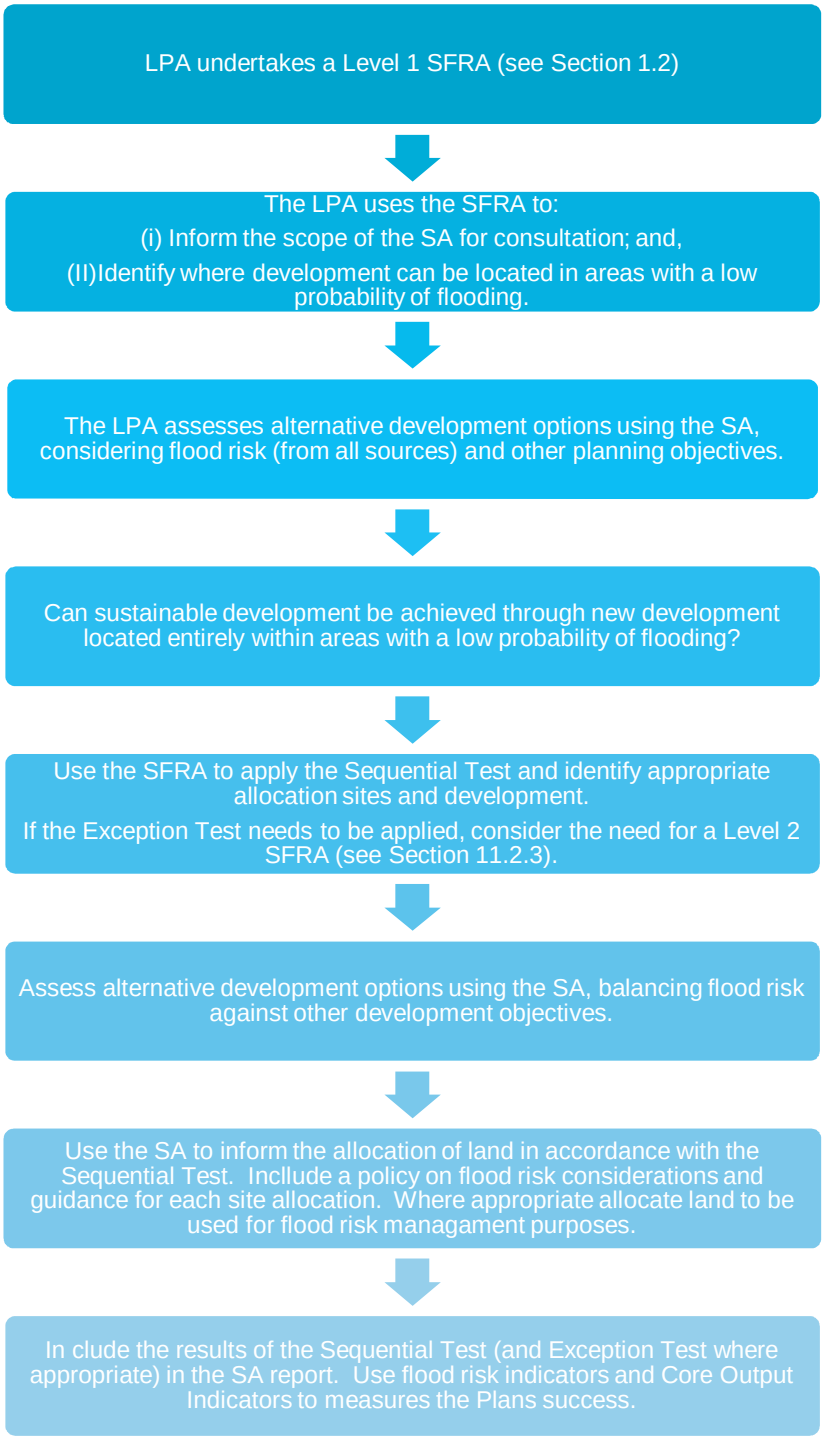

Figure 1-1 Taking flood risk into account in the preparation of a Local Plan (Planning Practice Guidance for Flood Risk and Coastal Change)

1.2 Purpose of a SFRA

The purpose of the Level 1 SFRA will be to collate and analyse the most up to date flood risk information for use by EHDC to inform the strategy for development in the Local Plan, and to further inform site-specific flood risk assessments. The SFRA will assess the risks associated with all types of flooding in accordance with the NPPF[1] and PPG[2] and will assess the risks both now and in the future. The SFRA will build on existing hydraulic modelling and available information.

The SFRA will inform the application of the Sequential and Exception Tests (where required) in the allocation of future development sites, as required by the NPPF[1] taking into account all sources of flooding. AECOM will prepare the SFRA in such a way that it will provide relevant and easily accessible information for applicants preparing site specific flood risk assessments.

2. Study Area

2.1 Local Planning Authority Area

The East Hampshire Local Plan reviews all strategic issues affecting East Hampshire outside of the South Downs National Park. This area is known as the Planning Authority Area. The SFRA therefore covers the Planning Authority Area only. However, during its preparation, neighbouring authorities including the South Downs National Park Authority, have been consulted to help identify any cross boundary flood risk issues to inform this SFRA.

The East Hampshire District is located in the County of Hampshire and is boarded by the authority areas of the South Downs National Park Authority, Hart District Council, Waverley Borough Council, Basingstoke and Deane Borough Council, Rushmoor Borough Council, Chichester District Council, Havant Borough Council and Winchester City Council.

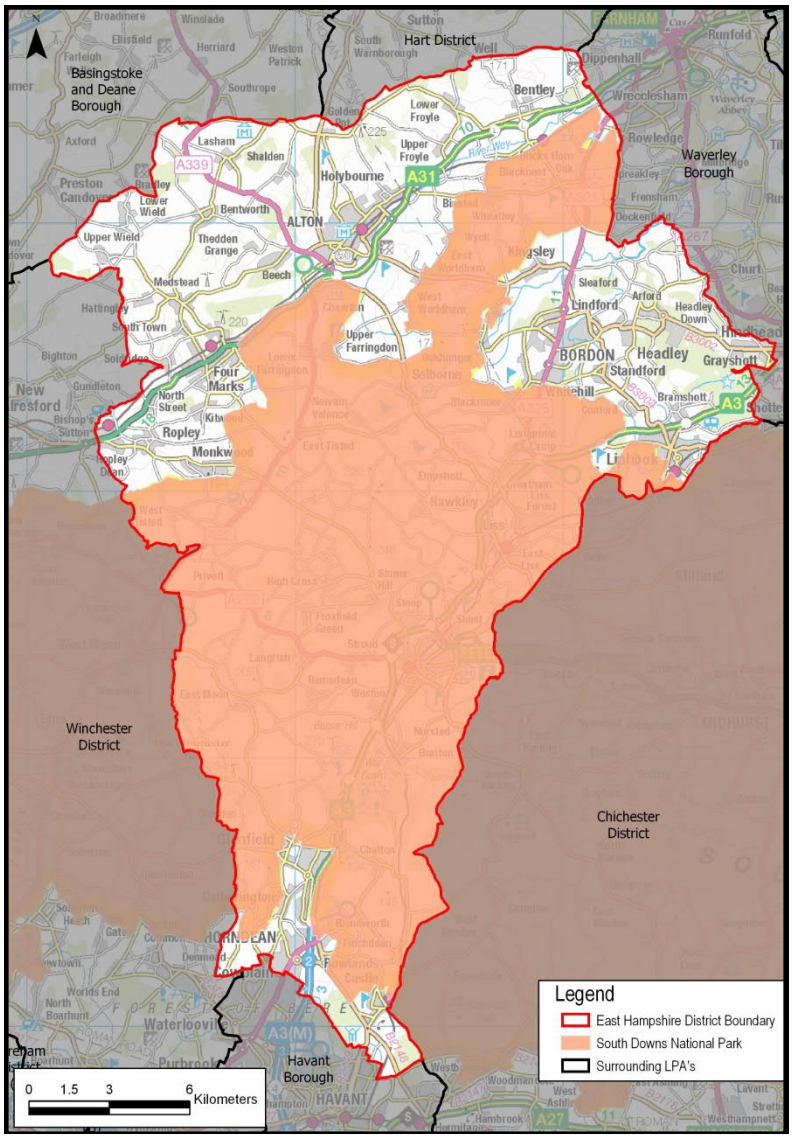

Figure 2-1 Study Area

2.2 Topography

Light Detection and Ranging (LiDAR) topographic survey data[3] is presented in Appendix A Figure 1. The highest point of the District is approximately 225m Above Ordnance Datum (AOD) to the east of the District, with the lowest point, <25m AOD, located south of Rowlands Castle in the south of the District.

Appendix A, Figure 1 Topography and Watercourses

2.3 Geology

Datasets have been obtained from the British Geological Survey (BGS) website to provide a high level identification of the superficial deposits and bedrock geology across the district. This is displayed in Appendix A Figure 2 and Figure 3.

Bedrock is the consolidated rock underlying the ground surface. Superficial deposits refer to the more geologically recent deposits (typically of Quaternary age) that may be present above the bedrock such as floodplain deposits, beach sands and glacial drift. Underlying geology can influence the presence and nature of groundwater in an area, and therefore potential groundwater flood risk. The geology can also impact on the potential for infiltration based drainage systems.

The primary solid deposits are the White Chalk Subgroup and Lower Greensand Group. Other formations present include Gault Formation, Grey Chalk Subgroup, and Upper Greensand Formation (undifferentiated), Lower Greensand Group, Lambeth Group, Thames Group.

In small areas of the district, superficial deposits, of varying thicknesses, overlie the solid deposits. These include Clay-with-flints Formation, which is present to the north west and south of the district and River Terrace Deposits (undifferentiated) which are present to the north and north west of the district.

Appendix A, Figure 2 and Figure 3

2.4 Hydrogeology

Aquifers are defined as layers of permeable rock or unconsolidated material (sand, gravel, silt etc.) capable of storing and transporting large quantities of water. The understanding of the behaviour and location of aquifers is important as they can provide an indication of the potential for groundwater flooding.

The White Chalk Subgroup and Grey Chalk Subgroup bedrocks that underlay the study area are described by the Environment Agency as being Principal Aquifers. The Environment Agency describes Principal Aquifers as:

> *'layers of rock or drift deposits that have a high intergranular and / or fracture permeability – meaning they usually provide a high level of water storage. They may support water supply and / or river base flow on a strategic scale'.*

Further information on groundwater flooding from aquifers is provided within Section 9.

2.5 Main Rivers

There are eleven main rivers located within the Planning Authority Area and four named ordinary watercourses as detailed in Table 2-1. The main rivers are mapped below in Figure 2-2 and Appendix A Figure 1. The catchment of the River Wey and tributaries covers a large area in the north of the Planning Authority Area. Further detail on the River Wey catchment is provided below in Section 2.5.1.

[3] Light Detection and Ranging (LiDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. Up to 100,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at spatial resolutions of between 25 cm and 2 m. The data covering EHDC has a spatial resolution of 1m. The Environment Agency's LiDAR data archive contains digital elevation data derived from surveys carried out since 1998.

Table 2-1 Rivers and Watercourses in the Planning Authority Area

Name	Location in the Planning Authority Area	Main River or Ordinary Watercourse	Settlement it flows through
River Wey (North Wey)	North West	Main River	Alton
Lavant Stream (north)	North West	Main River	None
Caker Stream	North West	Main River	Alton
Ryebridge Stream	North West	Ordinary Watercourse	Upper Froyle
River Wey (South Wey)	North East	Main River	Bordon and Stanford
Holly Water	North East	Main River	None
Dead Water	North East	Main River	Bordon
Oakhanger Stream	North East	Main River	Oakhanger
Orkney Moss	North East	Ordinary Watercourse	None
Kingsley Stream	North East	Main River	None
Oxney Stream	North East	Main River	None
River Slea	North East	Main River	None
Wishanger Lake	North East	Ordinary Watercourse	None
Barford Pond	North East	Ordinary Watercourse	None
Lavant Stream (south)	South	Main River	Rowlands Castle

2.5.1 River Wey

The River Wey is a tributary of the River Thames. The River Wey flows in a predominantly northeast direction from near Alton (North Wey) and Haslemere (South Wey) to Weybridge (see Figure 2-2). The section of the River Wey located within the study area is also defined as the ‘Upper Wey’. The River Wey is split into two branches within the study area, the northern branch and the southern branch.

The River Wey has a number of tributaries located within the study area including the River Deadwater, River Slea, the Lavant Stream (North) to Caker Stream and the Haslemere Stream, located on the southern branch of the River Wey (see Figure 2-2).

There are a number of urban areas on the Upper Wey, namely Farnham (in the Waverley Borough), Alton and Whitehill & Bordon. Through these urban areas as well as the more rural areas, the channel has been modified with mill structures, side channels and weirs throughout its length. The Upper Wey valley sides tend to rise quickly, keeping the flood extent of the River Wey well contained, particularly in the upper reaches and urban areas of Alton and Bordon.

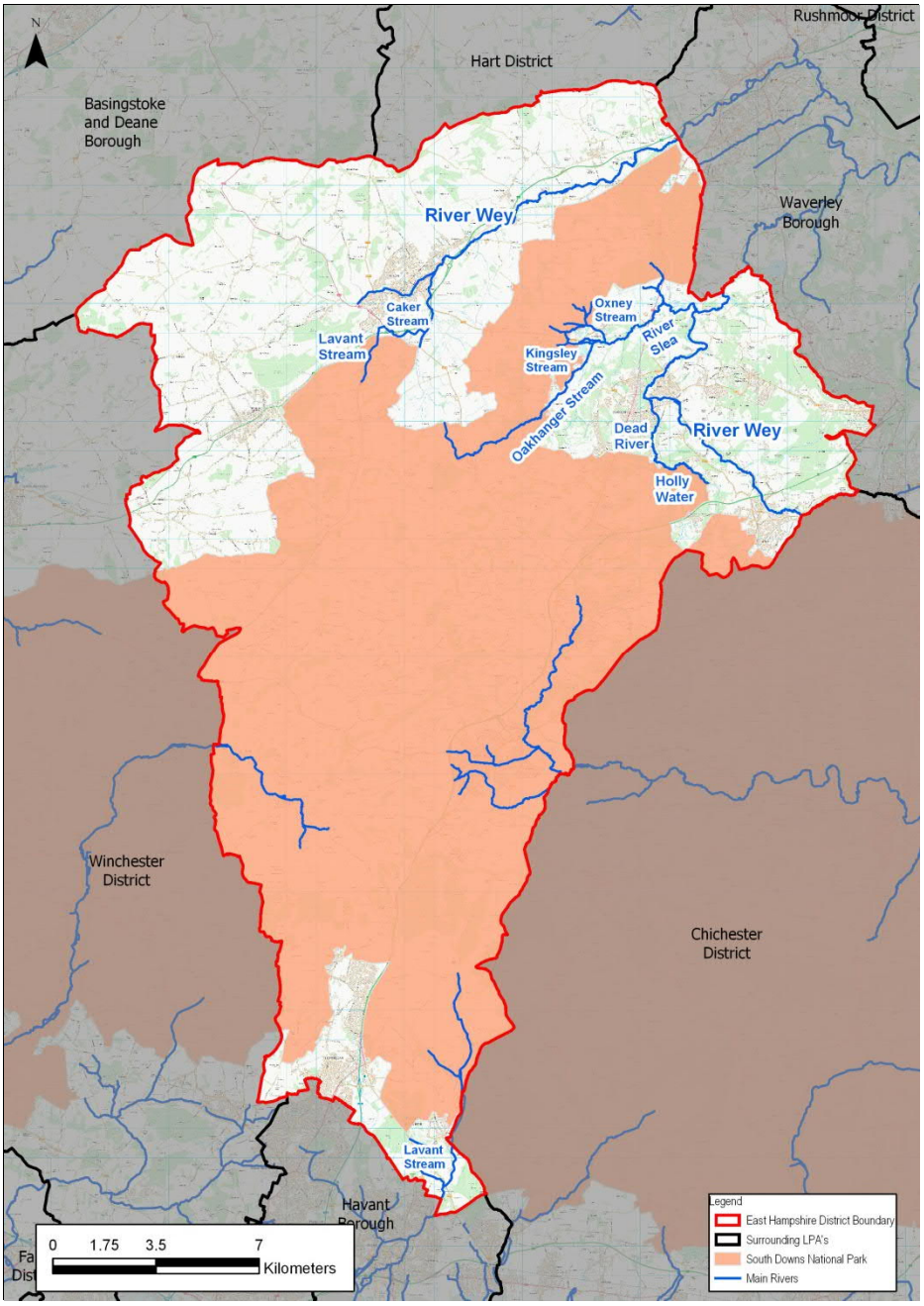

Figure 2-2 Main Rivers in East Hampshire

3. Policy and Local Context

There is an established body of policy and guidance documents which are of particular importance when considering development and flood risk. These are identified in Table 3-1 along with links for where these documents can be found for further detail.

Table 3-1 Flood Risk Policy and Guidance Documents

National Legislative and Policy Documents		
Flood and Water Management Act (2010)	Provides for a more comprehensive management of flood risk, designating roles and responsibilities for different Risk Management Authorities. Designates Hampshire County Council as the Lead Local Flood Authority, with duties and responsibilities for managing local flood risk (defined as flooding from surface water, groundwater and ordinary watercourses).	https://www.legislation.gov.uk/ukpga/2010/29/contents
Flood Risk Regulations (2009)	The Flood Risk Regulations transpose the EU Floods Directive into law in England. It aims to provide a consistent approach to flood risk across Europe.	http://www.legislation.gov.uk/uksi/2009/3042/contents/made
Revised National Planning Policy Framework	The NPPF was published by the UK's DCLG in March 2012 and updated in July 2018, consolidating over two dozen previously issued documents called Planning Policy Statements (PPS) and Planning Policy Guidance Notes (PPG) for use in England.	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728643/Revised_NPPF_2018.pdf
National Flood and Coastal Erosion Risk Management Strategy for England (2011)	The National FCERM Strategy sets out the long-term objectives for managing flood and coastal erosion risks and the measures proposed to achieve them. It provides a framework for the work of all flood and coastal erosion risk management authorities.	https://www.gov.uk/government/publications/national-flood-and-coastal-erosion-risk-management-strategy-for-england
The Environmental Permitting (England and Wales) Regulations (2016)	In order to complete works on or near a main river, on or near a flood defence structure, in a floodplain or on or near a sea defence. Guidance on obtaining an environmental permit is available from the Environment Agency.	https://www.gov.uk/guidance/flood-risk-activities-environmental-permits http://www.legislation.gov.uk/uksi/2016/1154/contents/made
Regional Flood Risk Policy		
Thames, Arun and Western Streams, South East Hampshire Catchment Flood Management Plans	Role of the CFMP is to establish flood risk management policies which will deliver sustainable flood risk management for the long term (an Environment Agency Document).	https://www.gov.uk/government/collections/catchment-flood-management-plans
Guidance Documents		
Planning Policy Guidance – Flood Risk and Coastal Change	Describes the planning approach to development within areas at risk of flooding from all sources	http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/
Environment Agency Standing Advice	Guidance on information to be included within robust site specific Flood Risk Assessments (FRAs)	https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities	A supporting note for the National FCERM Strategy. It provides the UK Climate Projections (UKCP09) climate change factors for river flood flows, extreme rainfall, storm surge and wave climate for each river basin district, and provides advice on applying climate change projections in the FCERM.	https://www.gov.uk/government/publications/adapting-to-climate-change-for-risk-management-authorities
Local Documents and Strategies		
East Hampshire District Local Plan: Joint Core Strategy (2014)	Core strategy sets out the EHDC and SDNPA plans for development within the District over the next 20 years including policy guidance on flood risk.	https://www.easthants.gov.uk/sites/default/files/documents/DP01EastHampshireDistrictLocalPlanJointCoreStrategy.pdf
Hampshire County Council (Hampshire County Council) Preliminary Flood Risk	In accordance with the Flood Risk Regulations 2009, Hampshire County Council provided a PFRA to provide a high level overview of flood risk from local sources for	http://documents.hants.gov.uk/flood-water-management/watercourses/PFR

National Legislative and Policy Documents

Assessment (PFRA) and PFRA Addendum	provision to the Environment Agency, ultimately reporting to Europe. The report was published in 2011 with an addendum published in 2017.	AReportsavedJan2016.pdf https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698544/PFRA_Hampshire_County_Council_2017.pdf
Hampshire County Council Local Flood Risk Management Strategy (LFRMS)	As LLFA, Hampshire County Council has created the LFRMS to understand and manage flood risk within the County.	http://documents.hants.gov.uk/flood-water-management/LFRMS-Summary.pdf
Hampshire County Council Surface Water Management Plan (SWMP) and Strategic Assessment and Background Information	The Strategic Assessment and Background Information provides information on flooding across the County.	http://documents.hants.gov.uk/flood-water-management/FWMASWaMPStrategicAssessmentandBackgroundInformation-2012-10-22.pdfhttp://documents.hants.gov.uk/flood-water-management/FWMASWaMPStrategicAssessmentandBackgroundInformation-2012-10-22.pdf
Hampshire County Council Hampshire County Council Guide to Flooding (2016)	The Hampshire County Council Hampshire County Council Guide to Flooding details essential information for people at risk of flooding as well as guidance and support the council can provide.	https://www.easthants.gov.uk/sites/default/files/documents/East%20Hants%20Flood%20Booklet_0.pdf
Hampshire County Council Hampshire County Council Groundwater Management Plan	Hampshire County Council Hampshire County Council has created the Groundwater Management Plan to understand and manage flood risk within the County.	http://documents.hants.gov.uk/flood-water-management/groundwater/GroundwaterManagementPlan.pdf
Partnership for Urban South Hampshire (PUSH) SFRA Update (2016)	The PUSH SFRA was published in 2016 to inform and provide an evidenced base for the PUSH South Hampshire Strategy to 2036.	https://maps.hants.gov.uk/push/Reports/PUSH_SFRA_2016_Update_v3.0_Final.pdf

Within the EHDC area there are a number of authorities responsible or involved with flood and/or water management. The table below shows who is responsible within the District.

Table 3-2 Responsibilities and duties for managing flood risk in East Hampshire

Key Responsibilities of Different Authorities	Environment Agency	Hampshire County Council	East Hampshire District Council	Thames Water	Southern Water	Highways England	Riparian Owners
Fluvial Flooding from Main Rivers	✓						✓
Fluvial Flooding from Ordinary Watercourses		✓	✓[4]				✓
Surface Water flooding		✓	✓[4]				
Groundwater Flooding		✓	✓[4]				
Sewer Flooding				✓	✓		
Reservoir Flooding	✓						✓
Highways flooding		✓				✓	✓

Table 3-3 below shows the organizations that are statutory and non-statutory planning consultees for flood risk issues within the District.

Table 3-3 Planning consultees for flood risk issues

Consultee / Flood Risk Issue	Environment Agency	Hampshire County Council (LLFA)	East Hampshire District Council drainage	Thames Water	Southern Water
Flood Zones 2 & 3	All development (except minor development and access & egress issues).		Development with access and egress issues & Minor development.		
Surface water drainage from site		All major developments (≥10 dwellings, commercial ≥ 1000m^2).	1-9 dwellings and new commercial buildings ≤1000m^2.	Where development connects to a Thames Water sewer (non-statutory).	Where development connects to a Thames Water sewer (non-statutory).
Surface Water Indicative Flood Problem Areas			All new buildings/ change of use to dwellings.		
Groundwater Indicative Flood Problem Areas			All new buildings/ change of use to dwellings.		
Ordinary watercourses		Works in Ordinary Watercourses (Non-Statutory).			

[4] Under the amended Land Drainage Act 1991 section 14A, district councils do have some limited powers. These powers include maintaining, repairing, operating and improving existing works; construct or repair new works; maintain or restore natural processes, monitor, investigate and survey a location or natural process, alter the water level, and alter or remove works as long as this is in line with Hampshire County Council's Local Flood Risk Management Strategy

Main river	Works within 20m of a designated Main River.		
Sewerage	Major development not using a main sewer.	Where development connects to a Thames Water sewer (non-statutory).	Where development connects to a Thames Water sewer (non- statutory).

4. User Guide

It is anticipated that this SFRA will have a number of end users with slightly different requirements; this Section describes how to use the SFRA and how to navigate the report and mapping deliverables. The SFRA Report is set out as follows:

- Section 5 SFRA Methodology
- Section 6 Flood Risk from Rivers
- Section 7 Flooding from Surface Water
- Section 8 Flooding from Sewers
- Section 9 Flooding from Groundwater
- Section 10 Flooding from Artificial Sources
- Section 11 Guidance on the application of the Sequential and Exception Test
- Section 12 Site Specific FRA Guidance
- Section 13 Managing and Mitigating Flood Risk
- Section 14 Summary and Recommendations
- Appendix A- Flood Maps
- Appendix B- Data Register

4.1.1 Strategic Planning and Policy

The main purpose of the SFRA for EHDC, as explained in the NPPF[1], is to provide a strategic overview of flood risk within the Planning Authority Area in order to enable effective risk-based strategic planning for the future, through the preparation of the Local Plan. Sections 5 to 9.2.3.3 presents the information that should be used by EHDC to inform their knowledge of flood risk from all sources throughout their area.

As part of this SFRA, a number of policy options have been developed for the District and presented in Section 13. These should be taken forward to inform the planning application of the Sequential and Exception Test during the process of allocating development within the Planning Authority Area.

4.1.2 Applying the Sequential Test

The NPPF[1] sets strict tests to protect people and property from flooding which all LPAs are expected to follow. The aim of the Sequential Test, under the NPPF[1], is to steer new development to areas with the lowest probability of flooding. Section 11 provides specific guidance on applying both the Sequential and, where appropriate, Exception Tests.

4.1.3 Emergency Planning

EHDC is a Category One Responder under the Civil Contingencies Act 2004[5] and therefore has a responsibility, along with other organisations, to develop emergency plans to help reduce, control or ease the effects of an emergency. EHDC has set out its response plan in the East Hampshire District Council and Havant Borough Council Emergency Response Plan[6].

The Emergency Response Plan sets out generic plans for any emergency event. However, the complex nature of flooding, and its subsequent impacts, often requires a comprehensive and sustained response from a wide range of organisations. Hampshire County Council is also a Category One Responder and coordinates Hampshire and Isle of Wight Local Resilience Forum. As such, Hampshire County Council has formed a Local Resilience Forum (LRF) to allow all Category One and Category Two responding parties to work together to plan and implement the response to emergency events including flooding. The SFRA deliverables should be used by EHDC's Emergency Planning team as a useful source of up to date information about flood risk. The SFRA should be reviewed by the team, such that the findings can be incorporated

[5] HSMO (2004) Civil Contingencies Act. Available from: http://www.legislation.gov.uk/ukpga/2004/36/contents
[6] East Hampshire District Council and Havant Borough Council Emergency Response Plan (2015). Available from: https://www.easthants.gov.uk/sites/default/files/documents/Emergency%20Response%20Plan%20East%20Hampshire%20and%20Havant.pdf

into their understanding of flood risk. Section 13 provides detail on Emergency Planning and Flood Warnings within the Planning Authority Area.

4.1.4 Preparing Site Specific FRAs

The SFRA can provide a useful starting point to the preparation of site specific Flood Risk Assessments (FRAs) for individual development sites as follows;

1. Sections 5 to 9.2.3.3 provides an overview of the key issues within the Planning Authority Area in relation to flood risk;
2. Section 11 provides guidance on the application of the Sequential Test for sites that have not yet been tested by the LPA, as well as details on when the Exception Test is required, and how to apply it;
3. Section 12 provides specific guidance for preparing site specific FRAs in accordance with the checklist presented in the PPG[2].
4. Section 13 provides details of measures that may need to be implemented to manage and mitigate flood risk;

4.1.5 Assessing Planning Applications

Development Management officers who are reviewing site specific FRAs as part of the planning application process should consult Sections 5.3 to 9.2.3.3 of the SFRA to provide background for flood risk in the area relating to the planning application. Section 12 can also be used by those assessing applications as a checklist for issues that need to be addressed as part of site specific FRAs.

4.1.6 Living Document

This SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the Planning Authority Area taking into account cross boundary flood risk issues. The Environment Agency review and update the Flood Map for Planning (Rivers and Sea)[7] on a quarterly basis and a rolling programme of detailed flood risk mapping is underway.

New information may influence future development control decisions within these areas. Therefore it is important that the SFRA is adopted as a 'living' document and is reviewed regularly in light of emerging policy directives, flood risk datasets and an improving understanding of flood risk within the Planning Authority Area. It is important to note that the SDNPA Level 1 SFRA covers the parts of East Hampshire District not covered by this SFRA.

[7] Environment Agency (2018) Flood Map for Planning https://flood-map-for-planning.service.gov.uk/

5. SFRA Methodology

5.1 Consultation

Under the Localism Act 2011[8], there is now a legal duty on LPAs to co-operate with one another, County Councils and other Prescribed Bodies to maximise the effectiveness within which certain activities are undertaken as far as they relate to a 'strategic matter'.

In complying with the duty to cooperate, Government Guidance recommends that LPAs 'scope' the strategic matters of Local Plan documents at the beginning of the preparation process taking account of each matters 'functional geography' and identify those LPAs and Prescribed Bodies that need to be constructively and actively engaged.

Flood risk is identified as a strategic matter and specific engagement activities are proposed with a number of adjoining LPAs and Prescribed Bodies, both in relation to the preparation of the SFRA and the Local Plan. As part of the SFRA, a number of organisations were contacted, invited to attend an inception meeting, and requested to provide data to inform the SFRA. A summary of the roles of each organization, and their involvement through the SFRA project, is provided in Table 5-1.

Table 5-1 SFRA Stakeholder Organisations and Roles

Stakeholder Organisation	Role with respect to EHDC SFRA
EHDC	As a LPA EHDC has a responsibility to consider flood risk in their strategic land use planning and the development of their Local Plan. The NPPF requires LPAs to undertake a SFRA and to use their findings, and those of other studies, to inform strategic land use planning including the application of the Sequential Test which seeks to steer development towards areas of lowest flood risk prior to consideration of areas of greater risk. EHDC is also required to consider flood risk and, when necessary, apply the Sequential and Exception Tests when assessing applications for development. During the preparation of the SFRA, EHDC has provided access to available datasets held by the Council regarding flood risk across the District and the Planning Authority Area. The SFRA will be used by the EHDC's Emergency Planning team to ensure that the findings are incorporated into their understanding of flood risk and the preparation of their Multi-Agency Flood Plan (MAFP).
Environment Agency	The Environment Agency has a duty to manage the risk of flooding from Main Rivers and to provide a strategic overview for all flooding sources and coastal erosion. The Environment Agency has a role to provide technical advice to LPAs and developers on how best to avoid, manage and reduce the adverse impacts of flooding. Part of this role involves advising on the preparation of spatial plans, sustainability appraisals and evidence base documents, including SFRAs as well as providing advice on higher risk planning applications. The Environment Agency undertakes systematic modelling and mapping of fluvial flood risk associated with all Main Rivers in the study area, as well as supporting Lead Local Flood Authorities (LLFA) with the management of surface water flooding by mapping surface water flood risk across England. The Environment Agency has supplied available datasets for use within the SFRA. The Environment Agency is a member of the East Hampshire Local Plan SFRA Steering Group and has been consulted throughout the preparation of this SFRA.
Hampshire County Council (Hampshire County Council)	As the LLFA, under the Flood and Water Management Act (FWMA) Hampshire County Council has a duty to take the lead in the coordination of local flood risk management, specifically defined as flooding from surface water, groundwater and ordinary watercourses and to this end has prepared the Local Flood Risk Management Strategy (LFRMS) for Hampshire. Hampshire County Council is responsible for regulation and enforcement on ordinary

[8] HMSO (2011) Localism Act Available from: http://www.legislation.gov.uk/ukpga/2011/20/contents/enacted

Stakeholder Organisation	Role with respect to EHDC SFRA
	watercourses and is a statutory consultee for future sustainable drainage systems (SuDS) for major developments in the county, following changes to the Town and Country Planning (Development Management Procedures) (England) Order 2015. Hampshire County Council is the Highways Authority and therefore has responsibilities for the effectual drainage of surface water from adopted roads insofar as ensuring that drains, including kerbs, road gullies and ditches and the pipe network which connect to the sewers, are maintained. As such, Hampshire County Council is a key stakeholder in the preparation of the SFRA and a member of the Steering Group. Hampshire County Council has provided current datasets in relation to the assessment of local sources of flooding (surface water, groundwater and ordinary watercourses), is a member of the East Hampshire Local Plan SFRA Steering Group and has been consulted throughout the preparation of this SFRA. HCC will be involved in the implementation of any policy outcomes with respect to sustainable drainage or ordinary watercourse management.
Thames Water Utilities Ltd	Thames Water Utilities Ltd (TWUL) is responsible for surface water drainage from development via adopted sewers and for maintaining public sewers into which much of the highway drainage connects. In relation to the SFRA, the main role that TWUL will play is providing data regarding past sewer flooding for the north of the study area.
Southern Water	Southern Water (SW) is responsible for surface water drainage from development via adopted sewers and for maintaining public sewers into which much of the highway drainage connects. In relation to the SFRA, the main role that SW will play is providing data regarding past sewer flooding for the south of the study area.
British Geological Survey	BGS hold a number of datasets that have informed the SFRA, including superficial and bedrock geology and suitability of infiltration SuDS.
Neighbouring LPAs and other consultees	East Hampshire District is covered by two planning authorities, the EHDC Planning Authority and the SDNP authority. The SDNP authority has its own SFRA evidence base but has been a key consultee on this SFRA. The following LPAs adjoin EHDC Planning Authority; SDNPA, Hart District Council, Waverley Borough Council, Basingstoke and Deane Borough Council, Rushmoor Borough Council, Chichester District Council, Havant Borough Council and Winchester City Council who have been consulted for any cross boundary flood risk issues.

5.2 Data Collection and Mapping

A large quantity of information and datasets have been made available by the stakeholder organisations and used to inform the assessment of flood risk. Descriptions of the datasets that have been used, along with details of their appropriate use or limitations, are included in Section 5 to 9.2.3.3, and a data register is included in Appendix B Data Register.

5.3 Overview of SFRA

Under Section 14 of the NPPF[1], the risk of flooding from all sources must be considered as part of a SFRA, including flooding from the sea, rivers, land, groundwater, sewers and artificial sources. The study area is not located within an area at risk of tidal flooding, therefore flood risk from this source will not be considered further as part of this SFRA. Sections 5 to 9.2.3.3 provide a strategic assessment of the flood risk across the Planning Authority Area from each source. Reference should be made to the supporting mapping in Appendix A.

6. Flooding from Rivers

Flooding from rivers occurs when water levels rise higher than bank levels causing floodwater to spill across adjacent land (floodplain). The main reasons for water levels rising in rivers are:

- Intense or prolonged rainfall causing runoff rates and flows to increase in rivers, exceeding the capacity of the channel. This can be exacerbated by wet conditions and where there is significant groundwater base flow.
- Constrictions in the river channel causing flood water to back up; and
- Constrictions preventing discharge at the outlet of the river e.g. locked flood gates.

6.1.1 Flood Map for Planning (Rivers and Sea)

The risk of flooding is a function of the probability that a flood will occur and the consequence to the community or receptor as a direct result of flooding. The NPPF[1] seeks to assess the probability of flooding from rivers by categorising areas within the fluvial floodplain into zones of low, medium and high probability, as defined in Table 6-1 and presented on the Flood Map for Planning (Rivers and Sea) available on the Environment Agency website. These Flood Zones have been presented in Figure 6 included in Appendix A.

Table 6-1 Fluvial Flood Zones (extracted from the PPG[2] 2014)

Flood Zone	Flood Zone Definition for River Flooding	Probability of Flooding
Flood Zone 1	Land having a less than 1 in 1,000 chance of river flooding each year (0.1% annual probability). Shown as clear on the Flood Map – all land outside Flood Zones 2 and 3.	**Low**
Flood Zone 2	Land having between a 1 in 100 and 1 in 1,000 chance of river flooding each year (between 1% and 0.1% annual probabilities).	**Medium**
Flood Zone 3a	Land having a 1 in 100 or greater chance of river flooding each year (greater than 1% annual probability).	**High**
Flood Zone 3b	Land where water has to flow or be stored in times of flood, or land purposely designed to be flooded in an extreme flood event (flood storage area). Flood Zone 3b is defined by the LPA in the SFRA, in this instance the 1 in 20 (5% AEP) has been used to define Flood Zone 3b. The Environment Agency does not separately distinguish Flood Zone 3b from Flood Zone 3a on the Flood Map for Planning (Rivers and Sea).	**Functional Floodplain**

The Environment Agency 'Flood Map for Planning (Rivers and the Sea)' provides information on the areas that would flood if there were no flood defences or buildings in the "natural" floodplain. The 'Flood Map for Planning (Rivers and Sea)' dataset is available on the Environment Agency website[9] and is the main reference for planning purposes as it contains the Flood Zones which are referred to in the NPPF[1].

The 'Flood Map for Planning (Rivers and Sea)' was first developed in 2004 using national generalised modelling (JFLOW) and is routinely updated and revised using results from the Environment Agency's ongoing programme of river catchment studies. The studies can include topographic surveys and hydrological and/or hydraulic modelling as well as incorporating information from recorded flood events.

The Environment Agency Flood Map for Planning dataset has been used to define and illustrate Flood Zone 1, 2 and 3a on Figure 6 contained within Appendix A of this SFRA. However, it should be noted that the Flood Zones shown on the Environment Agency Flood Map for Planning do not take account of the possible impacts of climate change. In the absence of this information, climate change mapped outlines have been derived from the following sources; (Further information on the Environment Agency hydraulic models are provided in Section 6.1.2).

[9] Environment Agency Flood Map for Planning (Rivers and Sea) http://apps.environment-agency.gov.uk/wiyby/37837.aspx

- River Wey - 1 in 100 year + 70% climate change allowance modelled flood outline derived from Environment Agency modelling (Capita AECOM 2017)
- River Deadwater - 1 in 100 year + 70% climate change allowance modelled flood outline derived from Environment Agency modelling (Capita AECOM 2018)
- Haslemere Stream - 1 in 100 year + 70% climate change allowance modelled flood outline derived from Environment Agency modelling (Capita AECOM 2018)
- River Lavant - The Havant Flood Mapping modelling study (Atkins 2008) does not have the updated modelled extents for climate change. In the absence of updated hydraulic modelling the 1 in 1000 year flood outline will be used as a conservative proxy for the 1% + 70% climate change allowance. Further information on climate change can be found in Section 6.1.6 of this report.

A proportion of East Hampshire is located in areas that have a Medium and High probability of flooding from rivers (i.e. Flood Zones 2 and 3). The floodplain of the River Wey (and its tributaries) affects the north and east of the Planning Authority Area including the towns of Alton, Whitehill & Bordon, and the surrounding villages. The floodplain of the River Lavant affects the south of the Planning Authority Area including the village of Rowlands Castle.

Appendix A, Figure 6 Fluvial Flood Risk

It should be noted that a separate map is available on the Environment Agency website which is referred to as 'Risk of Flooding from Rivers and Sea'[10]. This map takes into account the presence of flood defences and so describes the actual chance of flooding, rather than the chance if there were no defences present. While flood defences reduce the level of risk they do not completely remove it as they can be overtopped or fail (breach) in extreme weather conditions, or if they are in poor condition.

The residual risk of flooding or the risk should existing defences fail, is discussed further in Section 6.1.9.1 of this SFRA. However for planning purposes the 'Flood Map for Planning (Rivers and the Sea)' and associated Flood Zones remains the primary source of information.

6.1.2 Hydraulic Modelling Studies

Table 6-2 provides a summary of the hydraulic modelling studies that have been undertaken for the Main Rivers in East Hampshire and used to inform the Environment Agency's Flood Map for Planning (Rivers and Sea). The type of model (1D or 2D) is also specified, along with the corresponding available outputs for each model.

The scope of these modelling studies typically covers flooding associated with Main Rivers, and therefore Ordinary Watercourses that form tributaries to the Main Rivers may not always be included in the model. Modelling of Ordinary Watercourses available on the Flood Map for Planning (Rivers and Sea) may be the result of the national generalised JFLOW modelling carried out by the Environment Agency and may need to be refined when determining the probability of flooding for an individual site and preparing a site-specific FRA.

Table 6-2 Hydraulic models for Main Rivers in East Hampshire (fluvial flood risk)

Watercourse	Catchment Description	Modelling Study
River Wey	The River Wey is a tributary of the River Thames in the south east England. The River Wey flows in a predominantly northeast direction from near Alton (North Wey) and Haslemere (South Wey) to Weybridge. The Upper Wey flows through a number of urban areas (namely Farnham, (in the Waverley Borough Council authority area) Alton and Whitehill & Bordon) where the channel has been modified with several defences, mill structures, side channels and weirs throughout its length.	Capita AECOM, 2017, River Wey Upper Wey (Farnham) Modelling Report. Existing Environment Agency baseline model re-run in 2017 for the 20%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5%, 1%+CC and 0.1% Annual Exceedance Probability (AEP) fluvial events. Note for the purposes of mapping, Appendix A Map 6 illustrates the 1% AEP +70% climate change event. Updated modelling is also used to delineate Flood Zone 3b 5% AEP flood outline). **At the time of the production this report the extents from this model are still in draft format and are subject to amendments by the Environment Agency. The extents**

[10] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

Watercourse	Catchment Description	Modelling Study
		from this model have not been used to update the Environment Agency's Flood Map for Planning to inform this SFRA.
River Deadwater	The River Deadwater is a tributary of the Upper Wey model on the Southern Wey branch of the river. The River Deadwater extends from Eveley Wood to the River Wey/Deadwater confluence at Bordon.	Capita AECOM, 2018, River Deadwater Hydraulic Model – Technical Note. The model runs includes 50%, 20%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% and 0.1% Annual Exceedance Probability (AEP) fluvial events. A number of climate change runs have also been undertaken for the 1% AEP event. These include allowances for the Central, Higher Central and Upper estimates, 10%, 15%, 25%, 35% & 70% climate change events. Note for the purposes of mapping, Appendix A Map 6 illustrates the 1% AEP +70% climate change event. Updated modelling is also used to delineate Flood Zone 3b 5% AEP flood outline).
Haslemere Stream	The Haslemere Stream is part of the River Wey Southern Branch which is upstream of the Upper Wey model. The model extent covers the Haslemere Stream which flows near to Compton, Liphook and Haslemere. It's confluence with the main River Wey is near to Passfield,	Capita AECOM, 2018, Haslemere Stream Hydraulic Model – Technical Note. The model runs include 50%, 20%, 5%, 3.33%, 2%, 1.33%, 1%, 0.5% & 0.1% Annual Exceedance Probability (AEP) fluvial events. A number of climate change runs have also been undertaken for the 1% AEP event. These include allowances for the 10%, 15%, 25%, 35% & 70% climate change events. Note for the purposes of mapping, Appendix A map 6 illustrates the 1 1% AEP +70% climate change event. Updated modelling is also used to delineate Flood Zone 3b 5% AEP flood outline).
Havant Flood Mapping	The River Lavant catchment drains approximately 60 km² of a predominantly chalk rural catchment. The watercourse flows south into the town of Havant. Approximately 5% of the catchment within an urban area.	Atkins, 2008, Environment Agency Southern Region Havant Flood Mapping Study The model runs include in 100 and 1 in 1000 year flood events, with the 1 in 100 year flows increased by 20% in an additional run to simulate the effects of climate change to 2115

6.1.3 Functional Floodplain

The Functional Floodplain is defined in the NPPF[1] as 'land where water 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.

For the purposes of this SFRA, existing hydraulic modelling data has been interrogated to identify areas with an annual exceedance probability of 5%, or greater to be delineated as Flood Zone 3b. It should be noted that the Flood Zone 3b modelling outputs for the River Wey are in draft format at the time of producing this SFRA and are subject to amendments. The results are illustrated in Figure 6 in Appendix A. Where no detailed modelling is available, such as the Lavant Stream around Rowlands Castle Flood Zone 3 should be used as a precautionary approach to define the extent of the Functional Floodplain (Flood Zone 3b).

Appendix A, Figure 6 Fluvial Flood Zones

6.1.4 Dry Islands

The floodplain in East Hampshire, particularly along the River Wey, is relatively flat and broad. There may be small areas within the floodplain where the ground levels are slightly higher and which are therefore less likely to flood than the land around them. These areas are typically referred to as 'dry islands'. These areas can sometimes be identified by looking at the Flood Zone map; for example an area of Flood Zone 1 or 2, surrounded by land designated as Flood Zone 3. When considering the flood risk to these areas, the risk to the surrounding area should be taken into account.

6.1.5 Climate Change

The results of the hydraulic modelling studies for the main rivers suggest that climate change will not markedly increase the extent of river flooding within most areas of the Planning Authority Area. However, it is important to note that these areas, as well as those areas that are currently at risk of flooding may be susceptible to more frequent, more severe flooding in future years. This is because the changes in climate patterns and physical conditions, as a result of climate change, can increase the volume and frequency of precipitation, leading to an increase in the frequency of flooding. It is essential therefore that the development control process (influencing the design of future development within the Planning Authority Area) carefully mitigates against the potential impact that climate change may have upon the risk of flooding to the property.

For this reason, all of the development control recommendations set out in Section 13 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 upon the Planning Authority Area over the next 100 years, ensuring that future development is considered in light of the possible increases in flood risk over time.

6.1.6 Historic Flooding

The Environment Agency, EHDC and Hampshire County Council have provided their Flood History datasets for use in this SFRA. It should be noted that these records of flooding may not be complete and may not show the location of all the records of flooding within the Planning Authority Area.

The Environment Agency has provided their 'Historic Flood Map' which shows the maximum extent of all individual recorded flood outlines in this area. The Environment Agency has also supplied their Property Affected Database (PAD)[11] which shows 2 records of fluvial flooding within the EHDC authority area.

Hampshire County Council has supplied a database of flood incidences within the District. This data set includes records of fluvial flooding within the Rowlands Castle area, to the south of the District.

Records of flooding are also held by EHDC within the district including the areas of Alton, Bordon and Rowlands Castle and are displayed in Appendix A, Figure 7. The source of flooding is unknown however due to the location of some of the flood events; it can be presumed that some of these records could be attributed to fluvial flooding. EHDC should be contacted for further information on site specific records.

The Environment Agency also holds records of flooding in Alton in 1947, 1968 and in 2012 when the levels of the River Wey rose rapidly in the area of Alton High Street[12]. No further information on the impact of flooding is available. The Environment Agency holds records of property flooding in June and July in 1905 in Frith End however further information on the flooding is unknown[13]. These data sets show records of Fluvial Flooding within the Planning Authority Area and have been mapped on Figure 7 included within Appendix A of this report.

The Environment Agency Historic Flood Map data shows records of flooding in urban areas from the River Wey, including flooding in the east of the Planning Authority Area in Bordon. Records of flooding are also recorded to the south of the Planning Authority Area from the River Lavant affecting the village of Rowlands Castle.

The previous SFRA indicates a number of records of flooding including records of fluvial flooding. These have been displayed in Table 6-3 below.

[11] Records of historic flooding only refer to the north of the Planning Authority Area. No records of historic flooding were received from the Environment Agency for the south
[12] Environment Agency, Alton Attenuation And Flood Study Initial Assessment Report.
[13] Environment Agency, Frith End Flood Alleviation Scheme Initial Assessment Report

Table 6-3 Historic Flooding records taken from the 2008 Level 1 SFRA

Year of flooding	Location of flooding
1947	Extensive fluvial flooding
1954	Flooding along the Wey Northern Branch and Oakhanger Stream.
1960	Flooding along the Wey Northern Branch
1968	Flooding around the Wey River system
1990	Flooding in the Wey River system
1996	Flooding in Horndean

It should be noted that these records of flooding may not be complete and may not show the location of all the records of flooding within the Planning Authority Area.

Appendix A, Figure 7 Recorded Flood Outlines

6.1.7 Groundwater and Fluvial interactions

High groundwater levels can have a significant effect on many rivers within the catchment causing higher than normal baseflow. Whilst this increases the risk of fluvial flooding, impacts from this increase are not considered as groundwater flooding.

Flooding within Rowlands Castle in 2000/2001 can be attributed to groundwater rising further up in the catchment (within the SDNP authority area) of the River Lavant, causing the channel to be overwhelmed. Groundwater flood risk is discussed further in Section 9.

6.1.8 Cross Boundary Issues

The catchment of the River Wey and the River Lavant extends out of the Planning Authority Area and the District of East Hampshire into neighbouring local authority areas.

The source of the River Wey is located within East Hampshire. The River Wey flows north east through East Hampshire into the neighbouring borough of Waverley. As part of EHDC's Duty to Co-operate, Waverley Borough Council were consulted to identify any cross boundary issues that could impact flood risk from the River Wey. Waverley Borough Council identified the risk of new development within East Hampshire increasing flood risk downstream, potentially increasing flood risk within the settlements of Farnham, Frensham, Milford and Godalming. Further information on ensuring development does not increase flows downstream is given in Section 13.

The River Lavant flows south from the authority area of the South Downs National Park into the Planning Authority Area before flowing into the southern borough of Havant. The increase of flows upstream or from the East Hampshire District may result in flooding within the study area or in the neighbouring borough of Havant.

Hampshire County Council is working within the SDNP authority area to reduce the repeated consequences of prolonged flooding from the combined effects of surface water and high groundwater along the A32 (north of Tisted to Chawton), i.e. in Lower Farringdon. The maintenance and capital works are primarily focused on the ordinary watercourses upstream of the Lavant Stream (an upstream tributary of the Wey south of Alton), although some works have been identified for the main river. If maintenance and improvements are carried out through the course of the scheme, it is expected that when prolonged flooding occurs in and around the Lower Farringdon area, including the A32 highway during elevated levels of high groundwater, residents should continue to have emergency access to and from properties.

6.1.9 Flood Risk Management Schemes.

The Environment Agency has advised that there are currently no large flood defence schemes in the north of the Planning Authority Area. The priority within the area is to maintain the existing conveyance of the rivers. This is done through an annual program of bank and in channel weed clearance as well as the removal of obstructions.

The Environment Agency AIMS data shows that the majority of the watercourses within the Planning Authority Area flow in open channel. High ground and simple culverts are present along parts of the River Wey, in Alton.

6.1.9.1 Residual Risk

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

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

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 NPPF[1] Flood Zones provide a relatively robust depiction of flood risk for specific conditions, all modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response.

Steps should be taken to manage these residual risks through the use of flood warning and evacuation procedures, as described in Section 13.

7. Flooding from Surface Water

7.1 Surface Water Flood Risk

Overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems. It can run quickly off land and result in localised flooding.

The Environment Agency has undertaken modelling of surface water flood risk at a national scale and produced mapping identifying and classifying those areas at risk of surface water flooding:

- 3.33% annual probability (1 in 30 year), 'high'
- 1% annual probability (1 in 100 year), 'medium'
- 0.1% annual probability (1 in 1,000 year) 'low'

The latest version of the mapping is referred to as the 'Risk of Flooding from Surface Water Map (RoFfSW). Appendix A Figure 10 presents the RoFfSW mapping for the Planning Authority Area in combination with historical surface water flooding data recorded by Hampshire County Council. This dataset is also available nationally on the Environment Agency website, and is referred to as 'Risk of Flooding from Surface Water'[14].

Appendix A, Figure 10 Surface Water Flooding (RoFfSW) including recorded incidences

7.1.1 Historical Flooding

Further information of surface water flood events within the Planning Authority Area is provided in Table 7-1 below. This data has been provided by Hampshire County Council and is illustrated in Figure 10 (Appendix A).

Table 7-1 Flood Incidents

Date	Location	Description
17/01/2013	Lovedean	Surface water flooding of Lovedean Lane caused by blocked road drainage system.
22/01/2014	Holybourne	Gardens flooded
2013/2014	Chawton	Flooding caused by high groundwater levels, prolonged and heavy rainfall.

Additionally, flooding in 2000/2001 in Rowlands Castle[15] was caused by groundwater and fluvial flooding which then led to surface water flooding of roads and road drainage.

7.1.2 Climate Change

The RoFfSW does not include a specific scenario to determine the impact of climate change on the risk of surface water flooding. 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.

7.1.3 Groundwater and Surface Water Interactions

Groundwater flooding can often cause or exacerbate surface water flooding. Rising levels of groundwater can often lead to reduced infiltration during times of flooding as well as overwhelming road drainage that would otherwise accommodate surface water flows. A combination of surface water and groundwater has the potential to cause extensive flooding within an area. Further information on groundwater flood risk is included in Section 9.

[14] https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
[15] Environment Agency and Halcrow (2002) Winter 2000 – 2001 Flooding in Hampshire: Rowlands Castle. August 2002

8. Flooding from Sewers

8.1 Sewer Flooding

During heavy rainfall, flooding from the sewer system may occur if:

1. *The rainfall event exceeds the capacity of the sewer system/drainage system:*

Sewer systems are typically designed and constructed to accommodate rainfall events with an annual probability of 3.3% (1 in 30 chance each year) or greater. Therefore, rainfall events with an annual probability less than 3.3% would be expected to result in surcharging of some of the sewer system.

While TWUL and SW, as the sewerage undertakers recognise the impact that more extreme rainfall events may have, it is not cost beneficial to construct sewers that could accommodate every extreme rainfall event.

2. *The system becomes blocked by debris or sediment:*

Over time there is potential that road gullies and drains become blocked from fallen leaves, build-up of sediment and debris (e.g. litter).

3. *The system surcharges due to high water levels in receiving watercourses:*

Within the Planning Authority Area there is potential for surface water outlets to become submerged due to high river levels. Once storage capacity within the sewer system itself is exceeded, the water will overflow into streets and potentially into houses.

Water companies are required to maintain a register of properties which are at risk of flooding due to hydraulic overloading of the sewers (the sewer pipe is too small, or at too shallow a gradient). This is called the DG5 risk register.

Appendix A Figure 9 shows the internal and external sewer flood incident records from the DG5 Risk Register that has been supplied by Thames Water. It should be noted that these are flooding incidents that have been reported to TWUL by the home owners. It is likely that there will be incidents that don't get reported and therefore will not show on the database. Incidents of sewer flooding can be retrospectively reported to TWUL via their website – http://thameswater.co.uk/help-and-advice/9782.htm.

At the time of writing, no records have been provided by Southern Water for flooding within the south of the Planning Authority Area.

Appendix A, Figure 9 Sewer Flooding

8.1.1 Groundwater and Sewer interactions

During previous flooding events around Rowlands Castle as documented in Environment Agency reports[16], high groundwater has contributed to the drainage network being overwhelmed, resulting in sewer flooding. Mitigation measures were proposed in the form of new storm drainage pipework following the floods of 2001, although ingress into septic tanks is more difficult to manage. Minor works have been carried out including a replacement culvert but the issues have not been alleviated in Rowlands Castle.

[16] Environment Agency and Halcrow (2002) Winter 2000 – 2001 Flooding in Hampshire: Rowlands Castle. August 2002

9. Flooding from Groundwater

9.1 Groundwater Flooding

Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.

There are many mechanisms associated with groundwater flooding which are linked to high groundwater levels and can be broadly classified as:

- Direct contribution to channel flow – where the river channel intersects the water table and groundwater enters the streambed increasing water levels and causing flooding;
- Springs erupting at the surface;
- Exceptionally large flows from perennial springs or large flows from intermittent or dormant springs;
- Rise of typically high groundwater levels to extreme levels in response to prolonged extreme rainfall.

The main impacts of groundwater flooding are:

- Flooding of basements of buildings below ground level – in the mildest case this may involve seepage of small volumes of water through walls, temporary loss of services etc. In more extreme cases larger volumes may lead to the catastrophic loss of stored items and failure of structural integrity;
- Overflowing of sewers and drains – surcharging of drainage networks can lead to overland flows causing significant but localised damage to property. Sewer surcharging can lead to inundation of property by polluted water. Note: it is complex to separate this flooding from other sources, notably surface water or sewer flooding;
- Flooding of buried services or other assets below ground level – prolonged inundation of buried services can lead to interruption and disruption of supply;
- Inundation of roads, commercial, residential and amenity areas – inundation of grassed areas can be inconvenient; however the inundation of hard-standing areas can lead to structural damage and the disruption of commercial activity. Inundation of agricultural land for long durations can have financial consequences; and
- Flooding of ground floors of buildings above ground level – can be disruptive, and may result in structural damage. In addition, typically a groundwater flood event will have a long duration (when compared to other flood sources) which adds to the disruptive nature of the flood event.

9.2 Groundwater Flooding in East Hampshire

Groundwater poses a significant risk of flooding to the Planning Authority Area. The risk is predominantly associated with the extensive chalk (and other permeable rock) bedrock geology underlying the majority of East Hampshire.

The bedrock and superficial deposits which influence the nature of Groundwater flooding in East Hampshire are shown in Appendix A Figures 2 and 3

Appendix A, Figures 2 and 3 Bedrock Geology and Superficial Geology

Groundwater flooding in East Hampshire is typically caused by three main mechanisms.

- Rising water levels in superficial deposits;
- Groundwater flooding and fluvial flooding interactions; and
- Rising water levels in aquifers.

Groundwater flooding can be associated with rising water levels within permeable superficial deposits (such as river terrace gravels), typically found in river valleys. This can cause groundwater to emerge in low lying areas (otherwise

isolated from the impacts of fluvial flooding) causing groundwater flooding. This type of flooding may occur along the bottom of valleys where main rivers flow, proceeding the onset of fluvial flooding, and last longer than fluvial flooding. Groundwater flooding can also exacerbate the effects of fluvial flooding.

Groundwater flooding can also occur as a result of the water table in a bedrock or superficial aquifer rising as a result of extreme rainfall. Chalk aquifers can take several months to become saturated and do not react quickly to intense rainfall, however once the groundwater level has reached the surface, flooding can last several months.

Elevated groundwater levels in the aquifers can often result in groundwater emergence at the surface at topographical low points, such as 'dry valleys'. The Environment Agency's RoFfSW map (Appendix A Figure 10) gives an approximate indication of low lying areas where groundwater could emerge when levels are high.

Reference to the BGS dataset 'Susceptibility to Groundwater Flooding' included in Appendix A Figure 4, identifies areas in the north and east of the Planning Authority Area have the 'potential for groundwater flooding of property situated below ground level' or 'potential for groundwater flooding to occur at the surface'. These areas include the urban areas of Alton and Whitehill & Bordon.

Appendix 4, Figure 8 Groundwater Flooding

9.2.1 Historical Flooding

A summary of historical groundwater flooding events provided by Hampshire County Council and the Environment Agency is included below in Table 9-1.

Table 9-1 Flood Incidences

Date	Location	Description
1995	Rowlands Castle	Higher rainfall in the winter of 1994 and 1995 caused ground water levels to increase, resulting in flooding causing damage to gardens and road closure. The source of flooding from the 1995 event began in Finchdean within the SDNP Authority Area which also experienced flooding. Residents within the neighbouring villages of Finchdean and Deanlane End (located within the SDNP authority area) also experienced flooding during the 1994 event.
April 2000-March 2001	Rowlands Castle	A prolonged period of rainfall exceptional caused the aquifers within Hampshire to become saturated, causing groundwater flooding around Hampshire. Significant flooding was experienced in the south of the district in the village of Rowlands Castle where a number of properties experienced internal and external flooding. Groundwater flooding also caused the sewer system and cesspits to surcharging. Access was also prevented to properties.
January 2001	Bordon	Water in the garden of the property
March 2001	Whitehill	Water in the cellar
July 2001	Bordon	Standing water in the garden.
2013/2014	Rowlands Castle	Prolonged rainfall and high groundwater levels including associated river flows caused flooding within Rowlands Castle and Finchdean (SDNPA).
2013/2014	Chawton	Flooding caused by high groundwater levels, prolonged and heavy rainfall.
2014	Alton	The Environment Agency has also supplied their PAD which shows 5 records of flooding in Alton with a mixture of internal, basement and garden flooding reported.

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Groundwater flooding can often be confused with other sources of flooding and therefore not all groundwater flooding incidences may be reported.

9.2.2 Cross Boundary Issues

The district of East Hampshire has a known history of groundwater flooding. As part of EHDC's Duty to Co-operate, the authorities surrounding the East Hampshire District (Planning Authority Area) were consulted to identify any groundwater

related cross boundary issues. Cross boundary issues were identified by Basingstoke and Deane Borough Council and SDNPA. Within the Basingstoke and Deane Borough, groundwater flooding is prevalent across the Borough. The groundwater emergence maps indicate a potential susceptibility to groundwater flooding, mainly in the southern part of Basingstoke, but also on the south eastern corner of the Borough along the boundary with East Hampshire.

Groundwater flooding is a major source of flooding within the SDNPA area. The SDNPA SFRA[17] indicates the risk of groundwater flooding from Clearwater, Clearwater and Superficial Deposits and Superficial Deposits groundwater flooding types to the north and north east of the SDNP into the Planning Authority Area. Groundwater flooding within the SDNP has the potential to affect the towns of Alton and Lower Farringdon. However as stated in Section 6.1.8, Hampshire County Council is working with the SDNP Authority Area to alleviate flood risk in the Lower Farringdon area.

9.2.3 Flood Risk Management Schemes

Hampshire County Council as the LLFA has prepared a Groundwater Management Plan (GWMP) for the Hampshire County. Action Plans for specific areas within the District are shown below.

Table 9-2 Groundwater Management Plan

Location	Link to GWMP and GWMP Action Plan
Hampshire	http://documents.hants.gov.uk/flood-water-management/groundwater/GroundwaterManagementPlan.pdf
Finchdean	http://documents.hants.gov.uk/flood-water-management/groundwater/GWMPFinchdeanActionPlan.pdf
Rowlands Castle	http://documents.hants.gov.uk/flood-water-management/groundwater/GWMPRowlandsCastleActionPlan.pdf

9.2.3.1 Groundwater information for East Hampshire

The Environment Agency publishes 'Water situation: area monthly reports for England'[18] for each of its areas. These reports identify monthly rainfall, soil moisture deficit, river flows, groundwater levels and reservoir levels. The East Hampshire District spans two Environment Agency areas, the Thames area and the Solent and South Downs area. . The Environment Agency also publishes the 'Hampshire: groundwater situation'[19] reports which provides 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.

9.2.3.2 Flood Warning Areas

The Environment Agency also provides a free flood warning service for Groundwater Flooding for parts of the Planning Authority Area. You can register to receive a Groundwater Flood Alert messages for the Alton, Chawton, and Lower Farringdon Flood Alert Area or the Finchdean, Dean Lane End and Rowlands Castle Flood Alert Area by signing up to the Environment Agency's Floodline Warnings Direct service.

This service can be registered for by the following methods

- Email: WTenquiries@environment-agency.gov.uk
- Phone: 01491 828426.
- Online: https://www.fws.environment-agency.gov.uk/app/olr/register

9.2.3.3 Where to find information during a Flood

The latest flooding information is available for the above mentioned Flood Alert Areas by phoning Floodline. This can be done by:

[17] https://www.southdowns.gov.uk/wp-content/uploads/2018/05/TSF-45-Level-1-Update-and-Level-2-Strategic-Flood-Risk-Assessment.pdf
[18] https://www.gov.uk/government/publications/water-situation-local-area-reports
[19] https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk

- Phoning Floodline on 0345 988 11 88,
- Selecting Option 1 and then enter the Quickdial number for up to date flooding information.
- Quickdial number: 171909 – Alton, Chawton and Lower Farringdon
- Quickdial number: 216014-Finchdean, Deane Lane End & Rowlands Castle

The latest Flood Alert information can be found on the Environment Agency Website at: http://apps.environment-agency.gov.uk/flood/31618.aspx.

10. Flooding from Artificial Sources

The Environment Agency dataset 'Risk of Flooding from Reservoirs'[20] identifies areas that could be flooded if a large reservoir were to fail and release the water it holds. Environment Agency data shows a small area to the east of the District along the River Wey is risk of reservoir flooding if reservoirs were to fail. As the area at risk is a rural area, flooding would not cause a risk to property, therefore this data has not been mapped as part of the SFRA report.

The failure of a reservoir has the potential to cause catastrophic damage due to the sudden release of large volumes of water. The NPPG encourages LPAs to identify any impounded reservoirs and evaluate how they might modify the existing flood risk in the event of a flood in the catchment it is located within, and/or whether emergency draw-down (release of water to reduce the water level within the reservoir and therefore reduce flood risk) of the reservoir will add to the extent of flooding.

Reservoirs in the UK have an extremely good safety record. The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be inspected and supervised by reservoir panel engineers. It is assumed that these reservoirs are regularly inspected and essential safety work is carried out. These reservoirs therefore present a minimal risk.

[20] https://flood-warning-information.service.gov.uk/long-term-flood-risk/

11. Guidance on the application of the Sequential and Exception Tests

11.1 Overview

This Section guides the application of the Sequential Test and Exception Test in the Plan-making and planning application processes. Not all development will be required to undergo these tests, as described below, but may still be required to undertake a site specific FRA, guidance about which is included in Section 12.

The sequential approach is a decision-making tool designed to ensure that sites at little or no risk of flooding are developed in preference to sites at higher risk. This will help avoid the development of sites that are inappropriate on flood risk grounds. The subsequent application of the Exception Test where required will ensure that new developments in flood risk areas will only occur where flood risk is clearly outweighed by other sustainability drivers and where development can be made safe from flooding and not increase the risk of flooding elsewhere.

The sequential approach can be applied at all levels and scales of the planning process, both between and within Flood Zones. All opportunities to locate new developments (except Water Compatible) in reasonably available areas of little or no flood risk should be explored, prior to any decision to locate them in areas of higher risk.

11.2 Applying the Sequential Test for the Local Plan

As the LPA, EHDC must demonstrate that throughout the site allocation process a range of possible sites have been considered in conjunction with the flood risk and vulnerability information from the SFRA, and that the Sequential Test, and where necessary the Exception Test, has been applied.

The Sequential Test requires an understanding of the Flood Zones in the study area and the vulnerability classification of the proposed developments. Flood Zone definitions are provided in Table 6-1and mapped in Figure 6 in Appendix A (and the Environment Agency's Flood Map for Planning (Rivers and Sea)). Flood risk vulnerability classifications, as defined in the NPPG are presented in Table 11-1. The NPPF[1] acknowledges that some areas will (also) be at risk of flooding from sources other than fluvial. All sources must be considered when planning for new development including: flooding from land or surface water runoff; groundwater; sewers; and artificial sources.

If a location is recorded as having experienced repeated flooding from the same source this should be acknowledged within the Sequential Test.

The flow diagram presented in Figure 11-1 illustrates how the Sequential Test process should be applied to identify the suitability of a site for allocation, in relation to the flood risk classification.

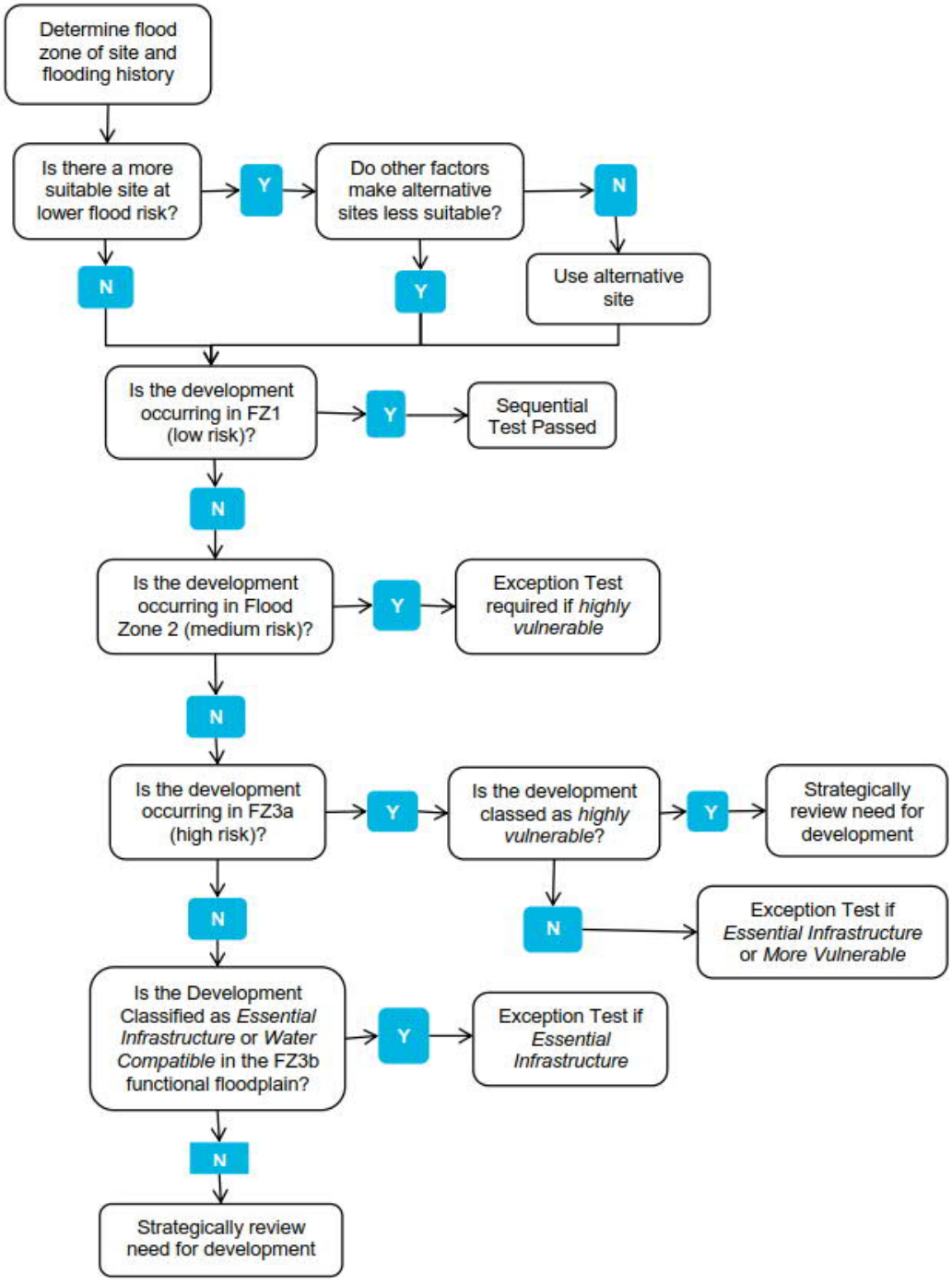

Figure 11-1 Application of Sequential Test for Local Plan preparation

Table 11-1 Flood Risk Vulnerability Classification (PPG[2])

Vulnerability Classification	Development Uses
Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. Wind turbines.
Highly Vulnerable	Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use. Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”).
More Vulnerable	Hospitals. Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non–residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding. Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in “more vulnerable”, and assembly and leisure. Land and buildings used for agriculture and forestry. Waste treatment (except landfill and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works which do not need to remain operational during times of flood. Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-Compatible Development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel working. Docks, marinas and wharves. Navigation facilities. MOD defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

The NPPF[1] indicates suitability of a development based on its vulnerability and location within a fluvial flood zone as set out in Table 11-2. However, the vulnerability classification of types of development is still relevant in considering flood risk from other sources. For example, a basement dwelling will still be more vulnerable to surface water flooding than an office development.

Table 11-2 Flood Risk Vulnerability and Flood Zone 'Compatibility' (PPG[2])

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test Required	✓	✓
	3a	Exception Test Required	✓	×	Exception Test Required	✓
	3b	Exception Test Required	✓	×	×	×

✓ – Development is appropriate × – Development should not be permitted

The recommended steps in undertaking the Sequential Test are detailed below.

11.2.1 Recommended Stages for LPA Application of the Sequential Test

The information required to address many of these steps is provided in the accompanying maps presented in Appendix A. When preparing a Local Plan a database of the potential allocation sites across East Hampshire should be generated and populated using flood risk information from all sources contained within this SFRA. This database can be used by EHDC when applying the steps below.

1. Assign potential developments with a vulnerability classification (Table 11-1). Where development is mixed, the development should be assigned the highest vulnerability class of the developments proposed.
2. The location and identification of potential development should be recorded.
3. The Flood Zone classification of potential development sites should be determined based on a review of the Flood Map for Planning (Rivers and Sea). Where these span more than one Flood Zone, all zones should be noted, preferably using percentages.
4. The design life of the development should be considered with respect to climate change:
    - 100 years – up to 2115 for residential developments; and
    - 75 years – up to 2090 for commercial / industrial developments, or other time horizon specific to the non-residential use proposed.
5. Identify existing flood defences serving the potential development sites. However, it should be noted that for the purposes of the Sequential Test, Flood Zones ignoring defences should be used.
6. Highly Vulnerable developments to be accommodated within the Planning Authority Area should be located on those sites identified as being within Flood Zone 1 and at low risk of flooding from other sources. If these cannot be located in areas of low risk, because the identified sites are unsuitable or there are insufficient sites in areas of low risk, sites in Flood Zone 2 can then be considered. Highly vulnerable sites in Flood Zone 2 will require application of the Exception Test. If sites in Flood Zone 2 are inadequate then the LPA may have to identify additional sites in Flood Zones 1 or 2 to accommodate development or seek opportunities to locate the development outside their administrative area. Within each flood zone, highly vulnerable development should be directed, where possible, to the areas at lowest risk from all sources of flooding, It should be noted that Highly Vulnerable development is not appropriate in Flood Zones 3a and 3b.
7. Once all Highly Vulnerable developments have been allocated to a development site, consideration can be given to those development types defined as More Vulnerable. In the first instance More Vulnerable development should be located in any unallocated sites in Flood Zone 1. Where these sites are unsuitable or there are insufficient sites remaining, sites in Flood Zone 2 can be considered. If there are insufficient sites in Flood Zone 1 or 2 to accommodate More Vulnerable development, sites in Flood Zone 3a can be considered. More Vulnerable developments in Flood Zone 3a will

require application of the Exception Test. As with Highly Vulnerable development, within each flood zone More Vulnerable development should be directed to areas at lowest risk from all sources of flooding. It should be noted that More Vulnerable development is not appropriate in Flood Zone 3b.

8. Once all More Vulnerable developments have been allocated to a development site, consideration can be given to those development types defined as Less Vulnerable. In the first instance Less Vulnerable development should be located on sites in Flood Zone 1, continuing sequentially with Flood Zone 2, then 3a. Less Vulnerable development types are not appropriate in Flood Zone 3b – Functional Floodplain.
9. Essential Infrastructure should be preferentially located in the lowest flood risk zones, however this type of development may be located in Flood Zones 3a and 3b, provided the Exception Test is satisfied.
10. Water Compatible development has the least constraints with respect to flood risk and it is considered appropriate to allocate these sites last. The sequential approach should still be followed in the selection of sites; however it is appreciated that Water Compatible development by nature often relies on access and proximity to water bodies.
11. On completion of the Sequential Test, consideration may need to be given to the risks posed to a site within an area at risk of flooding in more detail in a Level 2 SFRA (as explained in Section 11.2.3). By undertaking the Exception Test, this more detailed study should consider the detailed nature of the risk posed by all sources of flooding, and potential flood hazard to allow a sequential approach to site allocation. Consideration of flood hazard within a flood zone would include:
    - Flood risk management measures,
    - The rate of flooding,
    - Flood water depth,
    - Flood water velocity.
12. Where the development is Highly Vulnerable, More Vulnerable, Less Vulnerable or Essential Infrastructure and a site is found to be impacted by a recurrent flood source (other than tidal or fluvial), the site and flood sources should be investigated further regardless of any requirement of the Exception Test. It is noted that for any development at risk of flooding, a site specific FRA will be required.

11.2.2 Windfall Sites

Windfall sites are those which have not been specifically identified in the development plan. In cases where development needs cannot be fully met through the provision of site allocations, a realistic allowance for windfall development should be assumed, based on past trends. It is recommended that the acceptability of windfall applications in flood risk areas should be considered at the strategic level through a policy setting out broad locations and quantities of windfall development that would be acceptable or not in Sequential Test terms.

11.2.3 Level 2 SFRA

If, following the application of the Sequential Test, it is not possible to locate all of the sites within areas of low flood risk, it may be necessary for a Level 2 SFRA to be prepared to provide additional information to support the application of the Exception Test.

Where a Level 2 SFRA assessment is required, the assessment should build on the information in the Level 1 SFRA and include enough information for the exception test to be applied. The Level 2 SFRA should consider the flood risk to each site from all sources, based on available datasets. Further detail on the nature of flood risk from rivers including flood depth and hazard rating should also be considered where detailed modelling outputs are available. As well as the condition and location of flood defences. A level 2 SFRA should also use this information to apply the sequential approach and the sequential test to identify sites with the lowest risk of flooding.

11.3 Applying the Sequential Test for Planning Applications

It is necessary to undertake a sequential test for a planning application if both of the following apply:

1. The proposed development is in Flood Zone 2 or 3.
2. A sequential test hasn't already been done for a development of the type you plan to carry out on your proposed site.

The Environment Agency publication 'Demonstrating the flood risk Sequential Test for Planning Applications[21], sets out the procedure for applying the sequential test to individual applications as follows:

- Identify the geographical area of search over which the test is to be applied; this could be the District area, or a specific catchment if this is appropriate and justification is provided (e.g. school catchment area or the need for affordable housing within a specific area).
- Identify the source of 'reasonably available' alternative sites; usually drawn from evidence base / background documents produced to inform the Local Plan.
- State the method used for comparing flood risk between sites; for example the Environment Agency Flood Map for Planning, the SFRA mapping, site-specific FRAs if appropriate, other mapping of flood sources.
- Apply the Sequential Test; systematically consider each of the available sites, indicate whether the flood risk from all sources is higher or lower than the application site, state whether the alternative option being considered is allocated in the Local Plan, identify the capacity of each alternative site, and detail any constraints to the delivery of the alternative site(s).
- Conclude whether there are any reasonably available sites in areas with a lower probability of flooding from all sources that would be appropriate to the type of development or land use proposed.
- Where necessary, as indicated by Table 11-2, apply the Exception Test.
- Apply the Sequential approach to locating development within the site.

It should be noted that it is for EHDC, taking advice from the Environment Agency as appropriate, to consider the extent to which Sequential Test considerations have been satisfied, taking into account the particular circumstances in any given case. The developer should justify with evidence what area of search has been used when making the application.

Ultimately, after applying the Sequential Test, EHDC needs to be satisfied in all cases that the proposed development would be safe and not lead to increased flood risk elsewhere. This needs to be demonstrated within a FRA and is necessary regardless of whether the Exception Test is required.

11.3.1 Sequential Test Exemptions

It should be noted that the Sequential Test does not need to be applied in the following circumstances:

- Individual developments proposed on sites which have been allocated in development plans through the Sequential Test.
- Minor development, which is defined in the NPPF[1] as:
    - Minor non-residential extensions: industrial / commercial / leisure etc. extensions with a footprint <250m^2.
    - Alterations: development that does not increase the size of buildings e.g. alterations to external appearance.
    - Householder development: for example; sheds, garages, games rooms etc. within the curtilage of the existing dwelling, in additional to physical extensions to the existing dwelling itself. This

[21] Environment Agency (2012) Demonstrating the flood risk Sequential Test for Planning Applications, Version 3.1. Available from: https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

- Change of Use applications, unless it is for a change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site.
- Development proposals in Flood Zone 1 (land with a low probability of flooding from rivers or the sea) unless the SFRA, or other more recent information, indicates there may be flooding issues now or in the future (for example, through the impact of climate change).
- Redevelopment of existing properties (e.g. replacement dwellings), provided they do not increase the number of dwellings in an area of flood risk (i.e. replacing a single dwelling within an apartment block).

11.4 Exception Test

The purpose of the Exception Test is to ensure that, following the application of the Sequential Test, new development is only permitted in Flood Zone 2 and 3 where flood risk is clearly outweighed by other sustainability factors and where the development will be safe during its lifetime, considering climate change.

For the Exception Test to be passed:

- Part 1 - It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by the SFRA where one has been prepared; and
- Part 2 - A site-specific Flood Risk Assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the test will have to be passed for development to be allocated or permitted.

When determining planning applications, EHDC should ensure flood risk is not increased elsewhere. In order to consider development to be appropriate in an area at risk of flooding, it should be informed by a site-specific FRA, follow the Sequential Test, and if required the Exception Test, before demonstrating the following:

- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including any emergency planning carried out by the resident and/or owner; and it gives priority to the use of sustainable drainage systems.

There are a number of ways a new development can be made safe:

- Avoiding flood risk by not developing in areas at risk from floods;
- Substituting higher vulnerability land uses for lower vulnerability uses in higher flood risk locations and locating higher vulnerability uses in areas of lower risk on a strategic scale, or on a site basis;
- Providing adequate flood risk management infrastructure which will be maintained for the lifetime of the development; and
- Mitigating the potential impacts of flooding through design and resilient construction.

Further guidance is provided in Section 13.

12. Site Specific FRA Guidance

12.1 What is a Flood Risk Assessment?

A site-specific FRA is a report suitable for submission with a planning application which provides an assessment of flood risk to and from a proposed development, and demonstrates how the proposed development will be made safe, will not increase flood risk elsewhere and where possible will reduce flood risk overall in accordance with paragraph 155 of the NPPF[1] and PPG[2]. A FRA must be prepared by a suitably qualified and experienced person and must contain all the information needed to allow EHDC to satisfy itself that the requirements have been met.

12.2 When is a Flood Risk Assessment required?

The NPPF[1] states that a site-specific FRA is required in the following circumstances:

- Proposals for new development (including minor development and change of use) in Flood Zones 2 and 3.
- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Proposals of 1 hectare or greater.
- Proposals in Flood Zone 1 where land is identified in a Strategic Flood Risk Assessment as being at increased flood risk in future.
- Where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

12.3 How detailed should a FRA be?

The PPG[2] states that site-specific FRAs should be proportionate to the degree of flood risk, the scale and nature of the development, its vulnerability classification (Table 11-1) and the status of the site in relation to the Sequential and Exception Tests. Site-specific FRAs should also make optimum use of readily available information, for example the mapping presented within this SFRA and available on the Environment Agency website, although in some cases additional modelling or detailed calculations will need to be undertaken. For example, where the development is an extension to an existing house (for which planning permission is required) which would not significantly increase the number of people present in an area at risk of flooding, EHDC would generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater EHDC may require a more detailed assessment, for example, the preparation of site-specific hydraulic modelling to determine the flood risk to and from the site pre and post-development, and the effectiveness of any management and mitigation measures incorporated within the design.

As a result, the scope of each site-specific FRA will vary considerably. Table 12-1 presents the different levels of site-specific FRA as defined in the CIRIA publication C624[22] and identifies typical sources of information that can be used. The list is not exhaustive and the level of detail could vary depending on the location, scale and nature of the proposed works. Sufficient information must be included to enable the Council and where appropriate, consultees, to determine that the proposal will be safe for its lifetime, not increase flood risk elsewhere and where possible, reduce flood risk overall. Failure to provide sufficient information will result in applications being refused.

[22] CIRIA (2004) Development and flood risk – guidance for the construction industry C624.

Table 12-1 Levels of site specific FRA

Description
Level 1 Screening study to identify whether there are any flooding or surface water management issues related to a development site that may warrant further consideration. This should be based on readily available existing information. The screening study will ascertain whether a FRA Level 2 or 3 is required. Typical sources of information include: • EHDC SFRA • Flood Map for Planning (Rivers and Sea) • Environment Agency Standing Advice • NPPF Tables 1, 2 and 3
Level 2 Scoping study to be undertaken if the Level 1 FRA indicates that the site may lie within an area that is at risk of flooding, or the site may increase flood risk due to increased run-off. This study should confirm the sources of flooding which may affect the site. The study should include: • An appraisal of the availability and adequacy of existing information; • A qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere; and, • An appraisal of the scope of possible measures to reduce flood risk to acceptable levels. The scoping study may identify that sufficient quantitative information is already available to complete a FRA appropriate to the scale and nature of the development. Typical sources of information include those listed above, plus: • Local policy statements or guidance. • Thames and South East Hampshire Catchment Flood Management Plans. • Hampshire County Council PFRA and LFRMS. • Data request from the EA to obtain result of existing hydraulic modelling studies relevant to the site and outputs such as maximum flood level, depth and velocity. • Consultation with EA/Hampshire County Council/sewerage undertakers and other flood risk consultees to gain information and to identify in broad terms, what issues related to flood risk need to be considered including other sources of flooding. • Historic maps. • Interviews with local people and community groups. • Walkover survey to assess potential sources of flooding, likely routes for floodwaters, the key features on the site including flood defences, their condition. • Site survey to determine general ground levels across the site, levels of any formal or informal flood defences
Level 3 Detailed study to be undertaken if a Level 2 FRA concludes that further quantitative analysis is required to assess flood risk issues related to the development site. The study should include: • Quantitative appraisal of the potential flood risk to the development; • Quantitative appraisal of the potential impact of the development site on flood risk elsewhere; and • Quantitative demonstration of the effectiveness of any proposed mitigations measures. Typical sources of information include those listed above, plus: • Detailed topographical survey. • Detailed hydrographic survey. • Site-specific hydrological and hydraulic modelling studies which should include the effects of the proposed development. • Monitoring to assist with model calibration/verification. • Continued consultation with the LPA, Environment Agency and other flood risk consultees.

12.3.1 Environment Agency Data Requests

The Environment Agency offers a series of 'products' for obtaining flood risk information suitable for informing the preparation of site-specific FRAs as described on their website https://www.gov.uk/planning-applications-assessing-flood-risk.

- **Products 1 – 4** relate to mapped deliverables including flood level and flood depth information and the presence of flood defences local to the proposed development site;
- **Product 5** contains the reports for hydraulic modelling of the Main Rivers;
- **Product 6** contains the model output data so the applicant can interrogate the data to inform the FRA.
- **Product 7** comprises the hydraulic model itself.

Products 1 – 6 can be used to inform a Level 2 FRA. In some cases, it may be appropriate to obtain Product 7 and to use as the basis for developing a site-specific model for a proposed development as part of a Level 3 FRA. This can be requested via either their National Customer Contact Centre via enquiries@environment-agency.gov.uk.

12.3.2 Modelling of Ordinary Watercourses

It should be noted that the scope of hydraulic modelling studies undertaken by the Environment Agency typically cover flooding associated with Main Rivers, and therefore Ordinary Watercourses that form tributaries to the Main Rivers may not always be included in the model. Where a proposed development site is in close proximity to an Ordinary Watercourse and either no hydraulic modelling exists, or the available modelling is considered to provide very conservative estimates of flood extents (due to the use of national generalised JFLOW modelling), applicants may need to prepare a simple hydraulic model to enable more accurate assessment of the probability of flooding associated with the watercourse and to inform the site-specific FRA. This should be carried out in line with industry standards and in agreement with the Environment Agency and Hampshire County Council (as the LLFA).

12.4 What needs to be addressed in a Flood Risk Assessment?

The PPG[2] states that the objectives of a site specific flood risk assessment are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source;
- Whether it will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate;
- The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;
- Whether the development will be safe and pass the Exception Test, if applicable.

12.5 Flood Risk Assessment Checklist

Table 12-2 provides a checklist for site-specific FRAs including the likely information that will need to be provided along with references to sources of relevant information. As described earlier in this Section, the exact level of detail required under each heading will vary according to the scale of development and the nature of the flood risk. It is expected that this Checklist is completed for all planning applications. This will be a validation requirement once the Council has updated its validation checklist and proposals that are submitted without the completed Checklist will be regarded as invalid.

Table 12-2 Site specific FRA Checklist (developed from guidance in PPG[2])

What to include in the FRA		*Source(s) of Information*
1. Site Description		
Site address	-	-
Site description	-	
Location plan	*Including geographical features, street names, catchment areas, watercourses and other bodies of water*	*OS Mapping* *SFRA Appendix A*
Site plan	*Plan of site showing development proposals and any structures which may influence local hydraulics e.g. bridges, pipes/ducts crossing watercourses, culverts, screens, embankments, walls, outfalls and condition of channel*	*OS Mapping* *Site Survey*
Topography	*Include general description of the topography local to the site. Where necessary, site survey may be required to confirm site levels (in relation to Ordnance datum).* *Plans showing existing and proposed levels.*	*SFRA Appendix A* *Site Survey*
Geology	*General description of geology local to the site.*	*SFRA Appendix A* *Ground Investigation Report*
Watercourses	*Identify Main Rivers and Ordinary Watercourses local to the site.*	*SFRA Appendix A*
Status	*Is the development in accordance with the*	*See advice from EHDC if necessary.*

	Council's Spatial Strategy?	
2. Assessing Flood Risk		
The level of assessment will depend on the degree of flood risk and the scale, nature and location of the proposed development. Not all of the prompts listed below will be relevant for every application.		
Flooding from Rivers	*Provide a plan of the site and Flood Zones.* *Identify any historic flooding that has affected the site, including dates and depths where possible.* *How is the site likely to be affected by climate change?* *Determine flood levels on the site for the 1% annual probability (1 in 100 chance each year) flood event including an allowance for climate change.* *Determine flood hazard on the site (in terms of flood depth and velocity[23]).* *Undertake new hydraulic modelling to determine the flood level, depth, velocity, hazard, rate of onset of flooding on the site.*	*SFRA Appendix A* *Environment Agency Flood Map for Planning (Rivers and Sea).* *Environment Agency Products 1-7.* *New hydraulic model (where EA data not available)*
Flooding from Land	*Identify any historic flooding that has affected the site.* *Review the local topography and conduce a site walkover to determine low points at risk of surface water flooding.* *Review the Risk of Flooding from Surface Water mapping.* *Where necessary, undertake modelling to assess surface water flood risk.*	*SFRA Appendix A* *Topographic survey.* *Site walkover.* *Risk of Flooding from Surface Water mapping (EA website).*
Flooding from Groundwater	*Desk based assessment based on high level BGS mapping in the SFRA.* *Ground survey investigations.* *Identify any historic flooding that has affected the site.*	*SFRA Appendix A* *Ground Investigation Report*
Flooding from Sewers	*Identify any historic flooding that has affected the site.*	*SFRA Appendix A* *Where appropriate an asset location survey can be provided by Thames Water Utilities Ltd http://www.thameswater-propertysearches.co.uk/ and Southern Water https://www.southernwater.co.uk/drainage-water-searches*
Reservoirs, canals and other artificial sources	*Identify any historic flooding that has affected the site.* *Review the Risk of Flooding from Reservoirs mapping.*	*Risk of Flooding from Reservoirs mapping (EA website)*
3. Proposed Development		
Current use	*Identify the current use of the site.*	-
Proposed use	*Will the proposals increase the number of occupants / site users on the site such that it may affect the degree of flood risk to these people?*	-
Vulnerability Classification	*Determine the vulnerability classification of the development. Is the vulnerability classification appropriate within the Flood Zone?*	*SFRA Table 11-1*
4. Avoiding Flood Risk		
Sequential Test	*Determine whether the Sequential Test is required.* *Consult EHDC to determine if the site has been included in the Sequential Test.* *If required, present the relevant information to EHDC to enable their determination of the Sequential Test for the site on an individual basis.*	*SFRA Section 11.3*

[23] FD2320 Flood risk to people calculator http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2320_3364_TRP_pdf.sflb.ashx

Exception Test	*Determine whether the Exception Test is necessary.* *Where the Exception Test is necessary, present details of:* *Part 1) how the proposed development contributes to the achievement of wider sustainability objectives as set out in the EHDC Sustainability Appraisal Report.* *(Details of how part 2) can be satisfied are addressed in the following part 5 'Managing and Mitigating Flood Risk'.)*	*SFRA 11.4* *Refer to EHDC sustainability objectives*

5. Managing and Mitigating Flood Risk

Section 13 of the SFRA presents measures to manage and mitigate flood risk and when they should be implemented. Where appropriate, the following should be demonstrated within the FRA to address the following questions:

How will the site/building be protected from flooding, including the potential impacts of climate change, over the development's lifetime?

How will you ensure that the proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?

Are there any opportunities offered by the development to reduce flood risk elsewhere?

What flood-related risks will remain after you have implemented the measures to protect the site from flooding (i.e. residual risk) and how and by whom will these be managed over the lifetime of the development (e.g. flood warning and evacuation procedures)?

Development Layout and Sequential Approach	*Plan showing how sensitive land uses have been placed in areas within the site that are at least risk of flooding.*	*SFRA Section 13.2*
Finished Floor Levels	*Plans showing finished floor levels in the proposed development in relation to Ordnance Datum taking account of indicated flood depths.*	*SFRA Section 13.3*
Flood Resistance	*Details of flood resistance measures that have been incorporated into the design. Include design drawings where appropriate.*	*SFRA Section 13.4*
Flood Resilience	*Details of flood resilience measures that have been incorporated into the design. Include design drawings where appropriate.*	*SFRA Section 13.5*
Safe Access / Egress	*Provide a figure showing proposed safe route of escape away from the site and/or details of safe refuge. Include details of signage that will be included on site.* *Where necessary this will involve mapping of flood hazard associated with river flooding. This may be available from Environment Agency modelling, or may need to be prepared as part of hydraulic modelling specific for the proposed development site.*	*SFRA Section 13.6*
Floodplain Compensation Storage	*Provide calculations or results of a hydraulic modelling study to demonstrate that the proposed development provides compensatory flood storage and either will not increase flood risk to neighbouring areas or will result in an overall improvement. This should be located and designed to achieve level for level and volume for volume compensation, should be provided on land that is in hydrological continuity with the site within the applicant's ownership and subject to appropriate maintenance regimes for its lifetime. Include cross sectional drawings clearly showing existing and proposed site levels.*	*SFRA Section 13.7*
Flow Routing	*Provide evidence that proposed development will not impact flood flows to the extent that the risk to surrounding areas is increased. Where necessary this may require modelling.*	
Riverside Development Buffer Zone	*Provide plans showing how a buffer zone of relevant width will be retained adjacent to any Main River or Ordinary Watercourse in accordance with requirements of the Environment Agency or Hampshire County Council. https://www.gov.uk/guidance/flood-risk-activities-environmental-permits*	*Hampshire County Council guidance on OW consent.* *Environment Agency Environmental permitting Regulations https://www.gov.uk/guidance/flood-risk-activities-environmental-permits*

Surface Water Management		*Completion of SuDS Proforma for all major development proposals in Flood Zones 1, 2 or 3.* *Details of the following within FRA for all other developments located within Flood Zones 2 and 3:* *Calculations (and plans) showing areas of the site that are permeable and impermeable pre and post-development.* *Calculations of pre and post-development runoff rates and volumes including consideration of climate change over the lifetime of the development.* *Details of the methods that will be used to manage surface water (e.g. permeable paving, swales, wetlands, rainwater harvesting).* *Where appropriate, reference the supporting Outline or Detailed Drainage Strategy for the site.* *Information on proposed management arrangements*	*SFRA Section 13.10* *Hampshire County Council SuDS planning advice*
Flood Warning and Evacuation Plan		*Where appropriate reference the Flood Warning and Evacuation Plan or Personal Flood Plan that has been prepared for the proposed development (or will be prepared by site owners).*	*SFRA Section 13.11 and 13.12*

12.6 Pre-application Advice

At all stages, EHDC, and where necessary the Environment Agency, Hampshire County Council and/or the Statutory Water Undertaker may need to be consulted to ensure the FRA provides the necessary information to fulfil the requirements for planning applications.

The Environment Agency, Hampshire County Council and EHDC each offer pre-application advice services which should be used to discuss particular requirements for specific applications.

- East Hampshire District Council http://www.easthants.gov.uk/planning-permission/pre-application-planning-advice
- Hampshire County Council https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/HistoricFloodInformation
- Environment Agency https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion
- The following government guidance sets out when LPAs should consult with the Environment Agency on planning applications https://www.gov.uk/flood-risk-assessment-local-planning-authorities.

13. Managing and Mitigating Flood Risk

13.1 Overview

The NPPF[1] appreciates that 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 site in order to manage and mitigate flood risk. These measures should be considered when preparing a site-specific FRA as described in Section 12. This section outlines the approach that EHDC could adopt in relation to flood risk planning policy and development management decisions.

13.2 Development Layout and Sequential Approach

> **Policy Recommendation:** A sequential approach to site planning should be applied within new development sites

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.

13.3 Finished Floor Levels

> **Policy Recommendation:** All More Vulnerable and Highly Vulnerable development within Flood Zones 2 and 3 should set Finished Floor Levels 300mm above the known or modelled 1 in 100 annual probability (1% AEP) flood level including an appropriate allowance for climate change

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 land uses, is to ensure internal floor levels are raised a freeboard level above the design flood level . Low Vulnerability development should also aim to raise floor levels. Where this is not achievable, flood resilience measures should be incorporated to make up the shortfall. These measures should be detailed within the FRA.

With reference to the 'Flood risk assessment: standing advice for flood risk'[24], 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.

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 EHDC 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.

There are also circumstances where flood resilience measures should be considered first. These are described further below. 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.

13.4 Flood Resistance 'Water Exclusion Strategy'

There is a range of flood resistance and resilience construction techniques that can be implemented in new developments to mitigate potential flood damage. The Department for Communities and Local Government (CLG) have published a document 'Improving the Flood Performance of New Buildings, Flood Resilient

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

Construction'[25], the aim of which is to provide guidance to developers and designers on how to improve the resistance and resilience of new properties to flooding through the use of suitable materials and construction details. **Error! Reference source not found.** provides a summary of the Water Exclusion Strategy (flood resistance measures) and Water Entry Strategy (flood resilience measures) which can be adopted depending on the depth of floodwater that could be experienced.

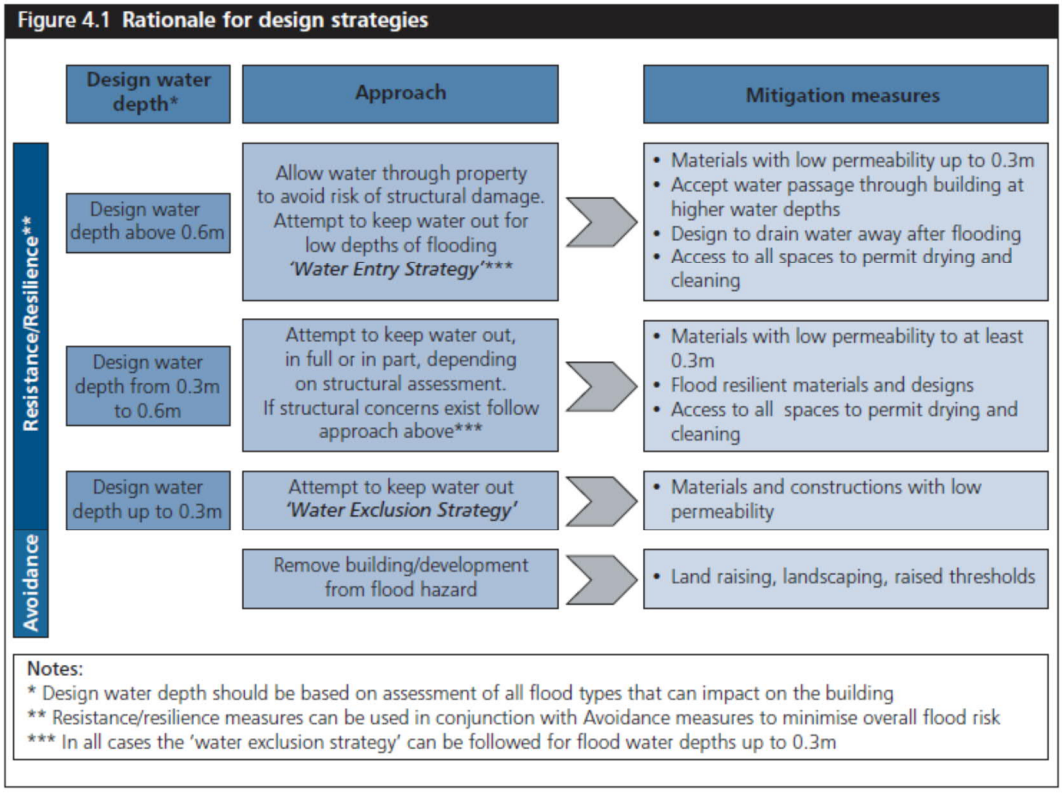

Figure 13-1 Flood Resistant / Resilient Design Strategies, Improving Flood Performance, CLG 2007

Resistance measures are aimed at preventing water ingress into a building (Water Exclusion Strategy); they are designed to minimise the impact of floodwaters directly affecting buildings and to give occupants more time to relocate ground floor contents. These measures will probably only be effective for short duration, low depth flooding, i.e. less than 0.3m, although these measures should be adopted where depths are between 0.3m and 0.6m and there are no structural concerns

In areas at risk of flooding of low depths (<0.3m), implement flood resistance measures such as:

- Using materials and construction with low permeability;
- Land raising;
- Landscaping e.g. creation of low earth bunds (subject to this not increasing flood risk to neighbouring properties);
- Raising thresholds and finished floor levels e.g. porches with higher thresholds than main entrance;
- Flood gates with waterproof seals; and,
- Sump and pump for floodwater to remove waste faster than it enters.

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 devises 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.

[25] CLG (2007) Improving the Flood Performance of New Buildings, Flood Resilient Construction. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7730/flood_performance.pdf

13.5 Flood Resilience 'Water Entry Strategy'

For flood depths greater than 0.6m, it is likely that structural damage could occur in traditional masonry construction due to excessive water pressures. In these circumstances, the strategy should be to allow water into the building, but to implement careful design in order to minimise damage and allow rapid re-occupancy. This is referred to as the Water Entry Strategy. These measures are appropriate for uses where temporary disruption is acceptable and suitable flood warning is received.

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. Resilience measures are either an integral part of the building fabric or are features inside a building that will limit the damage caused by floodwaters.

In areas at risk of frequent or prolonged flooding, implement flood resilience measures such as:

- Use 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.
- Coat walls with internal cement based renders; apply tanking on the inside of all internal walls.
- Ground supported floors with concrete slabs coated with impermeable membrane.
- Tank basements, cellars or ground floors with water resistant membranes.
- Use plastic water resistant internal doors.

Further specific advice regarding suitable materials and construction techniques for floors, walls, doors and windows and fittings can be found in 'Improving the Flood Performance of New Buildings, Flood Resilient Construction'[26].

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.

13.6 Safe Access and Egress

Safe access and egress is required to enable the evacuation of people from the development, provide the emergency services with access to the development during times of flood and enable flood defence authorities to carry out any necessary duties during periods of flood.

A safe access/egress 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. This is of particular importance when contemplating development on sites located on dry islands. The FRA should provide an assessment of the hazards along the route and demonstrate that the access route is a low hazard (as shown in Table 12-2 and in the FD2320 Flood risk to people calculator[27].

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[26] CLG (2007) Improving the Flood Performance of New Buildings, Flood Resilient Construction. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7730/flood_performance.pdf

[27] Defra Environment Agency Flood and Coastal Defence R&D Programme, 2005, http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/FD2320_3364_TRP_pdf.sflb.ashx

13.7 Flood Compensation Storage

Policy Recommendation: All new development within Flood Zone 3 must not result in a net loss of flood storage capacity. Where possible, opportunities should be sought to achieve an increase in the provision of floodplain storage.

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.

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.

As depicted in Figure 13-2, 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[28].

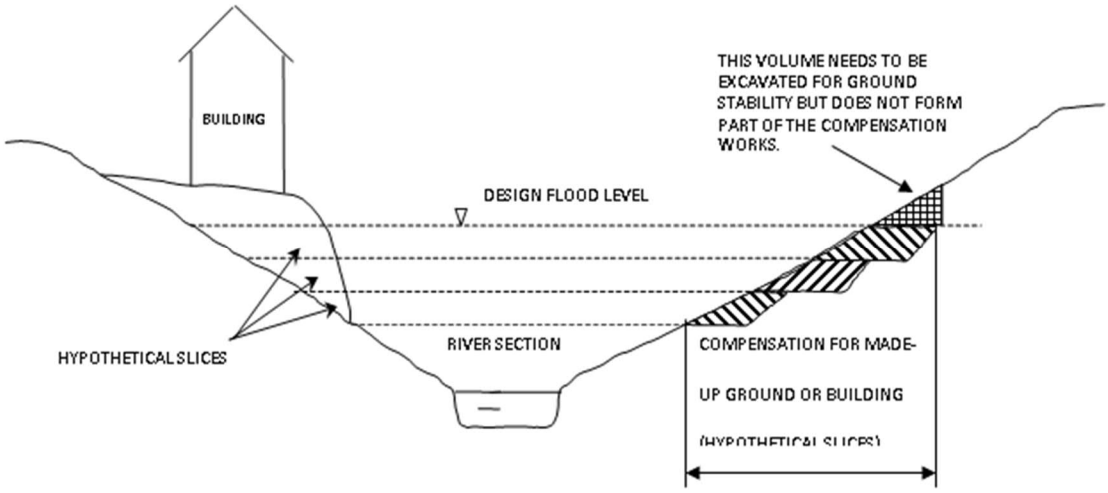

Figure 13-2 Example of Floodplain Compensation Storage (Environment Agency 2009)

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

Should it not be possible to achieve all the level for level compensation required, the Environment Agency may consider that the remainder be provided through the use of under-floor voids instead. The amount of level for level compensation would need to be maximised and any under-floor voids would need to be appropriately designed and kept clear to enable them to function effectively.

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

The use of under-floor voids with adequate openings beneath the raised finished floor levels can be considered for development in Flood Zone 2 and 3. They are generally considered to provide indirect compensation or mitigation, but not true compensation for loss of floodplain storage. The use of under-floor voids will typically require a legal agreement or planning condition and maintenance plan for them to remain open for the lifetime of the development and agreement that EHDC will enforce. Sole reliance on the use of under-floor voids to address the loss of floodplain storage capacity is generally not acceptable on undeveloped sites or for individual properties.

Ideally, void openings should be a minimum of 1m long and open from existing ground levels to at least the 1% annual probability (1 in 100 year AEP) plus climate change flood level. By setting finished floor levels at 300mm above the design flood level, there is usually enough space provision for voids below. There should be a minimum of 1m of open void length per 5m length of wall. Void openings should be provided along all external walls of the proposed extension. If security is an issue, 10mm diameter vertical bars set at 100mm centres can be incorporated into the void openings. The Environment Agency is likely to seek confirmation from EHDC that the voids be maintained in a free and open condition for the lifetime of the development.

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.

13.8 Flood Routing

Policy Recommendation: All new development in Flood Zones 2 and 3 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, such as:

- Removing boundary walls or replacing with other boundary treatments such as hedges, fences (with gaps).
- Considering alternatives to solid wooden gates, or ensuring that there is a gap beneath the gates to allow the passage of floodwater.
- On uneven or sloping sites, consider lowering ground levels to extend the floodplain without creating ponds. The area of lowered ground must remain connected to the floodplain to allow water to flow back to river when levels recede.
- 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.

In order to demonstrate that ‘flood risk is not increased elsewhere’, development in the floodplain will need to prove that flood routing is not adversely affected by the development, for example giving rise to backwater affects or diverting floodwaters onto other properties.

Potential overland flow paths should be determined and appropriate solutions proposed to minimise the impact of the development, for example by configuring road and building layouts to preserve existing flow paths and improve flood routing, whilst ensuring that flows are not diverted towards other properties elsewhere.

Careful consideration should be given to the use of fences and landscaping walls so as to prevent causing obstruction to flow routes and increasing the risk of flooding to the site or neighbouring areas.

13.9 Riverside Development

Policy Recommendation: Retain an 8 metre wide undeveloped buffer strip alongside Main Rivers or flood defence structure and explore opportunities for riverside restoration. Retain a 5 metre wide buffer strip alongside Ordinary Watercourses. New development within 8m of a Main River or Ordinary Watercourse will require consent from either the Environment Agency or Hampshire County Council (as LLFA) respectively.

The Environment Agency is likely to seek an 8 metre wide undeveloped buffer strip alongside main fluvial rivers for maintenance purposes, and would also ask developers to explore opportunities for riverside restoration as part of any development. Hampshire County Council will seek a 5 metre wide undeveloped buffer strip to be retained alongside Ordinary Watercourses.

Under the Environmental Permitting (England and Wales) Regulations (2016)[29], 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 flood plain.

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, floor or sea defence by contacting enquiries@environment-agency.gov.uk.

As of 6 April 2012 responsibility for the consenting of works by third parties on Ordinary watercourses under Section 23 of the Land Drainage Act 1991 (as amended by the Flood and Water Management Act 2010) has transferred from the Environment Agency to the Lead Local Flood Authority, Hampshire County Council. Hampshire County Council is now 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) within 8 metres that affect flow within the channel (such as in channel structures or diversion of watercourses). Enquiries and applications for ordinary watercourse consent can be submitted to Hampshire County Council on their website[30].

13.10 Surface Water Management

All major developments (10 or more dwellings and 100m^2 floorspace) and other development should not result in an increase in surface water runoff, and where possible, should demonstrate betterment in terms of rate and volumes of surface water runoff.

Sustainable Drainage Systems (SuDS) should be used to reduce and manage surface water run-off to and from proposed developments as near to source as possible in accordance with the requirements of the Technical Standards and supporting guidance published by DCLG and Department for the Environment, Food and Rural Affairs (Defra)[31]. In line with the EHDC Local Plan, SuDS must be implemented for all development sites unless it is demonstrated that SuDS are not suitable.

Suitable surface water management measures should be incorporated into new development designs in order to reduce and manage surface water flood risk to, and posed by the proposed development. This should ideally be achieved by incorporating (SuDS).

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 three goals identified below. Where possible SuDS solutions for a site should seek to:

[29] The Environmental Permitting (England and Wales) Regulations 2016 http://www.legislation.gov.uk/uksi/2016/1154/contents/made
[30] https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/WaterCourseConsent
[31] Sustainable drainage systems: non-statutory technical standards. Available from: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

- Reduce flood risk (to the site and neighbouring areas);
- Reduce pollution; and,
- Provide landscape and wildlife benefits.

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
- To a combined sewer

SuDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e. natural watercourse or public sewer etc.). The SuDS Manual[32] identified 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.

- **Infiltration**: the soaking of water into the ground. This is the most desirable solution as it mimics the natural hydrological process. The rate of infiltration will vary with soil type and condition, the antecedent conditions and with time. The process can be used to recharge groundwater sources and feed baseflows of local watercourses, but where groundwater sources are vulnerable or there is risk of contamination, infiltration techniques are not suitable.
- **Detention/Attenuation**: the slowing down of surface flows before their transfer downstream, usually achieved by creating a storage volume and a constrained outlet. In general, though the storage will enable a reduction in the peak rate of runoff, the total volume will remain the same, just occurring over a longer duration.
- **Conveyance**: the transfer of surface runoff from one place to another, e.g. through open channels, pipes and trenches.
- **Water Harvesting**: the direct capture and use of runoff on site, e.g. for domestic use (flushing toilets) or irrigation of urban landscapes. The ability of these systems to perform a flood risk management function will be dependent on their scale, and whether there will be a suitable amount of storage always available in the event of a flood.

As part of any SuDS scheme, consideration should be given to the whole life management and maintenance of the SuDS to ensure that it remains functional for the lifetime of the development.

Table 13-1 has been reproduced from the SuDS Manual, CIRIA C697 and outlines typical SuDS techniques.

The application of SuDS is not limited to a single technique per site. Often a successful SuDS solution will utilise a combination of techniques, providing flood risk, pollution and landscape/wildlife benefits. In addition, SuDS can be employed on a strategic scale, for example with a number of sites contributing to large scale jointly funded and managed SuDS. It should be noted, each development site must offset its own increase in runoff and attenuation cannot be “traded” between developments.

[32] CIRIA C697 SuDS Manual. Available from: http://www.ciria.org/Resources/Free_publications/the_suds_manual.aspx

Table 13-1 Typical SuDS Components (Y: primary process, * some opportunities subject to design)

Technique	Description	Conveyance	Detention	Infiltration	Harvesting
Pervious Surfaces	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water.		Y	Y	*
Filter Drains	Linear drains/trenches filled with a permeable material, often with perforated pipe in the base of the trench. Surface water from the edge of paved areas flows into the trenches, is filtered and conveyed to other parts of the site.	Y	Y		
Filter Strips	Vegetated strips of gently sloping ground designed to drain water evenly from impermeable areas and filter out silt and particulates.	*	*	*	
Swales	Shallow vegetated channels that conduct and/or retain water, and can permit infiltration when unlined.	Y	Y	*	
Ponds	Depressions used for storing and treating water.		Y	*	Y
Wetlands	As ponds, but the runoff flows slowly but continuously through aquatic vegetation that attenuates and filters the flow. Shallower than ponds. Based on geology these measures can also incorporate some degree of infiltration.	*	Y	*	Y
Detention Basin	Dry depressions designed to store water for a specified retention time.		Y		
Soakaways	Sub-surface structures that store and dispose of water via infiltration.			Y	
Infiltration Trenches	As filter drains, but allowing infiltration through trench base and sides.	*	Y	Y	
Infiltration Basins	Depressions that store and dispose of water via infiltration.		Y	Y	
Green Roofs	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. It is noted that the use of brown/green roofs should be for betterment purposes and not to be counted towards the provision of on-site storage for surface water. This is because the hydraulic performance during extreme events is similar to a standard roof (CIRIA C697).		Y		
Rainwater Harvesting	Storage and use of rainwater for non-potable uses within a building, e.g. toilet flushing. It is noted that storage in these types of systems is not usually considered to count towards the provision of on-site storage for surface water balancing because, given the sporadic nature of the use of harvested water, it cannot be guaranteed that the tanks are available to provide sufficient attenuation for the storm event.	*	*	*	Y

13.10.1 Suitability for Infiltration SuDS

The use of infiltration techniques is highly dependent on the underlying ground conditions. As part of this SFRA, an assessment of the suitability of using infiltration SuDS techniques across the District has been undertaken using the detailed BGS Infiltration SuDS Map.

Appendix A Figure 5 presents the Infiltration SuDS Map, which shows the following areas:

Highly compatible: The subsurface is likely to be suitable for free-draining infiltration SuDS.

Probably compatible for infiltration SuDS: The subsurface is probably suitable for infiltration SuDS, although design may be influenced by the ground conditions.

Opportunities for bespoke infiltration SuDS: The subsurface is potentially suitable for infiltration SuDS although the design will be influenced by the ground conditions.

Very significant constraints are indicated: There is a very significant potential for one or more geohazards associated with infiltration.

Appendix A, Figure 5 Infiltration SuDS Suitability

The coverage across the District identifies that over the large majority of the urbanised areas of the District the dataset identifies constraints for the use of infiltration SuDS.

Detention measures are not constrained by geology, though in areas of permeable geology, there will also be a degree of infiltration of runoff taking place. Infiltration SuDS may be constrained within Source Protection Zones (SPZs)[33], where there is a high risk of contamination of groundwater for public drinking water supply. The Environment Agency should be consulted on a site-specific basis as constraints and any required mitigation will vary between sites. Some infiltration of 'clean' water such as roof runoff may still be suitable in sensitive areas. Further information can be found in The Environment Agency's approach to Groundwater Protection[34].

13.10.2 Technical Standards and supporting guidance

A set of non-statutory Technical Standards have been published by DEFRA[35], to be used in conjunction with supporting guidance in the PPG[2], which set the requirements for the design, construction, maintenance and operation of sustainable drainage systems (SuDS).

The Technical Standards that are of chief concern in relation to the consideration of flood risk to and from development relating to peak flow control and volume control are presented below:

13.10.2.1 Peak flow control

Technical Standard S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

Technical Standard S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

13.10.2.2 Volume control

Technical Standard S4 Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

Technical Standard S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

Technical Standard S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

13.10.2.3 Flood risk within the development

Technical Standard S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

Technical Standard S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part

[33] Environment Agency Source Protection Zones http://apps.environment-agency.gov.uk/wiyby/37833.aspx
[34] Environment Agency (2018) The Environment Agency's approach to groundwater protection. February 2018 Version 1.2. Accessed October 2018 at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Envirnment-Agency-approach-to-groundwater-protection.pdf
[35] Department for Environment, Food and Rural Affairs, (2015) Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

Technical Standard S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

As of 6 April 2015, all major development should include provision for SuDS and, as the LLFA, Hampshire County Council is a statutory consultee on surface water management drainage issues for all such major developments. Hampshire County Council has set out clear advice and guidance documents on their website[36].

Applicants are strongly encouraged to discuss their proposals with Hampshire County Council at the pre-application stage. A request can be made via the Hampshire County Council website[37]. Whilst Hampshire County Council has no legal remit to provide surface water management advice for sites which have not been classified as 'major', there are occasions where smaller sites are liable to flooding or are particularly sensitive and specialist advice on surface water management is required. Hampshire County Council is able to provide information and guidance on a specific site with regard to surface water flood risk and whether the proposed surface water management scheme appears to be appropriate for the development as a chargeable service.

For smaller schemes located within Flood Zones 2 and 3, SuDS will need to be addressed as part of an FRA and will be assessed by EHDC.

13.11 Flood Warning and Evacuation Plans

Evacuation is where flood alerts and warnings provided by the Environment Agency enable timely actions by residents or occupants to allow evacuation to take place 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.

For all developments (excluding minor developments and change of use) proposed in Flood Zone 2 or 3, a Flood Warning and Evacuation 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 their development will not impact on the ability of the local authority and the emergency services to safeguard the current population.

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

The Environment Agency has a tool on their website to create a Personal Flood Plan[38]. 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.

Flood Warning and Evacuation Plans should include:

- How flood warning is to be provided, such as:
  - Availability of existing flood warning systems;
  - Where available, rate of onset of flooding and available flood warning time; and,
  - How flood warning is given.
- What will be done to protect the development and contents, such as:
  - How easily damaged items (including parked cars) or valuable items (important documents) will be relocated;
  - How services can be switched off (gas, electricity, water supplies);
  - The use of flood protection products (e.g. flood boards, airbrick covers);

[36] Hampshire County Council SuDS Planning Advice https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/HistoricFloodInformation
[37] https://www.hants.gov.uk/landplanningandenvironment/environment/flooding/HistoricFloodInformation
[38] Environment Agency Tool 'Make a Flood Plan'. Available from: https://www.gov.uk/government/publications/personal-flood-plan

- 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.)

There is no statutory requirement for the Environment Agency or the emergency services to approve evacuation plans. EHDC is accountable via planning condition or agreement to ensure that plans are suitable. This should be done in consultation with emergency planning staff.

13.12 Flood Warning Areas

The Environment Agency operates a free Flood Warning Service[39] for many areas at risk of flooding from rivers and the sea. In some parts of England the Environment Agency may also be able to tell when flooding from groundwater is possible. The Environment Agency has provided a GIS layer of Flood Warning Areas in East Hampshire.

Appendix A, Figure 8 Flood Warning Areas

There are two flood warning areas within the District, as shown in Appendix A Figure 10 and Table 13-2. The Environment Agency issues flood warnings to residents and businesses that have registered for the service in these specific areas when flooding is expected.

Table 13-2 Environment Agency Flood Warning Areas in East Hampshire

Flood Warning Area Name	Description
River Wey at Alton	River Wey and Caker Stream at Alton and the River Wey at Upper Froyle and Bentley, Hampshire
River Wey at Passfield Mill Business Park, Standford, Frensham and Millbridge	River Wey South Branch at Passfield Mill Business Park, Standford, Frensham and Millbridge, Hampshire and Surrey

EHDC has designated emergency rest centres across the District. Details of these centres have not been provided within the SFRA due to data sensitivity. It is advised that EHDC use the findings of the SFRA to inform the next regular review of the Multi-Agency Flood Plan as required.

13.13 Strategic Flood Risk Management

13.13.1 Natural Flood Management

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. The NPPF[1] , paragraph 157

[39]Environment Agency Flood Warning Service http://apps.environment-agency.gov.uk/wiyby/37835.aspx

specifically cites considering opportunities for Natural Flood management where appropriate within new developments to reduce the causes and impacts of flooding. Further guidance on the use of natural flood management processes is available from the Environment Agency in their 'Working with Natural Processes – Evidence Directory'[40].

13.13.2 River Restoration

One of the methods for reducing flooding using natural flood management is river restoration. 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.

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.

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[41].

Further guidance on river restoration is available from the Environment Agency[42].

13.13.3 Flood Storage

Flood Storage Areas (FSA's) 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 in to 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;
- to reduce flows passed downriver and mitigate downstream flooding.

Providing flood storage within an development area or further upstream of a development can manage and controlling 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 the other methods benefit only the local area, and may increase the flood risk downstream.

Further guidance on Flood Storage is provided within Chapter 10 of the Environment Agency's Fluvial Design Guide[43].

[40] Working with Natural Processes – Evidence Directoryhttps://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681411/Working_with_natural_processes_evidence_directory.pdf
[41] European Centre for River Restoration http://www.ecrr.org/RiverRestoration/Floodriskmanagement/HealthyCatchments-managingforfloodriskWFD/Environmentalimprovementscasestudies/Removeculverts/tabid/3125/Default.aspx
[42] Environment Agency, Fluvial Design Guidance Chapter 8 http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter8.aspx?pagenum=4
[43] Environment Agency, Fluvial Design Guidance Chapter 10 http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter10.aspx?pagenum=2

14. Summary and Recommendations

The NPPF[1] and accompanying Guidance emphasise the responsibility of LPAs to ensure that flood risk from all sources is understood and managed effectively and sustainably throughout all stages of the planning process. This SFRA aims to facilitate this process by identifying the spatial variation in flood risk across the Planning Authority Area, allowing an area-wide comparison of future development sites with respect to flood risk considerations. In addition to the SFRA report, planners and developers should use supporting mapping to inform site specific flood risk assessments.

Groundwater poses the most significant risk to the Planning Authority Area due to it not only being a direct cause of flooding but also a contributing factor to fluvial, surface water and groundwater flooding events.

A potential risk of flooding from other sources exists throughout the Planning Authority Area, including fluvial flood risk, sewer surcharge, and surface water flooding as a result of heavy rainfall and limited capacity of drainage infrastructure. It is expected that changing climate patterns will have a substantial impact on the level of flood risk from all sources within the Planning Authority Area. A summary of some of the locations at greatest risk from different flood sources in the Planning Authority Area is shown below in Table 14-1.

This SFRA identifies the floodplain areas associated with the River Wey and River Lavant and presents Flood Zone Maps that delineate the flood zones outlined in the NPPF[1]. These maps provide the necessary information to facilitate the NPPF[1] risk-based approach to planning. This process determines the compatibility of various types of development within each flood zone, subject to the application of the Sequential Test and the Exception Test when required

Given the proximity of the urban areas of the Planning Authority Area to the River Wey and the River Lavant, there is potential for risk of property flooding to increase in the future.

It is further recommended that policy options are expanded to include greater emphasis on floodplain management, SuDS, flood awareness and robust emergency planning and response will additionally be critical to sustainable ongoing flood risk management.

Table 14-1 Areas at principal risk of flooding from all sources

Flood Risk Source	Areas at principal risk
Fluvial	Alton, Whitehill & Bordon, Rowlands Castle
Surface	Alton and Rowlands Castle
Sewers	Liphook & Horndean, Whitehill & Bordon
Groundwater	Alton and Rowlands Castle
Artificial Sources	No significant urban area

Appendix A Flood Maps

Appendix B Data Register

	Dataset Description	Source	Format	Benefits / Limitations
Fluvial	Flood Map for Planning (Rivers and Sea) Flood Zones 2 and 3	Environment Agency Geostore* (*available to the public on the Environment Agency website)	GIS Layer	A quick and easy reference that can be used as an indication of the probability of flooding from Main Rivers. The original Flood Map was broad scale national mapping typically using JFLOW modelling software that is generally thought to have inaccuracies. This is regularly updated with the result of new modelling studies. For those rivers where there is no updated modelling, the Flood Zones from JFLOW modelling may not provide an accurate representation of probability of flooding. Typically watercourses with a catchment area less than 3km^2 are omitted from Environment Agency mapping unless there is a history of flooding affecting a population. Consequently there will be some locations adjacent to watercourses that on first inspection, suggest there is no flood risk.
	Main Rivers	Environment Agency Geostore	GIS Layer	Identification of the Main River network for which the Environment Agency have responsibility to maintain.
	Detailed River Network (DRN)	Environment Agency Geostore	GIS Layer	Identification of the river network including Main Rivers and Ordinary Watercourses for which the Environment Agency and Hampshire County Council have discretionary and regulatory powers.
	Modelled flood outlines for River Wey	Environment Agency	GIS Layer	The flood extents for the hydraulic model studies that have been completed for Rivers within the District have been mapped. These provide indication of flooding from these rivers. The Environment Agency applies the outcomes from these detailed modelling studies to update the Flood Map for Planning (Rivers and Sea) on a quarterly basis. Some watercourses have not been modelled (e.g. some of the tributaries of other the Main Rivers). The flood risk from these is based on broad scale JFLOW modelling and therefore the flood risk from these cannot be as accurately assessed.
	Modelled flood outlines for River Wey FAS- Haslemere Hydraulic Model	Environment Agency	GIS Layer	
	Modelled flood outlines for Dead River	Environment Agency	GIS Layers	
	Modelled flood outlines for the Havant Flood Mapping study	Environment Agency	GIS Layers	
	Asset Information Management System (AIMS) for the District	Environment Agency	GIS Layer	Shows where there are existing defences, structures, heights, type and design standard. However many fields contain default values.
Surface Water	'Risk of Flooding from Surface Water' dataset	Environment Agency Partners Catalogue	GIS Layer	Provides an indication of the broad areas likely to be at risk of surface water flooding, i.e. areas where surface water would be expected to flow or pond. This dataset does not show the susceptibility of individual properties to surface water flooding.
Groundwater	GIS layers of the geology across the District	EHDC	GIS Layer	Illustrates bedrock and superficial geology across the District.

	Dataset Description	Source	Format	Benefits / Limitations
	Aquifer Designation Maps for Bedrock and Superficial	Environment Agency Geostore	GIS Layer	A polygon shapefile that shows aquifer designations for bedrock aquifers. The designations identify the potential of the geological strata to provide water that can be abstracted and have been defined through the assessment of the underlying geology.
	GIS layer 'Infiltration SuDS Map'	British Geological Survey	GIS Layer	Dataset produced by the BGS of relevance to professionals who make decisions on SuDS design, construction and approval. The maps will help: (1) make preliminary decisions on the suitability of the subsurface for infiltration SuDS; (2) make preliminary decisions on the type of infiltration SuDS that will likely be appropriate; (3) assess SuDS planning applications to determine whether the necessary factors have been considered; and (4) determine whether infiltration SuDS could be appropriate where a non-infiltrating SuDS technique has been proposed.
	GIS layer 'Susceptibility to Groundwater Flooding'	British Geological Survey	GIS Layer	Dataset produced by BGS showing areas susceptible to groundwater flooding on the basis of geological and hydrogeological conditions. Suitable for broad scale assessment such as the SFRA.
Sewer	DG5 Register of sewer flooding incidents, by post code area.	Thames Water	MS Excel Spreadsheet	Indicates post code areas that may be prone to flooding as have experienced flooding in the last 10 years due to hydraulic incapacity. However, given that TWUL target these areas for maintenance and improvements, areas that experienced flooding in the past may no longer be at greatest risk of flooding. It should be noted that these are flooding incidents that have been reported to TWUL by the home owners. This will not account for any incidents that don't get reported and therefore do not show on the register. Incidents of sewer flooding can be retrospectively reported to TWUL via their website – http://thameswater.co.uk/help-and-advice/9782.htm. No data was received for the south of the District for the area covered by Southern Water
Other	LiDAR data (DTM, ASCII)	Environment Agency Geomatics Group	GIS ASCII	Provides a useful basis for understanding local topography and the surface water flood risk in the area. Spatial resolution of 1m. Accuracy of +/- 0.25m. The Environment Agency's LiDAR data archive contains digital elevation data derived from surveys carried out since 1998.
Historic Flooding	Recorded Flood Outlines	Environment Agency Geostore	GIS Layer	A single GIS layer showing the extent of historic flood events from fluvial, surface water, groundwater sources created using best available information at time of publication. However, some of the data is based on circumstantial and subjective evidence. There is not always available metadata, e.g. date of flood event.
	Environment Agency - Southern Region Hampshire and Isle of Wight Area Winter 2000 – 2001 Flooding in Hampshire Rowlands Castle August 2002	Environment Agency	PDF	The report examines the causes and impacts of groundwater flooding that occurred in Winter 2000 and 2001 in Rowlands Castle.

	Dataset Description	Source	Format	Benefits / Limitations
	Groundwater Flooding Investigation, Hampshire. Site 18 Rowlands Castle	Environment Agency	PDF	The report details the flood events that have occurred within Rowlands Castle and indicates options for alleviating flooding.
	Flood Investigations	Hampshire County Council	GIS	Location of flood investigations carried out by Hampshire County Council.
	Property Affected Database	Environment Agency	Excel Spreadsheet	Location of properties affected by flooding from Groundwater, surface water and fluvial sources.
Emergency Planning	Flood Warning Areas	Environment Agency Geostore	GIS Layer	Indicates which areas are covered by the flood warning system.
Planning	OS Mapping of East Hampshire administrative area	OS via EHDC BC	GIS Layer	Provides background mapping to other GIS layers. Designed for use at 1:50K and 1:10K scales.
	GIS layer of administrative boundary	EHDC	GIS Layer	Defines the administrative area of the District for mapping purposes.
	GIS layer of post code boundaries	EHDC	GIS Layer	Delineates post code boundaries for the District. Enables mapping of Thames Water datasets which are provided by post code sector.

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