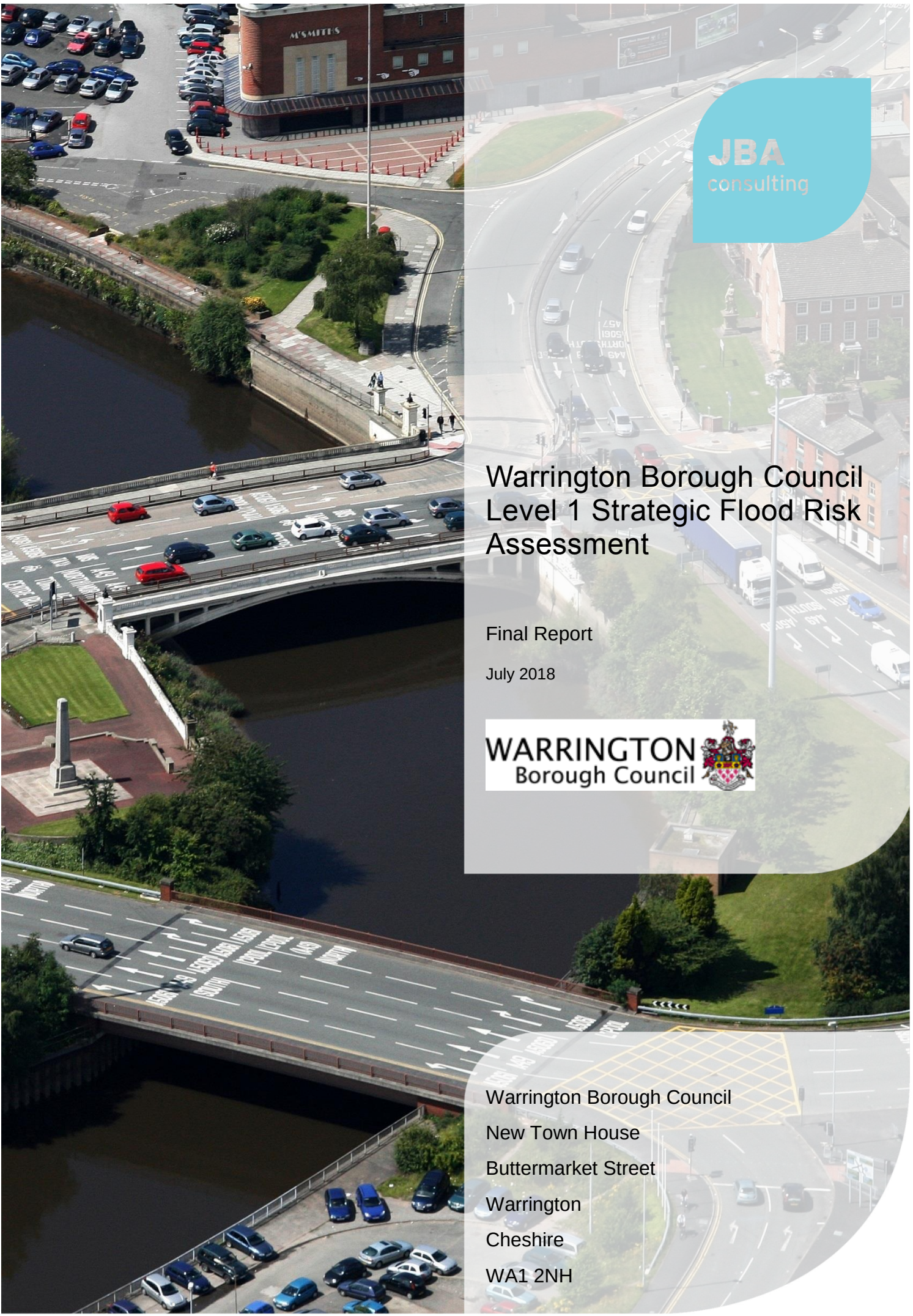

Warrington Borough Council Level 1 Strategic Flood Risk Assessment

Final Report

July 2018

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Revision History

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V1 initial draft		WBC Planning Policy
Final Draft v2.0	Revised sites assessment, WBC and EA comments addressed	WBC Planning Policy
Final Draft v3.0	JBA review	

Contract

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Purpose

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Acknowledgements

JBA would like to thank Warrington Borough Council, the Environment Agency and United Utilities staff for their time and commitment to providing data and discussing the issues identified during the course of this study.

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Executive Summary

This Level 1 Strategic Flood Risk Assessment (SFRA) updates the previous Level 1 assessment published in 2011 using up-to-date flood risk information together with the most current flood risk and planning policy available from the National Planning Policy Framework[1] (NPPF) and Flood Risk and Coastal Change Planning Practice Guidance[2] (FRCC-PPG). Warrington Borough Council (WBC) requires this update to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary. This will help to inform and to provide the evidence base for the Warrington Borough Local Plan.

Warrington Borough Council provided their latest potential sites data and information. An assessment of flood risk to all sites is provided to assist WBC in their decision-making process for sites to take forward as part of their Local Plan.

The aims and objectives of this Level 1 SFRA, as stated in the project brief, including those advised in the NPPF and FRCC-PPG, are:

- To form part of the evidence base and inform the Sustainability Appraisal (Incorporating the Strategic Environmental Assessment) for the council's Local Plan.
- To reflect current national policy documentation including the NPPF and its accompanying Flood Risk and Coastal Change Planning Practice Guidance to enable WBC to meet its obligations as defined by the NPPF.
- To supplement current policy guidelines and to provide a straightforward risk based approach to development management in the area.
- To make recommendations on the suitability of potential development sites based on flood risk for WBC's Local Plan.
- To understand current flood risk from all sources and any historic and future flood risk information to enable investigation and identification of the extent and severity of flood risk throughout the Borough. This assessment will enable WBC to steer development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To consider a precautionary approach to climate change.
- To provide guidance for developers and planning officers on planning requirements.
- To pay particular attention to surface water flood risk, using the Environment Agency's (EA's) third generation updated Flood Map for Surface Water (RoFSW).
- To provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn to for initial advice and guidance.
- To develop a report that forms the basis of an informed development management process that also provides guidance on the potential risk of flooding associated with future planning applications and the basis for site-specific Flood Risk Assessments (FRAs) where necessary.
- To provide a suite of interactive GeoPDF flood risk maps illustrating the interaction between flood risk and potential development sites.
- To identify land required for current and future flood management that should be safeguarded as set out in the NPPF.

A number of potential development sites are shown to be at varying risk from fluvial / tidal (Table 1-1), surface water flooding (Table 1-2), and residual risk. These tables summarise the results of the site screening process in the Development Site Screening spreadsheet in Appendix B.

1 http://planningguidance.planningportal.gov.uk/blog/policy/

2 http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

Table 1-1: Number of potential development sites at risk from fluvial / tidal flooding

Potential Development Site	Number of sites within…			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	316	162	134	97
Employment	25	2	2	1
Mixed Use	46	18	20	17
Gypsy & Traveller	2	0	1	0
Unknown	2	1	1	1
TOTAL	**391**	**183**	**158**	**116**
*Sites with 100% area within Flood Zone 1				

Table 1-2: Number of potential development sites at risk from surface water flooding

Potential Development Site	Number of sites within…		
	Low Risk (1 in 1000)	Medium Risk (1 in 100)	High Risk (1 in 30)
Residential	444	365	310
Employment	26	21	21
Mixed Use	67	53	43
Gypsy & Traveller	1	0	0
Unknown	3	3	3
TOTAL	**541**	**442**	**377**

The spreadsheet also includes high level broad-brush strategic recommendations on the viability of development for each site. Development viability is assessed, based on Tables 1, 2 and 3 of the flood risk and flood zone tables[3] of the FRCC-PPG (Paragraphs 065 - 067). The strategic recommendations are intended to assist the LPA in carrying out the Sequential Test. Table 1-3 shows the number of sites each strategic recommendation applies to.

Strategic recommendations:

- Strategic Recommendation A - consider withdrawing the site based on significant level of fluvial, tidal or surface water flood risk and site vulnerability;
- Strategic Recommendation B - Exception Test required if site passes Sequential Test;
- Strategic Recommendation C - consider site layout and design around the identified flood risk if site passes Sequential Test, as part of a detailed FRA or drainage strategy;
- Strategic Recommendation D - site-specific FRA required; and
- Strategic Recommendation E - site permitted on flood risk grounds due to little perceived risk, subject to consultation with the LPA / LLFA.

Table 1-3: Number of sites per strategic recommendation

Proposed use of site	Strategic Recommendation				
	A	B	C	D	E
Residential	52	24	305	80	32
Employment	1	0	1	24	1
Mixed use	10	1	44	14	14
Gypsy &Traveller	1	0	0	0	2
Unknown	1	0	0	2	0
Total	**65**	**25**	**350**	**120**	**37**

3 https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables

Of the 65 sites that are recommended for withdrawal, 42 sites are based on fluvial and / or tidal flooding and 23 are based on significant risk from surface water. A number of these 65 sites are large strategic development sites e.g. Site R18/P2/131A is 348 ha with just under a quarter of the site within the functional floodplain and therefore undevelopable. The other three quarters may be developable upon further investigation. The larger sites are more likely to be able to accommodate flood water on site compared to smaller sites. Site R18/P2/007, a potential gypsy and traveller site, is entirely within Flood Zone 3a and, being highly vulnerable, must be withdrawn.

Six sites have over 80% of their areas within Flood Zone 3b and are therefore unlikely to be developable, given the considerable reduction in developable area. Further, more detailed investigation may reveal that some of these sites may still be deliverable given that they cover large areas and therefore may be able to accommodate the functional floodplain on site by leaving these areas as open space or by creating amenity greenspace. The LPA should refer to the SFRA maps in Appendix A to check whether this may be possible before deciding whether to take these sites forward or to withdraw them.

9 of the sites recommended for withdrawal due to surface water risk are less than 1 hectare in size so are therefore unlikely to be able to accommodate surface water on-site. The residential sites are less likely to be able to mitigate surface water risk given the pressure on housing yields and possible safety concerns related to certain types of SuDS, i.e. retention pond, in residential areas. A more detailed assessment of site conditions would be required to ascertain whether there are actual surface water flow paths through the sites or whether risk is confined to certain parts of the site in natural depressions. Flood depths and hazards; ground condition assessments for SuDS; and provision for safe access and egress points during a flood would also need to be gauged. A detailed site design and drainage strategy together with a detailed FRA would have to show each site would be safe for its lifetime, which is considered to be 100 years for residential.

Included within this Level 1 SFRA, along with this main report, are:

- Detailed interactive GeoPDF maps showing all available flood risk information together with the potential development sites - Appendix A;
- Development Site Assessment spreadsheet detailing the risk to each site with recommendations on development - Appendix B;
- A note on the delineation of the functional floodplain following discussion and agreement between WBC and the EA - Appendix C;

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Abbreviations

ABD ..... Area Benefitting from Defences
ACDP ..... Area with Critical Drainage Problems
AEP ..... Annual Exceedance Probability
AIMS ..... Asset Information Management System
AOD ..... Above Ordnance Datum
AStGWF ..... Areas Susceptible to Groundwater Flooding
CaBA ..... Catchment Based Approach
CC ..... Climate change
CCA ..... Civil Contingencies Act
CDA ..... Critical Drainage Area
CFMP ..... Catchment Flood Management Plan
CIL ..... Community Infrastructure Levy
CSO ..... Combined Sewer Overflow
DCLG ..... Department for Communities and Local Government
DPD ..... Development Plan Documents
DTM ..... Digital Terrain Model
EA ..... Environment Agency
FAA ..... Flood Alert Area
FCDPAG ..... Flood and Coastal Defence Project Appraisal Guidance
FCERM ..... Flood and Coastal Erosion Risk Management Network
FDGiA ..... Flood Defence Grant in Aid
FEH ..... Flood Estimation Handbook
FRA ..... Flood Risk Assessment
FRCC-PPG ..... Flood Risk and Coastal Change Planning Practice Guidance
FRM ..... Flood Risk Management
FRMP ..... Flood Risk Management Plan
FRMS ..... Flood Risk Management Strategy
FRR ..... Flood Risk Regulations
FSA ..... Flood Storage Area
FWA ..... Flood Warning Area
FWMA ..... Flood and Water Management Act
GI ..... Green Infrastructure
GIS ..... Geographical Information Systems
HFM ..... Historic Flood Map
IDB ..... Internal Drainage Board
LA ..... Local Authority
LASOO ..... Local Authority SuDS Officer Organisation
LDF ..... Local Development Framework
LFRMS ..... Local Flood Risk Management Strategy

LLFA ..... Lead Local Flood Authority
LPA ..... Local Planning Authority
LRF ..... Local Resilience Forum
MAFRP ..... Multi-Agency Flood Response Plan
NFM ..... Natural Flood Management
NGO ..... Non-Governmental Organisation
NPPF ..... National Planning Policy Framework
PCPA ..... Planning and Compulsory Purchase Act
PFRA ..... Preliminary Flood Risk Assessment
PLP ..... Property Level Protection
RBD ..... River Basin District
RBMP ..... River Basin Management Plan
RFCC ..... Regional Flood and Coastal Committee
RoFSW ..... Risk of Flooding from Surface Water map
RMA ..... Risk Management Authority
RoFRS ..... Risk of Flooding from Rivers and the Sea Map
SA ..... Sustainability Appraisal
SEA ..... Strategic Environmental Assessment
SFRA ..... Strategic Flood Risk Assessment
SHLAA ..... Strategic Housing Land Availability Assessment
SMP ..... Shoreline Management Plan
SoP ..... Standard of Protection
SPD ..... Supplementary Planning Documents
SuDS ..... Sustainable Drainage Systems
SWMP ..... Surface Water Management Plan
UDP ..... Unitary Development Plan
UKCIP02 ..... UK Climate Projections 2002
UKCP09 ..... UK Climate Projections 2009
UU ..... United Utilities
WBC ..... Warrington Borough Council
WFD ..... Water Framework Directive
WwNP ..... Working with Natural Processes

1 Introduction

Warrington Borough Council (WBC) is a unitary authority consisting of the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA). The LPA requires a Strategic Flood Risk Assessment (SFRA) to inform development locations across the Borough and be used to feed into the Council's Spatial Distribution and Site Assessment Process and the Sustainability Appraisal (SA). It will also be used in the determining of planning applications. The LLFA, is responsible for managing flood risk from ordinary watercourses, surface water and groundwater whilst also being a statutory consultee on all planning applications submitted to the LPA.

1.1 Commission

WBC commissioned JBA Consulting in January 2017 to undertake an update of the existing Level 1 SFRA completed by JBA in September 2011. At commission, WBC was in the process of carrying out a Local Plan Review for its administrative area. The Plan Review was based on the need for Warrington to accommodate a significant increase in new homes and employment sites over the next 20 years as part of the Council's 'New City' aspirations. The Council also conducted a 'Call for Sites' exercise as part of the Local Plan Review.

The Local Plan will play a direct role in delivering the Borough's regeneration and growth objectives which will be informed by this Level 1 SFRA update.

This update has been carried out in accordance with the Government's latest development planning guidance including the National Planning Policy Framework[4] (NPPF) and flood risk and planning guidance called the Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG). The latest guidance is available online via:

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change

This updated SFRA makes use of the most up-to-date flood risk datasets to assess the extent of risk, at a strategic level, to potential development allocation sites identified by WBC. Included within the SFRA are this report together with appendices containing SFRA maps showing the potential sites overlaid with the latest, readily available, gathered flood risk information and a Development Site Assessment spreadsheet indicating the level of flood risk to each site following a strategic assessment of risk. This information will allow WBC to identify the strategic development options that may be applicable to each site and to inform on the need for the application of the Sequential Test.

1.2 Aims and objectives

In accordance with the supplied project brief and to adhere to the requirements of the FRCC-PPG (ID: 7-010-20140306), the objectives of this Level 1 SFRA update are:

- To understand flood risk from all sources and to investigate and identify the extent and severity of flood risk throughout the Borough. This assessment will enable WBC to apply the Sequential Test in the preparation of the Local Plan, steer development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To form part of the Local Plan Review evidence base and inform the Sustainability Appraisal and Spatial Distribution Site Assessment Appraisal that will inform the potential allocation of development sites across the Local Plan.
- To make recommendations on the suitability of potential development sites based on flood risk for WBC's Local Plan.
- To provide guidance for developers and planning officers dealing with applications as well as for the LLFA to fulfil its role including consultation on planning applications for the approval of Sustainable Drainage Systems (SuDS) schemes.
- To pay particular attention to surface water flood risk, using the EA's third generation Risk of flooding From Surface Water (RoFSW).

4 http://planningguidance.communities.gov.uk/blog/policy/

- To enable WBC to meet its obligations under the NPPF.
- To supplement current policy guidelines and to provide a straightforward risk based approach to development management in the Borough.
- To provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn to for initial advice and guidance.
- To develop a report that forms the basis of an informed development management process that also provides guidance on the potential risk of flooding associated with future planning applications and the basis for site-specific Flood Risk Assessments (FRAs) where necessary.
- To identify land required for current and future flood management that should be safeguarded as set out in the NPPF.
- To advise on the site-specific applicability of SuDS for managing surface water runoff.
- To assist WBC in identifying specific locations where further and more detailed flood risk data and assessment work may be required as part of a Level 2 SFRA, prior to the allocation of specific developments.
- To recommend opportunities offered by new development to reduce the causes and impacts of flooding including to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and of storage for flood water.
- Consider where climate change is expected to increase flood risk which could affect existing and new development.
- To consider any strategic cross boundary flood management issues which would require further joint working between local planning authorities and other flood management authorities.
- To consider any flood risk management infrastructure requirements for new development to feed into the infrastructure delivery plan.

This report begins by outlining the connections between the planning framework and flood risk policy thus discussing legislation, planning policy, flood risk management policy and the roles and responsibilities of key stakeholders. All available sources of flood risk within the local authority area are then examined before an assessment of flood risk to the potential development sites. Conclusions and recommendations are cited at the end of the report.

1.3 SFRA future proofing

As discussed, this SFRA has been developed using the most up-to-date data information available at the time of submission. The SFRA has been future proofed as far as possible though the reader should always confirm with WBC that the latest information is being used when decisions concerning development and flood risk are being made. The FRCC-PPG, alongside the NPPF, is referred to throughout this SFRA. It is the primary development and flood risk guidance information available at the time of the finalisation of this SFRA.

The EA would usually recommend updating an SFRA every three to four years, unless there is a significant flood affecting the area or a change in policy, in which case an immediate review should be undertaken.

This SFRA uses the EA's Flood Map for Planning issued in February 2018 to assess fluvial and tidal risk to potential development sites. The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should, therefore, refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since February 2018.

http://apps.environment-agency.gov.uk/wiyby/37837.aspx

2 Study Area

Situated in the North West of England between Manchester and Liverpool, the Borough of Warrington covers some 182 square kilometres. The population of Warrington is estimated to be 207,700 (midyear estimate 2015 rounded to the nearest 100)[5]. The town of Warrington is by far the largest settlement in the Borough following over 20-years of planned growth following its designation as a New Town in 1968. The SFRA covers the whole local authority area of Warrington from Culcheth in the north to Appleton and Stretton in the south; and Lymm in the east to Lingley Green and Penketh in the west.

The Borough has extensive areas of agricultural land, a varied landscape character, and important areas of nature conservation value, mostly within the relatively narrow gaps of open land separating Warrington from urban areas to the west, north and east. The area is generally flat and below 20 metres AOD with low-lying land within the Mersey floodplain acting as a constraint to development.

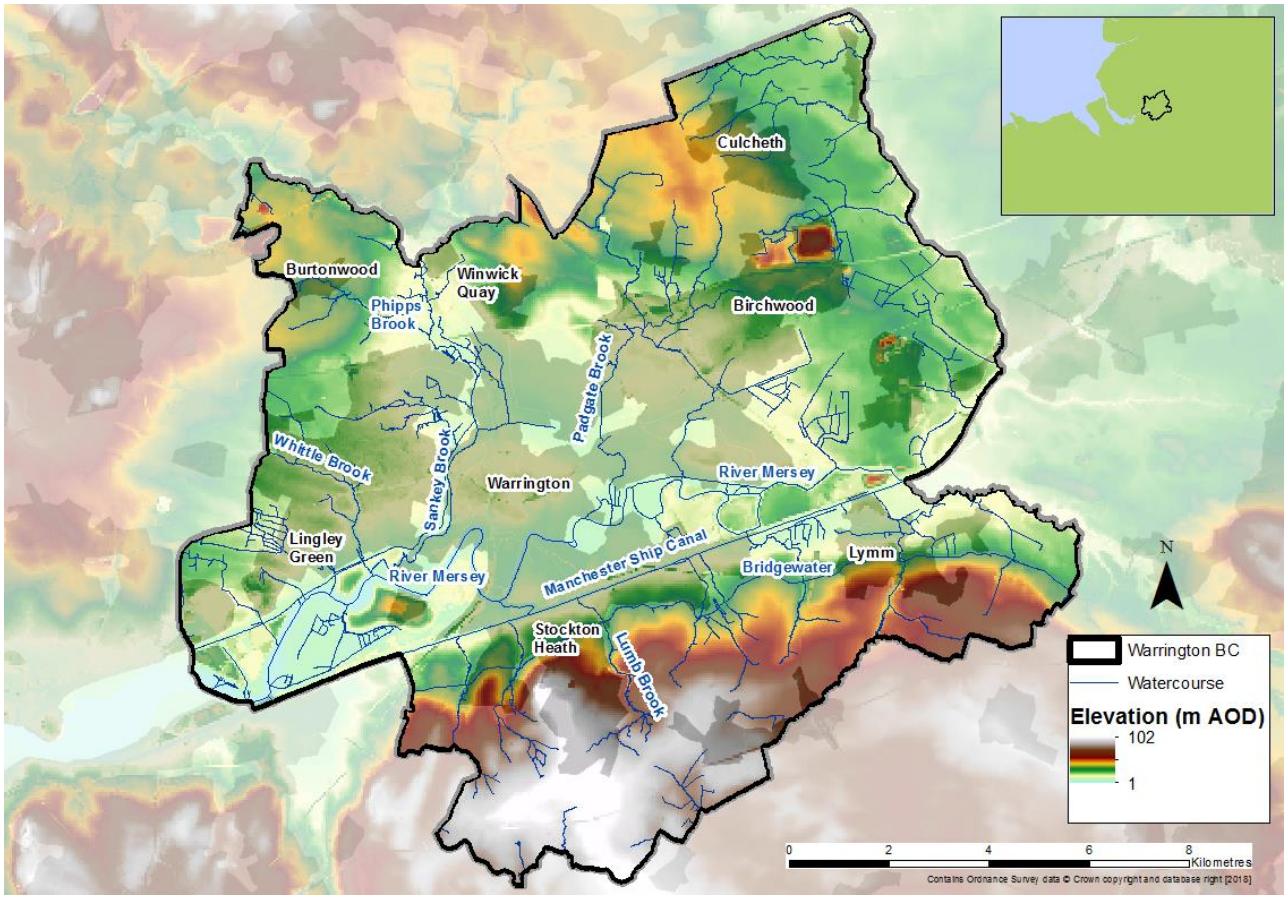
Two significant waterways cross the main urban area; the River Mersey, which passes close to the town centre and, running adjacent to the Mersey to the south, the Manchester Ship Canal.

Various small urban watercourses drain to the River Mersey in a roughly north-south direction. The River Mersey is tidal, with the normal tidal limit being at Howley Weir in the town centre of Warrington. The Manchester Ship Canal runs through Warrington, having split off from the River Mersey at Bollin Point. The Manchester Ship Canal receives flows from the River Mersey at Irlam and the Rivers Irwell, Irk and Medlock further east in Manchester.

The centre of Warrington is susceptible to flooding from combined fluvial and tidal events, and the interaction of the River Mersey and the Manchester Ship Canal is important in determining the extent of this flooding. Superimposed on this “major” drainage system is the drainage from the smaller local urban watercourses and the drains and sewers of roads and development. Excess water from rainfall events, which exceed the capacities of any of these systems or the surface infiltration capacity, can also cause flooding. Infiltration into the ground is restricted due to the generally impermeable nature of the soils and groundwater levels, which may be rising after the cessation of mining activity.

5 https://www.warrington.gov.uk/info/201120/population_facts_and_figures/1072/facts_and_figures_for_warrington

Figure 2-1: SFRA study area



3 Understanding Flood Risk

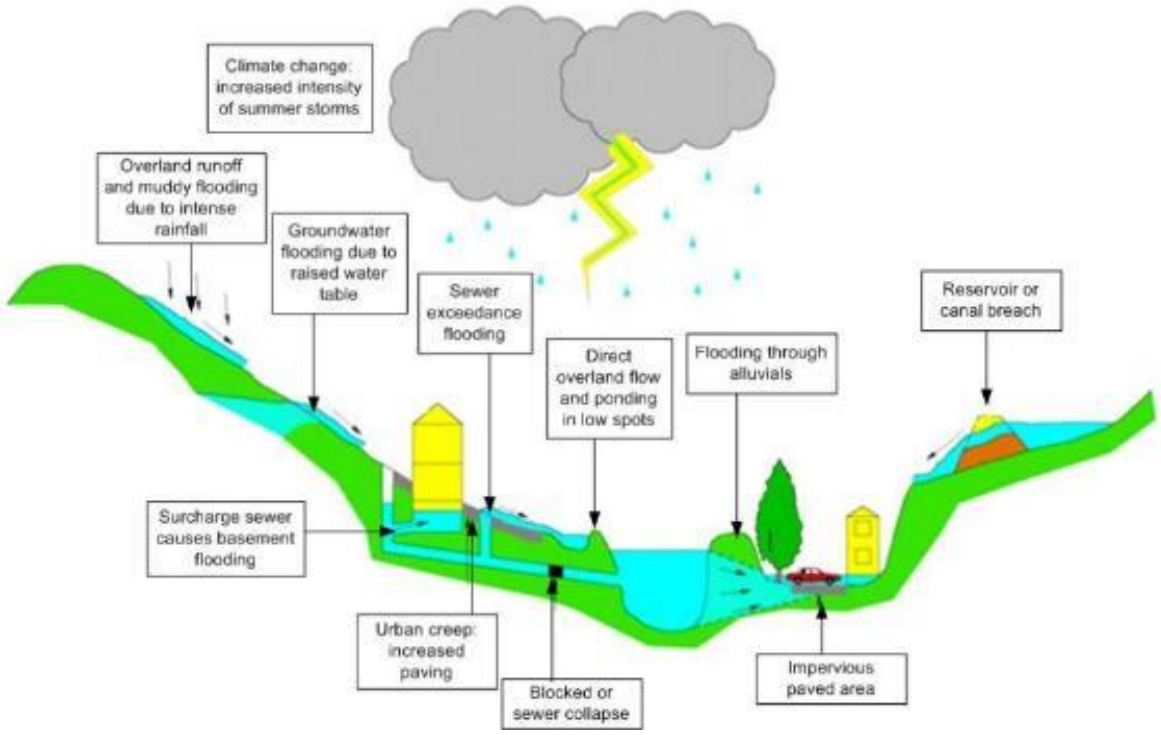
3.1 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways. Major sources of flooding (also see Figure 3-1) include:

- **Fluvia**l (main rivers and ordinary watercourse) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- **Tidal** - sea; estuary; overtopping of defences; breaching of defences; other flows (e.g. fluvial surface water) that could pond due to tide locking; wave action.
- **Surface water** - surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc.)
- **Groundwater** - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- **Infrastructure failure** - reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

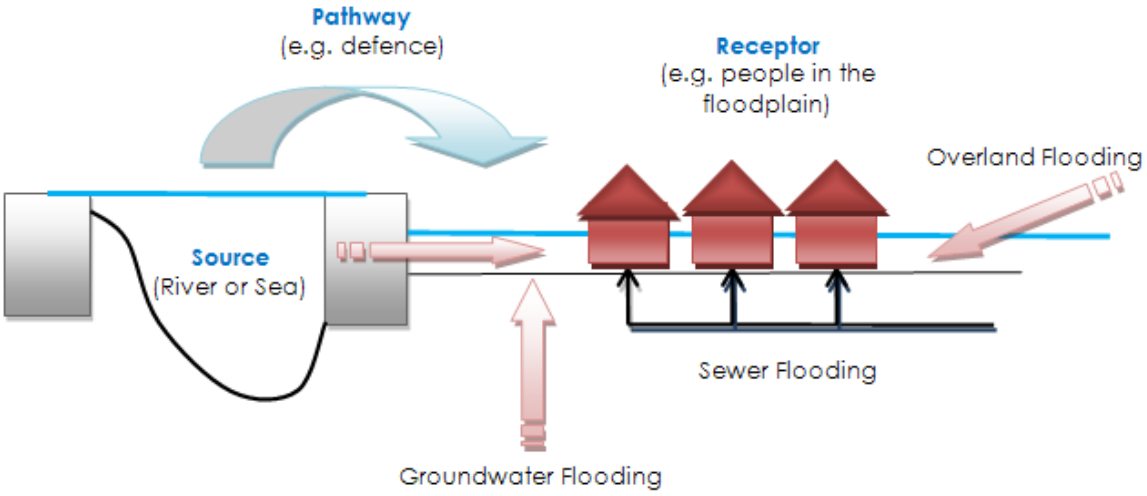
Figure 3-1: Flooding from all sources



3.2 Likelihood and consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 3-2 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

Figure 3-2: Source-Pathway-Receptor Model



The principal sources are rainfall or higher than normal sea levels, the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets and the receptors can include people, their property and the environment. All three

elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a consistent manner.

3.2.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years. Table 3-1 provides an example of the flood probabilities used to describe Flood Zones as defined in the FRCC-PPG and as used by the EA in its Flood Map for Planning (Rivers and Sea)[6].

Note that the Flood Zones shown on the Flood Map for Planning (Rivers and Sea) do not take account of any functional floodplain nor the possible impacts of climate change and consequent changes in the future probability of flooding.

6 http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=floodmap

Table 3-1: NPPF Flood Zones[7]

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	**This zone comprises land where water has to flow or be stored in times of flood.** Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Considered over the lifetime of development, such an apparently low frequency or rare flood has a significant probability of occurring. For example:

- A 1% flood has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage
- And a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime

3.2.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc.). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

3.3 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

3.3.1 Actual risk

This is the risk 'as is' taking into account any flood defences that are in place for extreme flood events (typically these provide a minimum Standard of Protection (SoP)). Hence, if a settlement lies behind a fluvial flood defence that provides a 1 in 100-year SoP then the actual risk of flooding from the river in a 1 in 100-year event is generally low. However, the residual risk may be high in that the impact of flood defence failure would likely have a major impact.

Actual risk describes the primary, or prime, risk from a known and understood source managed to a known SoP. However, it is important to recognise that risk comes from many different sources and that the SoP provided will vary within a river catchment. Hence, the actual risk of flooding from the river may be low to a settlement behind the defence but moderate from surface water, which may pond behind the defence in low spots and is unable to discharge into the river during high water levels.

7 Table 1, Paragraph 065 of the Flood Risk and Coastal Change Planning Practice Guidance

3.3.2 Residual risk

Defended sites, located behind EA flood defences remain at residual risk as there is a risk of overtopping or defence breach during significant flood events. Whilst the potential risk of failure may be reduced, consideration of inundation and the impact on development needs to be taken into account.

Paragraph 041 of the FRCC-PPG defines residual risk as:

"…those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- *the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;*
- *failure of a reservoir, or;*
- *a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with."*

Even when flood defences are in place, there is always a likelihood that these could be overtopped in an extreme event or that they could fail or breach, with the rapid onset of fast flowing, deep water with little or no flood warning. Where there is a consequence to that occurrence, this risk is known as residual risk. Defence failure can lead to rapid inundation of fast flowing and deep floodwaters, with significant consequences to people, property and the local environment behind the defence. Whilst the actual risk of flooding to a settlement that lies behind a fluvial flood defence that provides a 1 in 100-year SoP may be low, there will always be a residual risk from flooding if these defences overtopped or failed that must be taken into account. Because of this, it is never appropriate to use the term "flood free".

Developers must be able to demonstrate that development will be safe to satisfy the second part of the Exception Test (see Section 6.2). To that end, Paragraph 042 of the FRCC-PPG states:

"Where residual risk is relatively uniform, such as within a large area protected by embanked flood defences, the Strategic Flood Risk Assessment should indicate the nature and severity of the risk remaining, and provide guidance for residual risk issues to be covered in site-specific flood risk assessments. Where necessary, local planning authorities should use information on identified residual risk to state in Local Plan policies their preferred mitigation strategy in relation to urban form, risk management and where flood mitigation measures are likely to have wider sustainable design implications".

4 The Planning Framework and Flood Risk Policy

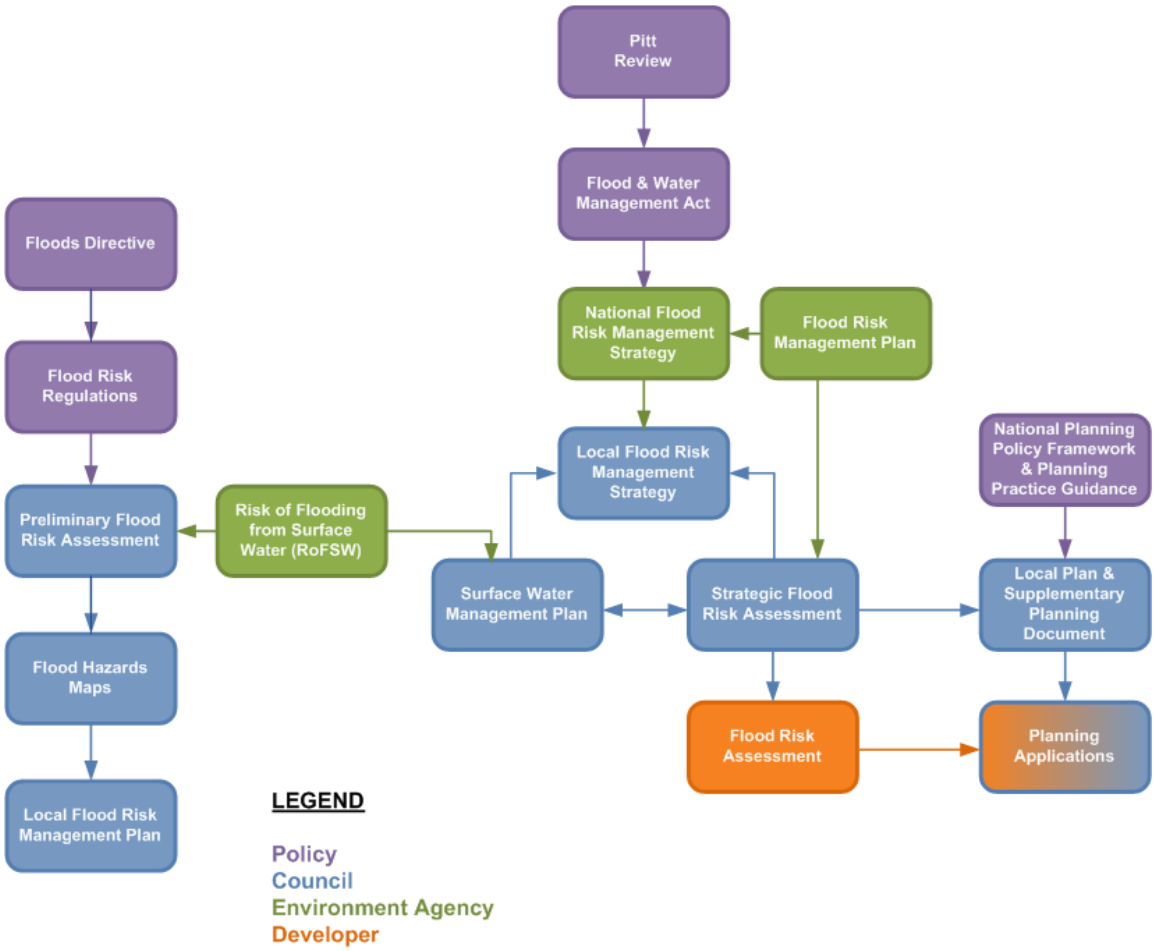
4.1 Introduction

The main purpose of this section of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of WBC's responsibilities and duty in respect to managing local flood risk including but not exclusive to the delivery of the requirements of the Flood Risk Regulations (FRR) 2009 and the Flood and Water Management Act (FWMA) 2010.

Figure 4-1 illustrates the links between legislation, national policy, statutory documents and assessment of flood risk. The figure shows that whilst the key pieces of legislation and policy are separate, they are closely related and their implementation should aim to provide a comprehensive and planned approach to asset record keeping and improving flood risk management within communities.

It is intended that the non-statutory Surface Water Management Plans (SWMPs) and SFRAs can provide much of the base data required to support the delivery of the council's statutory flood risk management tasks as well supporting local authorities in developing capacity, effective working arrangements and informing Local Flood Risk Management Strategies (LFRMS) and Local Plans, which in turn help deliver flood risk management infrastructure and sustainable new development at a local level. This SFRA should be used to support WBC's Local Plan and to help inform planning decisions.

Figure 4-1: Key documents and strategic planning links with flood risk



4.2 Legislation

4.2.1 EU Floods Directive & the Flood Risk Regulations

The European Floods Directive (2007) sets out the EU's approach to managing flood risk and aims to improve the management of the risk that floods pose to human health, the environment, cultural heritage and economic activity. The Directive was translated into English law by the Flood Risk Regulations (FRR) 2009 which require LLFAs and the EA to produce Flood Risk Management Plans (FRMPs).

The Directive puts in place a six year cycle of producing Preliminary Flood Risk Assessments (PFRAs) with the aim of identifying significant Flood Risk Areas, preparing flood hazard and risk maps and preparing Flood Risk Management Plans (FRMPs). The first six year cycle was completed in December 2015 and the second six year cycle is underway at the time of writing, due for completion by December 2017.

Figure 4-2: EU Floods Directive

PFRAs should cover the entire area for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). Where significant Flood Risk Areas are identified using a national approach (and locally reviewed), the LLFA is then required to undertake flood risk hazard mapping and to produce Flood Risk Management Plans as illustrated in Figure 4-2.

The FRMP would need to consider objectives for flood risk management (reducing the likelihood and consequences of flooding) and measures to achieve those objectives.

The EA has implemented one of the exceptions for creating PFRAs, etc. for Main Rivers and coastal flooding, as it already has mapping (i.e. EA Flood Map for Planning (Rivers and Sea), Risk of Flooding from Rivers and Sea Map) and plans (i.e. Catchment Flood Management Plans (CFMPs), River Basin Management Plans (RBMPs) in place to deal with this. The EA has therefore focused its efforts on assisting LLFAs through this process.

Warrington Borough Council Preliminary Flood Risk Assessment, 2011 & 2017

The first cycle PFRA for WBC was submitted to the EA in June 2011 and helped to determine whether there was a significant risk from flooding in the Borough, based on local flooding (surface water, groundwater, ordinary watercourses and canals) and, if so, to identify the parts of the Borough affected by these risks. As explained previously, the PFRA process is cyclical and the updated July 2017 PFRA is available from the link below:

https://www.warrington.gov.uk/info/201080/streets_and_transport/2037/flood_risk_and_water_management

The PFRA required WBC to:

- Collate and review existing data relating to historic and predicted future flood risk;
- Confirm areas across Warrington where local flood risk exceeds a locally determined threshold (in this case, where more than 80 houses are affected, 5 non-residential properties or one piece of critical infrastructure).

Based on the evidence that was collected as part of the PFRA process, there were not any past flood events that could be considered to have had 'significant harmful consequences'. However, it was noted historic flood risk is mainly from rivers, surface water and sewers with minimal risk from groundwater.

The assessment of future flood risk found that there is a risk of flooding from local sources across Warrington in some areas, particularly from fluvial and surface water sources. Based on a combination of the EA's national first generation Areas Susceptible to Surface Water Flooding

(AStSWF) and surface water modelling carried out for WBC's Surface Water Management Plan (2012), a flood event with a 1 in 200 chance of flooding in any given year, there may be 8,785 properties, including 6,571 residential properties potentially at risk from surface water flooding in the future. This did not however meet the threshold of 30,000 people within a cluster of significant areas required to identify a formal Flood Risk Area.

Warrington Borough Council PFRA 2017

In January 2017, the Department for Environment, Food and Rural Affairs (DEFRA) and the EA replaced its guidance on significant risk for the identification of flood risk areas of LLFAs. The new guidance updated the criteria for assessing and reviewing whether a risk of flooding is significant. The regulations require LLFAs to determine any part or parts of their area face significant risk of flooding and to identify any such areas as Flood Risk Areas. Since the 2011 PFRA there have been more recent flooding incidents however this has not changed the understanding of significant flood risk in the LLFA area as a result of floods that have occurred.

The PFRA methodology, based on the EA's Final PFRA Guidance and DEFRA's Guidance on selecting Flood Risk Areas, did not identify any Flood Risk Areas within Warrington. However, WBC has accepted the current proposed indicative significant FRAs. However, it recognised that Warrington had many locally significant flood risk Issues.

4.2.2 Catchment Flood Management Plans (CFMP)

The CFMPs were carried out by the EA in 2009 and were designed to establish flood risk management policies which will deliver sustainable flood risk management for the long term. The CFMPs were used by the EA to help direct resources to where the areas of greatest risk.

The CFMPs contain useful information about how the catchments work, previous flooding and the sensitivity of the river systems to increased rainfall. The EA draw on the evidence and previous measures and proposals set out in the CFMPs to help develop the FRMPs for RBDs. Warrington is included within the Mersey Estuary[8] and Weaver Gowy[9] CFMPs.

4.2.3 Flood Risk Management Plans

Following on from the CFMPs, Flood Risk Management Plans are designed to set out the risk of flooding from rivers, sea, surface water, groundwater and reservoirs within each River Basin District (RBD) and to detail how Risk Management Authorities (RMA) will work with communities to manage flood risk up to 2021 for this current cycle, at the time of writing. Both the River Basin Management Plans (RBMP) (Section 4.2.12) and FRMPs have been developed by the EA in tandem to ensure that flood defence schemes can provide wider environmental benefits during the same six-year cycle. Both flood risk management and river basin planning form an important part of a collaborative and integrated approach to catchment planning for water. Each EU member country must produce FRMPs as set out in the EU Floods Directive 2007.

North West River Basin District Flood Risk Management Plan, 2016

WBC is within the North West River Basin District which covers 13,160 square kilometres from Cumbria in the north to Cheshire in the south, with Lancashire, Merseyside and Greater Manchester in between. The river basin district comprises 12 river catchments as shown in

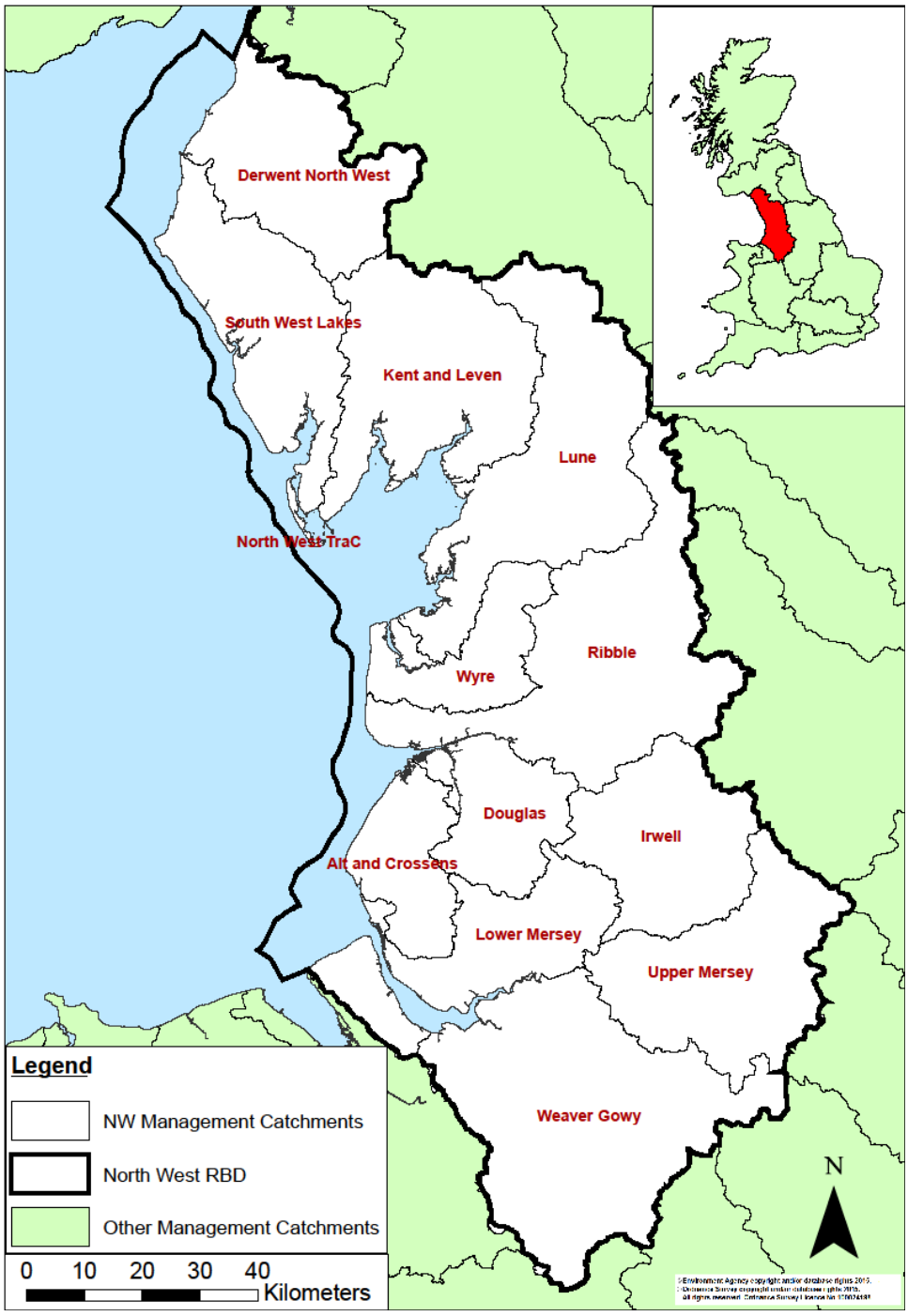
Figure 4-3. Of the 7 million people living in the river basin district, there are:

- over 51,000 people at high risk of surface water flooding (more than a 1 in 30 chance of being flooded in any year (3.3%))
- 31,000 people at high risk of flooding from rivers and the sea (more than a 1 in 30 chance of being flooded in any year (3.3%)).

8 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293769/Mersey_Estuary_Catchment_Flood_Management_Plan.pdf

9 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293779/Weaver_Gowy_Catchment_Flood_Management_Plan.pdf

Figure 4-3: Overview of North West RBD catchments[10]



Lower Mersey catchment

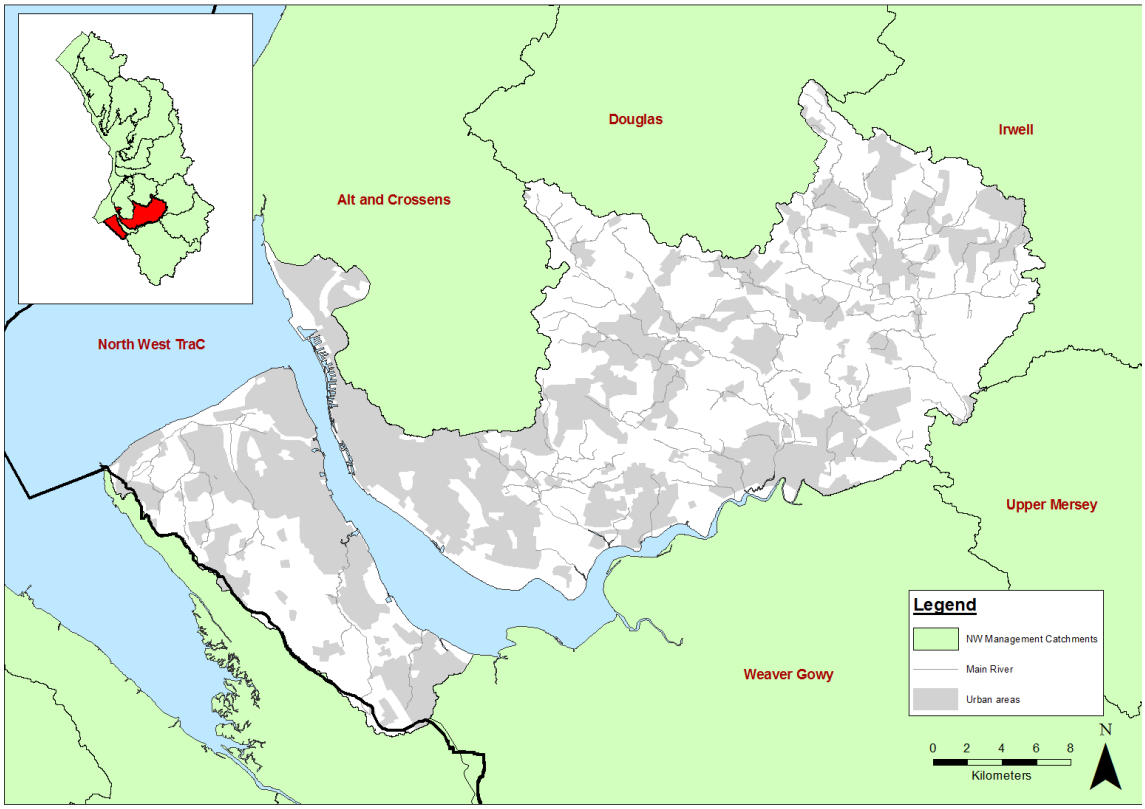
The Lower Mersey catchment covers the lowermost 800 km² of the main Mersey catchment, including most of the Wirral, and tributaries north of the Manchester Ship Canal. The area extends from South Bolton in the east, through Warrington and St Helens, and includes the Mersey Estuary at Liverpool. The catchment covers the majority of the WBC authority area

10 North West river basin district, Flood Risk Management Plan 2015 to 2021, PART A – Background and river basin district wide information, Environment Agency, March 2016

including the urban areas of Warrington, however small rural areas in the eastern and southern parts of the Borough lie within the Upper Mersey and Weaver Gowy catchments respectively. Policies within the Lower Mersey catchment will therefore have the greatest effect on flood risk within the Warrington authority area. Figure 4-4 shows the Lower Mersey catchment.

Over 47,000 people are at risk of flooding from rivers and the sea in the Lower Mersey Catchment, representing approximately 3% of the total population within the catchment with approximately 4,000 non-residential properties at risk from river and coastal flooding.

Figure 4-4: Lower Mersey catchment[11]



The North West RBD FRMP summarises various measures to help manage flood risk in the future in the Lower Mersey catchment. Those that may apply to Warrington include:

- Preparation for risk:
  - Identify opportunities to reduce the existing level of maintenance at key asset systems
  - Linked to the Regional Habitat Creation Programme, investigate viability of managed realignment for habitat creation and flood storage, including consultation and modelling of the impacts on the estuary
- Protection from risk:
  - The River Mersey Flood Risk Management Scheme to address fluvial and tidal flood risk from the River Mersey in Warrington
  - Mersey Estuary/Liverpool Bay Managed Realignment Viability Study - Investigate opportunities to set back defences in the medium term for habitat creation opportunities and flood reduction benefits

It is noted in the FRMP that the identification of these measures is not a commitment to deliver them but that the need has been identified. In many cases, an assessment of benefit and affordability has, at the time of writing, not yet been carried out.

11 North West river basin district, Flood Risk Management Plan 2015 to 2021, PART B – Sub Areas in the North West river basin district, Environment Agency, March 2016

Weaver Gowy catchment

There are small rural areas in the eastern and southern parts of the Borough that lie within the Upper Mersey and Weaver Gowy catchments respectively. The Weaver and Gowy catchments are situated to the South of the River Mersey on the Cheshire Plain. The area is approximately 1,730 km^2 and drains into the Mersey Estuary. The Cheshire Plain is predominantly rural and low lying in nature with the exception of an urban zone running through the centre of the Plain.

The Cheshire Plain forms the majority of the catchment, which is interrupted by a sandstone ridge running north-south across it. This area generally responds slowly to rainfall events. Higher ground surrounds the catchment, particularly in the Dane sub-catchment to the east, which generates a faster response to rainfall. Most rivers flow northwards into the Manchester Ship Canal which discharges into the River Mersey, however, some watercourses flow directly into the Mersey Estuary.

In the Borough of Warrington at Thelwall up to 150 of properties are at risk of flooding within the Weaver Gowy catchment.

4.2.4 Catchment Based Approach (CaBA)

The Catchment Based Approach embeds collaborative working at a river catchment scale to deliver cross cutting improvements to our water environments. The CaBA partnerships drive cost-effective practical delivery on the ground, resulting in multiple benefits including reduced flood risk and resilience to climate change.

Catchment partnerships are groups of organisations with an interest in improving the environment in the local area and are led by a catchment host organisation. The partnerships work on a wide range of issues, including the water environment but also address other concerns that are not directly related to river basin management planning. Government is also working to strengthen or establish partnerships in the areas most affected by the December 2015 floods to encourage a more integrated approach to managing risk across all catchments.

The National Resilience Review will align closely with Defra's work on integrated catchment-level management of the water cycle in the Government's 25 year Environment Plan. Government's aspirations for the next cycle of planning (now to 2021) is for more integrated catchment planning for water, where Flood and Coastal Risk Management, River Basin Management, nature conservation and land management are considered together.

WBC is part of the Lower Mersey Catchment Partnership. At the time of writing, the Partnership's steering group is developing a catchment plan.

4.2.5 Natural Flood Management and Working with Natural Processes - what is it?

Natural Flood Management (NFM) or Working with Natural Processes (WwNP) is a type of flood risk management used to protect, restore and renaturalise the function of catchments and rivers to reduce flood and coastal erosion risk. WwNP has the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible and to increase the lifespan of existing flood defences. NFM and WwNP are used interchangeably in the UK though the term WwNP used throughout this report.

A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). WwNP involves taking action to manage flood and coastal erosion risk by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts. Techniques and measures, that may be applicable to Warrington, include:

- Peatland and moorland restoration in upland catchments
- Re-meandering streams
- Targeted woodland planting
- Reconnection and restoration of functional floodplains
- Restoration of rivers and removal of redundant structures

- Installation or retainment of large woody material in river channels
- Improvements in management of soil and land use
- Creation of rural and urban SuDS

Both the European Commission and UK Government are actively encouraging the implementation of WwNP measures within catchments and coastal areas in order to assist in the delivery of the requirements of various EC Directives relating to broader environmental protection and national policies. It is fully expected that the sustained interest in WwNP implementation across the UK will continue in the post-Brexit era as a fundamental component of the flood risk management tool kit.

4.2.6 Evidence base for WwNP to reduce flood risk

There has been much research on WwNP, but it has never been synthesised into one location. This has meant that it has been hard for flood risk managers to access up-to-date information on WwNP measures and to understand their potential benefits. The EA has now produced the WwNP evidence base which includes three interlinked projects:

- Evidence directory
- Mapping the potential for WwNP
- Research gaps

The evidence base can be accessed via:

https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk

The evidence base can be used by those planning projects which include WwNP measures to help understand:

- Their potential FCRM benefits and multiple benefits
- Any gaps in knowledge
- Where it has been done before and any lessons learnt
- Where in a catchment they might be most effective

The evidence directory presents the evidence base, setting out the scientific evidence underpinning it. Its purpose is to help flood risk management practitioners and other responsible bodies access information which explains what is known and what is not known about the effectiveness of the measures from a flood risk perspective. There is also a guidance document which sits alongside the evidence directory and the maps which explains how to use them to help make the case for implementing WwNP when developing business cases.

4.2.7 Mapping the potential for WwNP

JBA Consulting has been working with the EA and Lancaster Environment Centre (LEC) to update national maps of Potential for Working with Natural Processes. LEC has developed a new spatial model of slowly permeable soils to identify areas where shrub or tree-planting could increase hydrological losses and slow the flow based on British Geological Survey (BGS) 1:50k maps, who have also agreed to an open government license for the maps. The new national maps for England make use of different mapping datasets and highlight potential areas for tree-planting (for three different types of planting), runoff attenuation storage, gully blocking, and floodplain reconnection. The maps can be used to signpost areas of potential, and do not take into account issues such as land-ownership and drainage infrastructure, but they may well help start the conversation and give indicative estimates of, for example, additional distributed storage in upstream catchments.

Interactive mapping showing the potential for WwNP is available for all river basin districts, including the North West, via:

http://wwnp.jbahosting.com/

These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps, however it is a useful tool to help start dialogue with key partners. The maps are provided as spatial data for use in GIS and also interactive GeoPDF format, supported by a user guide and a detailed technical guide.

4.2.8 Limitations

The effectiveness of WwNP measures is site-specific and depends on many factors, including the location and scale at which they are used. It may not always be possible to guarantee that these measures alone will deliver a specified standard of defence. Consequently, flood risk management measures should be chosen from a number of options ranging from traditional forms of engineering through to more natural systems. The research gaps that need to be addressed to move WwNP into the mainstream are identified in the evidence directory.

4.2.9 WwNP in Warrington

According to the spatial model of slowly permeable soils, there are areas within Warrington where by removing existing defences and reconnecting the floodplain could create areas with a potential for Working with Natural Processes without causing risk to properties. Keeping in mind the limitations with the data and that, realistically, not all areas will be appropriate, these areas for potential floodplain reconnection are predominately located along all watercourses within the borough, with the largest area located along Phipps Brook south East of Burtonwood. There are also larger areas with potential for floodplain reconnection along Fishington Brook from South Birchwood to East Martinscroft. Reconnecting a river with its floodplain and naturalising a river itself may lead to reduced peak flood levels which may subsequently assist in alleviating risk to properties and infrastructure downstream.

NFM measures are designed to reduce the flow of floodwater to minimise the risk of flooding to areas downstream. Tree planting can play a vital role in reducing flood risk within an area. Increased rainfall interception and infiltration may reduce surface water runoff and therefore increase the potential of NFM in the area. There are limited areas across Warrington for tree planting, however there are some areas located to the East of Warrington that would benefit from tree planting for instance from East Thelwall to north East Lymm, areas located along the River Mersey at Paddington Meadows and along Sankey Brook from West Dallam to West Winwick.

4.2.10 Making Space for Water Strategy

The “Making Space for Water Strategy” (MSFWS) is a milestone document that confirms the Government’s strategic direction for Flood and Coastal Erosion Risk Management (FCERM). Over the 20-year lifetime of the strategy, Government will implement a more holistic approach to managing flood and coastal erosion risks in England. The approach will involve taking account of all sources of flooding, embedding flood and coastal risk management across a range of Government policies, and reflecting other relevant Government policies in the policies and operations of operating authorities for flood and coastal erosion risk management.

The 2004 document “Making Space for Water[12]” sets out the following vision:

“…we want to make space for water so that we can manage the adverse human and economic consequences of flooding and coastal erosion while achieving environmental and social benefits in line with wider government objectives.”

In other words, the aim of the strategy is to balance the three pillars of sustainability, managing flood risk and ensuring that the social and economic benefits which accrue from growth and development are attained. This balanced approach, integrating sustainable development with responsible risk management, has underpinned this SFRA.

WBC are in the early stages of potential partnership / collaborative into becoming part of a MSFW Group which should consist of representatives of the LLFA, EA, district councils, UU and

12 Making space for water, Developing a new Government strategy for flood and coastal erosion risk management in England. A consultation exercise. July 2004

the Highways Authority. The MSFW groups work to resolve minor flood risk issues that require joint working in any particular district.

4.2.11 Flood & Water Management Act

The FWMA was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth. Table 4-1 provides an overview of the key LLFA responsibilities under the FWMA.

Table 4-1: Key LLFA Duties under the FWMA

FWMA Responsibility	Description of duties and powers	WBC LLFA Status
Local Strategy for Flood Risk Management	A LLFA has a duty to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different LA areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	Published April 2014 (see Section 4.4.4) At the time of writing being updated
Duty to contribute to sustainable development	The LLFA has a duty to contribute towards the achievement of sustainable development.	Ongoing
Duty to comply with national strategy	The LLFA has a duty to comply with national flood and coastal risk management strategy principles and objectives in respects of its flood risk management functions.	Ongoing
Investigating Flood Incidents	The LLFA, on becoming aware of a flood in its area, has (to the extent it considers necessary and appropriate) to investigate and record details of "locally significant" flood events within their area. This duty includes identifying the relevant risk management authorities and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	Ongoing available online: https://www.warrington.gov.uk/downloads/download/2472/investigating_after_a_flood
Asset Register	A LLFA has a duty to maintain a register of structures or features, which it considers to have a significant effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	Ongoing - available online: http://www.jbamap.co.uk/map/la/warringtonassetregister/
Duty to co-operate & Powers to Request Information	The LLFA must co-operate with other relevant authorities in the exercise of their flood and coastal erosion management functions.	Ongoing
Ordinary Watercourse Consents	A LLFA has a duty to deal with enquiries and determine watercourse consents where the altering, removing or replacing of certain flood risk management structures or features that affect flow on ordinary watercourses is required. It also has provisions or powers relating to the	Ongoing

FWMA Responsibility	Description of duties and powers	WBC LLFA Status
	enforcement of unconsented works.	
Works Powers	The Act provides a LLFA with powers to undertake works to manage flood risk from surface runoff, groundwater and on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Ongoing
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Ongoing
Emergency Planning	A LLFA is required to play a lead role in emergency planning and recovery after a flood event.	Local Resilience Forum - Cheshire Resilience Forum (Section 7.1.1)
Community Involvement	A LLFA should engage local communities in local flood risk management issues. This could include the training of community volunteers, the development of local flood action groups and the preparation of community flood plans, and general awareness raising around roles and responsibilities plans.	Various ongoing (Section 7.1.1)
Planning Requirements for SuDS	Consideration of Sustainable Drainage Systems (SuDS) is a planning requirement for major planning applications (10 or more residential units or equivalent commercial development schemes). The LLFA is a statutory planning consultee and provides recommendation to the LPA in respect of drainage proposals for a site. The LPA determines the acceptability of these proposed sustainable drainage schemes subject to exemptions and thresholds, as appropriate. Planning authorities use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of SuDS for the lifetime of the development.	Non-statutory technical standards for sustainable drainage systems and CIRIA Guidance are utilised. Sustainable Drainage Systems (SuDS) Design and Technical Guidance has been developed and approved by the Council for use. Available on line: **https://www.warrington.gov.uk/downloads/file/15569/design_and_technical_guidance**
Reservoirs	Designate high risk reservoirs, with preparation of a flood plan by the owner, including all relevant data.	Ongoing
Latest changes to FWMA legislation[13]		

13 http://www.legislation.gov.uk/ukpga/2010/29

4.2.12 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD), which was transposed into English Law by the Water Environment Regulations (2003), is to deliver improvements across Europe in the management of water quality and water resources through a series of plans called River Basin Management Plans. The EA is responsible for monitoring and reporting on the objectives of the WFD on behalf of Government. They work with Government, Ofwat, local government, non-governmental organisations (NGOs) and a wide range of other stakeholders including local businesses, water companies, industry and farmers to manage water[14]. The second management cycle of the WFD[15] has already begun and the second river basin management plans were completed in 2015, building upon the first set of RBMPs completed in 2009.

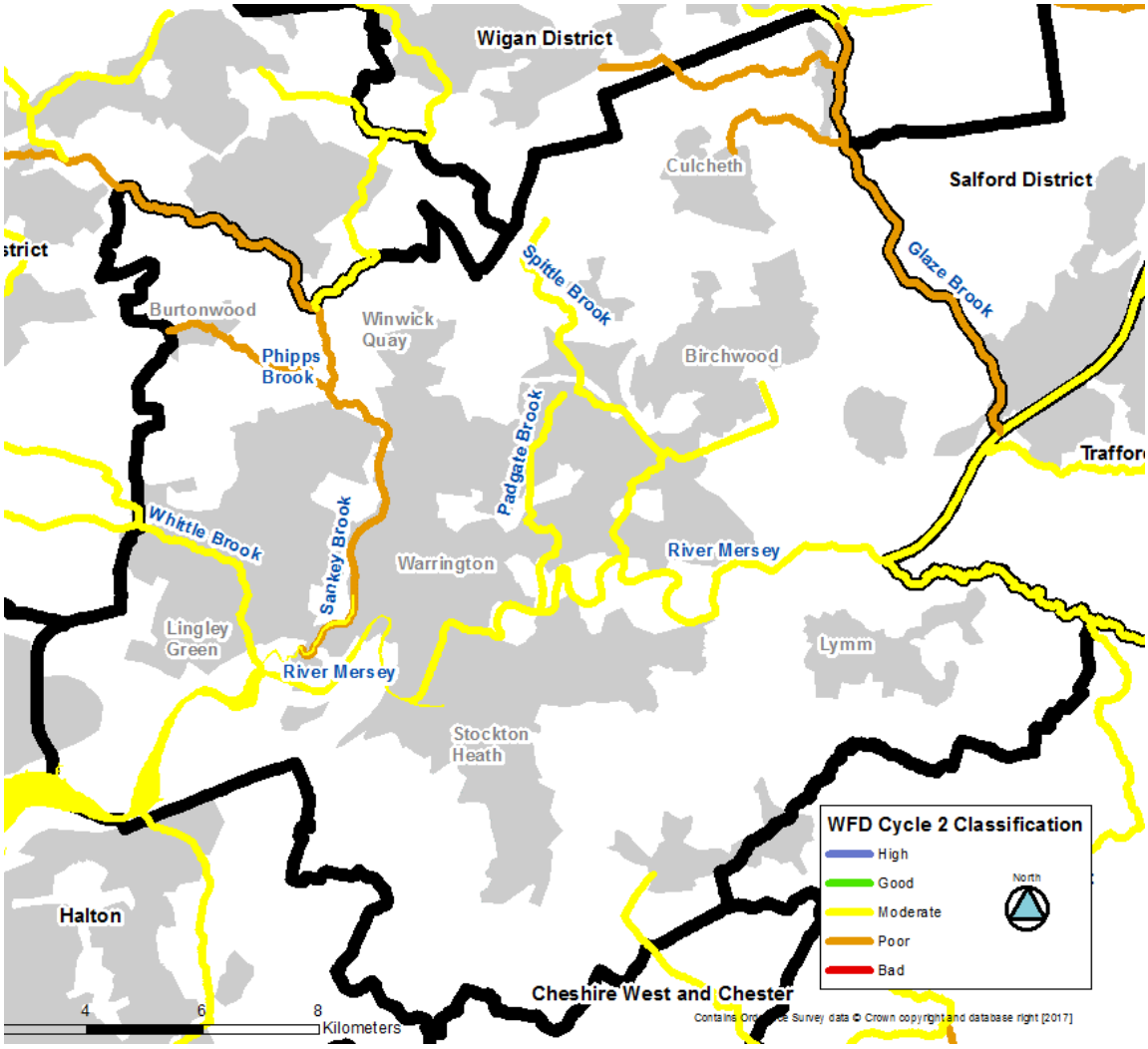
RBMPs are designed to address the pressures facing the water environment in the river basin management plan districts and the actions that will address them. The plans describe required objectives and measures to protect and improve the water environment over the next 20 years and aim to achieve WFD targets from 2015 onwards to 2021.

Figure 4-5 shows the WFD second cycle Main River classifications for Warrington. The majority of the major rivers in the area are classed as having Moderate ecological status. However, Sankey Brook, Phipps Brook and Glaze Brook are classed as Poor.

Figure 4-5: WFD Cycle 2 waterbody classification (2016)

14 https://www.gov.uk/government/publications/2010-to-2015-government-policy-water-quality/2010-to-2015-government-policy-water-quality#appendix-4-planning-for-better-water

15 http://ec.europa.eu/environment/water/water-framework/info/timetable_en.htm



The RBMPs, like the CFMPs, are important documents relevant to the development of the SFRA. The SFRA should take into account the wider catchment flood cell aims and objectives and understand how it can potentially contribute to the achievement of them.

The main responsibility for WBC is to work with the EA to develop links between river basin management planning and the development of local authority plans, policies and assessments. In particular, the general programme of actions (measures) within the RBMPs highlight the need for:

- Water Cycle Studies to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan implementation (WBC produced a Borough-wide SWMP in May 2012. Section 4.4.5 summarises the outcomes from the SWMP),
- Considering the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, including in Local Plans and Health and Well Being Strategy,
- Promoting the wide scale use of SuDS in new development.

North West River Basin District River Basin Management Plan

The North West River Basin District RBMP[16], managed by the EA, has been updated since the first cycle in 2009. The latest version was published in December 2015. Water quality and flood risk can go hand in hand in that flood risk management activities can help to deliver habitat restoration techniques. The FRMP promotes a range of benefits designed to contribute to the RBMP through re-naturalisation, water quality improvements, bathing water improvements and natural flood management.

Mersey Estuary catchment

The priority river basin management issues to tackle in this catchment are physical modifications, urban diffuse pollution and pollution from wastewater. Up to 2021 the following measures apply:

- Identifying opportunities of multiple benefit through evidence based mapping to target projects for maximum benefit.
- Action to address diffuse pollution through interventions and the River Guardians volunteer programme, starting with waterbodies within the Wirral area with a future view to progressing the approach across the rest of the catchment.

Future aims, dependant on funding, include:

- Development and implementation of catchment wide strategies to improve the water environment through a framework for individual operational catchments and waterbodies.
- Sustainable urban drainage systems project(s) with the potential to deliver benefits for the water environment and flood risk whilst addressing issues such as mine water contamination and highways runoff.
- Cross-catchment concerted River Guardians programme including public, private and voluntary sectors to enable citizen science for local communities to monitor their own water environment and take an active role in its stewardship.
- Implementation of a strategic programme of urban forestry across the catchment, with maximum flood alleviation, water quality and wider benefits such as growth agenda, jobs training, employment, health and wellbeing.
- Cross-catchment action for enhancement and restoration where appropriate, addressing physical modifications such as toe boarding, revetment, redundant weirs and tidal flaps to enable the passage of fish.

16 https://www.gov.uk/government/collections/river-basin-management-plans-2015#north-west-river-basin-district-rbmp:-2015

4.3 Planning Policy

4.3.1 Housing and Planning Act, 2016

The Act provides the statutory framework to build more homes that people can afford, expand home ownership, and improve housing management. The Act places a duty on local authorities to promote the development of starter homes, custom and self-build homes. The Act simplifies and speeds up the neighbourhood planning process to support communities that seek to meet local housing and other development needs through neighbourhood planning. In addition, the Act seeks to ensure that every area has a Local Plan, and gives the Secretary of State further powers to intervene if Local Plans are not effectively delivered.

The Secretary of State must also carry out a review of planning legislation, government planning policy and local planning policies, concerning sustainable drainage in relation to the development of land in England.

4.3.2 National Planning Policy Framework (NPPF), 2012

The NPPF was published in March 2012, and is based on core principles of sustainability. It forms the national policy framework in England and is accompanied by a number of Planning Practice Guidance notes. It must be taken into account in the preparation of Local Plans and is a material consideration in planning decisions. Section 10 Paragraph 100 of the NPPF states that Local Plans…

"...should be supported by a Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by applying the Sequential Test, if necessary applying the Exception Test, safeguarding land from development that is required for current and future flood management, using opportunities offered by new development to reduce the causes and impacts of flooding and where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long term, seeking opportunities to facilitate the relocation of development including housing to more sustainable locations".

The Sequential Test must be performed when considering the placement of future development and for planning application proposals. The Sequential Test is used to direct all new development to locations at the lowest probability of flooding. It states that development should not be permitted or allocated if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding.

The Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG) sits alongside the NPPF and sets out detailed guidance on how this policy should be implemented.

4.3.3 Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG)

On 6 March 2014 the Department for Communities and Local Government (DCLG) launched their planning practice guidance, including guidance for flood risk and coastal change, which replaces the previous Technical Guidance. This new guidance is available as a web-based resource[17], which is accessible to all and is regularly updated. Whilst the NPPF concentrates on high level national policy, the FRCC-PPG is more detailed. The practice guidance advises on how planning can take account of the risks associated with flooding and coastal change in plan making and the development management process. This is in respect of Local Plans, SFRAs, the sequential and exception tests, permitted development, site-specific flood risk, Neighbourhood Planning, flood resilience and resistance techniques and the vulnerability of development to make development safe from flooding.

17 http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

The national PPG also includes guidance for water supply, wastewater and water quality[18]. The Local Plan will need to grapple with and the contribution that can be made to a 'catchment-based approach' to water.

4.3.4 Localism Act

The Localism Act was given Royal Assent in November 2011 with the purpose of shifting power from Central Government back to local councils, communities and individuals. The Government abolished Regional Spatial Strategies, providing the opportunity for councils to re-examine the local evidence base and establish their own local development requirements for employment, housing and other land uses through the Plan making process.

Additionally, this act places a duty to cooperate on local authorities, including statutory bodies and other groups, in relation to the planning of sustainable development. This duty to cooperate requires local authorities to:

"...engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter." (Provision 110).

This act, together with the Neighbourhood Planning (General) Regulations 2012, also provides new rights to allow Parish or Town Councils to deliver additional development through neighbourhood planning (Neighbourhood Plans). This means local people can help decide where new homes and businesses should go and what they should look like. Local planning authorities can provide technical advice and support as neighbourhoods draw up their proposals. Neighbourhood Plans have a number of conditions and requirements as set out in the NPPF. Also refer to Paragraph 061-064 of the FRCC-PPG for information on neighbourhood planning and flood risk.

4.3.5 Local Plan

A Local Plan[19] is a statutory document prepared in consultation with the local community. It is designed to promote and deliver sustainable development. Local Plans have to set out a clear vision, be kept up to date and to set out a framework for future development of the local area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure as well as safeguarding the environment and adapting to climate change and securing good design.

Local plans set the context for guiding decisions and development proposals and along with the NPPF, set out a strategic framework for the long-term use of land and buildings, thus providing a framework for local decision making and the reconciliation of competing development and conservation interests.

The aim of a Local Plan is to ensure that land use changes proceed coherently, efficiently, and with maximum community benefit. Local plans should indicate clearly how local residents, landowners, and other interested parties might be affected by land use change. They are subject to regular periods of intensive public consultation, public involvement, negotiation and approval. The Local Plan should be the starting point when considering planning applications.

The NPPF requires that the evidence base for the Local Plan must clearly set out what is intended over the lifetime of the plan, where and when this will occur and how it will be delivered. The NPPF states that Local Plans should be supported by a SFRA and should take account of advice provided by the EA and other flood risk management bodies. The SFRA should be used to ensure that when allocating land or determining planning applications, development is located in areas at lowest risk of flooding. Policies to manage, mitigate and design appropriately for flood risk should be written into the Local Plan, informed by both the Sustainability Appraisal and this SFRA.

Government guidance on Local Plans can be found in the NPPF Local Plan PPG (ID12):

https://www.gov.uk/guidance/local-plans--2

18 https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality

19 Town and Country Planning, England. The Town and Country Planning (Local Planning) (England) Regulations 2012

Warrington Local Plan Core Strategy

The Warrington Local Plan Core Strategy was adopted by the Council on 21 July 2014 and is the current Statutory Development Plan for the Borough, setting out the overarching strategic policies for guiding the location and level of development in the Borough up to 2027.

Upon adoption, there was a High Court Challenge which resulted in parts of the Plan being quashed:

- The housing target of 10,500 new homes (equating to 500 per year) between 2006 and 2027 and;
- References to 1,100 new homes at the Omega Strategic Proposal

Not all of the Local Plan Core Strategy has been overturned and all other policies within the Plan remain unaltered and are considered to be a sound and robust basis for the determination of planning applications across the Borough at this point in time. However, as part of the Level 1 SFRA update, Policy QE4-Flood Risk, will be re-evaluated to check conformity with national policy, and amended to reflect this if necessary.

However, given the results of the High Court challenge and the emerging evidence underpinning the Borough's growth needs and economic development ambitions, the Council recognised the need to undertake a review of the Local Plan Core Strategy.

Local Plan Review

On the 10th October 2016, the Council's Executive Board approved commencement of the Regulation 18 Local Plan Review. A six-week public consultation period commenced on 24th October 2016, with interested parties invited to submit representations on the scope of the review and what the Local Plan ought to consider.

A further Regulation 18 consultation (Preferred Development Option) was approved by the Council's Executive Board on 10th July 2017. A ten week public consultation period commenced on the Preferred Development Option on 18th July 2017, with interested parties invited to submit representations on the proposals set out in the Preferred Development Option.

The next stage in the Local Plan process will be the Regulation 19, Draft Local Plan consultation stage, anticipated to take place by Autumn/Winter 2018.

4.4 Flood Risk Management Policy

4.4.1 WBC Local Plan Policy on flood risk

Policy QE4 of the Local Plan Core Strategy is the current Plan policy for dealing with flood risk across the Borough. This policy will be assessed in light of current national policy and guidance and amended accordingly to reflect this in the Draft Local Plan.

4.4.2 Sustainability Appraisal

The Sustainability Appraisal (SA) is a key component of the Local Plan evidence base, ensuring that sustainability issues are addressed during the preparation of Local Plans. The SA is a technical document which has to meet the requirements of the Strategic Environmental Assessment Directive 2001/42/EC which assesses and reports on a Plan's potential impact on the environment, economy, and society. The SA carries out an assessment of the draft policies at various stages throughout the preparation of the Local Plan, and does this by testing the potential impacts, and consideration of alternatives are tested against the Plan's objectives and policies. This ensures that the potential impacts from the plan on the aim of achieving sustainable development are considered, in terms of the impacts, and that adequate mitigation and monitoring mechanisms are implemented.

WBC Sustainability Appraisal

In October 2016, WBC produced a Sustainability Appraisal Scoping Report to support the review of the Local Plan Core Strategy. The scoping report was designed to help identify what the key

issues are that may affect the Local Plan and which of these should be the focus of the formal SA process. The scoping process generated a series of themes, objectives and other supporting criteria to produce a 'SA Framework' which is designed to provide a basis from which appraisals can be undertaken. Flood risk is included under the theme of 'Natural Resources' within the following SA objectives, to…

- *"Protect, manage and improve local environmental quality including land, air and controlled waters and reduce the risk of flooding.*
- *Ensure the sustainable and prudent use and management of natural resources including the promotion of natural resources including the promotion of sustainable drainage and water conservation."*

4.4.3 Warrington BC SFRA (September 2011)

The 2011 SFRA was commissioned by WBC to undertake a review and update of the 2008 SFRA. the 2011 SFRA was a combined Level 1 and Level 2 assessment, prepared in accordance with previous government planning policy including Planning Policy Statement 25 Development and Flood Risk (PPS25) and its Practice Guide, now replaced by the NPPF and its planning practice guides.

The assessment identified Critical Drainage Areas (CDAs) at several locations across the Borough. Within the 2011 SFRA, WBC recommended a reduction of 50% in surface water discharge rates from new development on brownfield sites and a reduction to greenfield rates on all other development sites. The 2011 SFRA also made the following recommendations which should still be applicable following this 2017 SFRA:

- Warrington BC should record historical flooding incidents from all sources of flooding. This should be carried out in line with the FWMA.
- As information held within this SFRA could become outdated, Warrington BC should continually update their flood risk datasets with the latest Environment Agency Flood Map and other flood risk information available from the Environment Agency.
- As it is critical that the outline for the functional floodplain is as accurate as possible, the true extent should always be assessed in more detail during any detailed site-specific FRA.
- Warrington BC should continue to work with the Environment Agency and United Utilities to develop the detailed understanding of risk and the interaction between multiple sources along Longford, Dallam, Padgate and Spittle Brooks.
- Through the Warrington SWMP (since completed in May 2012), United Utilities drainage model outputs (surcharged volumes) should be modelled to identify areas at risk from potential sewer flooding. This was carried out at a strategic level.
- In CDAs, a site-specific Flood Risk Assessment (FRA) or Drainage Impact Assessment (DIA) would be expected regardless of which Flood Zone applies for all development greater than 0.5 ha in size.
- Warrington BC should continue to liaise with the Environment Agency and the Manchester Ship Canal Company regarding the residuals risks associated with the Manchester Ship Canal and the Bridgewater Canal. This will include the development of any further evidence or updated position papers.

4.4.4 National and Local Flood Risk Management Strategies

As presented in Figure 4-1, the FWMA establishes how flood risk will be managed within the framework of National Strategies for England and Local Strategies for each LLFA area.

The National Strategy for England has been developed by the EA with the support and guidance of Defra. It sets out principles for how flood risk should be managed and provides strategic information about different types of flood risk and which organisations are responsible for their effective management. The Act requires risk management authorities (local authorities, sewerage companies and highways authorities) to work together and act consistently with the National Strategy in carrying out their flood and coastal erosion risk management functions

effectively, efficiently and in collaboration with communities, business and infrastructure operators to deliver more effective flood risk management.

LLFAs have responsibility for developing a Local Flood Risk Management Strategy (LFRMS) for their area covering local sources of flooding (see Table 4-1). The local strategy produced must be consistent with the National Strategy. The local strategy should set out the framework for local flood risk management functions and activities and should raise awareness of local organisations with responsibilities for flood risk management in the area. The strategy should also facilitate partnership arrangements to ensure co-ordination between local organisations and an assessment of flood risk and plans and actions for managing risk, as set out under section 9[20] of the FWMA.

Warrington Local Flood Risk Management Strategy (April 2014)

WBC's LFRMS was published in April 2014. The Strategy sets out how WBC will manage risk from all types of flooding such as surface water runoff, groundwater and ordinary watercourses for which the Council has a responsibility as LLFA, and other types of flooding where local agents can play a supporting role to lead agencies.

The LFRMS lists five key objectives, in accordance with the requirements of the FWMA:

- To clearly set out the different types of flooding, who is responsible and Governance arrangements.
- To assess the total risk of flooding from all sources in Warrington.
- To manage flood risk and where appropriate reduce the risk and consequences of flooding through a range of activities and by effective management.
- To develop actions and interventions to reduce flood risk where appropriate.
- To undertake flood risk management in a sustainable manner.

Policy QE4 Flood Risk of the adopted 2014 Core Strategy is reinforced within the LFRMS, however this has been updated through this SFRA (see Section 4.4.1).

4.4.5 Surface Water Management Plans

In June 2007, widespread extreme flooding was experienced in the UK. The Government review of the 2007 flooding, chaired by Sir Michael Pitt recommended that…

"…Local Surface Water Management Plans (SWMPs) … coordinated by local authorities, should provide the basis for managing all local flood risk."

The Government's guidance document[21] 2011 for SWMPs defines a SWMP as:

- *A framework through which key local partners with responsibility for surface water and drainage in their area, work together to understand the causes of surface water flooding and agree the most cost-effective way of managing surface water flood risk.*
- *A tool to facilitate sustainable surface water management decisions that are evidence based, risk based, future proofed and inclusive of stakeholder views and preferences.*
- *A plan for the management of urban water quality through the removal of surface water from combined systems and the promotion of SuDS.*

As a demonstration of its commitment to SWMPs as a structured way forward in managing local flood risk, Defra announced an initiative to provide funding for the highest flood risk authorities to produce SWMPs. No high risk locations were identified in the Warrington Borough as part of this process.

Warrington Surface Water Flooding Evidence Base (Surface Water Management Plan), 2012

The WBC SWMP was a Borough-wide study originally carried out in 2010, however, the Surface Water Flooding Evidence Base document was commissioned in 2011 to build upon the findings of the 2010 SWMP and the 2011 SFRA. This study was completed in May 2012 and was

20 http://www.legislation.gov.uk/ukpga/2010/29/section/9

21 Surface Water Management Plan Technical Guidance - https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance

designed to provide further evidence regarding the extent of surface water flooding across the Borough and to support the then emerging Local Development Framework Core Strategy.

To improve understanding of when and where surface water flooding occurs in the Borough and what impacts the flooding may cause, surface water flow modelling was carried out within the larger urban areas at the Borough. The results of this modelling helped to provide a clearer understanding of the risk of surface water flooding within the modelled areas for several rainfall events of differing durations. These model results were combined with the EA's first generation national Areas Susceptible to Surface Water Flooding (AStSWF) map to produce a Warrington SWMP Surface Water Flood Map. This map covered the whole of the Warrington BC area and showed areas at low to high susceptibility to surface water flooding.

The EA's third generation national surface water map the Risk of Flooding from Surface Water (RoFSW) map was published in December 2013 and should now be used as the Council's Locally Agreed Surface Water Flooding Information along with the new 2017 PFRA surface water maps, rather than the Warrington SWMP Surface Water Flood Map as stated within the PFRA (Section 4.2.1). See Section 5.3.2 for details on the RoFSW map.

4.4.6 Flood risk partnerships and partnership plans

WBC has been involved in the development of a number of partnerships designed to provide collaboration between public agencies, businesses and the community.

Managing local flood risk requires many organisations to work together in partnership. The main Risk Management Authorities (RMA) involved in flood risk partnerships in the Borough are discussed in Section 4.5. Partnership working allows organisations to pool expertise and resources to enable what they do to be as efficient and effective as possible. It encourages the sharing of knowledge, data and expertise and provides opportunities to manage cross boundary issues, ensure consistent approaches and develop and test innovative approaches to delivery. Government is also working to strengthen or establish partnerships in the areas most affected by the December 2015 floods to encourage a more integrated approach to managing risk across the whole North West River Basin District.

Regional Flood and Coastal Committees (RFCC) were first established in 2011 following the Flood and Water Management Act 2010, replacing the former Regional Flood Defence Committees. The North West RFCC is responsible for managing flood risk across some 14,921 square km of North West England. It covers some 6,569 km of designated main river, 298 km of estuary and 800 km of coastline. Committee Members are responsible for using their skills and experience to provide strategic advice, as well as contributing to the delivery of local flood risk plans and strategies by actively engaging with local communities, particularly to gain external views and financial contributions. The RFCC plays a key role in local funding and approving programmes of work that protect communities from flooding. The RFCC supports the EA and LLFA in working with these communities and other partners to identify and bring in funding. The EA annually submits the Medium Term Plan to the RFCC, which contains the funding bids for the EA and LLFA for the next six years.

Partnerships and plans that affect the area (see Section 7 on Emergency Planning for more information) include:

- Cheshire Mid Mersey Strategic Flood Risk Partnership Group, comprising WBC, St Helens Metropolitan Borough Council, Halton Borough Council, Cheshire West and Chester and Cheshire East unitary authorities, the EA and United Utilities (UU). This partnership group is represented on the RFCC by Local Council Elected Members and representatives from the North West England and North Wales Coastal Group (of Maritime District Councils).
- Mersey Estuary Catchment Partnership - following the catchment based approach to encourage a more integrated approach to managing risk across the whole catchment, led by the Healthy Waterways Trust[22].
- Cheshire Resilience Forum (see Section 7.1.1).

22 http://www.healthyriverstrust.org.uk/

- Emergency Response Manual.

4.4.7 Green Infrastructure

Green Infrastructure (GI) should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities and should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

Open space can provide many social, economic and environmental benefits close to where people live and work including:

- Places for outdoor relaxation and play;
- Space and habitat for wildlife with access to nature for people;
- Environmental education;
- Local food production - in allotments, gardens and through agriculture;
- Improved health and well-being – lowering stress levels and providing opportunities for exercise;
- Climate change adaptation - for example flood alleviation and cooling urban heat islands.

The NPPF explains that open space can perform many functions, including flood risk mitigation, and that Local Plans should account for increased flood risk, resulting from climate change, through the planning of Green Infrastructure. GI can have an important role to play in reducing the likelihood of flooding by providing space for flood storage, reducing runoff and increasing infiltration, whilst also providing other benefits as stated above.

Alongside GI should be the implementation of SuDS, specifically within potential development sites, where possible. The suitability of GI and SuDS can be informed by this SFRA through utilisation of open space for water in the areas of greatest flood risk, which would be key to helping deliver sustainable development. Examples include:

- Restoration of the natural character of floodplains;
- Keeping and preserving of areas of existing natural floodplain;
- Introduction of new areas and enhancing existing areas of greenspace whilst incorporating sustainable drainage within new development; and
- Reduction of downstream flood risk.

The Town and Country Planning Association together with The Wildlife Trusts produced a guidance document for Green Infrastructure[23]. The guidance states that local plans should identify funding sources for GI and provision should be made for GI to be adequately funded as part of a development's core infrastructure. For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. LPAs may include capital for the purchase, design, planning and maintenance of GI within the Community Infrastructure Levy (CIL) programme.

WBC could look to produce a Green Infrastructure Assessment in the future with regards to flood risk mitigation. This could link in with the WwNP measures proposed in Warrington, as discussed in Section 4.2.9.

4.5 Roles and Responsibilities

The responsibilities for the Risk Management Authorities (RMA) under the Flood and Water Management Act and the Flood Risk Regulations are summarised below.

4.5.1 EA as a RMA

- Has a strategic overview role for all forms of flooding;
- Has the power to request information from any partner in connection with its risk management functions;

23 Planning for a Healthy Environment - Good Practice Guidance for Green Infrastructure and Biodiversity, Published by the Town and Country Planning Association and The Wildlife Trusts, July 2012

- Must exercise its flood or coastal erosion risk management functions in a manner consistent with the National Strategy and Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA;
- Must help advise on sustainable development.

4.5.2 WBC LPA as a RMA

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to local strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA;
- Has a duty to be subject to scrutiny from the LLFA;
- Has a duty to cooperate and share information with other RMAs.

4.5.3 WBC LLFA as a RMA

- Must develop, maintain, apply and monitor a strategy for local flood risk management. This must be consulted on with all RMAs, the public and all other partners with an interest in local flood risk, and must comply with the National Strategy;
- Is required to coordinate and share information on local flood risk management between relevant authorities and partners;
- Is empowered to request information from others when it is needed in relation to its flood risk management functions;
- Must investigate significant flooding incidents in its area where it considers it necessary or appropriate;
- Has a duty to establish and maintain a record of structures within its area that it considers to have a significant impact on local flood risk;
- Is empowered to designate structures and features that affect flooding;
- Has powers to undertake works to manage flood risk from surface runoff, groundwater and ordinary watercourses;
- Must exercise its flood and coastal erosion risk management functions in a manner consistent with the National Strategy and the Local Strategy;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a Local Strategy) to other RMAs;
- Must aim to contribute to sustainable development;
- Should consider flooding issues that require collaboration with neighbouring LLFAs and other RMAs.

4.5.4 UU as a RMA

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the relevant LLFA;
- Has a duty to be subject to scrutiny from LLFAs;
- Has a duty to cooperate and share information with other RMAs;
- Is responsible for managing the risks of flooding from water and foul or combined sewer systems providing drainage from buildings and yards.

4.5.5 Highways Authority (WBC) and Highways England as RMAs

- Have a duty to act consistently with the National Strategy and Local Strategies;
- Have responsibility for ensuring effective drainage of local roads in so far as ensuring drains and gullies are maintained;
- Must be consulted on Local Strategies, if affected by the Strategy, by the LLFA;
- Have a duty to be subject to scrutiny from LLFAs.

4.5.6 The Local Community

- Must be consulted on Local Strategies by the LLFA;
- Has a key role in ensuring local strategies are capable of being successfully delivered within the community. They should actively participate in this process and be engaged by the LLFA.

4.5.7 Riparian Owners

A riparian owner is someone who owns land or property alongside a river or other watercourses. A watercourse is any natural or artificial channel through which water flows including flow through a culvert, ditch, drain, cut, dyke, sluice or private sewer.

Riparian owners have statutory responsibilities, including:

- Maintaining watercourses;
- Allowing the flow of water to pass without obstruction;
- Controlling invasive alien species

Further guidance for riverside property owners can be found in the EA's helpful booklet 'Owning a Watercourse'[24]

4.5.8 Developers

- Have a vital role in ensuring effective local flood risk management by avoiding development in areas at risk of flooding. Local Strategies should form a key element of local planning guidance.

24 https://www.gov.uk/guidance/owning-a-watercourse

5 Flood Risk within Warrington Borough

5.1 Flood risk datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within the Borough. The information contained is the best available at the time of publication and is intended to provide an overview of risk across the Borough. Where further detail is available, then the source of information is provided. Table 5-1 provides a summary of the key datasets used in this SFRA according to the source of flooding.

Table 5-1: Flood source and key datasets

Flood Source	Datasets / Studies
Fluvial / tidal	EA Flood Map for Planning (Rivers and Sea) (February 2018 version)
	EA Risk of Flooding from Rivers and Sea map
	Latest available EA Flood Risk Mapping Studies
	Catchment Flood Management Plan
Pluvial (surface water runoff)	EA Risk of Flooding from Surface Water (RoFSW)
	Critical Drainage Areas (from 2011 SFRA)
	Preliminary Flood Risk Assessment (2011/2017)
	Surface Water Management Plan (2012)
Sewer	UU historic flooding data
	UU Drainage Area Zones
Groundwater	EA Areas Susceptible to Groundwater Flooding (AStGWF)
Reservoir	EA Reservoir Flood Maps (available online)
All sources	Local Flood Risk Management Strategy (2014)
	Cheshire Fire & Rescue Service historic flood incident data
	North West RBD River Basin Management Plan (2015)
	North West RBD Flood Risk Management Plan (2016)
	LLFA historic flood incident register
	EA Historic Flood Map
	2011 SFRA
Flood risk management infrastructure	EA flood defence data
	LLFA FRM asset register (hosted online)

5.2 Fluvial and tidal flood risk

Fluvial flooding is associated with the exceedance of channel capacity during higher flows. The process of flooding from watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain; and infiltration and rate of runoff associated with urban and rural catchments.

Tidal flooding is caused by storm surge and wave action in times of high astronomical tides and strong winds. Flooding from estuaries can be complex and difficult to predict, influenced not just by the volume of water travelling down the catchment through the river system but also by the height and timing of tides and tidal surges. Tidal surges are caused by regional weather conditions such as pressure systems, wind direction and speed and local bathymetry (depth of the sea and estuary). The way the sea and river interact within the estuary not only causes a flood risk within the estuary itself, but also the effects can extend well beyond the immediate area due to the effects of tide locking.

The SFRA Maps in Appendix A present the EA's Flood Map for Planning which shows the fluvial and tidal coverage of flood zones 2 and 3 across the Borough.

5.2.1 Main River

The EA decides which watercourses are Main Rivers. It consults with other risk management authorities and the public before making these decisions.

The EA describes Main Rivers as usually being larger rivers and streams with other rivers known as ordinary watercourses. The EA carries out maintenance, improvement or construction work on Main Rivers to manage flood risk and will carry out flood defence work to Main Rivers only.

5.2.2 Ordinary watercourses

Ordinary watercourses are any watercourse not designated as Main River. These watercourses can vary in size considerably and can include rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.

LLFAs, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses.

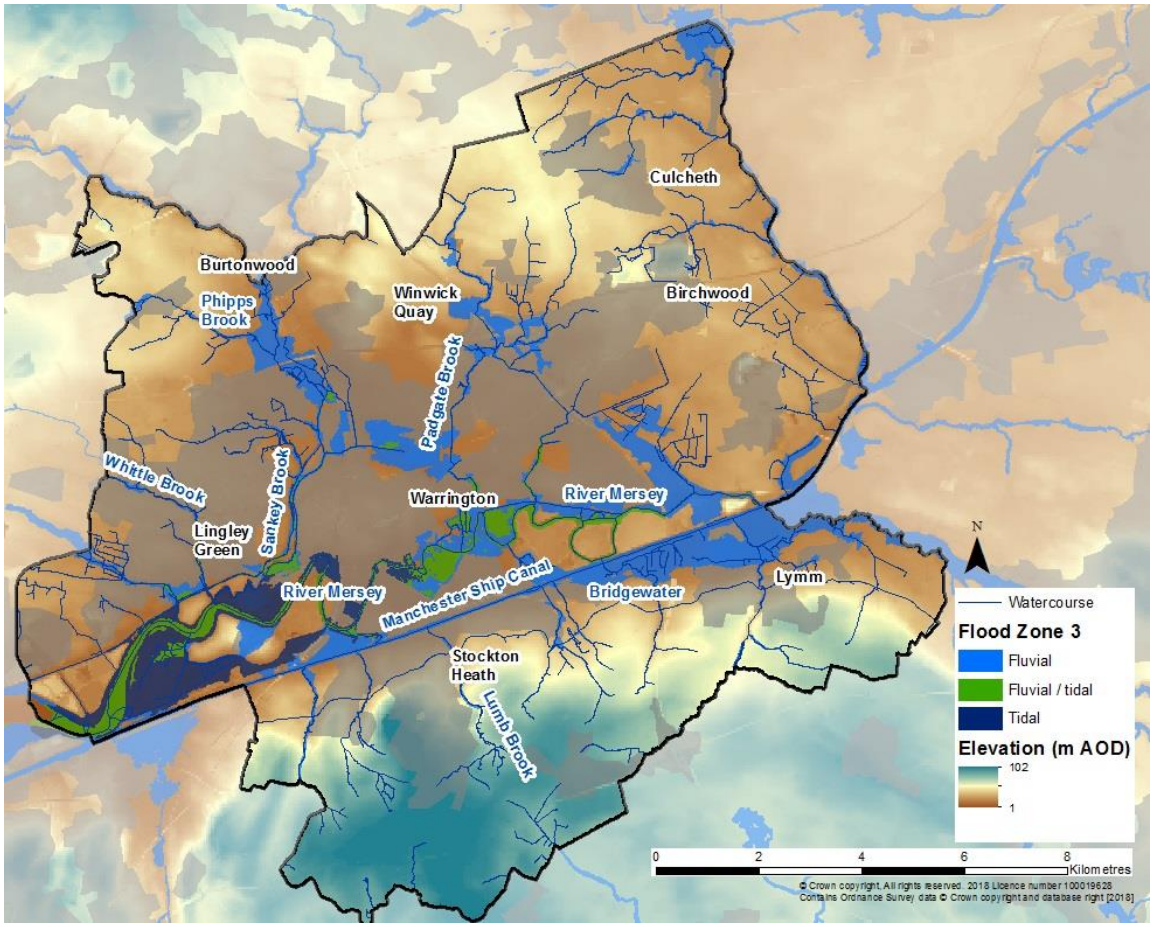
5.2.3 Fluvial and tidal risk in Warrington

Due to the hydrological nature of the area covered by the Borough, flooding can occur from both fluvial and tidal sources with both mechanisms occurring alone or in combination.

Warrington contains around 150 km of designated Main River. The Mersey is the dominant river in Warrington by size and has been artificially modified since the Manchester Ship Canal was built in 1894, altering its flow regime. The Mersey continues to drain a number of tributaries flowing from the north of Warrington, including Padgate Brook, Spittle Brook and Sankey Brook. The Manchester Ship Canal transfers the majority of flow from upstream of Warrington (collected mainly from the River Irwell and Upper Mersey), bypassing the Mersey through central Warrington. The Manchester Ship Canal also drains a number of watercourses from the south of Warrington, including the River Bollin, Sow Brook, Thelwall Brook, Lumb Brook and the River Glaze from the north.

Judging by Flood Zone 3 of the EA's Flood Map for Planning, presented on Figure 5-1, the majority of fluvial and tidal flood risk occurs within the Mersey floodplain to the north of the Manchester Ship Canal, affecting the town of Warrington. Fluvial risk is most apparent from the Ship Canal to the south near Lymm and through north Warrington from Sankey Brook, Padgate Brook and Phipps Brook.

Figure 5-1: Flood Zone 3 by flood source



The SFRA Maps in Appendix A present the EA's Flood Map for Planning which shows the fluvial and tidal coverage of flood zones 2 and 3 across the Borough.

5.2.4 EA Flood Map for Planning

The EA's Flood Map for Planning is the main dataset used by planners for predicting the location and extent of fluvial and tidal flooding. This is supported by the CFMPs and FRMPs along with a number of detailed hydraulic river modelling reports which provide further detail on flooding mechanisms.

The Flood Map for Planning provides flood extents for the 1 in 100 AEP fluvial event (Flood Zone 3), the 1 in 200 AEP tidal event (also Flood Zone 3) and the 1 in 1000 AEP fluvial and tidal flood events (Flood Zone 2). Flood zones were originally prepared by the EA using a methodology based on the national digital terrain model (NextMap), derived river flows from the Flood Estimation Handbook (FEH) and two dimensional flood routing. Since their initial release, the EA has regularly updated their flood zones with detailed hydraulic model outputs as part of their national flood risk mapping programme.

The EA Flood Map for Planning is precautionary in that it does not take account of flood defence infrastructure (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represents a worst-case scenario of flooding. The flood zones do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change. For this SFRA, Flood Zone 3 is subdivided into Flood Zone 3a and Flood Zone 3b (functional floodplain - see Section 5.2.5).

The EA has also produced a 'Risk of Flooding from Rivers and Sea Map'. This map shows the EA's assessment of the likelihood of flooding from rivers and the sea, at any location, and is

based on the presence and effect of all flood defences, predicted flood levels and ground levels. This dataset is not used in the assessment of flood risk for planning applications but is a useful source of extra information to show the presence and effect of flood risk management infrastructure. This dataset is further discussed in Section 5.2.6.

This SFRA uses the EA's Flood Map for Planning version issued in February 2018 to assess fluvial and tidal risk to potential development sites, as per the NPPF and the accompanying FRCC-PPG (see Section 6.3 for this assessment). The Flood Map for Planning is updated at quarterly intervals by the EA, as and when new modelling data becomes available. The reader should therefore refer to the online version of the Flood Map for Planning to check whether the flood zones may have been updated since February 2018:

http://apps.environment-agency.gov.uk/wiyby/37837.aspx

Also, to search for a particular property by postcode to check on the likelihood of flooding in the future, what local factors could cause or contribute to any potential flooding and where to find out more information about managing flood risk to the property, follow the link below:

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

5.2.5 Functional Floodplain (Flood Zone 3b)

The functional floodplain forms a very important planning tool in making space for flood waters when flooding occurs. Development should be directed away from these areas.

Table 1, Paragraph 065 of the FRCC-PPG defines Flood Zone 3b as:

"…land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency."

Paragraph 015 of the FRCC-PPG explains that

"*…the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point to help identify the functional floodplain.*

The area identified as functional floodplain should take into account the presence and effect of all flood risk management infrastructure including defences. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often."

Paragraph 015 of the FRCC-PPG explains that the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. However, land which would naturally flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1% annual probability) flood, should provide a starting point to help identify the functional floodplain.

The area identified as functional floodplain should take into account the presence and effect of all flood risk management infrastructure including defences. Areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain. If an area is intended to flood, e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often.

A technical note is provided in Appendix C which explains the methodology used in creating the functional floodplain outline. The outline is also displayed on the SFRA Maps in Appendix A. The functional floodplain outline was assessed and agreed upon by the LPA, the LLFA and the EA, based on their local knowledge. Any site-specific FRAs should further assess areas of

functional floodplain through detailed investigation and assessment of the actual risk and extent of any possible functional floodplain.

5.2.6 EA Risk of Flooding from Rivers and the Sea map

This map shows the likelihood of flooding from rivers and the sea based on the presence and effect of all flood defences, predicted flood levels and ground levels. The map splits the likelihood of flooding into four risk categories:

- High – greater than or equal to 1 in 30 (3.3%) chance in any given year
- Medium – less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year
- Low – less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year
- Very Low – less than 1 in 1,000 (0.1%) chance in any given year

The Risk of Flooding from Rivers and Sea map (RoFRS) is included on the SFRA Maps to act as a supplementary piece of information to assist the LPA in the decision making process for site allocation.

This dataset is not suitable for use with any planning application nor should it be used for the sequential testing of site allocations. The EA's Flood Map for Planning should be used for all planning purposes, as per the FRCC-PPG.

5.3 Surface Water Flooding

Surface water flooding, in the context of this SFRA, includes:

- **Surface water runoff (also known as pluvial flooding); and**
- **Sewer flooding**

Judging from the Risk of Flooding from Surface Water map (RoFSW), shown on the SFRA Maps in Appendix A, surface water flood risk is prevalent across the Borough though particularly within urban areas, where the probability and consequence of pluvial and sewer flooding are more prominent due to the complex hydraulic interactions that exist in the urban environment. Urban watercourse connectivity, sewer capacity, and the location and condition of highway gullies all have a major role to play in surface water flood risk.

It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site-specific and detailed investigations.

5.3.1 Pluvial Flooding

Pluvial flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. In these instances, the volume of water from rural land can exceed infiltration rates in a short amount of time, resulting in the flow of water over land. Within urban areas, this intensity can be too great for the urban drainage network resulting in excess water flowing along roads, through properties and ponding in natural depressions. Areas at risk of pluvial flooding can, therefore, lie outside of the fluvial flood zones.

Pluvial flooding within urban areas across the country will typically be associated with events greater than the 1 in 30 year design standard of new sewer systems. Some older sewer and highway drainage networks will have a lower capacity than what is required to mitigate for the 1 in 30 year event. There is also a residual risk associated with these networks due to possible network failures, blockages or collapses.

The RoFSW is the third generation national surface water flood map, produced by the EA, aimed at helping to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW, used in this SFRA to assess risk from surface water, has proved extremely useful in supplementing the EA Flood Map for Planning, by identifying areas in Flood Zone 1 which may have critical drainage problems.

5.3.2 Risk of Flooding from Surface Water

The Risk of Flooding from Surface Water (RoFSW), formally referred to as the updated Flood Map for Surface Water (uFMfSW) is the third generation national surface water flood map, produced by the EA, aimed at helping to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW, used in this SFRA to assess risk from surface water, has proved extremely useful in supplementing the EA Flood Map for Planning by identifying areas in Flood Zone 1, which may have critical drainage problems.

The RoFSW includes surface water flood outlines, depths, velocities and hazards for the following events:

- 1 in 30 AEP event (high risk)
- 1 in 100 AEP event (medium risk)
- 1 in 1000 AEP event (low risk)

The RoFSW is much more refined than the second generation map in that:

- More detailed hydrological modelling has been carried out using several design rainfall events rather than one for the second generation,
- A higher resolution Digital Terrain Model (DTM) has been used – 2 m, compared to 5 m for the second generation,
- Manual edits of DTM to improve flow routes at over 91,000 locations compared to 40,000 for the second generation,
- DTM edited to better represent road network as a possible flow pathway, this was not done for the second generation,
- Manning's n roughness (used to represent the resistance of a surface to flood flows in channels and floodplains) values varied using MasterMap Topography layer compared to blanket values for urban and rural land use applied in the second generation surface water flood map.

The National Modelling and Mapping Method Statement, May 2013 details the methodology applied in producing the map. The RoFSW is displayed on the SFRA Maps.

5.3.3 Sewer Flooding

Combined sewers spread extensively across urban areas serving residential homes, business and highways, conveying waste and surface water to treatment works. Combined Sewer Overflows (CSOs) provide an EA consented overflow release from the drainage system into local watercourses or large surface water systems during times of high flows. Some areas may also be served by separate waste and surface water sewers which convey waste water to treatment works and surface water into local watercourses.

Flooding from the sewer network mainly occurs when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. Pinch points and failures within the drainage network may also restrict flows. Water then begins to back up through the sewers and surcharge through manholes, potentially flooding highways and properties. It must be noted that sewer flooding in 'dry weather' resulting from blockage, collapse or pumping station mechanical failure (for example), is the sole concern of the drainage undertaker.

Some of the sewers across Warrington BC, including the areas of Penketh and Great Sankey, date back to the Victorian times. Since then, the population has grown as the community around Warrington expanded. More houses and businesses mean increased discharges and less permeable surfaces for rainwater infiltration. Climate change is also leading to longer, heavier periods of rain. These two factors result in the existing sewers and drains not being able to cope at certain times.

United Utilities (UU) is the water company responsible for the management of the majority of the Borough's drainage network.

5.3.4 Critical Drainage Areas / Areas with Critical Drainage Problems

The EA can designate Areas with Critical Drainage Problems (ACDPs). ACDPs may be designated where the EA is aware that development within a certain catchment / drainage area could have detrimental impacts on fluvial flood risk downstream, and / or where the EA has identified existing fluvial flood risk issues that could be exacerbated by upstream activities. In these instances, the EA would work with the LLFA and LPA to ensure that adequate surface water management measures are incorporated into new development to help mitigate fluvial flood risk.

Critical Drainage Areas (CDAs) can be designated by LPAs or LLFAs for their own purposes. The EA do not have to be consulted on sites that are within a CDA if such sites are in Flood Zone 1.

EA guidance on carrying out Flood Risk Assessments[25] states that a FRA should be carried out for sites in Flood Zone 1 that are…

"…in an area with critical drainage problems as notified by the Environment Agency."

This statement refers to sites within a ACDP, not a Critical Drainage Area (CDA).

The EA has not formally designated any ACDPs in Warrington, however, the 2011 SFRA did identify CDAs.

The Local Plan Core Strategy (2014) policy (QE4) on flood risk recommends that, for development proposals of 1 hectare or greater within Flood Zone 1 and within a critical drainage area, as defined by the 2011 SFRA, a site-specific Flood Risk Assessment is required to assess and justify the development proposal. The 2011 SFRA also stated the requirement for a reduction of 50% in surface water discharge rates from new development on brownfield sites and a reduction to greenfield rates on all other development sites.

As discussed in section 4.4.1, Policy QE4 will be re-evaluated against current national policy and guidance and amended accordingly to reflect this in the Draft Local Plan.

The use of appropriate mitigation measures should be investigated. Ideally, WBC should work closely with the EA, UU and individual developers to ensure surface water runoff is controlled as near to the source as possible which will include the application of SuDS. See Section 6.9 for more information on SuDS.

5.3.5 Locally Agreed Surface Water Information

EA guidance on using surface water flood risk information recommends that the LLFA, should:

"…review, discuss, agree and record, with the Environment Agency, Water Companies, Internal Drainage Boards and other interested parties, what surface water flood data best represents their local conditions. This will then be known as locally agreed surface water information".

For the purposes of the 2017 PFRA, WBC used the Risk of Flooding from Surface Water (RoFSW) combined with information from the NRD and the uFMfSW Property Points dataset to define surface water flood information in the region.

As mentioned previously in Section 4.4.5, the Risk of Flooding from Surface Water (RoFSW) map should now be used as the Council's Locally Agreed Surface Water Flooding Information along with the new 2017 PFRA surface water maps, superseding the, Warrington SWMP Surface Water Flood Map, as it provides a more robust representation of surface water flood risk in the area.

5.4 Groundwater flooding

Groundwater flooding is caused by the emergence of water from beneath the ground, either at point or diffuse locations. The occurrence of groundwater flooding is usually local and unlike

25 https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas

flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall, high in-bank river levels, artificial structures, groundwater rebound and mine water rebound. Properties with basements or cellars or properties that are located within areas deemed to be susceptible to groundwater flooding are at particular risk. Development within areas that are susceptible to groundwater flooding will generally not be suited to infiltration type SuDS; however, this is dependent on detailed site investigation and risk assessment at the FRA stage.

There are a number of national and local data sources and studies which contain some details about possible groundwater flooding in Warrington. The Mersey Estuary CFMP identified a number of locations in Warrington, including significant areas of the River Glaze and Sankey Brook that are at risk of groundwater flooding using Defra's Groundwater Study[26] and Groundwater Emergence Maps (GEMs). These maps do not necessarily imply flooding of properties, only that groundwater would emerge at the surface first within the indicated areas.

The EA prepared the Lower Mersey and North Merseyside Water Resources Study[27] in 2009, which has some details about possible groundwater flooding in Warrington. As well as a number of locations outside of Warrington, the study focuses on areas surrounding the River Mersey, Glaze Brook and Sankey Brook where most groundwater would naturally discharge. Groundwater flood risk should however be considered on a site by site basis in development planning.

The EA has produced a guidance document which may be used by developers and homeowners to help reduce the impacts caused to property by groundwater flooding:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297421/flho0911bugi-e-e.pdf

5.4.1 Areas Susceptible to Groundwater Flooding (AStGWF)

The main nationally available groundwater dataset is the EA's national dataset, Areas Susceptible to Groundwater Flooding (AStGWF). This is a low resolution map which uses four susceptibility categories to show the proportion of a network of 1 km grid squares where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and is not suitable for planning considerations at a site-specific level. It should only be used as a trigger for further investigation as to the possibility of groundwater flooding.

5.5 Canal and Reservoir Flood Risk

5.5.1 Canals

As a controlled water body, broad canals do not pose a direct risk of flooding to adjacent people and property, rather a residual risk associated with lower probability events such as overtopping and/or the breaching of embankments.

There are three types of canal in Warrington:

1. The Bridgewater is a broad canal that was initially built to serve the growing industrial centres of the North West during the Industrial Revolution. It is a shallow canal, embanked in places and mainly used today for tourism, carrying narrow boats and other small boats.
2. The Manchester Ship Canal was built by canalising sections of the lower River Irwell and River Mersey in the late nineteenth century to allow large ships to dock in Manchester City Centre. The Manchester Ship Canal Company manages the Manchester Ship

26 Defra (2004) Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study

27 ESI (2009) Lower Mersey and North Merseyside Water Resources Study

Canal with water levels in the canal carefully monitored and controlled by a system of sluices.

3. The Woolston New Cut Canal opened on the 14 February 1821 and its purpose was to remove loops in the Mersey and in so doing it replaced Woolston Old Cut. Paddington Lock was placed at its lower end and Woolston Lock at its upper end.

The flood risk mechanisms associated with these two canals are very different. For instance, the Bridgewater Canal shares the same principles as a controlled water body, whilst the Manchester Ship Canal shares the same properties as a canalised watercourse and hence its flooding mechanisms have more in common with a watercourse than a typical canal.

The Bridgewater Canal is owned and operated by The Bridgewater Canal Company Limited, part of The Peel Group, in conjunction with the Bridgewater Canal Trust. The Bridgewater Canal Company is the statutory body responsible for navigation and maintenance of the Bridgewater Canal. It is managed as part of Peel Land and Property Group;

The Manchester Ship Canal Company is owned and operated by Peel Ports Group, which has two shareholders - The Peel Group and Deutsche Asset Management. The Manchester Ship Canal Company is the statutory body responsible for navigation and maintenance of the Manchester Ship Canal governed by Acts of Parliament, and;

The Woolston New Cut Canal is owned by the Manchester Ship Canal Company.

The risk of flooding along each canal is dependent on a number of factors. As they are unnatural systems and heavily controlled, it is unlikely they will respond in the same way as a natural watercourse during a storm event. Flooding is more likely to be associated with residual risks, similar to those associated with river defences, such as overtopping of canal banks, breaching of embanked reaches or asset (gate) failure. Each canal also has significant interaction with other sources, such as the main rivers that feed them and the minor watercourses or drains that cross underneath.

The Environment Agency has updated and is continuing to update some of their modelling to show the impact of updated climate change allowances. Consequently, previous guidance on residual risk for the Manchester Ship Canal regarding sluice gate failure no longer applies and developers should follow the NPPF and the climate change guidance as they do elsewhere.

The risks associated with these events are also dependent on their potential failure location with the consequence of flooding higher where floodwater could cause the greatest harm due to the presence of local highways and adjacent property. The focus should be on areas adjacent to raised embankments. The pound length of the canal also increases the consequence of failure, as flows will only cease due to the natural exhaustion of supply.

Stop plank[28] (log) arrangements, stop gates and the continued inspection and maintenance of such assets by the Canal & River Trust help to manage the overall risk of a flood event. There are no records of historic canal flooding in the Borough.

Table 5-2: Canal Flooding Mechanisms

Potential Mechanism	Significant Factors
Leakage causing erosion and rupture of canal lining leading to breach	Embankments Sidelong ground Culverts Aqueduct approaches
Collapse of structures carrying the canal above natural ground level	Aqueducts Large diameter culverts Structural deterioration or accidental damage
Overtopping of canal banks	Low freeboard Waste weirs
Blockage or collapse of conduits	Culverts

28 Wooden boards for dropping into grooves at a narrows; to permit drainage for maintenance work on a canal section or to isolate a leaking section

5.5.2 Reservoirs

A reservoir can usually be described as an artificial lake where water is stored for use. Some reservoirs supply water for household and industrial use, others serve other purposes, for example, as fishing lakes or leisure facilities. Like canals, the risk of flooding associated with reservoirs is residual and is associated with failure of reservoir outfalls or breaching. This risk is reduced through regular maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

The EA is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be regularly inspected and supervised by reservoir panel engineers. LAs are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. WBC should work with other members of the Local Resilience Forum (LRF) to develop these plans. See Section 7.1.1 for information on the LRF of which WBC is a part. UU is responsible for the maintenance and water supply of the large reservoirs in the Borough.

According to the 2011 SFRA, there are ten large reservoirs located in Warrington and several located outside of the authority boundary which pose a risk to people and property within the authority area.

Whilst large reservoirs provide the obvious source of residual risk (breaching/overtopping) from artificial sources, there could potentially be a number of smaller water bodies within the area. Smaller water bodies have potential ownership issues resulting in a lack of regular inspections and poor embankment conditions which may increase the residual risk of breaching or overtopping.

Paragraph 014 of the FRCC-PPG states that, in relation to development planning and reservoir dam failure, "*the local planning authority will need to evaluate the potential damage to buildings or loss of life in the event of dam failure, compared to other risks, when considering development downstream of a reservoir. Local planning authorities will also need to evaluate in Strategic Flood Risk Assessments (and when applying the Sequential Test) how an impounding reservoir will modify existing flood risk in the event of a flood in the catchment it is located within, and/or whether emergency draw-down of the reservoir will add to the extent of flooding.*"

5.5.3 Reservoir Flood Maps

The EA has produced reservoir flood maps (RFM) for all large reservoirs that they regulated under the Reservoirs Act 1975 (reservoirs that hold over 25,000 cubic meters of water). The FWMA updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m³ to 10,000m³. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to. The maps were originally produced for Local Resilience Forums to use for emergency planning, however The Pitt Review, 2007, recommended that the maps be made available to the public online as part of wider flood risk information.

The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds, including information about the depth and speed of the flood waters. In September 2016, the EA produced a RFM guide 'Explanatory Note on Reservoir Flood Maps for Local Resilience Forums – Version 5'[29] which provides information on how the maps were produced and what they contain.

The RFM outlines are not included on the SFRA Maps due to data sensitivity, however they can be viewed online at:

https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater#Reservoirs_3-ROFR

The RFM shows that a there are a number of large reservoirs / impounded waterbodies within and surrounding Warrington that may affect populated areas, in the unlikely event of a breach. Such as:

- Carr Mill Dam

29 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/558441/LIT_6882.pdf

- Appleton Reservoir

5.6 Historical Flooding

According to Section 19 of the FWMA, local authorities have a duty to investigate and record any significant flood event in its area. This duty includes identifying which risk management authorities have relevant flood risk management functions and what they have done or intend to do with respect to the flood incident, notifying other risk management authorities where necessary and publishing the results of any investigation carried out.

WBC has provided its historic flood incident register as a excel spreadsheet as part of this SFRA. A number of these incidents include flooding of multiple properties, gardens, green areas, highways and footpaths dating from 2012-2018. Table 5-3 lists the locations of historical flood incidents. Table 5-3:

Table 5-3: Historical flood incidents between 2012 - 2018

Location	Number of flood risk incidents
Appleton	12
Bewsey & Whitecross	6
Birchwood	1
Burtonwood & Winwick	12
Chapelford & Old Hall	1
Culcheth, Glazebury & Croft	19
Fairfield & Howley	1
Grappenhall	3
Great Sankey North & Whittle Hall	1
Great Sankey South	2
Latchford East	1
Lymm North & Thelwall	6
Lymm South	6
Orford	10
Penketh & Cuerdley	5
Poulton North	2
Poulton South	3
Rixton & Woolston	3
Stockton Heath	5
Westbrook	1

5.6.1 Historic fluvial / tidal flooding

The 2011 SFRA discussed the fact that there have been relatively few major historical flood events in the Borough, mainly because Warrington is a relatively new town and only expanded significantly in 1980s. Any major historical events are concentrated around the town centre and the River Mersey. Fluvial flooding is more associated within Mersey tributaries, such as Dallam, Sankey, and Whittle Brooks, rather than the Mersey itself. This is because Warrington has benefited from the Manchester Ship Canal, which transfers significant flow past Warrington and reduces the risk of fluvial flooding along the Mersey. Since its channel construction in 1894, the Mersey through Warrington is not known to have not caused any fluvial flooding in Warrington.

Despite the construction of the Manchester Ship Canal, the Mersey is at risk of tidal flooding, with the most significant recent flood events occurring in February 1990 and October / November 2000 and December 2015. There are locations where tidal flood risk combines with fluvial, such as on the lower reaches of the tributaries, and on the stretch of the Mersey between Arpley Landfill Site and Woolston Weir.

In February 1990, the River Mersey over-topped its banks flooding Knutsford Road. Properties in Westy, Latchford, Howley, Arpley Bridge and Lower Walton were flooded. This led to the Warrington Flood Risk Management Scheme, carried out by the EA in partnership with WBC and the first phase (the Knutsford Road section) was completed in 2014, being commissioned at a cost of £23m. the second phase has now been completed in January 2018 costing a total of £34m. The scheme involved the construction of new flood defence walls and embankments along the Mersey, providing protection to around 2,000 homes and businesses.

Table 5-4, taken from the 2011 SFRA report, provides a list of significant fluvial and tidal flood events in Warrington, compiled from various sources of information including the CFMP and the EA's Warrington Flood Risk Management Strategy[30]. This is not a complete list of events but only those easily identifiable from the information.

Table 5-4: Significant fluvial and tidal flooding incidents

Date	Event	Evidence Source
1767	Fluvial and tidal flooding in central Warrington	Warrington FRM Strategy/ British Hydrology Society
1967	Fluvial event along Dallam Brook	Mersey Estuary CFMP
April 1967	Fluvial flooding along Whittle Brook where 50 properties were flooded	Mersey Estuary CFMP
July 1968	Flooding of the Dallam and Bewsey areas from Sankey Brook	Environment Agency
April 1971	More than 50 properties were flooded from Whittle Brook	Warrington FRM Strategy
1978	Sankey Brook, around the Sankey Bridges area	Mersey Estuary CFMP
February 1990	Tidal flooding along the River Mersey where 17 properties, 8000 m³ of commercial floor space and a public school were flooded along Eastford Road and areas in Latchford south of Knutsford Road	Mersey Estuary CFMP
February 1990	Areas in Bewsey were flooded from Sankey Brook	Environment Agency's Historical Flood Map
February 1990	Large area to the south side of the Mersey, in between Arpley Landfill site and Moss Side Farm, was subject to tidal flooding	Environment Agency's Historical Flood Map
February 1990	Areas to the north of Westy were affected by flooding from the Mersey	Environment Agency's Historical Flood Map
October 1999	Flooding along Carr Brook due to water level exceeding channel capacity	Environment Agency Middle & Lower Mersey ABD
June 2000	Flooding from Whittle Brook due to a sewage pipe overflow	Environment Agency Middle & Lower Mersey ABD
June 2000	Castle Street and Clifton Street. The Environment Agency estimates that this was a 1 in 10-year event	Environment Agency Middle & Lower Mersey Flood Risk Mapping
October 2000	Areas in Bewsey were flooded from Sankey Brook	Environment Agency's Historical Flood Map
October/November 2000	Fluvial flooding along Dallam Brook where 20 houses in the Dallam area were flooded	Mersey Estuary CFMP
February 2002	Minor tidal flooding along Bridge street	Mersey Estuary CFMP
September 2008	Minor flooding to the Solway Close area adjacent to Spittle Brook. The Environment Agency estimates	Halcrow Spittle and Padgate Brook

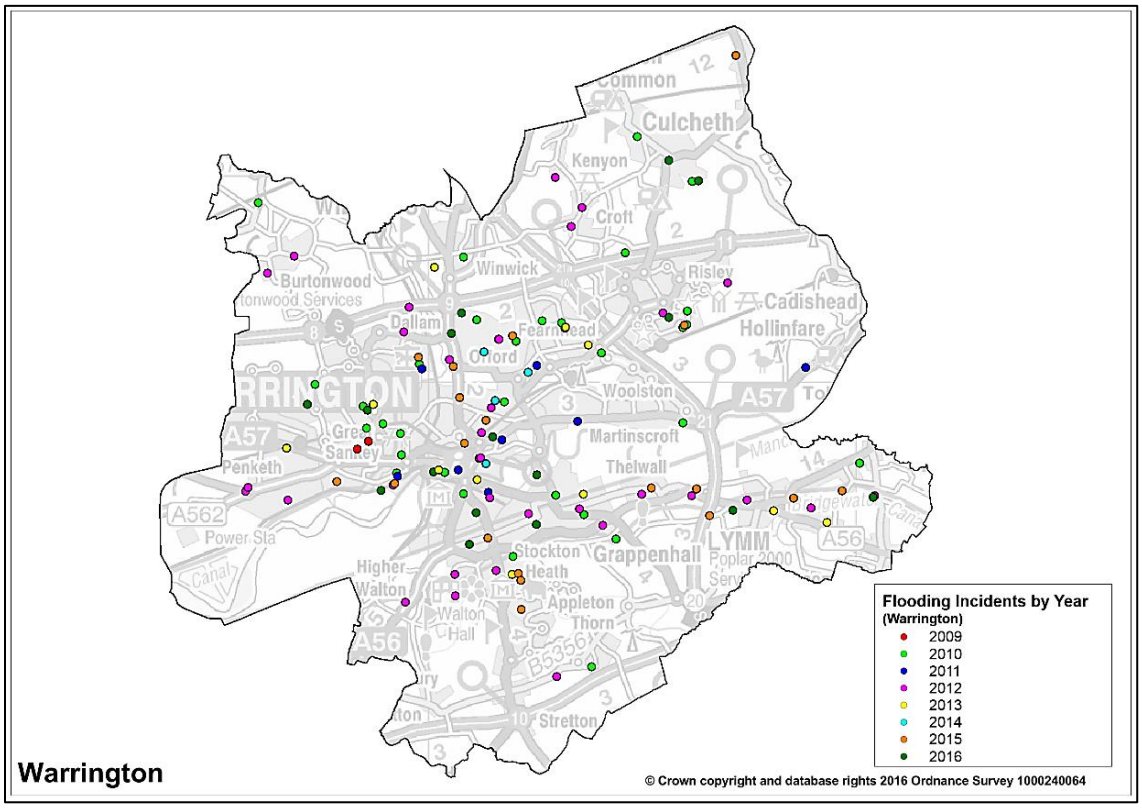
30 Environment Agency (2010) Warrington Flood Risk Management Strategy

	that this was a 1 in 8-year event	Hydrology Report

5.6.2 Cheshire Fire and Rescue Service Flood Incident Data

Cheshire Fire and Rescue Service provided an Excel spreadsheet containing flooding incident locations that the Service has attended over an eight-year period from 2009 to 2016. The source of flooding is however unknown. Figure 5-2 shows a small scale map included within the spreadsheet showing the locations of the recorded attended flood incidents. It can be seen from the map that the majority of incidents attended were around the main town of Warrington, which would be expected given that this is the largest built up area in the Borough. The total number of flood incidents attended by the Service across the Borough was 141 with 16 in 2016 and a high of 45 in 2012.

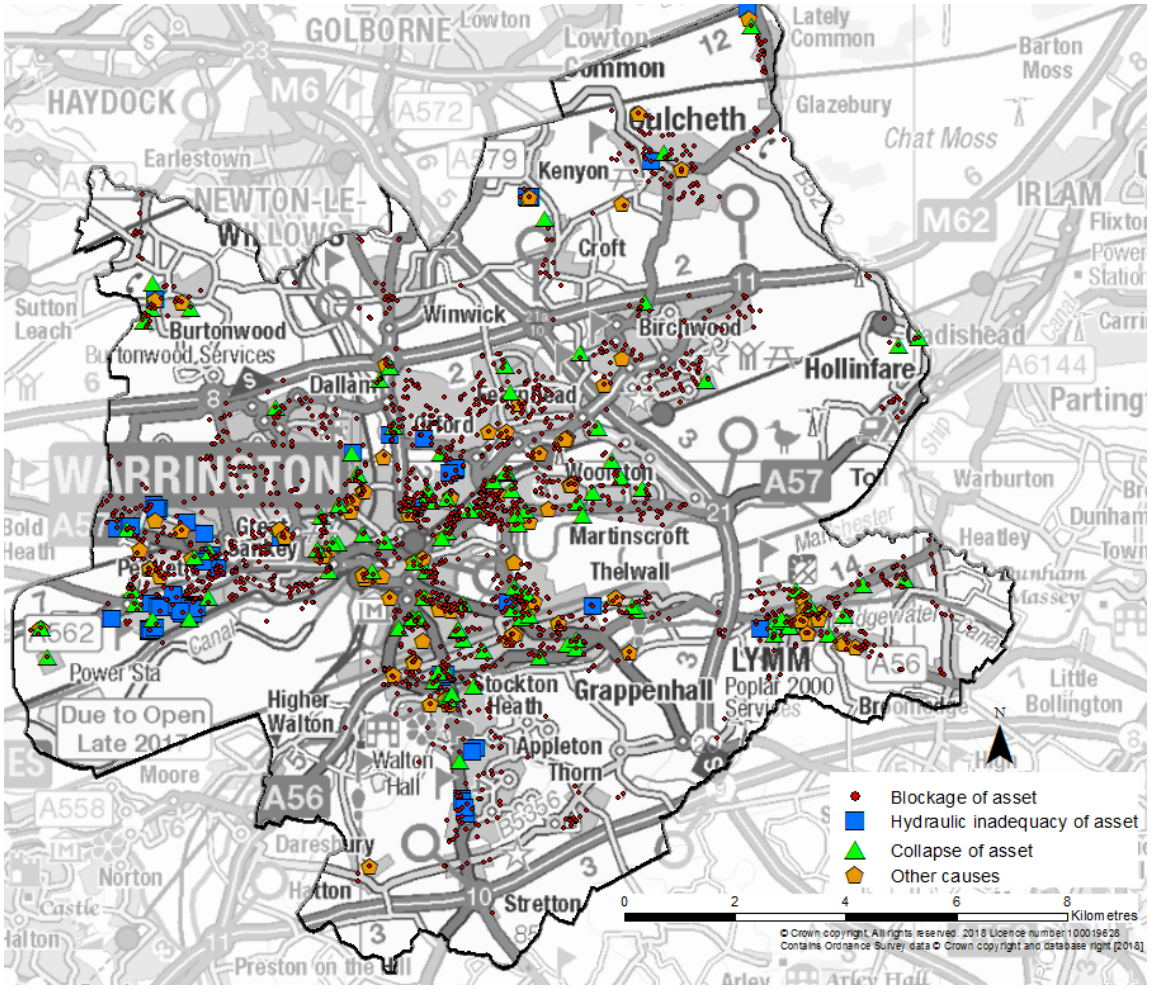
Figure 5-2: Cheshire Fire and Rescue Service flood incidents attended 2009-2016



5.6.3 Historic Surface Water Flooding

UU provided various spatial datasets showing where surface water / sewer flooding incidents have occurred to property that are attributable to water company controlled sewer networks since April 2008 up to April 2014. The datasets are split depending on the cause of the flood incident such as flood risk management asset blockage, asset collapse, hydraulic inadequacy or from other causes. Due to the sensitivity of this information being at the property level, this data has not been included on the detailed SFRA Maps in Appendix A but rather shown on small scale OS mapping in Figure 5-3. Across the Borough there were 2,605 incidents relating to asset blockage, 154 related to hydraulic inadequacy of assets, 124 related to flooding caused by other causes and 121 related to the collapse of an asset. Again, the majority of incidents are clustered around the Warrington area.

Figure 5-3: UU recorded flood incidents April 2008 - April 2014



5.6.4 Historic groundwater flooding

The 2017 PFRA and 2014 LFRMS state that there are known locations with high groundwater within Warrington however, there are no specific records or reported incidents of groundwater flooding.

Areas Susceptible to Groundwater Flooding map

The EA's national dataset, Areas Susceptible to Groundwater Flooding (AStGwF), provides the main dataset used to assess the future risk of groundwater flooding. The AStGwF map uses four susceptibility categories to show the proportion of each 1 km grid square where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring.

The AStGwF map indicates that extensive areas in the eastern part of the Borough are at risk from rising groundwater levels. However, it is not backed up by historical evidence and high groundwater levels are known to exist in other areas not highlighted by the dataset, according to information within the LFRMS. The LFRMS continues to state that it is possible that groundwater levels may be rising after the cessation of mining activity in Warrington and the surrounding areas therefore there may be a risk that flooding may occur in the future in areas not previously thought to be at risk.

The Environment Agency's CFMPs identified a number of locations in Warrington, including significant areas of the River Glaze and Sankey Brook that are at risk of groundwater flooding using Defra's Groundwater Study and Groundwater Emergence Maps (GEMs). These maps do

not necessarily imply flooding of properties, only that groundwater would emerge at the surface first within the indicated areas. The AStGwF is shown on the SFRA Maps.

5.6.5 EA Historic Flood Map

The Historic Flood Map (HFM) contains outlines of past fluvial, tidal and groundwater flooding though does not contain any information regarding flood source, return period or date of flooding. Records began in 1946 when predecessor bodies to the EA started collecting detailed information about flooding incidents. As opposed to the EA dataset 'Recorded Flood Outlines', the HFM only contains those flood outlines that are 'considered and accepted' if the following criteria are met:

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

There are several areas of the Borough covered by the HFM, as shown on the SFRA Maps in Appendix A. The most significant area is that close to Warrington Town Centre around Howley and along Knutsford Road. This is the area recorded to have flooded in the February 1990 tidal event before the construction of flood defences in 2014. The large area to the south of the Mersey, at the Penketh Reach to the east can also be attributed to the 1990 event. Other areas within the HFM include a small area at the Ferry Tavern Pub, which has flooded frequently in the past, and several areas around Dallam and Bewsey which were subject to fluvial flooding from Sankey and Dallam Brooks in October 2000.

5.7 Flood Risk Management

The aim of this section of the SFRA is to identify existing Flood Risk Management (FRM) assets and previous / proposed FRM schemes in the Borough. The location, condition and design standard of existing assets will have a significant impact on actual flood risk mechanisms. Whilst future schemes in high flood risk areas carry the possibility of reducing the probability of flood events and reducing the overall level of risk. Both existing assets and future schemes will have a further impact on the type, form and location of new development or regeneration.

5.7.1 EA Assets

The EA's spatial defences dataset contains such information on all flood defence assets, whether owned by the EA or by private owners, within the Borough as:

- Asset type (e.g. wall, embankment, high ground, flood gate)
- Asset description (e.g. earth embankment, concrete wall)
- Design standard of protection (as a return period in years e.g. 100 years)
- Asset condition (graded from 1 = very good to 5 = very poor). See Table 5-5 for condition assessment grades using the EA's Condition Assessment Manual[31] (CAM).

31 Environment Agency. (2012). Visual Inspection Condition Grades. In: EA Condition Assessment Manual. Bristol: Environment Agency. p9.

Table 5-5: EA flood defence condition assessment grades

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no impact on performance
2	Good	Minor defects that will not reduce the overall performance of the asset
3	Fair	Defects that could reduce the performance of the asset
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed.
5	Very Poor	Severe defects resulting in complete performance failure.

There are 130 sections of walls and embankments across the Borough with standards of protection ranging from 5 to 1000 years. The 1000 year walls are located around a Scottish Power site protecting electricity infrastructure from tidal and fluvial flood risk from the Mersey in Howley. These walls are assessed as being in very good condition. This will be due to the high consequences associated with flooding of such essential infrastructure. The majority of the major defence assets are located along the Mersey and its tributaries, as can be seen on the SFRA Maps in Appendix A.

As well as the ownership and maintenance of a network of formal defence structures, the EA carries out a number of other flood risk management activities that help to reduce the probability of flooding, whilst also addressing the consequences of flooding. These include:

- Maintaining and improving existing flood defences, structures and Main River.
- Enforcement and maintenance where riparian owners unknowingly carry out work that may be detrimental to flood risk.
- Identifying and promoting new flood alleviation schemes (FAS) where appropriate.
- Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is permitted relative to the scale of flood risk.
- Operation of Floodline Warnings Direct and warning services for areas within designated Flood Warning Areas (FWA) or Flood Alert Areas (FAA). EA FWAs are shown on the SFRA Maps in Appendix A.
- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are therefore sufficiently prepared in the event of flooding.
- Promoting resilience and resistance measures for existing properties that are currently at flood risk, or may be in the future as a result of climate change.

5.7.2 WBC Assets

The LLFA own and maintain a number of flood risk management assets throughout the Borough including culverts, bridge structures, gullies, weirs and trash screens. **All these assets can have flood risk management functions as well as an effect on flood risk if they become blocked or fail.** In the majority of cases responsibility lies with the riparian / land owner.

As part of its FWMA duties, the LLFA has a duty to maintain a register of structures or features, which are considered, by the LLFA, to have a significant effect on flood risk, including details on ownership and condition as a minimum.

The Asset Register should include those features relevant to flood risk management function including feature type, description of principal materials, location, measurements (height, length, width, diameter) and condition grade (as per Table 5-5). The Act places no duty on the LLFA to maintain any third party features, only those for which the authority has responsibility as land / asset owner.

WBC has such a register hosted online for 94 culverts. Available information includes structure type, watercourse, condition and ownership. Each asset can be viewed on a map and some records contain photographs and details of previous inspections carried out. The Register is 'live' and is continually updated with new information as the Council responds to flood incidents, conducts further investigations and carries out maintenance. WBC's Asset Register can be accessed online via:

http://www.jbamap.co.uk/map/la/warringtonassetregister/

5.7.3 Water Company Assets

The sewerage infrastructure across the Borough is likely to be based on Victorian sewers from which there is a risk of localised flooding associated with the existing drainage capacity and sewer system. The drainage system may be under capacity and / or subject to blockages resulting in localised flooding of roads and property. UU is the water company responsible for the management of the urban drainage systemin the Borough. This includes surface water and foul sewerage. There may however be some private surface water sewers in the area as only those connected to the public sewer network transferred to the water companies under the Private Sewer Transfer in 2011. Surface water sewers discharging to watercourses however did not transfer to the water companies and are therefore not under the ownership of UU, unless otherwise adopted under a Section 104 adoption agreement.

Water company assets typically include Wastewater Treatment Works, Combined Sewer Overflows, pumping stations, detention tanks, sewer networks and manholes.

5.7.4 Future Flood Risk Management Work Programmes

Warrington Borough Council's approach to developing maintenance and intervention measures in respect of reducing flood risk is as follows:

- Work closely with the Environment Agency to identify, fund and implement schemes in regard to fluvial flooding from main river;
- Consider managing residual risk where it is not economically feasible to undertake works through property resilience and flood warning site telemetry;
- Identify as far as possible responsible riparian owners;
- Consider long term sustainable solutions encompassing leisure and habitat creation;
- Develop risk based maintenance programmes to maximise reducing financial resources;
- Collaboration with United Utilities and other interested stakeholders to identify and implement partnership working opportunities.

The EA currently has two main Flood Risk Management Schemes:

Penketh and Whittle FRMS:

The risk of flooding from Whittle Brook has been mitigated by flood defence improvement works undertaken in 1975, 1984 and 1995, which consisted primarily of raised defences. However the level of flood defence currently provided falls below the indicative standard for such an area, and any existing defences are approaching the end of their design life.

Latest modelling indicates that flooding in the area begins at a 1:20 event (5% chance of occurring in any given year), and that during a 1:100 year event (1% chance of occurring in any given year), 208 residential and 3 non-residential properties would be affected.

Potential schemes considered include linear defences, new culvert and a combination on both water courses.

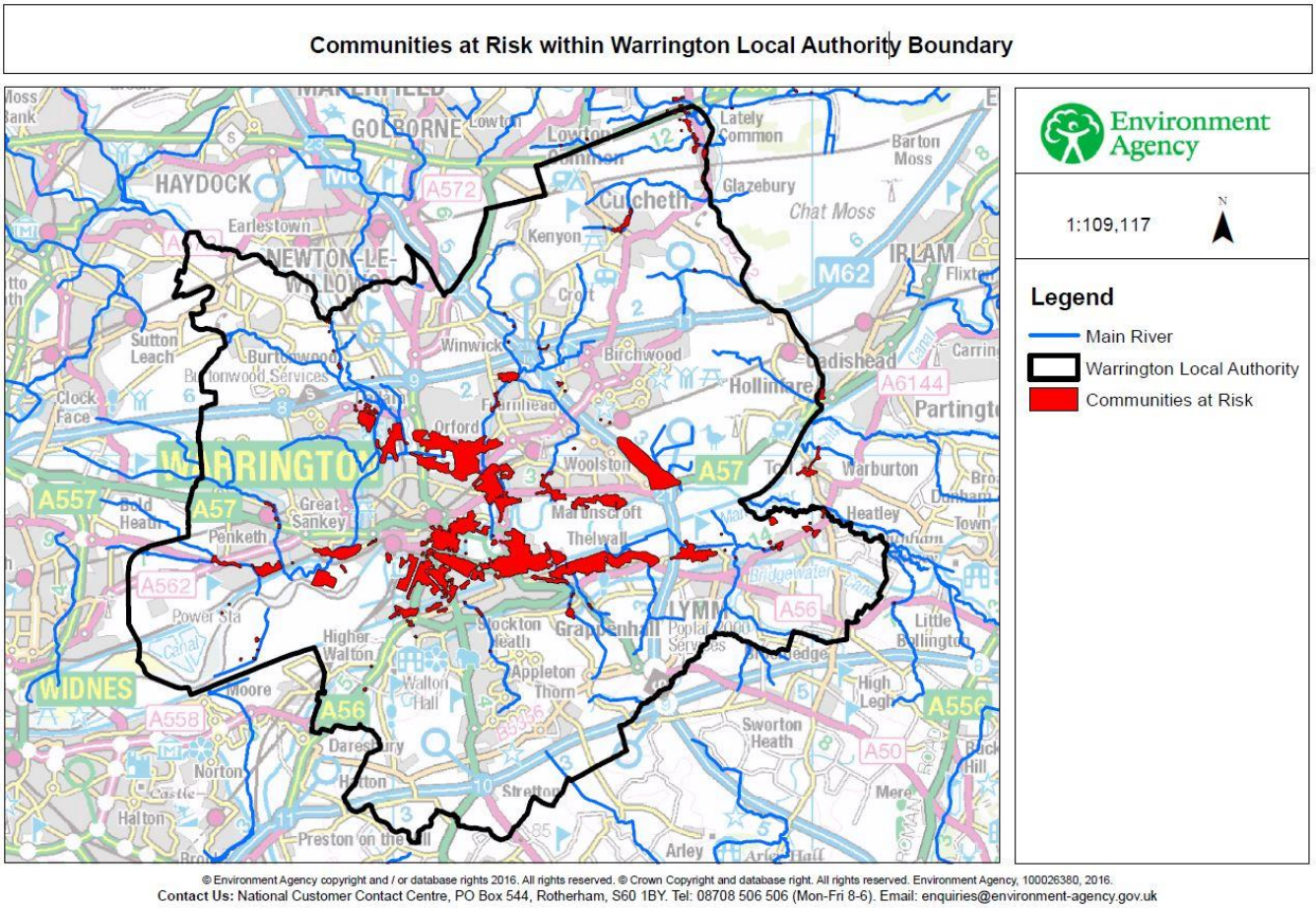
Sankey Brook FRMS:

The Sankey Brook Flood Risk Management Scheme (FRMS) is being developed to address fluvial and pluvial flood risk from the hydraulically linked, Sankey, Dallam and Longford Brooks. The concept design includes providing linear defences and the upgrade of Longford Tidal Barrage/Pumping Station to provide a 1 in 100 year standard of protection from both direct river flooding and surface water flooding. There are 413 residential and 92 commercial properties at risk from a 1 in 100 year event.

Future Projects:

PSO Data and Project Pipeline Team within the Environment Agency are looking to develop a robust 6 year FCRM programme from 2021- 2027. This will look at Communities at Risk and explore and maximise Project Delivery and integration to deliver multiple benefits. The key areas include Thelwall, Statham, Heatley, Glazebury, Culcheth and can be seen in Figure 5-4.

Figure 5-4: Communities at risk in Warrington 32



32 Map is based only on the 'undefended' flood map showing main river fluvial and tidal flood risk only. Surface water and sewer flooding risk also exists across Warrington but this is not identified on the map. Therefore, there will be communities at risk that are not shown.

6 Development and Flood Risk

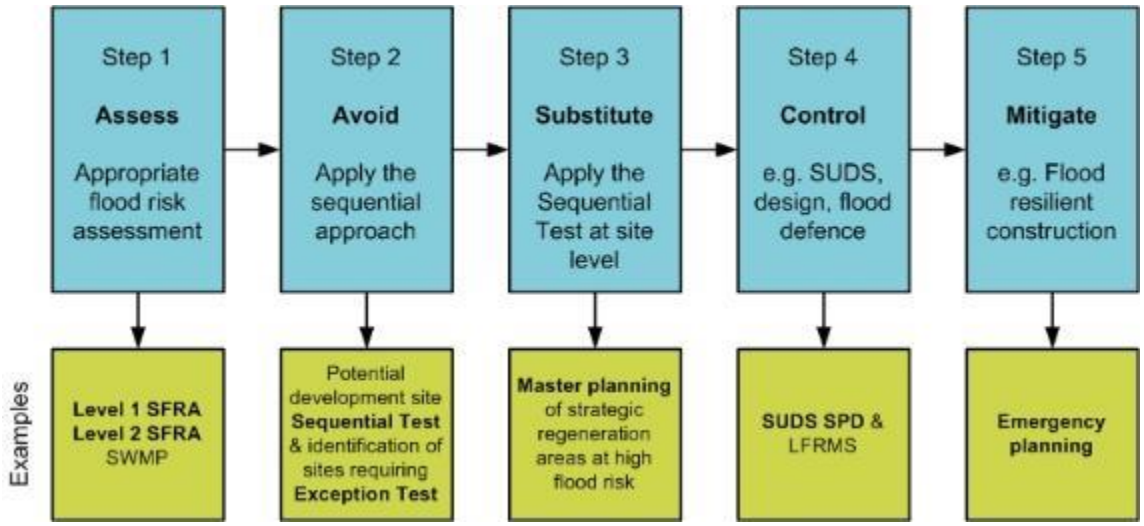
6.1 The Sequential Approach

The FRCC-PPG provides the basis for the Sequential Approach. It is this approach, integrated into all stages of the development planning process, which provides the opportunities to reduce flood risk to people, property, infrastructure and the environment to acceptable levels.

The approach is based around the flood risk management (FRM) hierarchy, in which actions to avoid, substitute, control and mitigate flood risk is central. For example, it is important to assess the level of risk to an appropriate scale during the decision-making process, (starting with this Level 1 SFRA). Once this evidence has been provided, positive planning decisions can be made and effective FRM opportunities identified.

Figure 6-1 illustrates the FRM hierarchy with an example of how these may translate into the council's management decisions and actions.

Figure 6-1: Flood Risk Management hierarchy



Using the EA's Flood Map for Planning, the overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system is being carried out i.e. LPAs allocating land in Local Plans or determining planning applications for development. This SFRA does not remove the need for a site-specific Flood Risk Assessment at a development management stage.

The following sections provide a guided discussion on why and how the Sequential Approach should be applied, including the specific requirements for undertaking Sequential and Exception Testing.

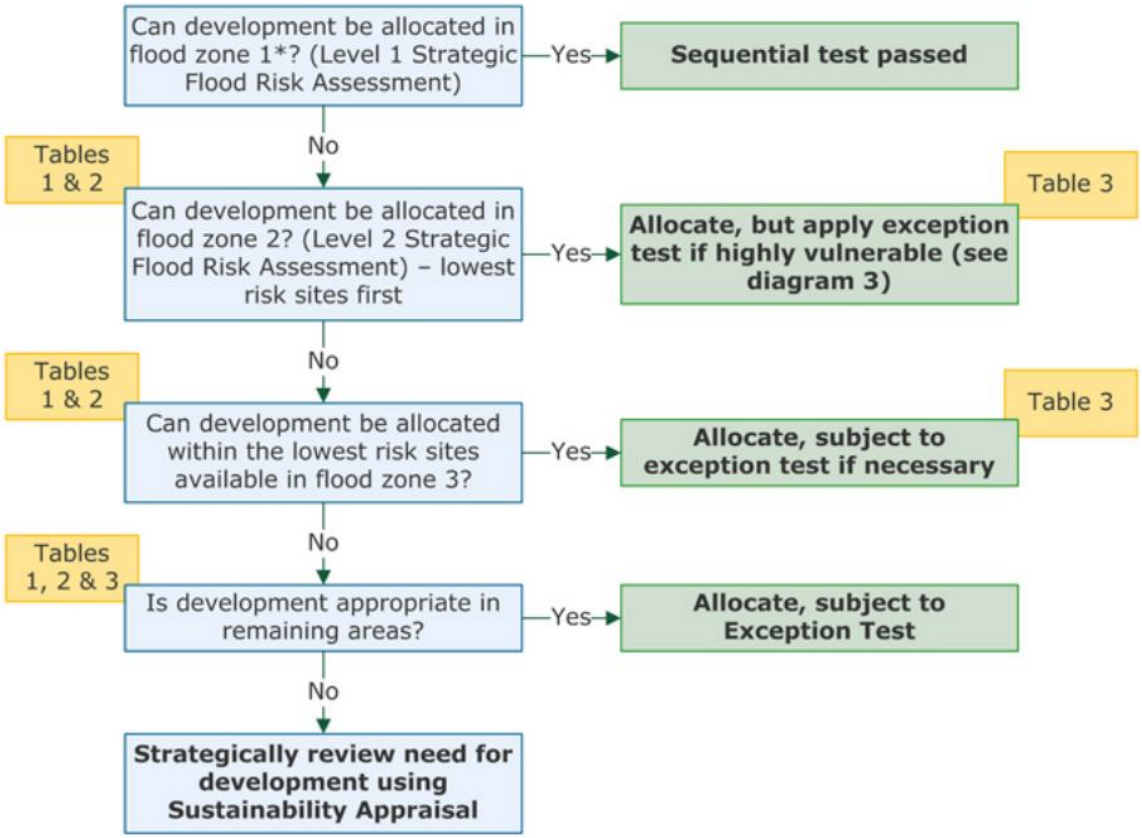
6.2 Local Plan Sequential and Exception Test

The LPA, should seek to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk and ensuring that all development does not increase risk and where possible can help reduce risk from flooding to existing communities and development.

At a strategic level, this should be carried out as part of WBC's Local Plan. This should be done by:

1. Applying the Sequential Test and if the Sequential Test is passed, applying the Exception Test, if required;
2. Safeguarding land from development that is required for current and future flood management;
3. Using opportunities offered by new development to reduce the causes and impacts of flooding and where climate change is expected to increase flood risk so that existing development may not be sustainable in the long term;
4. Seeking opportunities to facilitate the relocation of development including housing to more sustainable locations.

Figure 6-2: Local Plan sequential approach to site allocation

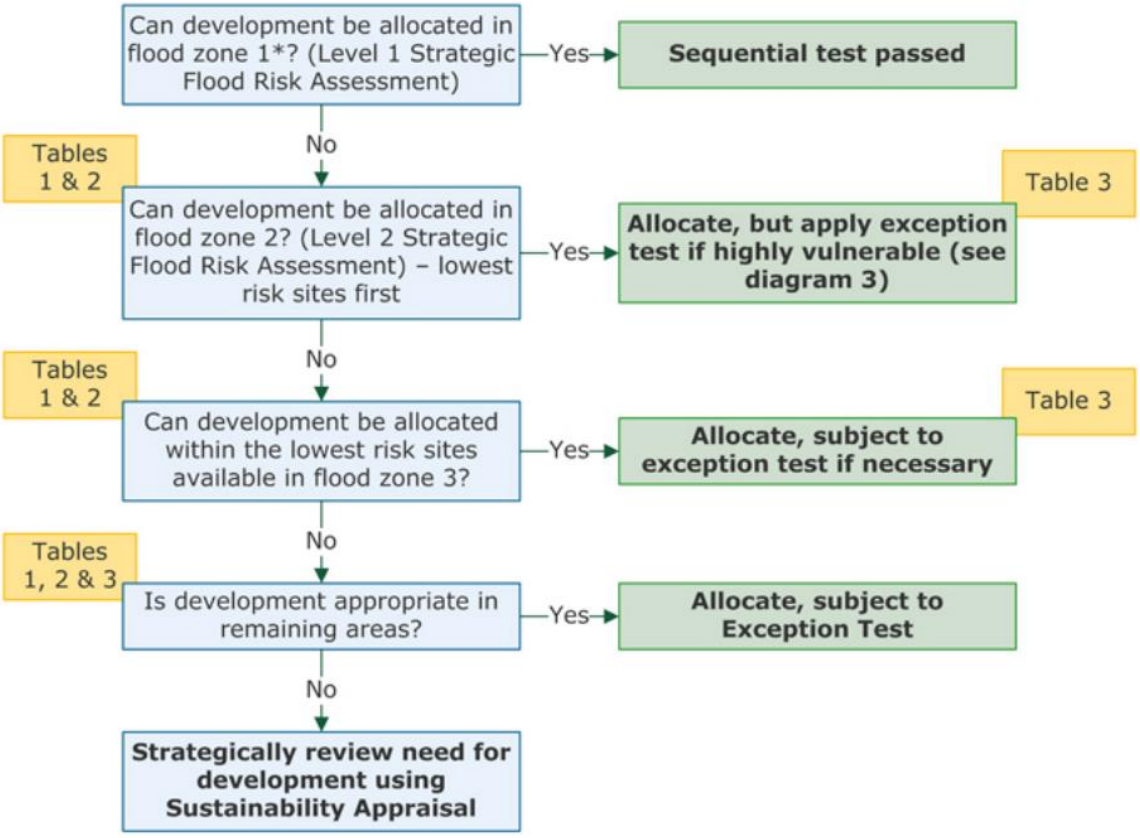


illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against the EA's Flood Map for Planning flood zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented and evidence used to support decisions recorded.

This can be done using the Development Site Assessment spreadsheets in Appendix B. This spreadsheet will help show that the LPA has applied the Sequential Test, through this SFRA, and thus considered development viability options for each potential development site.

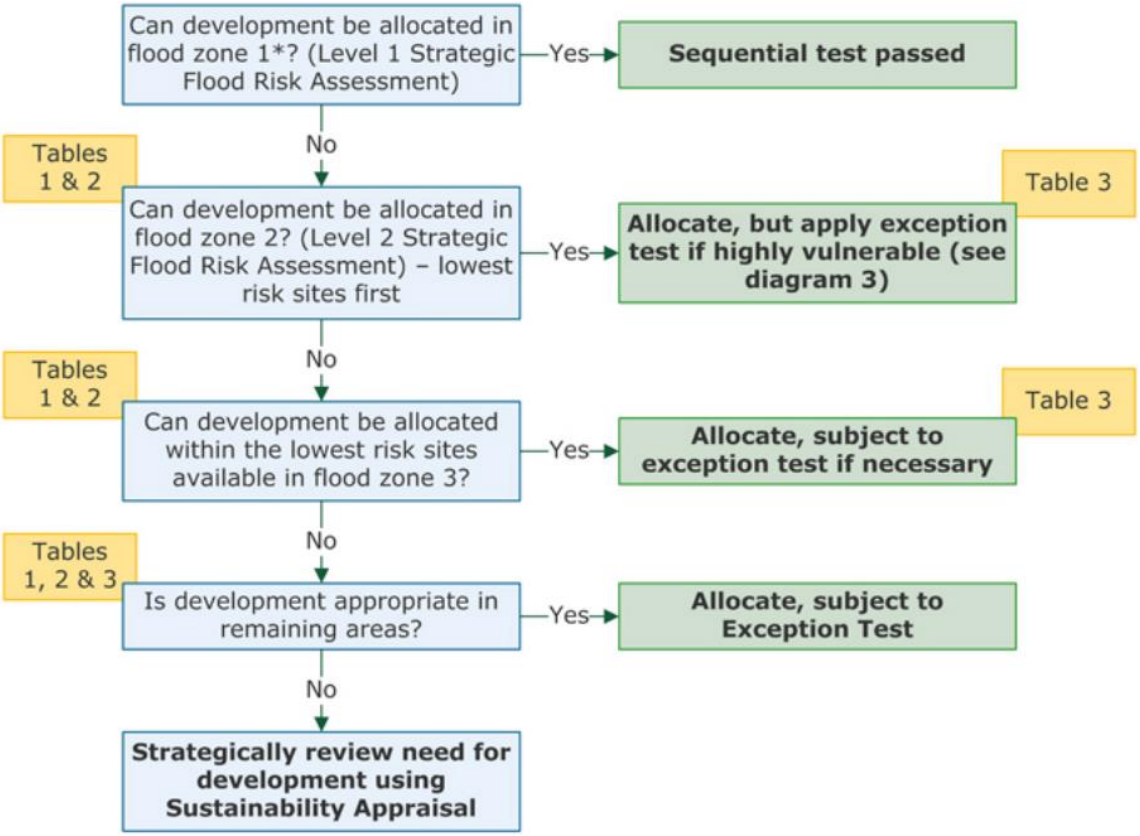
Figure 6-2: Local Plan sequential approach to site allocation[33]



(Tables 1, 2, 3 refer to the Flood Zone and flood risk tables of the FRCC-PPG Paragraphs 065-067).

33 https://www.gov.uk/guidance/flood-risk-and-coastal-change#Sequential-Test-to-Local-Plan

The approach shown in Figure 6-2: Local Plan sequential approach to site allocation



provides an open demonstration of the Sequential Test being applied in line with the NPPF and the FRCC-PPG. The EA works with local authorities to agree locally specific approaches to the application of the Sequential Test and any local information or consultations with the LLFA should be taken into account.

This SFRA provides the main evidence required to carry out this process. The process also enables those sites that have passed the Sequential Test, and may require the Exception Test, to be identified. Following application of the Sequential Test the LPA and developers should refer to 'Table 3: Flood risk vulnerability and flood zone 'compatibility'' of the FRCC-PPG (Paragraph 067) when deciding whether a development may be suitable or not.

For the Exception Test to be passed, the NPPF Paragraph 102 states:

a. *"It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
b. *A site-specific Flood Risk Assessment (FRA) 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".

Although passing the Exception Test will require the completion of a site-specific FRA, the LPAs should be able to assess the likelihood of passing the test at the Local Plan level by using the information contained in this SFRA to answer the following questions:

a. Can development within higher risk areas be avoided or substituted?

b. Is flood risk associated with possible development sites considered too high; and will this mean that the criteria for Exception Testing are unachievable?

c. Can risk be sustainably managed through appropriate development techniques (resilience and resistance) and incorporate Sustainable Drainage Systems without compromising the viability of the development?

d. Can the site, and any residual risks to the site, be safely managed to ensure that its occupiers remain safe during times of flood if developed?

To fully answer questions b to d, further, more detailed assessment may be required through a Level 2 SFRA.

Where it is found to be unlikely that the Exception Test can be passed due to few wider sustainability benefits, the risk of flooding being too great, or the viability of the site being compromised by the level of flood risk management work required, then the LPA should consider avoiding the site altogether.

Once this process has been completed, the LPA should then be able to allocate appropriate development sites through its Local Plan as well as prepare flood risk policy including the requirement to prepare site-specific FRAs for all allocated sites that remain at risk of flooding or that are greater than one hectare in area.

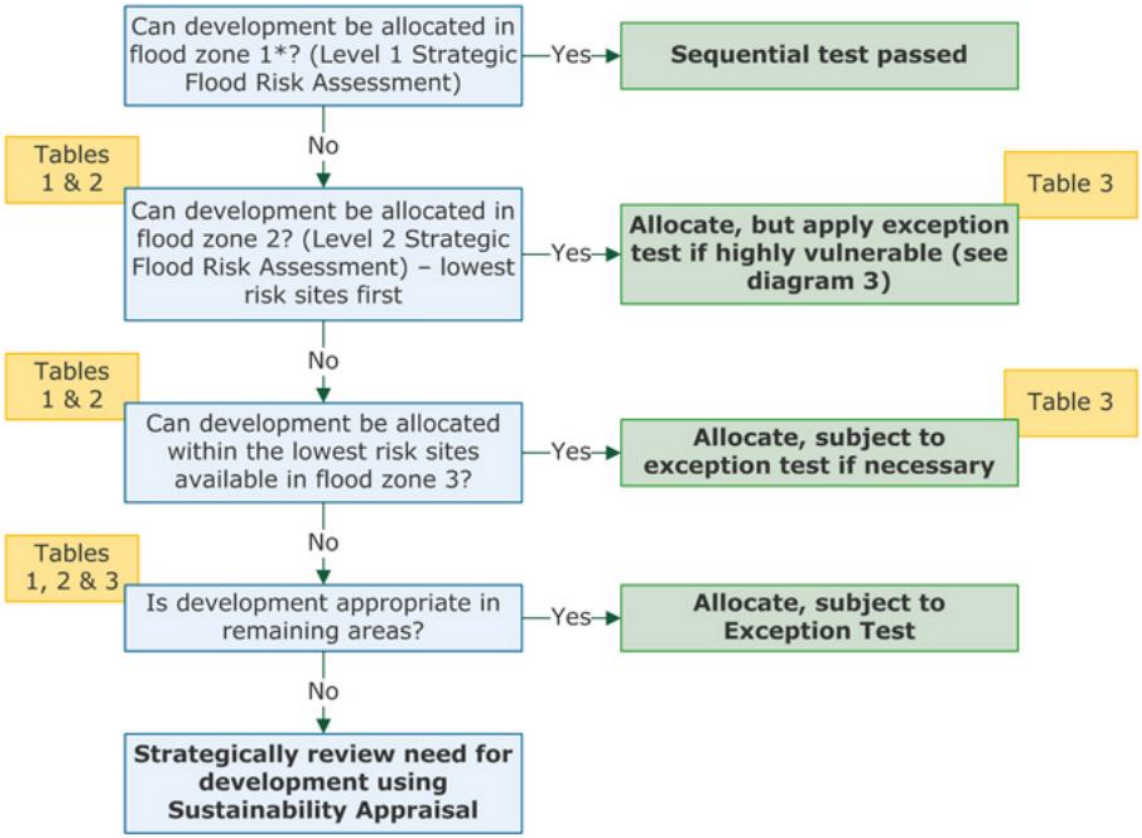
6.3 Local Plan Sites Assessment

The LPA Policy Team provided a GIS layer of SHLAA sites and possible development sites with potential to be included as site allocations in the Draft Local Plan. 597 potential sites have been provided, including the proposed uses listed in Table 6-1, along with the associated vulnerability of each proposed use that is used to help assign the strategic site recommendations discussed in Section 6.4.

Table 6-1: Proposed site uses and flood risk vulnerability

Proposed site use	Flood risk vulnerability (Table 2 of FRCC-PPG)
Residential	More vulnerable
Employment	Less vulnerable
Mixed use	More vulnerable
Gypsy & Traveller	Highly vulnerable
Unknown	N/A

In order to inform the first part of the Sequential Approach for allocation of development through the Local Plan (illustrated in Figure 6-2: Local Plan sequential approach to site allocation



), this SFRA has carried out a high level GIS screening exercise which involved overlaying the potential sites against Flood Zones 1, 2, 3a and 3b. Flood Zones 1, 2 and 3a are sourced from the EA's Flood Map for Planning (Rivers and Sea) and Flood Zone 3b (functional floodplain) was delineated through this SFRA (see Section 5.2.5).

Surface water risk to potential sites is assessed by way of the EA's Risk of Flooding from Surface Water (RoFSW) flood zones, namely the high risk 1 in 30 AEP zone; the medium risk 1 in 100 AEP zone; and the low risk 1 in 1000 AEP zone. Results are presented in the Development Site Assessment spreadsheet in Appendix B.

For this SFRA, surface water flood risk is afforded the equivalent level of importance as fluvial and tidal risk, as discussed in Section 5.3, in terms of the strategic recommendations assigned to each potential development site (see Section 6.4 below).

6.4 Screening of potential development sites

This section of the report draws together the results included in the Development Site Assessment spreadsheet (Appendix B), produced from the GIS screening exercise. The LPA should use the spreadsheet to identify which sites should be avoided during the Sequential Test. If this is not the case, or where wider strategic objectives require development in areas already at risk of flooding, then the LPA should consider the compatibility of vulnerability classifications and Flood Zones (refer to FRCC-PPG) and whether or not the Exception Test will be required before finalising sites. The decision-making process on site suitability should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

The Appendix B spreadsheet provides a breakdown of each site and the area (in hectares) and percentage coverage of each fluvial flood zone and each surface water flood zone. Fluvial Flood Zones 3b, 3a, 2 and 1 are considered in isolation. Any area of a site within the higher risk Flood Zone 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any area within Flood Zone 3a is excluded from Flood Zone 2. This allows for the sequential assessment of risk at each site by addressing those sites at higher risk first. The same approach applies to the surface water flood zones.

Table 6-2 shows the number of sites within each fluvial / tidal flood zone and Table 6-3 shows the number of sites within each surface water flood zone.

Table 6-2: Number of potential development sites at risk from fluvial / tidal flooding

Potential Development Site	Number of sites within…			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	316	162	134	97
Employment	25	2	2	1
Mixed Use	46	18	20	17
Gypsy & Traveller	2	0	1	0
Unknown	2	1	1	1
TOTAL	**391**	**183**	**158**	**116**
*Sites with 100% area within Flood Zone 1				

Table 6-3: Number of potential development sites at risk from surface water flooding

Potential	Number of sites within…

Development Site	Low Risk (1 in 1000)	Medium Risk (1 in 100)	High Risk (1 in 30)
Residential	444	365	310
Employment	26	21	21
Mixed Use	67	53	43
Gypsy & Traveller	1	0	0
Unknown	3	3	3
TOTAL	**541**	**442**	**377**

The spreadsheet also includes high level broad-brush strategic recommendations on the viability of development for each site. Development viability is assessed, based on Tables the flood risk and flood zone tables[34] of the FRCC-PPG (Paragraphs 065 - 067). recommendations are intended to assist the LPA in carrying out the Sequential Test.

34 https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables

Table 6-4 shows the number of sites each strategic recommendation applies to.

Strategic recommendations:

- Strategic Recommendation A - consider withdrawing the site based on significant level of fluvial, tidal or surface water flood risk and site vulnerability;
- Strategic Recommendation B - Exception Test required if site passes Sequential Test;
- Strategic Recommendation C - consider site layout and design around the identified flood risk if site passes Sequential Test, as part of a detailed FRA or drainage strategy;
- Strategic Recommendation D - site-specific FRA required; and
- Strategic Recommendation E - site permitted on flood risk grounds due to little perceived risk, subject to consultation with the LPA / LLFA.

Table 6-4: Number of sites per strategic recommendation

Proposed use of site	Strategic Recommendation				
	A	B	C	D	E
Residential	52	24	305	80	32
Employment	1	0	1	24	1
Mixed use	10	1	44	14	14
Gypsy &Traveller	1	0	0	0	2
Unknown	1	0	0	2	0
Total	**65**	**25**	**350**	**120**	**37**

It is important to note that this Level 1 SFRA does not assess each individual site in detail. Each individual site will require further investigation, as local circumstances may dictate the outcome of the strategic recommendation. The strategic recommendation may therefore change upon further investigation.

Such local circumstances may include the following:

- Flood depths and hazards will differ locally to each at risk site therefore modelled depth, hazard and velocity data should be assessed for the relevant flood event outlines, including climate change (using the EA's February 2016 allowances), as part of a site-specific FRA or Level 2 SFRA.
- Current surface water drainage infrastructure and applicability of SuDS techniques are likely to differ at each site considered to be at risk from surface water flooding. Further investigation would therefore be required for any site at surface water flood risk, to ascertain local ground conditions and groundwater levels.
- It may be possible at some sites to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water?
- Surrounding infrastructure may influence scope for layout redesign/removal of site footprints from risk.
- Safe access and egress must exit at all times during a flood event for emergency response and evacuation
- Existing planning permissions may exist on some sites where the EA may have already passed comment and/or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations/FRAs may already have been carried out at some sites.
- Cumulative effects. New development may result in increased risk to other potential or existing sites. This should be assessed through a Level 2 SFRA or drainage strategy, whichever may be applicable.

The following strategic recommendations provide only a guide, based on the fluvial and surface water flood risk information made available for this Level 1 SFRA. Information regarding local, site specific information is beyond the scope of this Level 1 SFRA. It is the LPA's responsibility to carry out sequential testing of each site using the information provided in this SFRA and more specifically using their local, site specific knowledge and advice from the EA and LLFA. The strategic recommendations should be read alongside the Development Site Assessment spreadsheet in Appendix B, which assists the LPA in carrying out the Sequential Test

6.4.1 Strategic Recommendation A – consider withdrawal of site

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone

Strategic Recommendation A applies to any site where the following criteria is true:

- 10% or greater of the site area is within Flood Zone 3b. The FRCC-PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test and water-compatible uses must be designed and constructed to remain operational and safe for users in times of flood; must result in no net loss of floodplain storage; and not impede water flows and not increase flood risk elsewhere. Development should not be permitted for sites within the highly, more, or less vulnerable categories (see Table 6-1) that fall within Flood Zone 3b. If the developer is able to avoid 3b however, then part of the site could still be delivered.
- 10% or greater of the site area of highly vulnerable sites is within Flood Zone 3a
- 10% or greater of the site area of any site type is within the high risk surface water flood outline, and therefore at significant surface water flood risk.
- 10% or greater of the site area of highly or more vulnerable sites are within the medium risk surface water flood outline, and therefore at significant surface water flood risk.

The 10% threshold is not included within any policy, it is merely considered that it may prove difficult for developers to deliver a site where 10% or more of the site area is undevelopable, based on the NPPF. This 10% threshold does not account for local circumstances therefore it may be possible to deliver some of the sites, particularly sites, included with Strategic Recommendation A upon more detailed investigation Level 2 SFRA or drainage strategy. Strategic Recommendation A applies to 65 41 sites recommended for withdrawal based on fluvial / tidal risk (see

Table 6-6) and 24 sites due to significant surface water risk (**Error! Reference source not found.**).

Further, more detailed investigation may reveal that some of these sites may still be deliverable given that they cover large areas and therefore may be able to accommodate the functional floodplain on site by leaving these areas as open space or by creating amenity greenspace. The LPA should refer to the SFRA maps in Appendix A to check whether this may be possible before deciding whether to take these sites forward or to withdraw them.

Following the LPA and LLFA review, a number of sites have change strategic recommendation the reasoning and new strategic recommendation can be seen in 6.4.6.

Table 6-5: Sites to consider withdrawing due to fluvial / tidal flood risk

Site Reference	Proposed use	Site area (ha)	% of area within Flood Zone 3b
1518	Residential	1.71	56.52
1521	Residential	4.63	43.72
1629	Residential	16.96	15.12
1706	Residential	1.96	30.03
2147	Residential	3.11	66.26
2172	Residential	4.84	19.15
2452	Residential	3.70	22.45
2591	Residential	1.31	21.27
2601	Residential	12.80	83.63
2602	Residential	4.41	87.88
2690	Residential	0.52	51.89
3110	Residential	11.10	17.15
3111	Residential	15.40	92.55
3112	Residential	3.93	96.89
3116	Residential	3.32	83.23
3135	Residential	1.10	61.41
3146	Residential	20.11	46.68
3163	Residential	23.09	36.13

Site Reference	Proposed use	Site area (ha)	% of area within Flood Zone 3b
3166	Residential	4.47	57.27
3167	Residential	30.26	10.37
R18/019	Mixed Use	11.10	17.15
R18/020	Mixed Use	15.40	92.55
R18/021A	Mixed Use	7.54	96.74
R18/024	Mixed Use	3.32	83.23
R18/044	Residential	16.96	15.12
R18/057	Residential	1.10	61.41
R18/067	Residential	16.96	15.12
R18/073	Residential	4.63	43.72
R18/077	Mixed Use	20.11	46.68
R18/094	Residential	3.70	22.45
R18/109	Unknown	23.09	36.13
R18/130	Residential	4.47	57.27
R18/134	Residential	4.84	19.15
R18/135	Mixed Use	12.80	83.63
R18/136	Mixed Use	4.41	87.88
R18/138	Residential	30.26	10.37
R18/P2/007	Gypsy & Traveller*	0.51	100.00*
R18/P2/031	Residential	32.14	11.41
R18/P2/057	Residential	3.71	22.37
R18/P2/115	Residential	32.14	11.41
R18/P2/124	Residential	30.26	10.37
R18/P2/131A	Mixed Use	347.85	24.39
*Highly vulnerable and within Flood Zone 3a, not within Flood Zone 3b			

Table 6-6: Sites to consider withdrawing due to significant surface water risk

Site Reference	Proposed use	Site area (ha)	High Risk RoFSW outline (%)	Medium Risk RoFSW outline (%)
1527	Residential	0.27	1.49	17.19
1543	Residential	2.50	0.62	20.07
1655	Residential	7.34	20.61	6.22
1719	Residential	0.32	0.06	24.29
1720	Residential	0.37	3.84	12.94
1762	Residential	0.58	8.79	15.17
1806	Residential	0.51	36.52	22.14
2189	Residential	0.43	8.20	15.04
2193	Residential	0.49	3.27	30.64
2244	Residential	0.51	10.98	4.75
2246	Residential	0.54	7.20	11.19
2675	Residential	1.77	3.47	19.39
3151	Residential	20.11	10.23	6.50
3160	Residential	3.20	35.45	15.61
R18/084	Mixed Use	7.34	20.61	6.22
R18/089	Residential	20.11	10.23	6.50
R18/102	Residential	3.20	35.45	15.61
R18/131	Residential	0.04	0.00	22.71
R18/P2/005	Mixed Use	1.51	12.05	4.07
R18/P2/033	Employment	2.79	16.49	10.91
R18/P2/060A	Residential	20.11	10.23	6.50
R18/P2/104D	Residential	3.20	35.45	15.61
R18/P2/130A	Residential	20.11	10.23	6.50

A number of these 65 sites are large strategic development sites e.g. Site R18/P2/131A is 348 ha with just under a quarter of the site within the functional floodplain and therefore undevelopable. The other three quarters may be developable upon further investigation. The larger sites are more likely to be able to accommodate flood water on site compared to smaller sites. Site R18/P2/007, a potential gypsy and traveller site, is entirely within Flood Zone 3a and, being highly vulnerable, must be withdrawn. Six sites have over 80% of their areas within Flood Zone 3b and are therefore unlikely to be developable, given the considerable reduction in developable area.

11 sites, recommended for withdrawal due to surface water risk, are less than 1 hectare in size and are unlikely to be able to accommodate surface water on-site. The residential sites are less likely to be able to mitigate surface water risk given the pressure on housing yields and possible safety concerns related to certain types of SuDS, i.e. retention pond, in residential areas.

A more detailed assessment of site conditions would be required to ascertain whether there are actual surface water flow paths through the sites or whether risk is confined to certain parts of the site in natural depressions. Flood depths and hazards; ground condition assessments for SuDS; and provision for safe access and egress points during a flood would also need to be gauged. A detailed site design and drainage strategy together with a detailed FRA would have to show each site would be safe for its lifetime, which is 100 years for residential.

6.4.2 Strategic Recommendation B – Exception Test

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

Strategic Recommendation B applies to sites where it is likely the Exception Test would be required, assuming the Sequential Test has been passed in the first instance. This does not include any recommendation on the likelihood of a site passing the Exception Test. A more in-depth investigation such as a Level 2 SFRA would be required to assess this. The developer / LPA should always attempt to avoid the risk area where possible.

Strategic Recommendation B applies to sites where the following criteria is true:

- 10% or greater of any more vulnerable site that is within Flood Zone 3a. Less vulnerable uses of land do not require the Exception Test.
- 10% or greater of any highly vulnerable site that is within Flood Zone 2

NOTE: All development proposals in Flood Zones 3a and 2 must be accompanied by a flood risk assessment.

The 10% threshold is not included within any policy; it is merely considered that it would be very difficult for developers to avoid Flood Zone 3a when 10% or more of the site area is within it. This 10% threshold does not account for local circumstances therefore it may be possible to avoid Flood Zone 3a altogether for some of the sites included with Strategic Recommendation B.

Table 6-7 shows that there are 25 sites, at a minimum, that should be subject to and have to pass the second part of the Exception Test, assuming the first part can be passed. All 25 sites are proposed for residential use. There are 13 sites that are highly unlikely to pass the second part of the Exception Test, given that over half of each site area is within Flood Zone 3a. The LPA should investigate these sites in more detail before deciding whether to take any of these sites forward to a more detailed assessment, such as a Level 2 SFRA.

Following the LPA and LLFA review, a number of sites have change strategic recommendation the reasoning and new strategic recommendation can be seen in 6.4.6.

Table 6-7: Sites which may proceed subject to passing the exception test

Site Reference	Proposed use	Site area (ha)	% of area within Flood Zone 3a
1041	Residential	0.54	14.59
1178	Residential	15.48	82.03
1505	Residential	1.95	100.00
1620	Residential	0.88	17.37
1621	Residential	0.29	50.41
1707	Residential	0.39	24.89
1715	Residential	15.74	49.38
1717	Residential	0.25	87.58
1809	Residential	0.25	24.68
1831	Residential	1.81	35.77
1861	Residential	1.58	11.22
1891	Residential	1.85	85.41
2273	Residential	0.52	99.70
2482	Residential	4.88	47.91
2603	Residential	2.37	55.18
2657	Residential	15.07	43.81
2677	Residential	5.46	14.12
R18/004	Residential	0.29	50.41
R18/100	Residential	0.88	17.36
R18/103	Residential	15.74	49.38
R18/137	Mixed Use	2.37	55.18
R18/P2/008	Residential	1.04	49.67
R18/P2/038	Residential	0.86	92.59
R18/P2/104F	Residential	0.88	17.36
R18/P2/150	Residential	1.12	100.00

6.4.3 Strategic Recommendation C – consider site layout and design as part of a detailed FRA

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

This recommends that, due to only a small proportion of a site being at risk, it may be possible that a detailed review of site layout and / or design around the flood risk, as part of a detailed FRA at the development planning stage, may enable development to proceed. Or it may be possible to incorporate suitable SuDS into the site layout to mitigate risk on-site, following a detailed FRA or drainage strategy. A Level 2 SFRA or detailed site-specific FRA would be required to help inform on site layout and design.

Strategic Recommendation C applies to sites where the following criteria is true:

- <10% of the area of any site type is within Flood Zone 3b.
- <10% of any highly or more vulnerable site is within Flood Zone 3a.
- <10% of any highly or more vulnerable site within the high or medium risk surface water flood zone
- 10% or greater of a less vulnerable site within the medium risk surface water flood zone

The 10% threshold is not included within any policy, it is merely considered that it may be possible for developers to avoid Flood Zone 3b and Flood Zone 3a and also the high and medium risk surface water flood zones when less than 10% of the site area is at risk. This 10% threshold does not account for local circumstances.

Paragraph 050 of the FRCC-PPG states:

"Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally.

There are 350 potential sites to which Strategic Recommendation C applies (refer to Appendix B). Of these sites, 305 are for residential, 44 are for mixed use and one is for employment. 60 of these sites are partially within Flood Zone 3b (see Appendix B). The areas within Flood Zone 3b must not be developed and must be left as open space or the site boundaries adjusted to remove the functional floodplain from the site footprint.

Half of Site R18/133, which is a large employment site (75 ha) is within Flood Zone 3a meaning a particularly detailed and robust FRA will be required along with strict emergency planning procedures will be required to ensure safety of development users.

248 more vulnerable sites are either 100% or over 95% within Flood Zone 1 and not at any significant risk from surface water flood risk. Despite the fact that these sites are more vulnerable residential or mixed use, it should still be straightforward to mitigate the surface water risk, given the proportions of the site areas at risk. However, further investigation is still required to ascertain the site-specific risk.

Following the LPA and LLFA review, a number of sites have change strategic recommendation the reasoning and new strategic recommendation can be seen in 6.4.6.

6.4.4 Strategic Recommendation D – Subject to FRA

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

This recommends that development could be allocated due to low flood risk perceived from the EA flood maps, assuming a site-specific FRA shows the site can be safe and it is demonstrated that the site is sequentially preferable. A site within Flood Zone 2 could still be rejected if the conclusions of the FRA decide development is unsafe or inappropriate.

Strategic Recommendation D applies to sites where the following criteria is true:

- Any site within Flood Zone 2 that does not have any part of its footprint within Flood Zone 3a, with the exception of a highly vulnerable development which would be subject to, and have to pass, the Exception Test.
- Less vulnerable and water compatible sites within Flood Zone 3a. No part of the site can be within Flood Zone 3b.
- Any site 100% within Flood Zone 1 where surface water flood risk is apparent but not considered significant.
- Any site 100% within Flood Zone 1 that is greater than or equal to 1 hectare in area.

Recommendation D applies to 120 potential sites overall. 111 of these sites are 100% within Flood Zone 1 with 105 at some level of surface water risk. The other 15 are at very low risk from surface water, according to the RoFSW, though are greater than 1 ha in area and therefore must be subject to a FRA.

6.4.5 Strategic Recommendation E – development could be allocated on flood risk grounds subject to consultation with the LPA / LLFA

This strategic recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a flood zone.

This recommends that development should be allocated on flood risk grounds, based on the evidence provided within this SFRA. Further investigation may be required by the developer and an FRA would be required to assess further or new information that may not have been included within this SFRA. Recommendation E applies to 37 sites.

Strategic Recommendation E applies to any site with its area 100% within Flood Zone 1, not within any surface water flood zone and less than 1 hectare in size.

6.4.6 Strategic Recommendation alterations following LPA/LLFA review

Following the LPA and LLFA review, a number of sites have change strategic recommendation the reasoning and new strategic recommendation can be seen in Table 6-8.

Table 6-8: LPA/LLFA strategic recommendation review

Site Reference	Previous Recommendation	New recommendation	Reasoning
1543	Recommendation A	Recommendation C	Site is in a sustainable location within the existing and established urban residential area. Also, now in an area benefitting from flood defences. As long as surface water (100 year event) is appropriately mitigated using appropriate SuDS investigated and planned at the site design and layout stage then recommendation can change to C.
1629	Recommendation A	Recommendation B	Avoid development in Flood Zone 3 (FZ3) and change to recommendation B-Exception Test. Need to assess the site as per the boundary submitted to the Council.
1719	Recommendation A	Recommendation C	Site is in a sustainable location within the existing and established urban residential area. As long as surface water (100 year event) is appropriately mitigated using

			appropriate SuDS investigated and planned at the site design and layout stage then recommendation can change to C.
1720	Recommendation A	Recommendation C	Same reasons as above
1762	Recommendation A	Recommendation C	Same reasons as above
1809	Recommendation B	Recommendation C	Flood Map for Planning is based on undefended scenario therefore NPPF would advise Exception Test. However, a Level 2 SFRA or FRA should investigate the residual risk through defence breach/overtopping modelling. To satisfy the second part of the Exception Test, it must be shown that the residual risk can be overcome to the satisfaction of the LPA and EA. Remember that areas behind flood defences are at particular risk from rapid onset of fast-flowing and deep water flooding, with little or no warning if defences are overtopped or breached. here will be a need to assess the residual risk from overtopping or a breach of the defences that are in place. However, for SHLAA site 2905 (planning permission 2016/27350), the EA advised that because of the presence of flood defences, there would be no need to apply the Exceptions Test, just the need for a FRA.
2189	Recommendation A	Recommendation C	Site is in a sustainable location within the existing and established urban residential area. As long as surface water (100 year event) is appropriately mitigated using appropriate SuDS investigated and planned at the site design and layout stage then recommendation can change to C.
2193	Recommendation A	Recommendation C	Same reasons as above
2246	Recommendation A	Recommendation C	Same reasons as above
2675	Recommendation A	Recommendation C	Same reasons as above
3151	Recommendation A	Recommendation C	This is a large site, and the majority of it is within Flood Zone 1 (FZ1). Avoid FZ3 and deal with surface water.
3167	Recommendation A	Recommendation C	Avoid development in FZ3. Need to assess the site as per the boundary submitted to the Council.
R18/020	Recommendation A	Recommendation C	Same reasons as above
R18/044	Recommendation A	Recommendation B	Avoid development in FZ3. Need to assess the site as per the boundary submitted to the Council.
R18/067	Recommendation A	Recommendation B	Same reasons as above
R18/089	Recommendation A	Recommendation C	This is a large site, and the majority of it is within FZ1. Avoid FZ3 and deal with surface water
R18/094	Recommendation A	Recommendation C	Avoid development in FZ3 need to assess the site as per the boundary submitted to the Council.
R18/109	Recommendation A	Recommendation C	Same reasons as above

R18/131	Recommendation A	Recommendation C	Site is in a sustainable location within the existing and established urban residential area. As long as surface water (100 year event) is appropriately mitigated using appropriate SuDS investigated and planned at the site design and layout stage then recommendation can change to C.
R18/134	Recommendation A	Recommendation C	Avoid development in FZ3 Need to assess the site as per the boundary submitted to the Council.
R18/138	Recommendation A	Recommendation C	Same reasons as above
R18/P2/031	Recommendation A	Recommendation C	Avoid development in FZ3. Need to assess the site as per the boundary submitted to the Council.
R18/P2/033	Recommendation A	Recommendation C	As long as surface water is appropriately mitigated using appropriate SuDS investigated and planned at the site design and layout stage.
R18/P2/057	Recommendation A	Recommendation C	Avoid development in FZ3 Need to assess the site as per the boundary submitted to the Council.
R18/P2/060A	Recommendation A	Recommendation C	This is a large site, and the majority of it is within FZ1. Avoid FZ3 and deal with surface water
R18/P2/124	Recommendation A	Recommendation C	Avoid development in FZ3. Need to assess the site as per the boundary submitted to the Council.

6.5 Summary of sequential testing outcomes and assessment of surface water risk

There are several outcomes which could come out of the sequential testing process and the surface water risk assessment. Each outcome is discussed below. The LPA should refer to Section 6.4 and Appendix B for details on the sites assessments carried out for this SFRA.

6.5.1 Rejection of site

A site which fails to pass the Sequential Test and / or the Exception Test would be rejected. Rejection would also apply to any highly (gypsy and traveller), more (residential, mixed use inclusive of residential) or less vulnerable (employment) sites within Flood Zone 3b where no development should be permitted. The FRCC-PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test and clearly demonstrate that it does not increase or exacerbate flood risk elsewhere. If the developer is able to avoid Flood Zone 3b, part of the site could still be delivered.

In terms of surface water flood risk, if risk is considered significant, based on AEP and development vulnerability, or where the size of the site does not allow for on-site storage or application of appropriate SuDS, then such sites could be rejected.

6.5.2 Exception Test required

Applies to those sites that, according to the FRCC-PPG vulnerability tables, would require the Exception Test. Only water-compatible and less vulnerable uses of land would not require the Exception Test in Flood Zone 3a. More vulnerable uses, including residential, and essential infrastructure are only permitted if the Exception Test is passed and all development proposals in Flood Zone 3a must be accompanied by a Flood Risk Assessment. To avoid having to apply the Exception Test, the developer / LPA should attempt to avoid the risk area altogether.

6.5.3 Consideration of site layout and design

Site layout and site design is important at the site planning stage where flood risk exists. The site area would have to be large enough to enable any alteration of the developable area of the site to remove development from the functional floodplain, or to leave space for on site storage of flood water. Careful layout and design at the site planning stage may apply to such sites where it is considered viable based on the level of risk. Surface water risk and opportunities for SuDS should also be assessed during the planning stage.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint from Flood Zone 3b to a lower risk zone then development should not be permitted. If it is not possible to adjust the developable area of a site to remove the proposed development from Flood Zone 3a to a lower risk zone or to incorporate the on site storage of water within site design, then the Exception Test would have to be passed as part of a site-specific Flood Risk Assessment.

Any site layout and design options should take account of the 8 metre easement buffer along watercourses, from the top of the bank or the landward toe of a defence on main rivers, where development is not permitted. This easement buffer is recommended by the EA to allow ease of access to watercourses for maintenance works. Any site redesign, where Flood Zone 3a is included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of appropriate SuDS techniques (see Section 6.9).

6.5.4 Site-Specific Flood Risk Assessment

According to the FRCC-PPG (Para 030), a site-specific FRA is:

"…*carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 5 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability of PPG).*"

The objectives of a site-specific FRA are to establish:

Whether a proposed development is likely to be affected by current or future flooding (including effects of climate change) from any source. This should include referencing this SFRA to establish sources of flooding. Further analysis should be performed to improve understanding of flood risk including agreement with the council on areas of functional floodplain that have not been specified within this SFRA. Key objectives:

- Whether the development 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.

When is a Site-Specific FRA Required?

According to NPPF footnote 5, a site-specific FRA should be prepared when the application site is:

- Situated in Flood Zone 2 and 3; for all proposals for new development (including minor development and change of use)
- 1 hectare or greater in size and located in Flood Zone 1
- Located in Flood Zone 1 where there are critical drainage problems
- At risk of flooding from other sources of flooding, such as those identified in this SFRA
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding

The LPA may also like to consider further options for stipulating FRA requirements, such as:

- Situated in an area currently benefitting from defences
- Situated within 20 metres of the bank top of a Main River
- Situated over a culverted watercourse or where development will require controlling the flow of any river or stream or the development could potentially change structures known to influence flood flow

These further options should be considered during the preparation and development of the Local Plan

Paragraph 031 of the FRCC-PPG contains information regarding the level of detail required in that FRAs should always be proportionate to the degree of flood risk whilst making use of existing information, including this SFRA. Paragraph 068 of the FRCC-PPG contains an easy to follow FRA checklist for developers to follow.

Together with the information in the FRCC-PPG, there is further detail and support provided for the LPA and developers in the EA's FRA guidance[35] and also the EA guidance for FRAs for planning applications[36]. CIRIA's report 'C624 Development and Flood Risk[37]' also provides useful guidance for developers and the construction industry. Section **Error! Reference source not found.** of this report provides further guidance on FRAs for developers.

6.5.5 Sites passing the Sequential and Exception Tests

Development sites can be allocated or granted planning permission where the Sequential Test and the Exception Test (if required) are passed. In addition, a site is likely to be allocated without the need to assess flood risk where the proposed use is for open space. Assuming the site is not to include any development and is to be left open then the allocation is likely to be acceptable from a flood risk point of view. However, for sites where there is potential for flood storage, options should be explored as part of an FRA.

In terms of opportunities for reducing flood risk overall as a requirement of the Exception Test, the FRCC-PPG states:

"Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally." (Paragraph 50).

35 https://www.gov.uk/flood-risk-assessment-local-planning-authorities

36 https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

37 CIRIA C624 Development and Flood Risk - guidance for the construction industry. 2004

6.5.6 Surface water risk to potential sites

For sites at surface water flood risk the following should be considered:

- Possible withdrawal, redesign or relocation of the site for those sites at identified to be at significant risk;
- A detailed site-specific FRA incorporating surface water flood risk management or drainage strategy for larger strategic sites;
- A FRA may want to consider detailed surface water modelling, particularly for the larger sites which may influence sites elsewhere;
- The size of development and the possibility of increased surface water flood risk caused by development on current Greenfield land (where applicable), and cumulative impacts of this within specific areas;
- Management and re-use of surface water on-site, assuming the site is large enough to facilitate this and achieve effective mitigation. Effective surface water management should ensure risks on and off site are controlled;
- Larger sites could leave surface water flood prone areas as open greenspace, incorporating social and environmental benefits;
- SuDS should be used where possible. Appropriate SuDS may offer opportunities to control runoff to Greenfield rates or better. Restrictions on surface water runoff from new development should be incorporated into the development planning stage. For brownfield sites, where current infrastructure may be staying in place, then runoff should attempt to mimic that of Greenfield rates, unless it can be demonstrated that this is unachievable or hydraulically impractical. Developers should refer to the national 'non-statutory technical standards for sustainable drainage systems' and other guidance documents cited in Section 6.9;
- Runoff up to and including the 1% AEP event should be managed on site where possible;
- Measures of source control should be required for development sites;
- Developers should be required to set part of their site aside for surface water management, to contribute to flood risk management in the wider area and supplement green infrastructure networks;
- Developers should be required to maximise permeable surfaces;
- Flow routes on new development where the sewerage system surcharges as a consequence of exceedance of the 1 in 30 AEP design event should be retained; and
- Whether the delineation of Critical Drainage Areas may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the LLFA, UU, any relevant Internal Drainage Board and the EA would be required. It may then be beneficial to carry out a SWMP or drainage strategy for targeted locations with any such areas with critical drainage problems. Investigation into the capacity of existing sewer systems would be required in order to identify critical parts of the system. Drainage model outputs could be obtained to confirm the critical parts of the drainage network and subsequent recommendations could then be made for future development i.e. strategic SuDS sites, parts of the drainage system where any new connections should be avoided, and parts of the system that may have any additional capacity and recommended runoff rates.

6.6 Sustainability Appraisal and flood risk

The Sustainability Appraisal should help to ensure that flood risk is taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in Figure 6-2.

By avoiding sites identified in this SFRA as being at significant risk, such as those listed in Section 6.4.1, or by considering how changes in site layout can avoid those parts of a site at

flood risk, such as any site included within Recommendation C (6.4.3), the Council would be demonstrating a sustainable approach to development.

In terms of surface water, the same approach should be followed whereby those sites at highest risk should be avoided or site layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques (see Section 6.9).

Surface water flood risk should be considered with the same importance as fluvial and tidal flood risk.

Once the LPA has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a site-specific FRA, a phased approach to development should be carried out to avoid any cumulative impacts that multiple developments may have on flood risk. For example, for any site where it is required, following the Sequential Test, to develop in Flood Zone 3, detailed modelling would be required to ascertain where displaced water, due to development, may flow and to calculate subsequent increases in downstream flood volumes. The modelling should investigate scenarios based on compensatory storage techniques to ensure that downstream or nearby sites are not adversely affected by development on other sites.

Using a phased approach to development, based on modelling results of floodwater storage options, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus ensuring a sustainable approach to site development. Also, it may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites (see Sections 4.2.5 to 4.2.9 for information on Natural Flood Management and Working with Natural Processes).

6.7 Safeguarded land for flood storage

Where possible, the LPA may look to allocate land designed for flood storage functions. Such land can be explored through the site allocation process whereby an assessment is made, using this SFRA, of the flood risk at potential sites and what benefit could be gained by leaving the site undeveloped. In some instances, the storage of flood water can help to alleviate flooding elsewhere, such as downstream developments. Where there is a large area of a site at risk that is considered large enough to hinder development, it may be appropriate to safeguard this land for the storage of flood water.

Applicable sites may include any current greenfield sites:

- That are considered to be large enough to store flood water to achieve effective mitigation,
- With large areas of their footprint at high or medium surface water flood risk (based on the RoFSW),
- That is within the functional floodplain (Flood Zone 3b),
- With large areas of their footprint at risk from Flood Zone 3a and Flood Zone 2, and
- That are large enough and within a suitable distance to receive flood water from a nearby development site, where storage is not feasible, using appropriate SuDS techniques which may involve pumping, piping or swales / drains.

Brownfield sites could also be considered though this would entail site clearance of existing buildings and conversion to greenspace.

By using the sequential approach to site layout, the LPA and developers should be able to avoid the areas at risk and leave clear for potential flood storage. See the SFRA Maps in Appendix A to spatially assess the areas of the sites at risk.

6.8 Guidance for Developers

This SFRA provides the evidence base for developers to assess flood risk at a strategic level and to determine the requirements of an appropriate site-specific FRA. Before carrying out an FRA, developers should check with the LPA whether the Sequential Test has been carried out. If not, the developer must apply the Sequential Test as part of their FRA by comparing their proposed development site with other available sites to ascertain which site has the lowest flood risk. The EA provides advice on this via:

https://www.gov.uk/guidance/flood-risk-assessment-the-sequential-test-for-applicants

When initially considering the development options for a site, developers should use this SFRA, the NPPF and the FRCC-PPG to:

- ***Identify whether the site is***
    - *A windfall development, allocated development, within a regeneration area, single property or subject to a change of use to identify if the Sequential and Exception Tests are required.*
- ***Check whether the Sequential Test and / or the Exception Test have already been applied (see Figure 6-3)***
    - *Request information from the LPA on whether the Sequential Test, or the likelihood of the site passing the Exception Test, have been assessed;*
    - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test.*
- ***Consult with the LPA, the LLFA and the EA and the wider group of flood risk consultees, where appropriate, to scope an appropriate FRA if required***
    - *Guidance on FRAs provided in Section 6.5.4 of this SFRA;*
    - *Also, refer to the EA Standing Advice, CIRIA Report C624, the NPPF and the FRCC-PPG;*
    - *Consult the LLFA.*
- ***Submit FRA to the LPA and the EA for approval, where necessary***

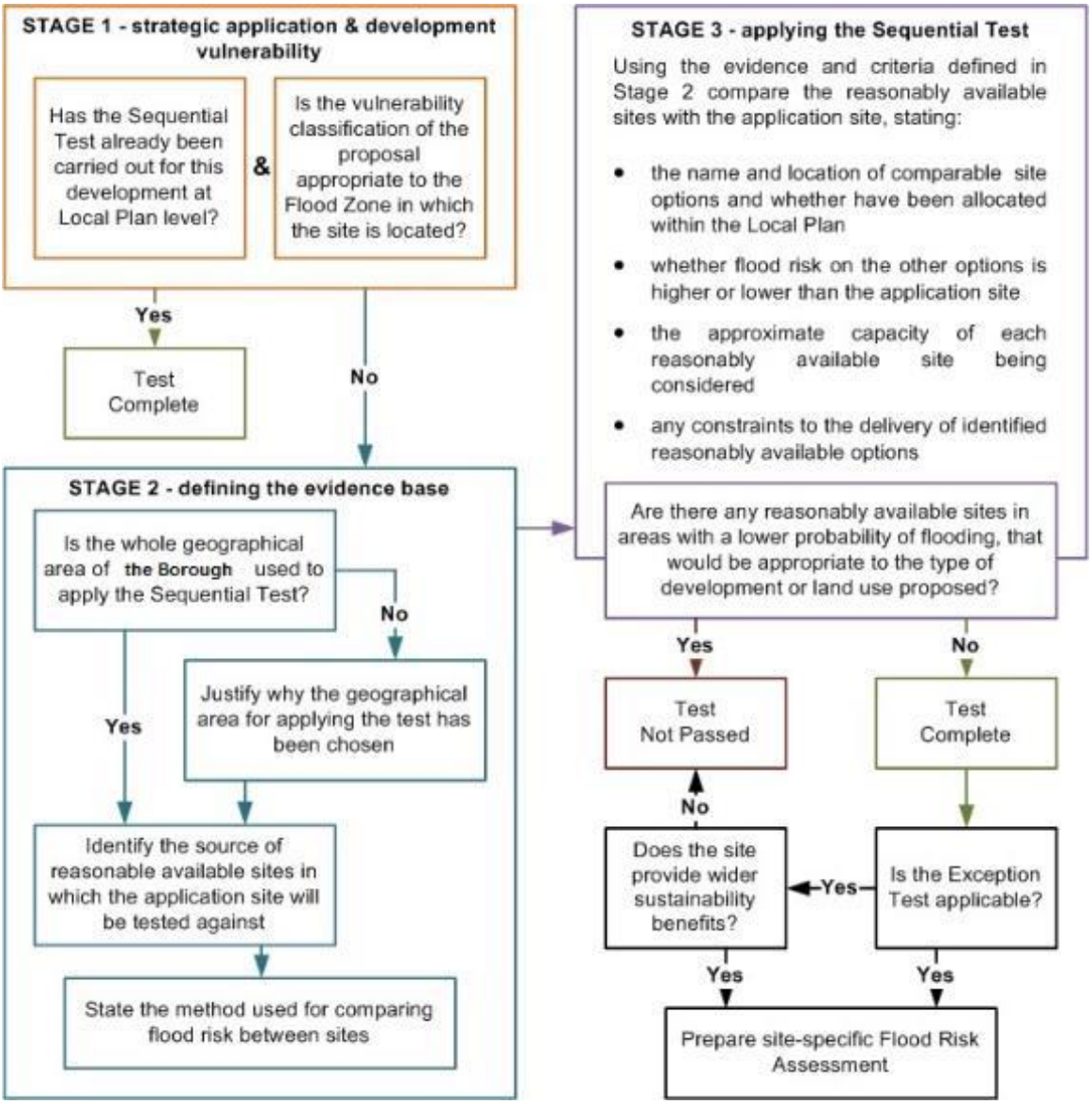
Table 6-9 identifies, for developers, when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who should apply the tests if required.

Table 6-9: Development types and application of Sequential and Exception Tests for developers

Development	Sequential Test Required	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Allocated Sites	No (assuming the development type is the same as that submitted via the allocations process)	LPA should have already carried out the test during the allocation of development sites	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Yes	Developer provides evidence, to the LPA that the test can be passed. An area of search will be defined by local circumstances relating to the catchment and for the type of development being proposed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration Sites Identified Within Local Plan	No	-	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Redevelopment of Existing Single Properties	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Changes of Use	No (except for any proposal involving changes of use to land involving a caravan, camping or chalet site	Developer provides evidence, to the LPA that the test can be passed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

Figure 6-3 shows what developers should do with regards to applying the Sequential Test if the LPA has not already done so.

Figure 6-3: Development management Sequential Test process



The Sequential Test does not apply to change of use applications unless it is for change of land use to a caravan, camping or chalet site, or to a mobile home site or park home site. The Sequential Test can also be considered adequately demonstrated if both of the following criteria are met:

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (Local Plan); and
- The development vulnerability is appropriate to the Flood Zone (see Table 3 of the FRCC-PPG).

If both these criteria are met, reference should be provided for the site allocation of the Local Plan document and the vulnerability of the development should be clearly stated.

When applying the Sequential Test, the following should also be considered:

- **The geographic area in which the Test is to be applied;**

- **The source of reasonable available sites in which the application site will be tested against; and**
- **The evidence and method used to compare flood risk between sites.**

Sites should be compared in relation to flood risk; Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development on the local area, and future environmental conditions that would be experienced by the inhabitants of the development.

The test should conclude if there are any reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

The LPA should now have sufficient information to be able to assess whether or not the proposed site has passed the Sequential Test. If the Test has been passed, then the developer should apply the Exception Test in the circumstances set out by tables 1 and 3 of the FRCC-PPG.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific FRA has not already been carried out, a site-specific FRA should be completed in line with the NPPF and the FRCC-PPG.

In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach to locating development within the site. As part of their application and masterplanning discussions with applicants, LPAs should seek whether or not:

- Flood risk can be avoided by substituting less vulnerable uses or by amending the site layout;
- Less vulnerable uses for the site have been considered; or
- Density can be varied to reduce the number or the vulnerability of units located in higher risk parts of the site.

6.9 Sustainable Drainage Systems (SuDS)

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and consequently a potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding.

The Department for Communities and Local Government (DCLG) announced, in December 2014, that local planners should be responsible for delivering SuDS[38]. Changes to planning legislation gave provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the 'non-statutory technical standards for sustainable drainage systems'[39], published in March 2015. A Practice Guidance[40] document has also been developed by the Local Authority SuDS Officer Organisation (LASOO) to assist in the application of the non-statutory technical standards.

This builds on the existing planning system, the NPPF, which developers and local authorities are already using. Policy changes to the planning system can also be introduced relatively quickly ensuring that flood risk benefits from sustainable drainage systems can be brought forward as part of planning application proposals. The NPPF continues to reinforce how

38 http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/

39 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

40 http://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf

planning applications that fail to deliver SuDS above conventional drainage techniques could be rejected and sustainable drainage should form part of integrated design secured by detailed planning conditions so that the SuDS to be constructed must be maintained to a minimum level of effectiveness.

Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers; and, set out a minimum standard to which the sustainable drainage systems must be maintained.

The runoff destination should always be the first consideration when considering design criteria for SuDS including the following possible destinations in order of preference:

1. To ground;
2. To surface water body;
3. To surface water sewer;
4. To combined sewer.

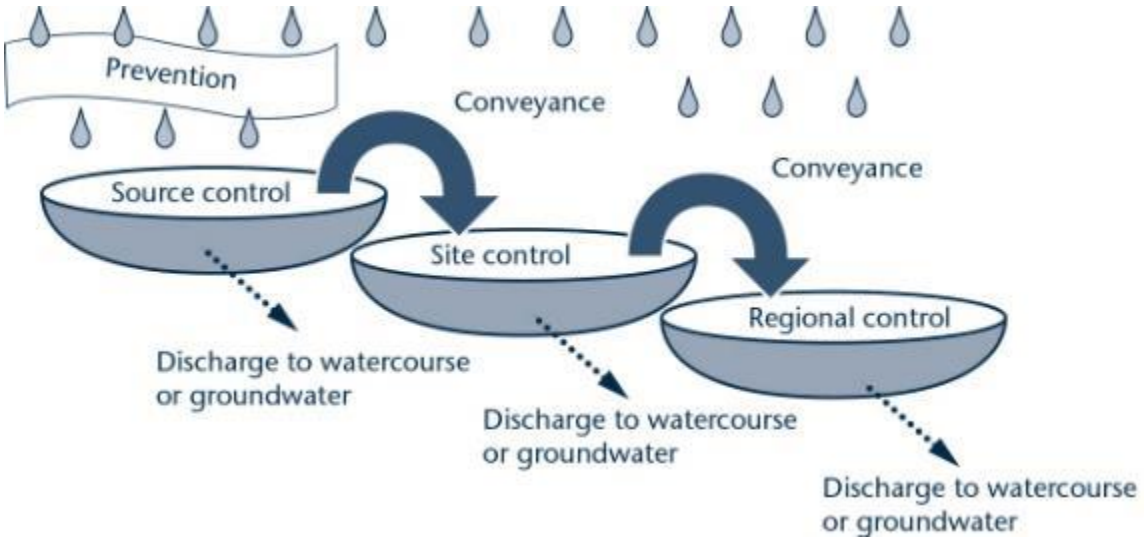
Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination. Developers should also establish that proposed outfalls are hydraulically capable of accepting the runoff from SuDS through consultation with the LLFA, EA and UU.

The non-statutory technical standards for sustainable drainage systems (March 2015) sets out appropriate design criteria based on the following:

1. Flood risk outside the development;
2. Peak flow control;
3. Volume control;
4. Flood risk within the development;
5. Structural integrity;
6. Designing for maintenance considerations;
7. Construction.

Many different SuDS techniques can be implemented. As a result, there is no one standard correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle (see **Error! Reference source not found.**), will be required, where source control is the primary aim.

Figure 6-4: SuDS Management Train Principle[41]



The effectiveness of a flow management scheme within a single site is heavily limited by land use and site characteristics including (but not limited to) topography; geology and soil (permeability); and available area. Potential ground contamination associated with urban and former industrial sites should be investigated with concern being placed on the depth of the local water table and potential contamination risks that will affect water quality. The design, construction and ongoing maintenance regime of any SuDS scheme must be carefully defined as part of a site-specific FRA. A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential for successful SuDS implementation.

6.9.1 Local standards

In addition to the national standards, the LPA and LLFA may set local requirements for planning permission that include more rigorous obligations than these non-statutory technical standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high risk areas. This could include improvements on Greenfield runoff rates.

The Council has adopted Local Standards SuDS Guidance that will need to be considered when developing development proposals. The LPA should always be contacted with regards to these local requirements at the earliest opportunity in development planning.

The Council's Design and Technical SuDS Guidance is available to view from the link below:

https://www.warrington.gov.uk/downloads/file/15569/design_and_technical_guidance

The CIRIA SuDS Manual[42] 2007 should also be consulted by the LPA and developers. The SuDS manual (C697) is highly regarded and was updated in 2016 to incorporate the latest research, industry practice, technical advice and adaptable processes to assist in the planning, design, construction, management and maintenance of good SuDS. The SuDS Manual complements the non-statutory technical standards and goes further to support the cost-effective delivery of multiple benefits.

Drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in

41 CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative

42 https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

Managing surface water discharges from new development is crucial in managing and reducing flood risk to new and existing development.

Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding. The Planning System has a key role to play in setting standards for sustainable drainage from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage plays an important part in reducing flows in the sewer network and in meeting environmental targets, alongside investment in maintenance by the water companies on their assets. Water companies plan their investment on a five year rolling cycle, in consultation with key partners, including the EA.

WBC expect the content for a SuDS Design Statement for a typical housing development should include:

- Description and plan showing the characteristics of the site including – topography, ground conditions, natural directions and paths for water movement.
- Options analysis of discharge routes offsite (infiltration, watercourse, surface water sewer) with information on any agreements / confirmed information.
- Options analysis of drainage solutions demonstrating considerations of SuDS principles in development layout. Particularly - keeping water on or near the surface from collection to conveyance to storage, the use of sub-catchments and SuDS in sequence from management at source to larger features in open space, integration with landscape. **NOTE: If no agreement on discharge route has been established alternatives must be explored.**
- Outline figures to support drainage options.
- Principles of management of return periods both within and external to the drainage system up to 1 in 100 plus climate change.
- Proposed management arrangements for all drainage infrastructure including who is responsible, what maintenance activities and how resourced.
- Concept plan and critical sections to demonstrate feasibility of solutions.

The most successful SuDS schemes are delivered through a collaboration between the Drainage Engineer and the design team for example, the architect, landscape architect and Highway Engineer.

Overland Flow Paths

Underground drainage systems have a finite capacity and regard should always be given to larger events when the capacity of the network will be exceeded. Hence there is a need to design new developments with exceedance in mind. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

Master planning should ensure that existing overland flow paths are retained within the development. As a minimum, the developer should investigate, as part of a FRA, the likely extents, depths and associated hazards of surface water flooding on a development site, as shown by the RoFSW dataset. This is considered to be an appropriate approach to reduce the risk of flooding to new developments. Green infrastructure should be used wherever possible to accommodate such flow paths. **Floor levels should always be set a minimum of 300 mm above adjacent roads** to reduce the consequences of any localised flooding.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography; geology and soil (permeability); development density; existing drainage networks both on-site and in the surrounding area; adoption issues; and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined at an early stage and a clear and comprehensive

understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential.

6.10 Accounting for climate change

Climate change will increase flood risk over the lifetime of a development. This SFRA has considered a precautionary approach to climate change as updated modelled climate change outputs (i.e. using the EA's 2016 allowances for peak water levels) are not available for this study. It is often the case that modelled 1 in 1000 AEP event outlines are similar to modelled climate change scenarios for the 1 in 100 AEP event. Therefore, Flood Zones 2 and 3 of the EA's Flood Map for Planning have been used as a climate change proxy to provide an indication of risk to sites in the future.

For this SFRA therefore, the assumption should be that the current day Flood Zone 2 will become Flood Zone 3a in 100 years' time and Flood Zone 3a could become the Flood Zone 3b. Predicting future expansion of the functional floodplain is however more difficult as the functional floodplain extent is based on a number of different criteria, as discussed in Section 5.2.5.

This approach to climate change is precautionary though is considered to be the most pragmatic methodology available. This approach is also consistent with other SFRAs and professional modelling experience. As such, for any sites within Flood Zone 2, the possibility of these sites being within Flood Zone 3a within 100 years' time should be considered through the FRA.

A more detailed assessment of the impacts of climate change on flooding from the land and rivers should be carried out as part of any Level 2 SFRA or FRA. This should be carried out using the sensitivity ranges presented in this section which will provide an appropriately robust response to the uncertainty about climate change impacts on rainfall intensities and river flows. Considering the impacts of climate change within a FRA / Level 2 SFRA will have implications for both the type of development that is appropriate according to its vulnerability to flooding and design standards for any SuDS or mitigation schemes proposed. For example, through very flat floodplains, using the +30 per cent from 2070 to 2115 allowance for peak river flows, could see an area currently within lower risk zones (Flood Zone 2), in future be re-classified as lying within a higher risk zone (Flood Zone 3a). Therefore, residential development may not be appropriate without suitable flood mitigation measures or flood resilient or resistant houses. In well-defined floodplains, the same climate change allowance could have significant impacts on flood depths influencing building type and design (e.g. finished floor levels).

The EA revised the climate change allowances in 2016 and further updated them in February 2017, for use in FRAs and SFRAs and will use these revised allowances when providing advice:

https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

The revised climate change allowances are predictions of anticipated change for:

- Peak river flow by River Basin District;
- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

Deciding on which of the peak river flow allowances to use is based on the flood zone the development is within and the associated vulnerability classification (see Table 2 of the FRCC-PPG). Table 6-10 shows the peak river flow allowances for the North West River Basin District.

Table 6-10: Recommended Peak River Flow Allowances for the North West River Basin District

Allowance Category	Total Potential Change Anticipated for…		
	2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Upper end	+20%	+35%	+70%
Higher central	+20%	+30%	+35%
Central	+15%	+25%	+30%

The peak rainfall intensity allowance applies to the whole of England. SFRAs and FRAs should assess both the central and upper end allowances to gauge the range of impacts. Table 6-11 shows these allowances.

Table 6-11: Peak Rainfall Intensity Allowance in Small and Urban Catchments for England

Allowance Category	Total Potential Change Anticipated for…		
	2015-2039	2040-2069	2070-2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Allowances for sea level rise are based on different regions of England. The allowances for the North West of England are shown in Table 6-12. The number in brackets is the cumulative sea level rise for each year within each range.

Table 6-12: Sea Level Allowance for North West England

1990 - 2025	2026 - 2055	2056 - 2085	2086 - 2115	Cumulative Rise 1990 - 2115 (metres)
2.5 mm (87.5 mm)	7 mm (210 mm)	10 mm (300 mm)	13 mm (390 mm)	0.99 m

The EA will also require consideration, if appropriate, of the 'high++ allowances' for peak river flows and mean sea level rise where a development is considered to be very sensitive to flood risk and with lifetimes beyond the end of the century. This could include infrastructure projects or developments that significantly change existing settlement patterns. The high++ allowances can be found in the EA's *Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities*[43], which uses science from UKCP09. This guidance is based on the government's policy for climate change adaptation, and is specifically intended for projects or strategies seeking Government Flood Defence Grant in Aid (FDGiA) funding. However, RMAs in England may also find it useful in developing plans and making Flood and Coastal Erosion Risk Management (FCERM) investment decisions even if there is no intention of applying for central government funding. This is important for any future large scale infrastructure used to support the delivery of strategic sites such as flood defence schemes.

Although, it is anticipated that increases in river flows will lie somewhere within the range of the central to upper end estimates of the February 2016 allowances, more extreme change cannot be discounted. The high++ allowances can be used to represent more severe climate change impacts and help to identify the options that would be required. The UKCP09 high++ allowances for peak river flows and relative mean sea level rise are presented in Table 6-13 and Table 6-14 respectively.

Table 6-13: UKCP09 High++ Allowances for Peak River Flow for North West England (relative to 1961-90 baseline)

River Basin District	Total Potential Change Anticipated for…		
	2020s (2015-39)	2050s (2040-69	2080s (2070-2115
North West	+25%	+45%	+95%

Table 6-14: UKCP09 High++ Mean Sea Level Allowance (compared to 1990 baseline, includes land movements)

Sea Level Rise mm/yr up to 2025	Sea Level Rise mm/yr 2026 to 2050	Sea Level Rise mm/yr 2051 to 2080	Sea Level Rise mm/yr 2081 to 2115
6	12.5	24	33

As discussed, modelled climate change outputs, using the February 2016 allowances, are not available at the time of writing for this Level 1 SFRA. However, any Level 2

43 Environment Agency Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities

assessment, following on from this Level 1, could involve the modelling of appropriate climate change events, where fully functioning EA hydraulic models are available.

7 Emergency Planning

The provisions for emergency planning for local authorities as Category 1 responders are set out by the Civil Contingencies Act, 2004 and the National Flood Emergency Framework for England, December 2014[44]. This framework is a resource for all involved in emergency planning and response to flooding from the sea, rivers, surface water, groundwater and reservoirs. The Framework sets out the Government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies,
- Give all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies,
- Establish clear thresholds for emergency response arrangements,
- Place proper emphasis on the multi-agency approach to managing flooding events,
- Provide clarity on the means of improving resilience and minimising the impact of flooding events,
- Provide a basis for individual responders to develop and review their own plans, and
- Being a long-term asset that will provide the basis for continuous improvement in flood emergency management.

Along with the EA flood warning systems, there are a range of flood plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and tactical response framework for key responders.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The SFRA Maps in Appendix A and accompanying GIS layers should be made available by the LPA for consultation by emergency planners during an event and throughout the planning process.

7.1 Civil Contingencies Act

Under the Civil Contingencies Act (CCA, 2004)[45], WBC is classified as a Category 1 responder and has duties to assess the risk of emergencies occurring, and uses this to:

- inform contingency planning;
- put in place emergency plans;
- put in place Business continuity management arrangements;
- put in place arrangements to make information available to the public about civil protection matters;
- maintain arrangements to warn, inform and advise the public in the event of an emergency;
- share information with other local responders to enhance coordination;
- cooperate with other local responders to enhance coordination and efficiency and to provide advice and assistance to businesses and voluntary organisations about business continuity management.

During an emergency such as a flood event, the local authority must also co-operate with other Category 1 responders (such as the emergency services and the EA) to provide the core response.

7.1.1 Local Resilience Forum

WBC is a partner of the Cheshire Resilience Forum (CRF[46]). The role of the Resilience Forum is to ensure an appropriate level of preparedness to enable an effective multi-agency response to

44 https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england

45 https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act

46 http://cheshireresilience.org.uk/

emergency incidents that may have a significant impact on the communities of Cheshire. CRF consists of representatives from the Emergency Services, all four of Cheshire's local authorities (WBC, Halton Borough Council, Cheshire West and Chester Council and Cheshire East Council), the EA, Cheshire Constabulary, British Transport Police, NHS England, Public Health England and the Maritime and Coastguard Agency. The CRF's Advice on flooding can be found online via

http://cheshireresilience.org.uk/flood-warning-areas/

Community Risk Register

As a strategic decision-making organisation, the CRF prepared a Community Risk Register (CRR)[47], last updated in 2014, which considers the likelihood and consequences of the most significant risks and hazards the area faces, including coastal and inland fluvial and urban flooding. This SFRA can help to inform this. The CRR is considered as the first step in the emergency planning process and is designed to reassure the local community that measures and plans are in place to respond to the potential hazards listed within the CRR.

Emergency Response Manual

The Cheshire Emergency Response Manual[48], last updated in October 2014, is designed to provide, in a single document, an outline of the role and responsibilities of individual agencies when responding to an emergency being managed across agencies, as well as to highlight any multi-agency plans. By outlining these different roles, the manual helps provide a unified managed response during any emergency. Appendix H of the manual discusses the emergency responses to flooding.

Community Emergency Plan

Communities may need to rely on their own resources to minimise the impact of an emergency, including a flood, before the emergency services arrive. Many communities already help each other in times of need, but experience shows that those who are prepared cope better during an emergency. Communities with local knowledge, enthusiasm and information are a great asset and a Community Emergency Plan can help. Details on how to produce a community emergency plan, including a toolkit and template, are available from the government's website[49].

Household Emergency Life-Saving Plan

The CRF recommends individual families should complete a Household Emergency Life-Saving Plan and emergency grab bag to prepare for emergencies. A template plan can be downloaded from http://cheshireresilience.org.uk/be-prepared/how-to-prepare-2/in-emergencies/

A checklist on what to include in an emergency grab bag is available via

http://cheshireresilience.org.uk/emergency-grab-bag/

7.1.2 Local Flood Plans

This SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. WBC will be unable to write specific flood plans for new developments at flood risk. Developers should write their own. Generally, owners with individual properties at risk should write their own individual flood plans, however larger developments or regeneration areas, such as retail parks, hotels and leisure complexes, should consider writing one collective plan for the assets within an area.

A number of multi-agency Flood Plans are currently in place across the Borough, helping to underpin the emergency response to a local or wide scale flood incident. Templates for completing flood plans for personal, business and community purposes can be found on the government website via:

https://www.gov.uk/prepare-for-flooding/future-flooding

47 http://www.cheshirefire.gov.uk/Assets/1/CRF-CRR-Public-April-2014.pdf

48 http://cheshireresilience.org.uk/wp-content/uploads/2016/05/CRF-Emergency-Response-Manual.pdf

49 https://www.gov.uk/guidance/resilience-in-society-infrastructure-communities-and-businesses#community-resilience

This SFRA can help to:

- Update these flood plans if appropriate;
- Inform emergency planners in understanding the possibility, likelihood and spatial distribution of all sources of flooding (emergency planners may however have access to more detailed information, such as for Reservoir Inundation Maps, which have not been made available for this SFRA);
- Identify safe evacuation routes and access routes for emergency services;
- Identify key strategic locations to be protected in flooding emergencies, and the locations of refuge areas which are capable of remaining operational during flood events;
- Provide information on risks in relation to key infrastructure, and any risk management activities, plans or business continuity arrangements;
- Raise awareness and engage local communities;
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk; and
- Provide flood risk evidence for further studies.

7.2 Flood Warning and Evacuation Plans

Developments that include areas that are designed to flood (e.g. ground floor car parking and amenity areas) or have a residual risk associated with them, will need to provide appropriate flood warning and instructions so users and residents are safe in a flood. This will include both physical warning signs and written flood warning and evacuation plans. Those using the new development should be made aware of any evacuation plans.

Whilst there is no statutory requirement on the EA or the emergency services to approve evacuation plans, WBC is accountable under its Civil Contingencies duties, via planning condition or agreement, to ensure that plans are suitable. This should be done in consultation with Development Management Officers. Given the cross cutting nature of flooding, it is recommended that further discussions are held internally to WBC between emergency planners and policy planners / development management officers, the LLFA, drainage engineers and also to external stakeholders such as the emergency services, the EA and UU.

It may be useful for both the LLFA and spatial planners to consider whether, as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. The application of such a condition is likely to require policy support in the Local Plan, and discussions within the Local Resilience Forum are essential to establish the feasibility / effectiveness of such an approach, prior to it being progressed. It may also be useful to consider how key parts of agreed flood evacuation plans could be incorporated within local development documents, including in terms of protecting evacuation routes and assembly areas from inappropriate development.

Once the development goes ahead, it will be the requirement of the plan owner (developer) to make sure the plan is put in place, and to liaise with WBC regarding maintenance and updating of the plan.

7.2.1 What should the Plan Include?

Flood warning and evacuation plans should include the information stated in

Table 7-1. Advice and guidance on plans is accessible from the EA website and there are templates available for businesses and local communities

Table 7-1: Flood warning and evacuation plans

Consideration	Purpose
Availability of existing flood warning system	The EA offers a flood warning service that currently covers designated Flood Warning Areas in England and Wales. In these areas they are able to provide a full Flood Warning Service (see Section 7.2.2).
Rate of onset of flooding	The rate of onset is how quickly the water arrives and the speed at which it rises which, in turn, will govern the opportunity for people to effectively prepare for and respond to a flood. This is an important factor within Emergency Planning in assessing the response time available to the emergency services.
How flood warning is given and occupants awareness of the likely frequency and duration of flood events	Everyone eligible to receive flood warnings should be signed up to the EA flood warning service. Where applicable, the display of flood warning signs should be considered. In particular sites that will be visited by members of the public on a daily basis such as sports complexes, car parks, retail stores. It is envisaged that the responsibility should fall upon the developers and should be a condition of the planning permission. Information should be provided to new occupants of houses concerning the level of risk and subsequent procedures if a flood occurs.
The availability of staff / occupants / users to respond to a flood warning and the time taken to respond to a flood warning	The plan should identify roles and responsibilities of all responders. The use of community flood wardens should also be considered.
Designing and locating safe access routes, preparing evacuation routes and the identification of safe locations for evacuees	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and flood hazard rating, including allowance for climate change, should be considered when identifying these routes.
Vulnerability of occupants	Vulnerability classifications associated with development as outlined in the FRCC-PPG. This is closely linked to its occupiers.
How easily damaged items will be relocated and the expected time taken to re-establish normal use following an event	The impact of flooding can be long lasting well after the event has taken place affecting both the property which has been flooded and the lives that have been disrupted. The resilience of the community to get back to normal will be important including time taken to repair / replace damages.

7.2.2 EA Flood Warning Areas

The EA monitor river levels within the main rivers affecting the Borough and based upon weather predictions provided by The Met Office, making an assessment of the anticipated maximum water level that is likely to be reached within the proceeding hours (and/or days). Where these predicted water levels are expected to result in inundation of a populated area, the EA will issue a series of flood warnings within defined Flood Warning Areas (FWA), encouraging residents to take action to avoid damage to property in the first instance.

More information on flood warning is provided by the EA via:

https://www.gov.uk/government/publications/flood-warnings-what-they-are-and-what-to-do

There are 20 EA Flood Warning Areas (FWA) in operation in the Borough. The majority of FWAs are located along the right bank of the Mersey Estuary. There also large FWAs along Sankey Brook. The SFRA Maps in Appendix A show the location and coverage of each FWA.

Live information on flood warnings and flood alerts is available via:

https://flood-warning-information.service.gov.uk/

7.3 Flood Awareness

Emergency planners may also use the outputs from this SFRA to raise awareness within local communities. This should include raising awareness of flood risks, roles and responsibilities and

measures that people can take to make their homes more resilient to flooding from all sources whilst also encouraging all those at fluvial flood risk to sign up to the EA's Floodline Warnings Direct[50] service.

It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas, to ensure that adequate pre-planning, response and recovery arrangements are in place.

50 https://fwd.environment-agency.gov.uk/app/olr/home

8 Conclusions and Recommendations

8.1 Conclusions

This SFRA provides a single repository planning tool relating to flood risk and development in Warrington region. Key flood risk stakeholders namely the EA, the LLFA, UU and Canal & River Trust were consulted to collate all available and relevant flood risk information on all sources into one comprehensive assessment. Together with this report, this SFRA also provides a suite of interactive GeoPDF flood risk maps (Appendix A) and a Development Site Assessment spreadsheet (Appendix B) illustrating the level of risk to the potential development sites identified by the LPA, with subsequent recommendations.

The flood risk information, assessment, guidance and recommendations of the SFRA will provide the Council with the evidence base required to apply the Sequential Test, as required under the NPPF, and demonstrate that a risk based, sequential approach has been applied in the process of allocating land for new development through the new Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas where the council is looking for continued growth, this will not always be possible. This SFRA therefore provides the necessary links between spatial development, wider flood risk management policies, local strategies / plans and on the ground works by combining all available flood risk information together into one single repository. As this is a strategic study, detailed local information on flood risk is not fully accounted for. For a more detailed assessment of specific areas or sites, a Level 2 SFRA may be carried out following on from the completion of this Level 1 assessment, if required.

8.2 Planning Policy and flood risk recommendations

The following planning policy recommendations relating to flood risk are designed to enable the Council to translate the information provided in this Level 1 SFRA into meaningful Local Plan policy for flood risk and water management:

Policy Recommendation 1: No development within Flood Zone 3b…

…as per the NPPF and FRCC-PPG, unless in exceptional circumstances such as for essential infrastructure or where development is water compatible.

Development must not impede the flow of water within Flood Zone 3b nor should it reduce the volume available for storage of flood water.

Refer to tables 1 to 3 of the FRCC-PPG.

Policy Recommendation 2: Consider surface water flood risk…

…alongside fluvial and tidal risk, including possible withdrawal, redesign or relocation for sites at significant surface water risk.

Flood Risk Assessments should always consider surface water flood risk management and options for on-site flood storage.

Policy Recommendation 3: Sequential approach to site allocation and site layout…

…must be followed by the LPA to ensure sustainable development when either allocating land in Local Plans or determining planning applications for development.

The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required (i.e. for highly vulnerable sites).

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3a, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test, if required.

This SFRA, the NPPF and FRCC-PPG should be consulted throughout this process.

Policy Recommendation 4: Requirement for a site-specific Flood Risk Assessment…

…from a developer when a site is:

- Within Flood Zone 3a or Flood Zone 2
- Within Flood Zone 1 and 1 hectare or greater in size
- At risk from surface water flooding
- Within a CDA and 0.5 hectare or greater in size
- Situated in an area currently benefitting from defences
- Situated within 20 metres of the bank top of a Main River
- Situated over a culverted watercourse or where development will be required to control or influence the flow of any watercourse

Before deciding on the scope of the FRA, this SFRA should be consulted along with the LPA, LLFA and EA. The FRA should be submitted to and approved by the LPA including suitable consultation with the LLFA and the EA.

Policy Recommendation 5: Use of appropriately sourced of SuDS…

…required for all major developments of 10 or more residential units or equivalent commercial development. This is in accordance with the interim national standards published in March 2015.

SuDS scoping and design, as part of a site-specific FRA, must be included within the early stages of the site design in order to incorporate appropriate SuDS within the development.

The LPA, LLFA and UU must be consulted during the site design stage and the FRA must be submitted to and approved by the LPA, considering all consultation with key stakeholders.

Appropriate guidance should be followed, as referenced within this SFRA.

The EA should be consulted with regards to surface water if surface water is being discharged from the site to a Main River.

Policy Recommendation 6: Phasing of development…

…should be carried out by the LPA to avoid any cumulative impacts of flood risk.

Using a phased approach to development, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus contributing to a sustainable approach to site development.

It may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

Policy Recommendation 7: Planning permission for at risk sites…

…can only be granted by the LPA where a site-specific FRA shows that:

- The NPPF and FRCC-PPG have been referenced together with appropriate consultation with the LLFA, the EA, UU and the IDB, where applicable
- The effects of climate change have been taken into account using the February 2016 allowances developed by the EA, though modelled climate change outputs are not available and have not been used in this Level 1 SFRA
- There is no loss in floodplain storage resulting from the development
- The development will not increase flood risk elsewhere
- There is no adverse effect on the operational functions of any existing flood defence infrastructure
- Proposed resistance / resilience measures designed to deal with current and future risks are appropriate
- Appropriate SuDS techniques have been considered and are to be incorporated into the design of the site, where applicable
- Whether the development will be safe and has passed the Exception Test, if applicable.

8.3 Recommendations for Further Work

The SFRA process has developed into more than just a planning tool. Sitting alongside the Warrington LFRMS, SWMP and PFRA, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are a number of plans and assessments listed in Table 8-1 that would be of benefit to WBC in developing its flood risk evidence base to support the delivery of the Local Plan or to help fill critical gaps in flood risk information.

8.3.1 Level 2 SFRA

The Council should review the sites where they expect the main housing numbers and employment sites to be delivered, using Section 6.4 of this report, the SFRA Maps in Appendix A and the Development Site Assessment spreadsheet in Appendix B. A Level 2 SFRA will be required if a large site, or group of sites, are within Flood Zone 3 and have strategic planning objectives, which means they cannot be relocated or avoided. A Level 2 SFRA may also be required if the majority of the sites are within Flood Zone 2 or are at significant risk of surface water flooding. Residual flood risk, such as defence infrastructure failures or defence breaches or overtopping, should also be taken account of when considering options for future work. A Level 2 assessment can also be used to model the EA's February 2016 climate change allowances, once the aforementioned EA models are available.

A Level 2 SFRA should build on the source information provided in this Level 1 assessment and should show that a site will not increase risk to others and will be safe, once developed, and will pass the Exception Test, if required. A Level 2 study may also assess locations and options for the implementation of open space, or Green Infrastructure, to help manage flood risk in key areas.

The LPA will need to provide evidence in their Local Plan to show that the housing numbers (and other sites) can be delivered. The Local Plan may be rejected if a large number of sites require the Exception Test to be passed but with no evidence that this will be possible.

Once all sites within this Level 1 assessment have been reviewed by the LPA then further advice or guidance should be sought to discuss possible next steps.

Table 8-1: Recommended further work for WBC

Type	Study	Explanation	Timeframe
Understanding of local flood risk	EA Flood Risk Mapping updates / Level 1 SFRA update	EA modelling updates of models to update this Level 1 SFRA once models are finalised	Short term
	Level 2 SFRA	Further, more detailed assessment of flood risk to high risk sites, as notified by this Level 1 SFRA	Short term
	SWMP / drainage strategy	Update of the 2012 SWMP for those high surface water risk sites / areas as notified by this Level 1 SFRA. Refinement of CDAs delineated through 2011 Level 1 SFRA. More robust data now available	Short term
	Climate change assessment for Level 1 update or Level 2 SFRA	Modelling of climate change, using EA's February 2016 allowances for updated EA models	Short term
Flood storage	Community Infrastructure Levy (CIL). WwNP and GI Assessment	For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. The LPA could include capital for the purchase, design, planning and maintenance of GI within its CIL programme. Continue WwNP proposals in upper catchments	Short term

Type	Study	Explanation	Timeframe
Data Collection	Flood Incident Data	The LLFA has a duty to investigate and record details of locally significant flood events. General data collected for each incident should include date, location, weather conditions, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any RMA.	Short Term / Ongoing
	FRM Asset Register	The LLFA should continue to update and maintain its flood risk management register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Risk assessment	Asset Register Risk Assessment	The LLFA should carry out a strategic assessment of structures and features on the FRM Asset Register to inform capital programme and prioritise maintenance programme. Critical assets (i.e. culverts in poor condition) to be prioritised for assessment and any subsequent designated works.	Short Term
Capacity	SuDS review / guidance	The LLFA with the LPA should identify internal capacity required to deal with SuDS applications, set local specification and set policy for adoption and maintenance of SuDS.	Specification adopted (Section 6.9.1)
Partnership	UU	WBC should continue to work with YWS on sewer and surface water projects.	Ongoing
	EA	WBC should continue to work with the EA on fluvial flood risk management projects. SCC should also identify potential opportunities for joint schemes to tackle flooding from all sources.	Ongoing
	Manchester Ship Canal Company	WBC should continue to work with the Manchester Ship Canal Company on flood risk and development planning, if applicable	Ongoing
	Canal & River Trust	WBC should continue to work with the Canal & River Trust to understand the residual risks associated with the canal network, and also asset owners of reservoirs.	Ongoing
	Community	Continued involvement with the community through WBC's existing flood risk partnerships.	Ongoing

Appendices

A SFRA Maps

Interactive GeoPDF Maps

Open the Overview Map in Adobe Acrobat (2016s5327_Warrington_BC_SFRA_Index.pdf). The Index Map contains a set of index squares covering the authority area at a scale of 1:10,000. Clicking on one of these index squares will open up a more detailed map of that area (scale = 1:10,000) by way of a hyperlink.

Within the detailed maps, use the zoom tools and the hand tool to zoom in/out and pan around the open detailed map. In the legend on the right-hand side of the detailed maps, layers can be switched on and off when required by way of a dropdown arrow. The potential development site reference labels can also be switched on and off if, for example, smaller sites are obscured by the labels.

B Development Site Assessment Spreadsheet

Excel spreadsheet containing an assessment of flood risk to the potential development sites based on Flood Zones 2, 3a and 3b as delineated through this SFRA, and also the Risk of Flooding from Surface Water map (RoFSW).

C Functional Floodplain Delineation

Technical note explaining the methodology behind the delineation of the functional floodplain (Flood Zone 3b) for this SFRA.

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