Level 1 Strategic Flood Risk Assessment

Wirral Council

Final Report

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Contract

This report describes work commissioned by John Entwistle, on behalf of Wirral Council, by a letter dated April 2018. Wirral Council's representative for the contract was John Entwistle. Rachel Bryan of JBA Consulting carried out this work.

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Purpose

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JBA Consulting has no liability regarding the use of this report except to Wirral Council.

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Carbon footprint

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Executive Summary

This Level 1 Strategic Flood Risk Assessment (SFRA) is an update to the 2009 Level 1 SFRA 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) (2019) and Flood Risk and Coastal Change Planning Practice Guidance[2] (FRCC-PPG).

The Level 1 SFRA is focused on collecting readily available flood risk information from a number of key stakeholders, the aim being to help identify the number and spatial distribution of flood risk sources present throughout Wirral Council's authority area to inform the application of the Sequential Test.

Wirral Council (WC) requires this Level 1 SFRA 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 provide the evidence base for the Local Planning Authority's' (LPA) new Local Plan.

The LPA provided its latest assessed sites data and information. An assessment of flood risk to all assessed sites is provided to assist the LPA in its decision-making process for sites to take forward as part of the Local Plan.

A number of WC's SHLAA sites and Green Belt land parcels are shown to be at varying risk from fluvial, tidal and surface water flooding and residual risk. Development consideration assessments for all assessed SHLAA sites and Green Belt land parcels are summarised through a number of strategic recommendations within this report and the Development Sites Assessment spreadsheet in Appendix B. The strategic recommendations broadly entail the following:

- Strategic Recommendation A – potentially unsuitable site based on significant level of tidal / fluvial or surface water flood risk; (if development cannot be directed away from risk areas, the site will be unsuitable for development)
- 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;
- 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.

SHLAA sites

Of the 70 sites that are recommended as being potentially unsuitable for development, 25 sites are due to their location within the functional floodplain, listed in Table 6-9, and 45 sites due to significant surface water flood risk.

Of the 27 SHLAA sites to which Strategic Recommendation B applies, 25 have an indicative residential use and 2 have indicative mixed uses. Overall there are 186 assessed SHLAA sites to which Strategic Recommendation C applies. 156 of these sites are entirely within Flood Zone 1, meaning surface water risk is what needs to be mitigated at these sites. For these sites, the developer should consider the site layout with a view to removing the site footprint from the flood zone that is obstructing development i.e. the high and medium risk surface water flood zones. If this is not possible then the alternative would be to investigate the incorporation of on-site storage of water into the site design.

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

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

There are a number of large strategic sites with an indicative residential use, which are not at any significant risk from Flood Zones 3b or 3a. It should be possible for development to proceed in at least 73 of the indicative residential sites, which are over 1ha in size. There are 80 remaining indicative residential sites that are less than or equal to 1ha in size.

Recommendation D applies to 227 assessed SHLAA sites, 213 of which all are within Flood Zone 1, with 168 of the 213 at some level of surface water risk. The other 45 are not at any risk from surface water, according to the RoFSW.

Green Belt land parcels

Fourteen Green Belt land parcels are recommended as being potentially unsuitable for development, of which 12 have an indicative residential use, one is an existing hospital and one includes a large existing caravan site. Eight parcels have more than 10% of the site footprint within the functional floodplain. Five of these eight parcels, namely SP007, SP018, SP023, SP024, SP027, are unlikely to be suitable for development due to the considerably large areas located within the functional floodplain (20-45%).

Any area within the functional floodplain must either be removed from the site boundary (i.e. redrawn developable area boundaries) or the risk area is incorporated into the site design as open space / amenity areas free from development. For example, parcel SP018 (which includes a large caravan site) has a large area of 197ha and is 31% within the functional floodplain. In this instance, the parcel may be developable if the 31% is removed from the developable area, and the boundary redrawn, which will remove the risk from such a large site. However, each site will require more detailed assessment to gauge the viability of development going forwards. This is specific to sites / parcels where the developable area boundary is redrawn to exclude flood risk areas if feasible. Otherwise, the council may have to carry out a Level 2 assessment in order to assess whether risk can be accommodated on site and therefore allocate 'at risk' sites in the local plan. The Level 2 assessment should show that such sites can pass the second part of the Exception Test. The developer would still however be required to carry out a suitable FRA in order to gain planning permission.

All 6 parcels recommended as being potentially unsuitable for development based on significant surface water risk have an indicative residential use, and therefore more vulnerable. Each of the 6 parcels are less than 10% within the 1 in 30 AEP event, and all 6 parcels are also between 10%-20% within the 1 in 100 year event and therefore are at significant surface water flood risk. In particular, parcel SP109 which is 0.19 ha in size, may struggle to accommodate surface water on site whereas parcels such as SP026 (40.62 ha) and SP044 (41.63 ha) may be able to provide areas for surface water storage.

All parcels will need to be reviewed on a site by site basis to determine whether any of these can be taken forward or whether they should be withdrawn.

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 assessed SHLAA sites and Green Belt land parcels - Appendix A;
- Development Site Assessment spreadsheet detailing the risk to each site with recommendations on development - Appendix B; and
- A note on the delineation of the functional floodplain following discussion and agreement between the Council and the EA - Appendix C.

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Abbreviations

ABD	Areas Benefitting from Defences
ACDP	Area with Critical Drainage Problems
AEP	Annual Exceedance Probability
AIMS	Asset Information Management System
BGS	British Geological Survey
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
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
MEA	Marine, Energy and Automotive
NFM	Natural Flood Management

NGO	Non-Governmental Organisation
NPPF	National Planning Policy Framework
PCPA	Planning and Compulsory Purchase Act
PFRA	Preliminary Flood Risk Assessment
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
UKCP18	UK Climate Projections 2018
WC	Wirral Council
WFD	Water Framework Directive
WwNP	Working with Natural Processes

1 Introduction

1.1 Commission

Wirral Council (WC) commissioned JBA Consulting by a letter dated April 2018 for the undertaking of a Level 1 Strategic Flood Risk Assessment (SFRA) to update the existing Level 1 SFRA carried out in 2009. WC requires this updated Level 1 SFRA 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 using the most up-to-date information and guidance. This will help to inform and provide the evidence base for the Council's new Local Plan.

WC is a metropolitan district council which acts as the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA). WC is a part of the Liverpool City Region Combined Authority.

1.2 Wirral Level 1 SFRA

This SFRA has been carried out in accordance with Government's latest development planning guidance including the National Planning Policy Framework[3] (NPPF) (2019) and flood risk and planning guidance called the Flood Risk and Coastal Change Planning Practice Guidance[4] (FRCC-PPG) (last updated March 2014, at the time of writing). The latest planning practice guidance is available online via:

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

A updated version of the NPPF was published on 24 July 2018, with the most recent revised version published in February 2019 which sets out Government's planning policies for England and how these are expected to be applied. This revised Framework replaces the previous NPPF published in March 2012 and July 2018. The revised 2019 NPPF can be downloaded via:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

This SFRA assesses the spatial distribution of flood risk across the local authority area and provides the discussion and guidance required to put this information into practice when taking account of flood risk in development plans and the level of detail required for site specific Flood Risk Assessments (FRAs).

This SFRA makes use of the most up-to-date flood risk datasets, at the time of submission, to assess the extent of risk, at a strategic level, to assessed SHLAA sites and Green Belt land parcels identified by WC. The SFRA appendices contain interactive GeoPDF maps showing the assessed SHLAA sites and Green Belt land parcels overlaid with the latest, readily available, gathered flood risk information along with a Development Site Assessment spreadsheet indicating the level of flood risk to each site following a strategic assessment of risk. This information will allow the LPA to identify the strategic development options that may be applicable to each site and to inform on the application of the Sequential Test.

1.3 Aims and Objectives

The aims and objectives of this Level 1 SFRA, as advised in the NPPF and FRCC-PPG and indicated by WC, are to:

- Update the previous 2009 SFRA taking into account the latest flood risk information, Government policy in the NPPF (2019), the methodology

3 https://www.gov.uk/government/publications/national-planning-policy-framework--2

4 https://www.gov.uk/guidance/flood-risk-and-coastal-change

contained in the National Policy Planning Guidance (NPPG), guidance from the EA and best practice, using new or updated flood risk information including climate change allowances, where available;

- Ensure that flood risk is fully taken into account when considering site allocation options and plan polices in the emerging Wirral Local Plan, including policies for drainage and flood risk management (to ensure that flood risk is not increased) and enabling application of the sequential test and where necessary the exception test;
- Investigate and identify the extent and severity of flood risk from all sources, both presently and in the future, using available data. This assessment will enable the LPA 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;
- Determine the acceptability of flood risk in relation to emergency planning capability;
- Consider opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance and of storage for flood water;
- Inform the Sustainability Appraisal (SA) of the Local Plan, so that flood risk is fully taken into account when considering allocation options and in the preparation of plan policies, including policies for flood risk management to ensure that flood risk is not increased;
- Apply the Sequential Test and, where necessary, the Exception Test when determining land use allocations; safeguarding land from development that is required for current and future flood management;
- Use opportunities offered by new development to reduce the causes and impacts of flooding;
- Identify the requirements for site-specific flood risk assessments in particular locations, including those at risk from sources other than river flooding;
- Reflect current national policy and legislation including the NPPF and FRCC-PPG to enable the LPA to meet its statutory obligations in relation to flood risk;
- Identify any cross-boundary flooding issues and work collaboratively with all relevant Risk Management Authorities (RMA);
- Adopt a catchment based approach to flood risk assessment and management to help inform potential catchment-wide approaches and solutions to flood risk;
- Take into account any specific requirements of the LPA and LLFA;
- Make recommendations on the suitability of assessed SHLAA sites and Green Belt land parcels, as an evidence base for local plan making;
- Identify land required for current and future flood management that should be safeguarded as set out in the NPPF;
- Provide guidance for developers and local authority planning officers on planning requirements in relation to flood risk.
- Consider a precautionary approach to climate change, using the EA's February 2016 allowances where available.
- Pay particular attention to surface water flood risk, using the Environment Agency's (EA's) third generation Risk of Flooding from Surface Water (RoFSW) dataset.

- 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.
- 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.
- Provide a suite of interactive GeoPDF flood risk maps illustrating the interaction between flood risk and assessed SHLAA sites and Green Belt land parcels.

1.4 SFRA Future Proofing

This SFRA has been developed using the most up-to-date data and information available at the time of submission. The SFRA has been future proofed as far as possible though the reader should always confirm with the source organisation (Wirral Council) that the latest information is being used when decisions concerning development and flood risk are being considered. The FRCC-PPG, alongside the NPPF (2019), is referred to throughout this SFRA, being the current 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. Where possible, the SFRA should be kept as a 'live' entity and continually updated when new information becomes available. It is in any authority's interest to keep the SFRA as up to date as possible.

The emerging Liverpool City Region (LCR) Combined Authority Spatial Development Strategy (SDS), due for adoption in 2020 will have this SFRA as part of its evidence base.

This SFRA uses the EA's Flood Map for Planning version issued in April 2018 to assess fluvial and tidal risk to assessed SHLAA sites and Green Belt land parcels. 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 April 2018, via the following link:

https://flood-map-for-planning.service.gov.uk/

To assess the surface water risk to SHLAA indicative sites and Green Belt land parcels, this SFRA uses the EA's RoFSW dataset. The third edition of the RoFSW dataset was published in 2013 by the EA and is updated periodically. The reader should therefore refer to the online version of the RoFSW map to check whether the surface water flood outlines have been updated, via the following link:

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

2 Study area

The Metropolitan Borough of Wirral is located in north-west England and lies on the low-lying peninsula with the Mersey Estuary to the north and the Dee Estuary to the south. Wirral is approximately 157sq kilometres with a population of 319,783 according to the 2011 census[5]. Chester and Cheshire West borough borders Wirral to the south east.

The borough has extensive residential areas near the coast and inland watercourses which primarily lie along the Mersey coast to the north of Wirral and east of the M53, including port development at Twelve Quays and Birkenhead Docks. West of the M53 the Borough comprises of small villages and towns separated by areas of Greenbelt.

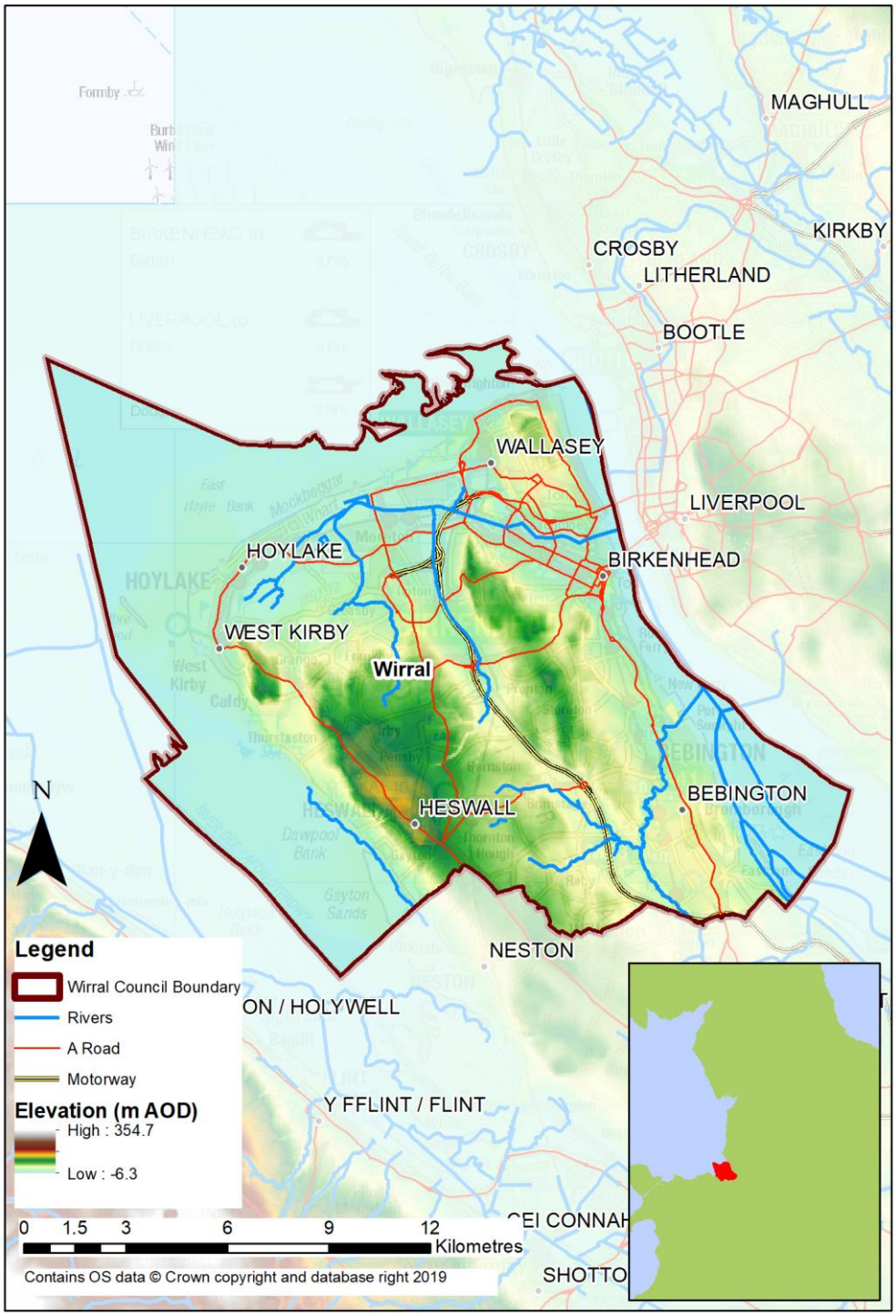
Wirral Borough is bounded by the River Mersey, the Irish Sea, and the River Dee; it also has a network of ordinary watercourses. There are over 5km of 'ordinary watercourses', 3.9km of which are culverted.

The main river catchments in the borough are the River Birket to the north and the Dibbinsdale Brook to the south, as per Figure 2-1. The river tributaries drain into the Mersey Estuary, which has engineered infrastructure to minimise the risk of tidal inundation. Properties near the Rivers Birket and Fender are protected by flood defences that have varying Standard of Protection (SoP) up to a 0.1% annual exceedance probability (AEP) event in places.

The topography of Wirral is relatively flat with gentle gradients. The land is generally lowest towards the edges of the council boundary and has two areas of higher ground, Birkenhead and Wallasey. Two sandstone ridges run north-west to south-east; one from Bidston to Bebington and one from West Kirby to Heswall. The latter marks the watershed between the Mersey and Dee Estuaries. Much of the borough is founded on sandstone that forms an aquifer. The aquifer supports large-scale ground water extractions and is moderately unresponsive to rainfall.

5 https://www.ons.gov.uk/census/2011census

Figure 2-1: Study area



3 Understanding Flood Risk

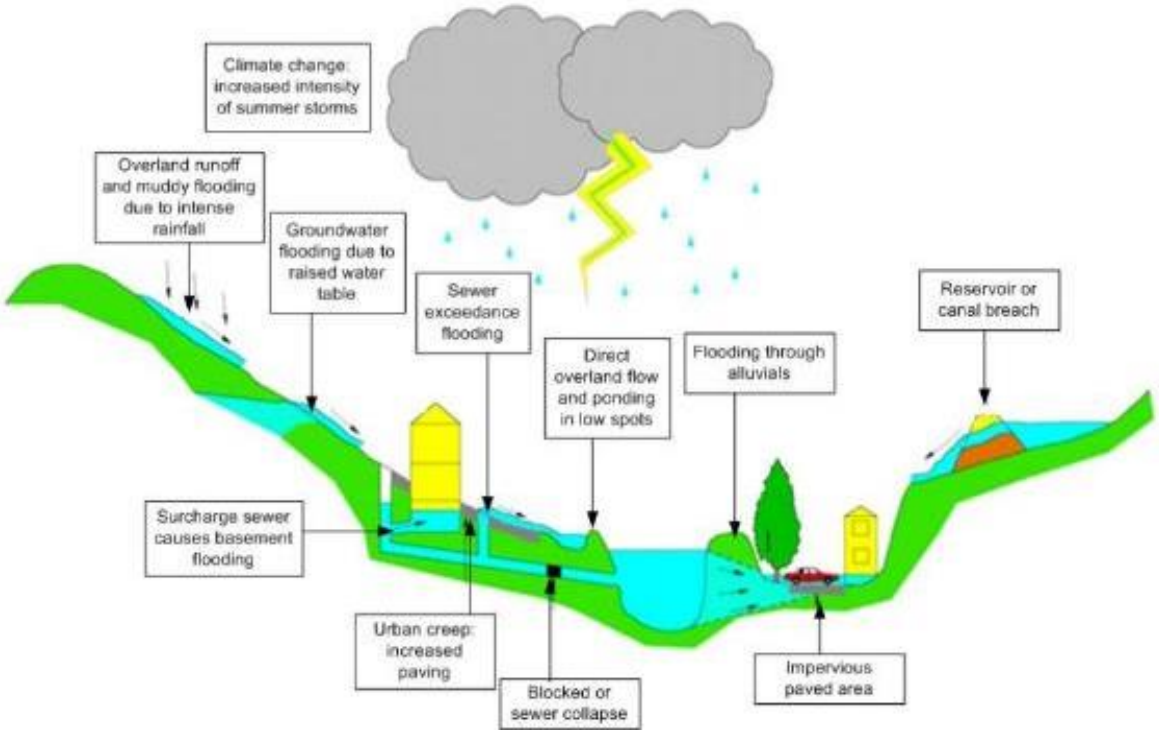
3.1 Sources of Flooding

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:

- Fluvial (main rivers and ordinary watercourses) - 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.

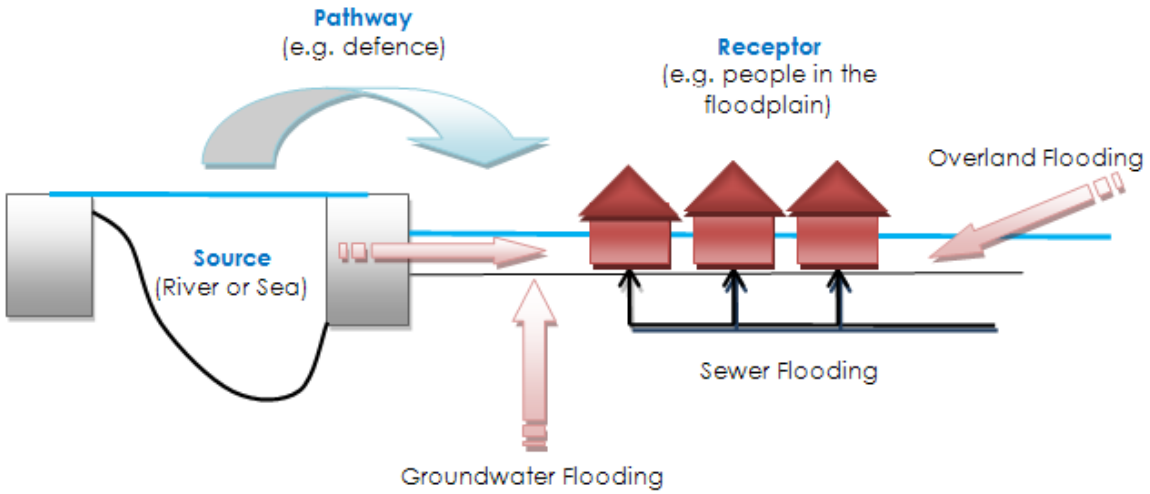
Figure 3-1: Flooding from all sources



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 the fluvial and tidal flood zones as defined in the FRCC-PPG and as used by the EA in their Flood Map for Planning (Rivers and Sea).

- 0.1% AEP = 1 in 1000-year event
- 1% AEP = 1 in 100-year event
- 3.33% AEP = 1 in 30-year event

Note that the flood zones shown on the Flood Map for Planning do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. The Flood Map for Planning can be accessed via:

https://flood-map-for-planning.service.gov.uk/

Table 3-1: NPPF Flood Zones[6]

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

The PPG states that in terms of flood risk and coastal change, the lifetime of residential development should be considered for a minimum of 100 years, unless there is specific justification for considering a shorter period.

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

6 Table 1: Flood Zones, Paragraph 065 of the Flood Risk and Coastal Change Planning Practice Guidance

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.

3.3.2 Residual Risk

Defended areas, located behind EA, WC and private organisation 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 considered.

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*
- *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.*

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."

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. 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 for the entirety of its existence. 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

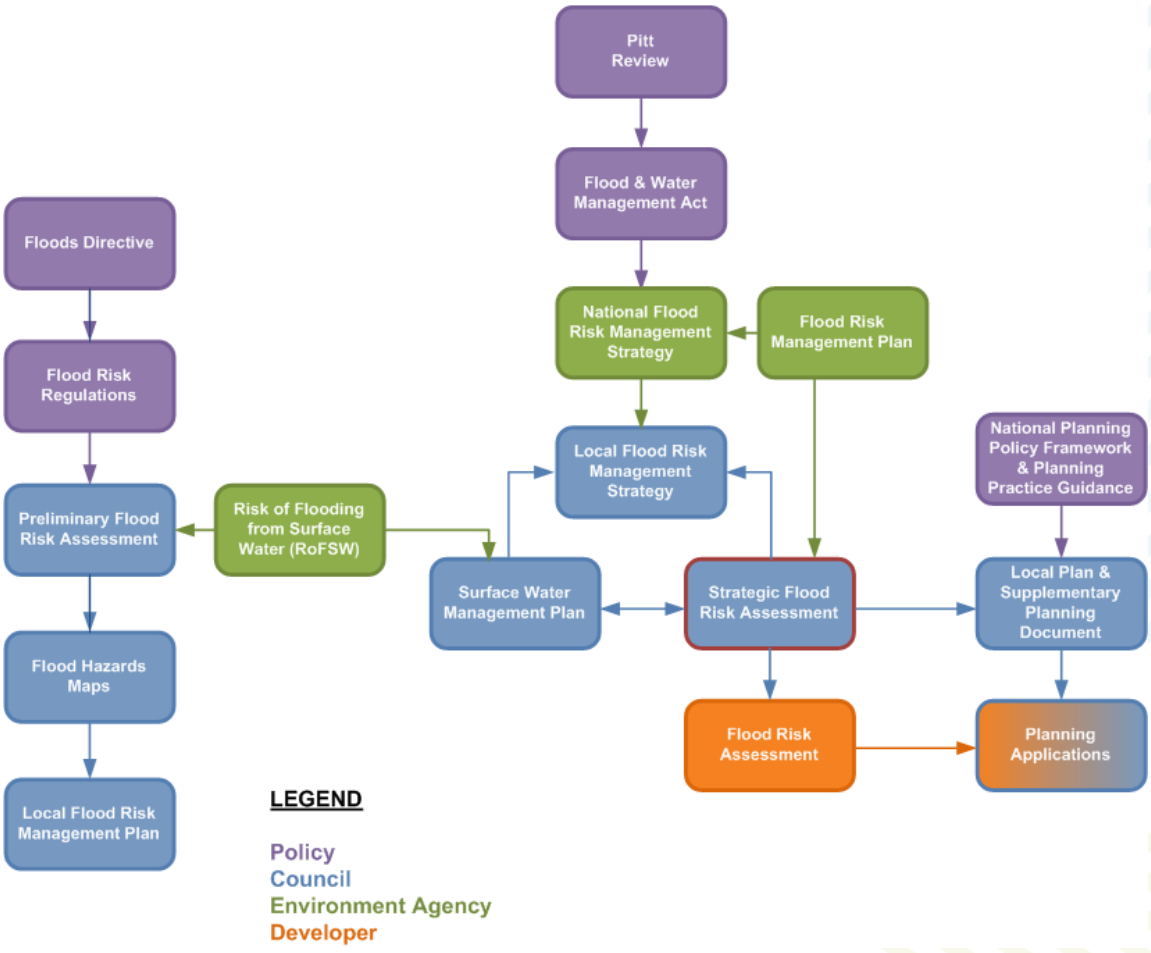
4.1 Introduction

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 the LLFA's and LPA's responsibilities and duties 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 SWMPs and SFRAs can provide much of the base data required to support the delivery of the LLFA'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 the LPA's Local Plan and to help inform planning decisions.

Figure 4-1: Key Documents and Strategic Planning Links – 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 and Welsh law by the Flood Risk Regulations 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 currently underway.

Figure 4-2: EU Floods Directive

PFRAs should cover the entire LLFA area for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). Where significant Flood Risk Areas are identified using the 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: EU Floods Directive. FRMPs are also completed for each River Basin District in England by the EA.

The FRMP should consider objectives for flood risk management (reducing the likelihood and consequences of flooding) and measures to achieve those objectives. Significant Flood Risk Areas were not identified in Wirral therefore the LLFA was not required to produce a FRMP. A FRMP was however completed by the EA for the North West and Dee river basin districts. See Section 4.2.5.

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

4.2.2 Wirral Preliminary Flood Risk Assessment 2011 and 2017[7]

The first cycle PFRA for Wirral was submitted to the EA in June 2011. The PFRA provides a high level overview of local flood risk, from sources including surface water, groundwater and ordinary watercourses. The second cycle PFRA, reviewed in 2017, used all relevant current flood risk data and information available at the time to update the 2011 version and was agreed with the EA in December 2017.

7 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698416/PFRA_Wirral_Metropolitan_Borough_Council_2017.pdf

Understanding of flood risk has increased both with respect to areas at risk and multiple sources of risk. Increased knowledge has informed the LFRMS, S19 Action Plans[8] and influenced priorities in the investment programme.

The PFRA methodology did not identify any further Flood Risk Areas in Wirral.

According to the PFRA, Wirral Council along with other councils agreed that a 'locally significant flooding incident' is that which affects 20 people (or approximately 8 houses) or 1 critical service, within a 1km grid square. Reporting under the Flood Risk Regulations (2009) as part of the 2017 PFRA, a number of locally significant flooding events were identified, which required investigation under S19 of the FWMA. These events included (since the 2011 PFRA):

13th August 2012

15th August 2012

29th August 2012

24th September 2012

5th December 2013

August and September 2015

4.2.3 Catchment Flood Management Plans (CFMP)

The CFMPs were carried out by 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 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. Wirral is mostly within the Mersey Estuary CFMP area, with the exception of the western area, which is located within the Dee CFMP area.

4.2.4 Shoreline Management Plans

The management of coastal flooding and coastal erosion risks is set out in Shoreline Management Plans (SMP) produced by Coastal Groups working with the EA and coastal district councils. The purpose of the SMPs is to provide a large-scale assessment of the risks associated with coastal processes and a policy framework to reduce these risks, both to people and the environment, in a sustainable way over the following 100 years.

The coastline of Wirral is covered by the North West and North Wales SMP2[9]. Development of the North West England and North Wales SMP began in 2008, with the final document published in February 2011. The SMP was formally approved by the EA on 15th August 2016.

4.2.5 Flood Risk Management Plans

Following on from the CFMPs, FRMPs are designed to set out the risk of flooding from rivers, sea, surface water, groundwater and reservoirs within each RBD and to detail how RMAs 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) and

8 An investigation into a flooding event that a lead local flood authority (LLFA) is required to carry out under Section 19 of the Flood and Water Management Act 2010, and according to the LLFA's LFRMS strategy

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698416/PFRA_Wirral_Metropolitan_Borough_Council_2017.pdf

9 http://www.mycoastline.org.uk/info/1/shoreline_management/3/

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.

Wirral is within the North West RBD with a small area to the west of the authority area within the Dee RBD (Figure 4-3 and Figure 4-4) which are two of the 11 river basin districts across England and Wales.

Figure 4-3: Overview of North West RBD and Dee RBD catchments

Figure 4-4: North West and Dee RBDs

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North West RBD FRMP, 2016[10]

The North West RBD covers an area of 13,160 km^2 from Cumbria to the north of the district, to Cheshire in the south, with Lancashire, Greater Manchester and Merseyside included. The North West RBD comprises 12 management catchments which contain almost 7 million people.

Flood Risk Areas show areas where the risk of flooding has the greatest impact on residential buildings and critical infrastructure. These areas cover surface water flooding only.

The Wirral Flood Risk Area contains approximately 13,100 properties that are at risk following a 1 in 200-year rainfall event, however there is only a 0.5% chance of this occurring in any one year. There are over 51,000 people at high risk of surface water

10 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507122/LIT_10210_NORTH_WEST_FRMP_PART_B.pdf

flooding and 31,000 people at high risk of flooding from rivers and sea with a 1 in 30 chance of being flooded in any one year, within the North West RBD.

Lower Mersey Catchment

Wirral is located within the Lower Mersey catchment of the North West RBD where river levels tend to rise slowly during heavy rain; however, some places on the Wirral experience combined effects of river and tidal flooding. Tidal flooding affects places along the Mersey estuary and around the Wirral peninsula, where the risk can be high with water funnelling into the estuary. The catchment covers the lowermost 800 km^2 of the Mersey Catchment and includes the Mersey Estuary.

The Lower Mersey is a mixture of agricultural land in the upper part of the catchment and urban development downstream, with approximately a third of the North West of England's population living in the catchment. Figure 4-5, extracted from the North West RBD FRMP, shows an overview of the Lower Mersey catchment.

Figure 4-5: Lower Mersey catchment (North West RBD FRMP)

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

- Preparing for risk:
    - Investigate viability of managed realignment for habitat creation and flood storage, including consultation, modelling of impacts on the estuary, and investigation of options for managing contamination risks.
    - Monitor any proposals for estuary tidal power barrages and build into next review of the SMP.
    - EA is currently undertaking a groundwater resource investigation in North Merseyside and Lower Mersey Basin. The outcomes will be reviewed and look to enhance existing groundwater monitoring network targeting areas susceptible to groundwater emergence.

- Protecting from risk:
    - 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. The measures stated do not all have secured funding, at time of writing, and therefore are not guaranteed to be implemented.

The Dee RBD FRMP, 2016[11]

The Dee RBD is unique from the other RBDs that cover England and Wales in that the Dee is the only RBD that is not split into smaller WFD Management Catchments. In addition, there are no Flood Risk Areas as designated under the Flood Risk Regulations in the Dee RBD.

The Dee RBD covers an area of 2,200 square kilometres, mainly in Wales but in the lower reaches the Dee often runs along the border with England, namely Wirral. Its source is in the mountains and lakes of the Snowdonia National Park and it runs to the internationally significant intertidal and wading bird habitat of the Dee Estuary. Reservoirs in the upper part of the catchment store water and regulate flows in the Dee.

The English Dee

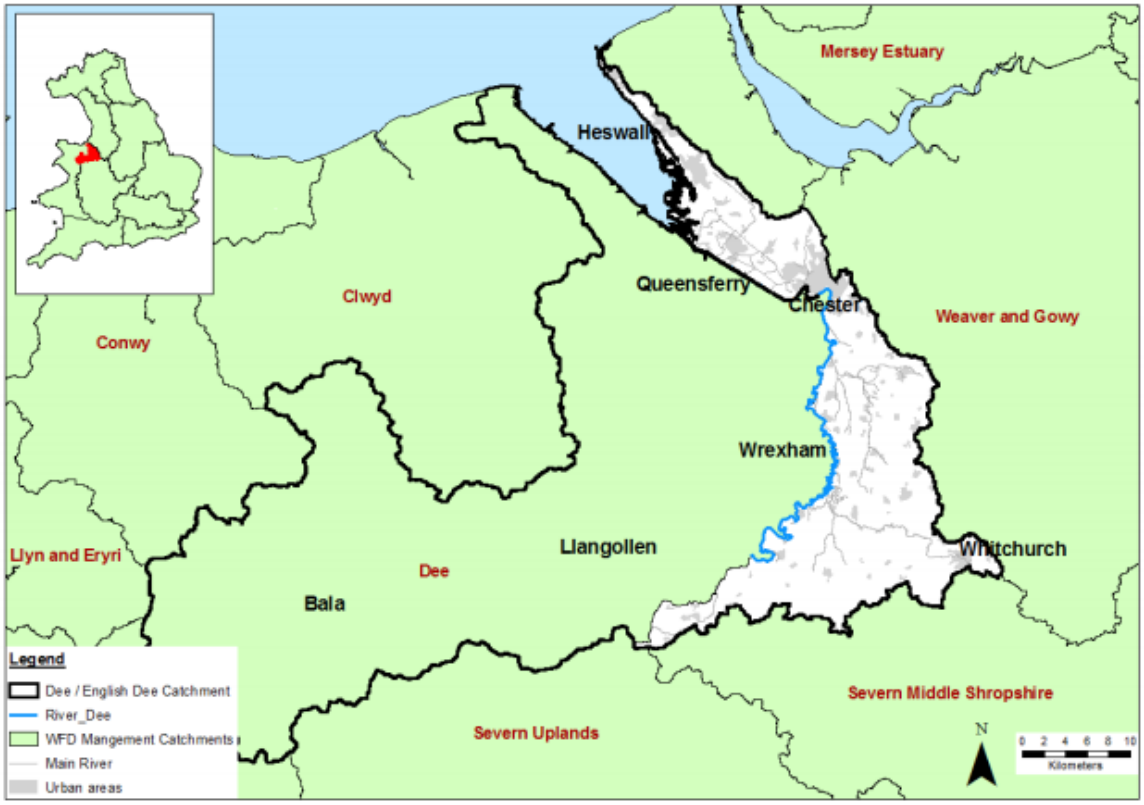
The English Dee area covers 500km² of the River Dee catchment, including Chester, part of Wirral, and tributaries east of the River Dee. The River Dee itself forms the entire western boundary of the English Dee area, and flows northwards through Chester to the Dee Estuary. The area covers the Dee catchment that falls within England, from Whitchurch in the south east, through Tattenhall and Chester, the Dee Estuary at Queensferry and the south western shoreline of Wirral, including Heswall.

Following rainfall events in upstream areas, water levels in the Dee can take a few days to peak in the downstream reaches. During very high tides, tide locking can occur where the level of the incoming high tide prevents fluvial water flowing out to sea.

In the Dee RBD there are approximately 26,400 people at flood risk from main rivers and the sea; over 3,000 of these are considered to be at high risk. The proportion of the population at medium or high risk of flooding from rivers and the sea is relatively low, at less than 2%. Figure 4-6, extracted from the Dee RBD FRMP, shows an overview of the English Dee area.

11 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507153/LIT_10199_DEE_FRMP.pdf

Figure 4-6: Overview map of the English Dee area



The Dee RBD FRMP summarised various measures to help manage flood risk in the English Dee area. Those that may apply to Wirral include:

- Preparing from risk:
  - Produce local community flood plans covering key communities including: West Kirby and Heswall
  - Improve existing Flood Awareness Plans to encourage more people to sign up to and respond to flood warnings as well as using self-help methods to protect themselves and their properties.
- Protecting from risk:
  - Encourage the owners and operators of storm water pumping stations and associated infrastructure to undertake an assessment of their current and future risks to determine their resilience to flooding. Develop a flood resilience and adaptation plan as appropriate.
  - Identify where working with natural processes/natural flood management can help to reduce flood and coastal erosion risk and help catchments both adapt and become more resilient to the impacts of Climate Change
  - Incorporate Climate Change allowances into flood risk management works (see Section 6.12.2)
  - Identify where working with natural processes/natural flood management can help to reduce flood and coastal erosion risk and help catchments both adapt and become more resilient to the impacts of Climate Change

4.2.6 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 NRW.

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 Wirral LLFA responsibilities under the FWMA.

Table 4-1: Key LLFA responsibilities under the FWMA

FWMA responsibility	Description of responsibilities and powers	LLFA status
Local Strategy for Flood Risk Management	The LLFA has a duty to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy 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 should not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	Final version produced July 2018 (see Section 4.7.1)
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 its 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 RMA must publish the results of its investigation and notify any other relevant RMAs.	Ongoing
Asset Register	The 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	Ongoing

FWMA responsibility	Description of responsibilities and powers	LLFA status
	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.	
Duty to co-operate and Powers to Request Information	The LLFA must co-operate with other relevant authorities in the exercise of their flood and coastal erosion management functions. The LLFA has powers to request information as necessary (e.g. from United Utilities) under the Flood and Water Management Act.	Ongoing
Ordinary Watercourse Consents	The 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 enforcement of unconsented works and non-maintenance by riparian owners.	Ongoing
Works Powers	The Act provides the LLFA with powers to undertake works to manage flood risk from surface runoff, groundwater and ordinary watercourses, consistent with the LFRMS for the area.	Ongoing
Designation Powers	The Act provides the 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	The Council is required to play a lead role in emergency planning and recovery after a flood event.	Merseyside Local Resilience Forum (Section 7.1.1)
Community Involvement	The 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.	Various ongoing (Section 7.1)
SuDS	Sustainable Drainage Systems (SuDS) are a planning requirement for major planning applications of 10 or more residential units or	National Planning Policy and

FWMA responsibility	Description of responsibilities and powers	LLFA status
	equivalent commercial development schemes with sustainable drainage. The LLFA is a statutory planning consultee and it will be between the LPA and the LLFA to determine the acceptability of these proposed sustainable drainage schemes. Approvals must be given before the developer can commence construction, and sometime before the occupation of dwellings. Planning authorities should use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of the SuDS over the lifetime of the development.	Defra's non-statutory technical standards used. Developers are guided through a Technical Guidance for Developers note which is available on Wirral's Planning website.
Latest changes to FWMA legislation[12]		

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

4.3 Flood and water focused policies and plans

4.3.1 25 Year Environment Plan[13]

This Plan sets out government action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats. It calls for an approach to agriculture, forestry, land use and fishing that puts the environment first. The Plan also sets out how government will tackle the effects of climate change, considered to perhaps be the most serious long-term risk to the environment given higher land and sea temperatures, rising sea levels, extreme weather patterns and ocean acidification. The Plan aims to show that government will work with nature to protect communities from flooding, slowing rivers and creating and sustaining more wetlands to reduce flood risk and offer valuable habitats.

Focusing on flood risk, government will look to update the national flood and coastal erosion risk management strategy, looking to strengthen joint delivery across organisations. In terms of funding, government will look at current partnership arrangements ahead of a review of funding needs beyond 2021, seeking to attract more non-public sector investment, and make sure all relevant agencies are able to respond quickly and effectively to support communities if and when flooding does occur. The Plan states that the EA will use its role in statutory planning consultations to seek to make sure that new developments are flood resilient and do not increase flood risk. Government will also look strengthen the relevant protections in the NPPF.

For flood mitigation, government will focus on using more natural flood management solutions; increasing the uptake of SuDS, especially in new development; and improving the resilience of properties at risk of flooding and the time it takes them to recover should flooding occur.

4.3.2 The North West Regional Flood and Coastal Committee (RFCC) Business Plan

The emerging North West FRCC Business Plan sets out the long term goals in which the North West RFCC, with the support of its FCERM Strategic Partnerships, will deliver to better protect homes and deliver more resilient communities in the North West from 2019 – 2022. The Plan has identified priorities and objectives for the period to 2022 and will be monitored through the North West RFCC quarterly meetings to adapt to change if necessary.

The Business Plan, at the time of writing, is currently at the public consultation review stage and will be adopted in 2019.

13 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/673203/25-year-environment-plan.pdf

Figure 4-7: Main goals and policy areas the Plan is intended to help work towards

4.3.3 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 RBMPs. The WC area is covered by the North West and Dee Basin Management Plans, managed by the EA and published in 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 North West and Dee RBMPs, 2016, includes such examples whereby land management techniques have been designed to reduce flood risk whilst also reducing sediment loss and improving water quality. 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 begun and the second RBMPs were completed in 2015, building upon the first set 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.

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 WC 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:

- Strategic working with United Utilities / Dwr Cymru Welsh Water (UU/DCWW) to seek partnership opportunities for improved infrastructure management e.g. reduced Combined Sewer Overflows (CSOs)
- Water Cycle Studies to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan implementation,
- Consideration of the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, including LDDs and Sustainable Community Strategies, and
- Promotion of the wide scale use of Sustainable Drainage Systems (SuDS) in new development.

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

4.4 Other related plans and policies

4.4.1 Catchment partnerships

The Catchment Based Approach (CaBA) 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.

Catchment partnerships relevant to Wirral, and detailed in Figure 4-8 include:

- The Lower Mersey Catchment Partnership, hosted by the Mersey Rivers Trust.
- The Tidal Dee Catchment Partnership, hosted by Cheshire Wildlife Trust.

4.4.2 FCERM Governance framework

The FWMA requires the EA to "develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England'. The current national FCERM strategy was published in May 2011 and is being updated, at the time of writing.

The following groups relevant to Wirral fall under FWMA legislation:

- North West Regional Flood and Coastal Committee
- Merseyside FCERM (Flood and Coastal Erosion Risk Management) Partnership
- Wirral Flood and Water Management Partnership
- Wirral Operational Group

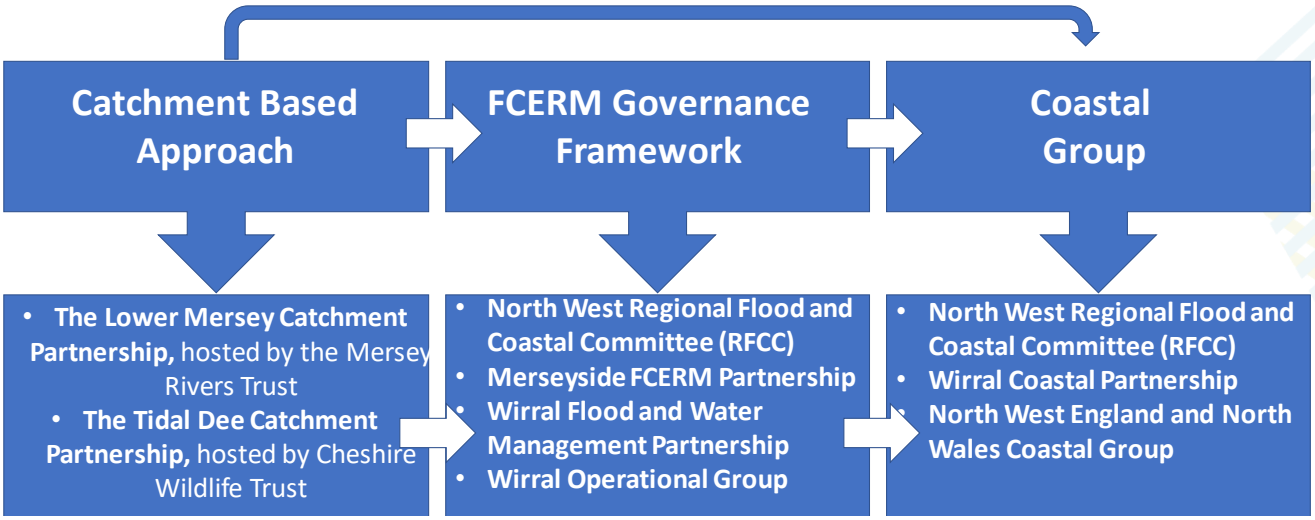
4.4.3 Coastal Groups

The following coastal groups are a separate partnership operating under different legislation (the Coast Protection Act 1949, as amended by Flood & Water Management Act 2010).

Coastal groups relevant to Wirral, and detailed in Figure 4-8 include:

- North West Regional Flood and Coastal Committee (RFCC)
- Wirral Coastal Partnership
- North West England and North Wales Coastal Group

Figure 4-8: Partnership working



The CaBA, FCERM and Coastal frameworks are all interlinked and feed into each other.

4.5 Planning legislation

4.5.1 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.

4.5.2 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 (as amended), 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.

There are currently five designated Neighbourhood Areas in Wirral:

- Devonshire Park
- Hoylake
- Leasowe
- Birkenhead and Tranmere
- Birkenhead North

More information on the individual Neighbourhood Plans can be found via:

https://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/neighbourhood-planning

4.6 Planning policy

4.6.1 National Planning Policy Framework (NPPF), 2019

The revised NPPF was published in February 2019, replacing the previous versions published in July 2018 and March 2012. The NPPF sets out Government's planning policies for England and how these are expected to be applied. The Framework is based on core principles of sustainability and forms the national policy framework in England, also accompanied by a number of Planning Practice Guidance (PPG) notes. It must be taken into account in the preparation of local plans and is a material consideration in planning decisions.

The PPG documents will, where necessary, be updated in due course to reflect the changes in the revised NPPF.

Section 14 Paragraph 156 of the revised NPPF states that…

"...Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards."

> 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 (through the site allocation process) to locations at the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

The key changes in the revised 2019 NPPF compared to the 2012 NPPF include:

- Strategic policies should also now consider the 'cumulative impacts in, or affecting, local areas susceptible to flooding' (para 156), rather than just to or from individual development sites (see Section 6.10);
- Future risk from climate change. The 'sequential approach should be used in areas known to be at risk now or in the future from any form of flooding' (para 158) (see Sections 6.12.1, 6.12.2 and Appendix B);

- Natural Flood Management. 'Using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques)' (para 157c) (see Section 5.7.4 and Appendix B);
- SuDS. 'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate' (Para 165) (see Section 6.13) and;
- Emergency planning. Emergency plans are required as part of an FRA that includes the inclusion of safe access and egress routes (para 163e) (Section 7).

As explained, the FRCC-PPG sits alongside the NPPF and sets out detailed guidance on how this policy should be implemented.

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

At the time of writing, the current FRCC-PPG was published on 6 March 2014 and is available online via:

https://www.gov.uk/guidance/flood-risk-and-coastal-change

Following the revision of the NPPF, Government will, where necessary be updating the FRCC-PPG to reflect the changes discussed above in Section 4.6.1. It is advised that any hyperlinks within the FRCC-PPG that direct users to the previous 2012 NPPF should be disregarded.

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. As discussed, the FRCC-PPG may in the future be updated in places to reflect the revised NPPF.

4.6.3 Local Plans

A Local Plan[16] 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

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

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. This 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 this SFRA and the Sustainability Appraisal.

Government guidance on Local Plans can be found via:

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

Wirral Council Local Plan[17]

The Development Plan for Wirral comprises a number of documents that set out the Council's policies for the development and use of land within the Metropolitan Borough of Wirral. These documents currently comprise:

- The Local Development Scheme[18];
- A Statement of Community Involvement;
- The remaining 'saved' policies in the Unitary Development Plan (UDP) (adopted February 2000);
- The Joint Waste Local Plan for Merseyside and Halton (adopted July 2013);
- The Neighbourhood Development Plan for Devonshire Park, made in December 2015; and the Neighbourhood Development Plan for Hoylake, made in December 2016;
- A series of Supplementary Planning Guidance Notes and Supplementary Planning Documents to support the delivery of existing adopted Development Plan policies;
- A Proposals Map; and
- A series of Monitoring Reports

Over time, these documents will also include:

- a Core Strategy Local Plan;
- a Land Allocations and Heritage Local Plan;
- a series of Neighbourhood Planning documents, including Neighbourhood Development Plans, prepared by the local community;
- a series of additional and replacement Supplementary Planning Documents, to support the delivery of the Core Strategy Local Plan;

WC is developing its Local Plan which will update the Council's long-term vision, objectives and spatial strategy for the metropolitan borough over the next 15 years. The aim of the Local Plan is to establish a planning framework for future development, identifying how much land is available and where such land should be provided for new homes and employment, alongside associated infrastructure. A Proposed Submission Draft Core Strategy was published for public comment in 2012. The council consulted

17 http://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/local-plans

18 http://www.wirral.gov.uk/sites/default/files/all/planning%20and%20building/Local%20plans%20and%20planning%20policy/Local%20plans/Local%20Development%20Scheme/Local%20Development%20Scheme%20Review%20March%202018.pdf

on the outcome of a review of Development Options in September 2018. At the time of writing, comments on the Development Options Review are being analysed with an update on progress reported to Cabinet on 17th December 2018; the Local Plan timetable thereafter is subject to further review.

Wirral's planning policy is currently set out in the Borough's 'old style' Unitary Development Plan (UDP)[19], adopted in February 2000. The Joint Waste Local Plan for Merseyside and Halton replaced the policies previously contained within Section 17 of the UDP in July 2013[20]. The remaining UDP policies will gradually be replaced by the emerging Local Plan for Wirral. The Liverpool City Region Combined Authority will be preparing a Spatial Development Strategy for adoption in 2020 under the terms of the 2015 Devolution Agreement, guided by the Combined Authorities (Spatial Development Strategy) Regulations 2018.

The Spatial Vision in the 2012 proposed Submission Draft Core Strategy stated that by April 2028, Wirral will continue to offer a high quality of life, as an attractive place to live an active, sustainable, productive, safe and healthy lifestyle, to competent the attractiveness of and make a significant contribution to the economic competitiveness of the Liverpool City Region.

4.6.4 Sustainability Appraisals

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.

WC Sustainability Appraisal

Relative to flood risk, the draft SA Scoping Report[21], published in July 2007, and the Baseline Review, published in 2012 (alongside the SA of the Proposed Submission Draft Core Strategy), following the review of relevant plans, policies and programmes, discusses sustainability issues and problems for Wirral that are relevant to the preparation of the Local Plan. The SA recognises that flood risk is likely to increase over the next 25 years due to the impacts of climate change.

The main objectives of the SA are as follows:

- Ensure that the Local Plan considers impacts on and of policies, plans and programmes on an international, national and local scale;
- Establish a baseline assessment of Wirral, outlining environmental, social and economic characteristics and raise any issues the Local Plan needs to focus on;
- Create a framework to assess the sustainability of the Local Plan;
- Test sites and policies against the sustainability framework to assess the impacts and suggest alterations if necessary; and
- Ensure that realistic alternative options are tested as part of the process.

19 http://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/local-plans/unitary-development-plan

20 http://www.wirral.gov.uk/planning-and-building/local-plans-and-planning-policy/local-plans/joint-waste-local-plan-merseyside

21https://www.wirral.gov.uk/sites/default/files/all/planning%20and%20building/Local%20plans%20and%20planning%20policy/Local%20plans/Core%20strategy%20local%20plan/Sustainability%20Appraisal/CS%20SA%20Scoping%20Report%20with%20appendices%20July%2007.pdf

4.7 Flood risk management policy

4.7.1 National and Local Flood Risk Management Strategies

As presented in Figure 4-1 in Section 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 FWMA requires risk management authorities (local authorities, EA, 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, businesses and infrastructure operators to deliver more effective flood risk management.

LLFAs have responsibility for developing a 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 of the FWMA.

The following link provides links to guidance for Risk Management Authorities (RMA) and local authorities on various subjects of flood risk management, including tools to support LLFAs in developing their LFRMS:

https://www.gov.uk/guidance/flood-risk-management-information-for-flood-risk-management-authorities-asset-owners-and-local-authorities

Wirral Council Local Flood Risk Management Strategy (2016-2019)[22]

The WC LFRMS sets out how the metropolitan borough will manage flood risk from 2016-2019, from surface water runoff, groundwater, the sea and ordinary watercourses for which the Council has a responsibility as LLFA. The aim of the Local Strategy is to ensure the overall context of the National Strategy is met through Wirral's management of flood risk.

The LFRMS has five objectives which aim to form the policies for Wirral Council:

- Understand the local risks of flooding and coastal erosion, working together with partners, other risk management authorities, organisations and the community to identify the causes and put in place long-term plans to manage these risks and make sure that other plans take account of them;
- Ensure that the guiding principles for sustainable development are applied and inappropriate development is avoided in existing and future areas at risk of flood and coastal erosion while elsewhere, carefully managing other land to avoid increasing the risks;
- Where financially viable, build, maintain and improve local flood and coastal erosion management infrastructure and systems to mitigate or reduce the likelihood of harm to people and damage to the economy; environment (natural, historic, built and social) and society as a whole;

22https://democracy.wirral.gov.uk/documents/s50035397/Appendix%201%20-%20Wirral%20Local%20Flood%20Risk%20Management%20Strategy.pdf

- Increase public awareness of the effects of climate change and the implications for an increase in flood risk, engage with people specifically at risk of flooding, to encourage them to take action to manage and/or mitigate the risks that they face and to make their property more resilient;
- Support and assist those bodies responsible for improving the detection, forecasting and issue of warnings of flooding. Plan for and co-ordinate a rapid response to flood emergencies and promote faster recovery from flooding.

The LFRMS Action Plan[23] identifies actions for delivery by flood risk management authorities and other partners within short, medium and long time scales to manage local flood risks on the Wirral. The LFRMS was adopted in July 2017 and is to be formally reviewed every three years, meaning that the next Strategy is due in 2020.

Wirral Coastal Strategy, April 2013[24]

The coastline of Wirral is a place used for recreation, enjoyed for its natural beauty and provides valuable habitat for a variety of important plants and animals. However, its beauty has attracted urban development and this development means that the coastline needs to be activity managed to ensure risks posed by tidal flooding and coastal erosion are acceptable.

Development and land use on Wirral is also managed in a coordinated way through local planning policy. Planners need a strategic level assessment of coastal hazards across Wirral, both present and future, in order to make better planning decisions.

During the 1970s and 1980s there was significant investment in providing improved coastal defence, particularly along the North Wirral coast and much of the shoreline now benefits from the provision of manmade defences. However, according to the Coastal Strategy, there has been no major capital investment in coastal defence measures across Wirral frontage since 2001, apart from refurbishment of the outer wall of the Marine Lake, West Kirby, which was carried out in 2008. There has however been on-going maintenance of existing coastal defence assets and ancillary infrastructure.

There is a need to identify sustainable arrangements for the future management of flood and coastal erosion risk and it is against the above background that Wirral Coastal Strategy has been produced. Preparation of the Strategy was finalised in June 2013.

The Coastal Strategy identifies a timescale for intervention to reduce flood and coastal erosion risk across the entire Wirral coastline, which is split into three primary frontages, consistent with natural processes, behaviour and environmental interests.

- Strategy Frontage West – the River Dee shoreline, from the Borough boundary at Gayton to Red Rocks at Hoylake;
- Strategy Frontage North – the North Wirral shoreline, from the Red Rocks at Hoylake to Fort Perch Rock at New Brighton; and
- Strategy Frontage East – the River Mersey shoreline, from Fort Perch Rock at New Brighton to the Borough boundary at Eastham.

The Strategy provides an overall justification for desirable schemes and provides:

- A more detailed understanding of the physical coastal processes applying (tides, waves and beach movement)
- Improved definition of the flood and coastal erosion risks faced by shoreline communities both now and in the future

23 https://democracy.wirral.gov.uk/documents/s50035398/Appendix%202%20-%20Action%20Plan%20to%20LFRMS.pdf

24 https://democracy.wirral.gov.uk/documents/s50014529/Wirral%20Coastal%20Strategy%20Report%20-%20Flood%20and%20Coastal%20Erosion%20Risk%20Management.pdf

- Identification of the likely environmental impacts, and
- Assessment of alternative approaches for future management of the coastline of Wirral.

The strategy then identifies a preferred set of management arrangements for Wirral, as well as a preliminary assessment of the amount of support that particular measures will receive from the public purse and the additional locally sourced funding that will be required for the implementation of the measures.

The strategy considers future management approaches over a 100-year timeframe, which is generally considered with the same three epochs as defined in the SMP2:

- Short Term - the next 20 years (plus a sub-division listing works in the next 5 years)
- Medium Term – 20-50 years from the present
- Long Term – 50-100 years from the present

Table 4-2 identifies the Capital works prioritised by the Strategy for implementation in the short term, the estimated Flood Defence Grant in Aid (FDGiA) funding that they could attract, the balance that will be required elsewhere.

Table 4-2 Wirral Strategy Prioritised Works

Wirral Strategy Prioritised Works							
Strategy Unit	**Proposed Works**	**Type of Works**	**Potential Earliest Implementation (years from present)[1]**	**Urgency of Issue**	**Est. Cost (£k)**	**Est. Max Gov Contribution (£k)**	**Comment**
West Kirby	Provision of new flood prevention measures	New construction works	2-3	Moderate	1,800	1,000	Local / Council contribution essential to implement
Rock Park	River wall refurbishment works	Refurbishment	3-4	Low	1,700	700	External / Local / Council contribution essential to implement.[3]
Meols Parade	Sea wall toe and refurbishment works	Reinforcement of existing defence	2-6	Moderate	3,750	1,000	Local / Council contribution essential to implement[4]
Wallasey Embankment	Additional embankment toe protection	Reinforcement of existing defence	11-20	Low	700	700	FDGiA funding likely to be available but contributions from beneficiaries are likely to be expected.

Notes
[1] Timing of works is subject to EA approval and obtaining required external contributions, where appropriate
[2] Potential contribution from the Highways Capital Programme and other potential funding sources to be identified.
[3] Potential Heritage Lottery Grant of up to £1.4 million identified.
[4] Potential contribution from the Highways Capital Programme and other possible funding sources to be identified.

4.7.2 Wirral Council Level 1 SFRA (June 2009)[25]

In 2009, the Borough's first Level 1 SFRA was commissioned by WC. This SFRA was prepared in accordance with the now superseded PPS25 and its Practice Guidance. The study analysed current and future flooding issues in order to support the LPA assessment of future development sites, including providing data to inform the application of the Sequential Test.

A number of conclusions were drawn from the report which are still relevant within this update, including:

- WC needs to focus on flooding from "other sources" (e.g. surface water and sewer) with production of a SWMP being the next step.

  Consideration should be given to the extent to which defence design measures should be adopted.
- Wirral should be considered as a whole when development decisions are being made considering both upstream and downstream impacts of development.
- Regularly review and update SFRA due to climate change projections.

The previous SFRA focused on fluvial and tidal flood risk, partly because flood risk from rivers and sea were thought to be the main issues, but also because flood risk from other sources such as surface water and sewers was poorly defined (or data was not available). This SFRA assesses surface water flooding with equal importance as fluvial and tidal, including possible withdrawal (to sites where high risk areas cannot be avoided), redesign or relocation for sites at significant surface water risk (see Policy Recommendation 2, section 8.2).

4.7.3 Wirral Water Cycle Study (WCS) (2013)[26]

The objective of Wirral's WCS was to identify any constraints on housing and employment growth planned for the area up to the year 2027, that may be imposed upon by the water cycle and how these can be resolved i.e. by ensuring that appropriate water infrastructure is provided to support indicative development. Furthermore, it aimed to provide a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the region is not compromised.

The outline WCS was carried out as a high level review of potential future development against the water cycle, such as water supply, wastewater treatment, sewer network capacity, flood risk and other environmental considerations.

4.7.4 Local Flood Studies – Flood Investigation Reports (FIR)

This section briefly describes any notable flood risk management studies, investigations or works that have taken place in Wirral.

Oxton, Claughton, Bidston, Prenton, Birkenhead and Bromborough FIR (investigation approved January 2018)[27]

This FIR provides details on the flooding that occurred on Sunday 23rd July 2017 where 74 properties were flooded; 35 properties internally, and 39 properties externally flooded as a result of approximately 28mm of intense rainfall which fell between 06:00 and 10:00 across the eastern side of Wirral from Birkenhead to Bromborough.

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25 Wirral Council. Level 1 Strategic Flood Risk Assessment. June 2009

26 Wirral Council Water Cycle Study. Outline Study: Main Planning Report. June 2013

27 https://www.wirral.gov.uk/sites/default/files/all/communities%20and%20neighbouhoods/Emergencies/Flooding/Flood%20Investigation%20Report%20July%2023%202017.pdf

The design capacity of the sewerage network was exceeded in places due to the intensity of rainfall, causing sewers to surcharge and cause overland flow. In many locations, surface water flooding issues were combined with sewer flooding.

A number of strategic and local recommendations have been identified as a result of this FIR;

Strategic Recommendation:

- WC, LLFA is to develop a formal 'request for information' procedure in accordance with the requirements under Section 14 of the FWMA.
- WC to share the 'request for information' procedure with all partners for information, once completed and ahead of any future flood incident.

Local Recommendations:

- WC Highway Authority to review the gully cleansing frequency at Allport Road Car Park, Bromborough.
- WC Highway Authority to consider modifications to the perimeter wall at Allport Road Car Park to prevent discharge of surface water from the car park onto the highway at The Rake.
- WC, LLFA to write to Oxton Cricket Club requesting that they consider improving drainage systems and /or retaining surface water within their boundary to prevent run-off from their private land to neighbouring properties in Duddon Close.
- WC, LLFA to work with Wirral Golf Club to further investigate the cause of flooding to property on Vyner Road South and to further work with WGC on a solution to alleviate the ongoing flooding problem.
- WC, LLFA to write to residents affected by surface water run-off from private land advising them of: the outcome of the investigation , the responsibilities of the landowner from where the run-off originates and how they can make their property more resilient to future flooding.
- WC, LLFA to write to the landowner of the ordinary watercourse at Roman Road, Prenton advising of their riparian responsibility.
- WC, LLFA to write to the Church Commission for the United Reform Church to advise that the surface water run-off from their property at Alton Road increases the risk of flooding of the highway and properties on Alton Road, Oxton.
- WC Highway Authority to review the highway sweeping and highway gulley cleansing frequency at Alton Road Oxton, Vyner Road South Bidston and Gayton Road Gayton.
- WC Highway Authority to review the prioritisation of response to flooding and highway flooding incidents and communicate this to relevant contact centres.
- UU to ensure re-connection of highway drainage following sewer lining operations.
- United Utilities to review performance of property level protection at Christleton Close with a view to correcting manufacturing or maintenance defects (complete and remedial measures undertaken).
- Wirral Council to develop and submit a Capital Funding bid to investigate and resolve ongoing highway flooding issues at Woodchurch Road.

Various locations within Wirral Boundary (May 2016)[28]

This report details the flooding that occurred on 22nd August 2015 and 1st September 2015. The rainfall that fell on these dates was severe, amounting to a total depth of 93mm in 48 hours.

On 22nd August 2015, intense rainfall fell across the south-east of Wirral, from Rock Ferry through to Bromborough and Bebington. This event resulted in localised flooding which resulted in road closures and disruption to a number of critical transport routes including the entrance to the Mersey Tunnel.

On the 1st September 2015 severe rainfall fell for 48 hours across the wider Wirral Peninsula. This consequently led to significant flooding on the morning of the 2nd September, with significant numbers of property damages occurring around (but not limited to) the urban areas of Moreton, Greasby, Pensby, Irby and Thingwall.

452 reports of flooding were submitted to LAs and the emergency services between these two dates. Of these 452 reports, 7 can be confirmed as corresponding with internal property flooding on the 22nd August 2015 and 73 on the 2nd September 2015. Given the number of properties flooded and the impact on critical infrastructure these incidents are considered to be significant flood events that require further investigation under Section 19 of the FWMA.

After an assessment of flooding mechanisms, the FIR highlights several actions that could be applied across the metropolitan borough. These can be found in Section 8.1 of the Flood Investigation Report (see footnote for link to document).

West Kirby and New Brighton Flood Investigation Report (December 2013)[29]

Widespread coastal flooding was experienced during the flood incident on Thursday 5th December 2013 with the towns of West Kirby and New Brighton particularly affected.

At West Kirby the crest of the sea wall was exceeded by tide levels with green water flowing freely across the closed highway and causing flooding to residential properties and damage to their boundary walls. Further upstream within the Dee Estuary, properties experienced some degree of damage and erosion however properties here are situated well above tide levels and were not flooded during this incident.

Along north Wirral the sea defences at Meols and Hoylake were overtopped causing the closure of the coastal promenades due to flooding. Wallasey Embankment was impassable but was not overtopped. At New Brighton, there was spray overtopping along the entire length of Kings Parade sea wall from Harrison Drive to Victoria Road. The overtopping flooded Kings Parade and also Ian Fraser Walk. The containment wall constructed as part of Marine Point development was also exceeded causing flooding to businesses, car parks and adjacent highways.

As a result of this Flood Investigation Report, various recommendations have been identified:

- WC, as LLFA implements, where appropriate, the governments Flood Support Scheme measures.
- The EA introduces a targeted Flood Warning Area for New Brighton specifically around Marine Point.
- The EA seeks to improve take up of the existing Flood Warning Area at West Kirby.

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28 https://www.wirral.gov.uk/sites/default/files/all/communities%20and%20neighbouhoods/Emergencies/Flooding/Flood%20report%20August%202015.pdf

29 https://www.wirral.gov.uk/sites/default/files/all/communities%20and%20neighbouhoods/Emergencies/Flooding/Flood%20Investigation%20Report%20Dec%205%202013.pdf

- The EA rebrands its Flood Alerts for the Dee Estuary and north Wirral to make the locations more familiar to Wirral residents.
- WC, as Highways Authority considers how diversionary routes at New Brighton and West Kirby can best implemented to reduce risks to traffic.
- WC, as Highways Authority considers the placement of non-temporary road closure measures at West Kirby and New Brighton.
- Wirral Council investigates how best to manage the risk to people and vehicles using coastal car parks.

Reeds Lane / Reedville Grove, Leasowe, Flood Investigation Report (September 2012)

The flooding that occurred on 24/25th/26th September 2012 at Reedville Close and Reeds Lane only flooded one property internally, although pedestrian access to Reedville Grove was very difficult and vehicular access was not possible for an extended period. Reeds Lane, itself, had to be closed making access difficult to Commercial Units in the vicinity; Bristol Myers Squibb also had to close its factory for a day on the 25th September. This location has flooded previously on the 5th-6th September 2008 when the flood extent and depth was observed to be greater than this last flood and one property suffered serious internal flooding.

Rainfall started around 18:00 on Sunday 23rd September and stopped around 17:00 on Monday 24th September. This causes flood water to surcharge from manholes on the public combined sewer system. The public surface water sewer system also surcharged and was unable to drain the floodwater through the gullies in the road. High river levels on the Birket are believed to have prevented efficient discharge from the public surface water system at the flapped outfall.

A number of recommendations that have come from this FIR include:

- UU should check the functionality of the flapped outlet from the surface water sewer into the Birket.
- The EA together with UU and WC should consider whether there are any viable options to minimise river locking of the surface water outfalls into the Birket.
- UU should review the performance of their assets/infrastructure during the event and consider any viable options to reduce the surcharging of the system at this low point.
- WC to investigate any flood reports from the nearby area to see if they are in anyway linked to this location.
- WC to consider as part of its flood risk planning at this location the early closure of the road to prevent problems from the wake of buses and cars.
- In partnership with the Local Community, the Council's Emergency Planning Team will develop a local flood response plan, as any works proposed or undertaken are unlikely to completely remove the risk of flooding at this location. Resident's expectations concerning any proposals need to reflect the Partners individual funding methods and the future funding changes likely to be experienced by both the EA and Local Government, particularly over the next 3 years.
- Residents, supported by Councillors and Partner Organisations, to consider the development of a local neighbourhood/community flood group.
- Local Councillors to be kept informed of progress with these recommendations to enable feedback to residents.

Various locations within Wirral boundary (September 2012)[30]

An extreme storm event (1 in 20 / 25 yr event) hit Wirral on Monday 24 September 2012, following an extended period of intermittent heavy rain. The storm fell on saturated ground with many of the rivers/watercourses and sewers already at capacity. 1 internal property and 24 external residential properties were affected by this event, as well as a number of road which had to be closed.

As a result of the flood event, the following outcomes were provided in the Flood Investigation Report:

Action taken: All properties visited and details of flooding noted. Road gullies in vicinity of the properties checked and no problems identified. Residents advised to contact Water Company to report flooding.

Action required: Water Companies to investigate public sewers in vicinity of flooded properties.

Further investigation: Investigations of locations were gullies are connected to a highway drain rather than a public sewer. However, the existing drainage systems as a whole were unable to deal with the amount of surface water generated by the storm event. Once storm had abated all flooding drained away.

Other information: It is unlikely that any improvements/additions to the highway drainage system would prevent future flooding from storm events of this magnitude. The Water Companies only design new sewers not to flood during this type of event they will however surcharge, which will prevent gullies connected to them from discharging.

Various locations within Wirral boundary (13th, 15th and 29th August 2012)[31]

There are three FIR that provide details on the extreme storm events that hit Wirral on 13th, 15th and 29th August 2012. The sources of flooding include a combination of: sewer drainage, highway drainage, surface water, ground water and fluvial flooding. The maximum depth of flooding on the 13th August was 200mm and decreased to 150mm on the 15th and 29th August 2012.

Properties effected:

13th August 2012 – 46 (internal), 31 (external) residential

15th August 2012 – 26 (internal), 9 (external) residential

29th August 2012 – 10 (internal), 5 (external) residential

Actions taken, actions required, further investigation and further investigation for this event are in line with those in the previous FIR above.

Various locations within Wallasey / New Brighton / Leasowe and Heswall (August 2011)[32]

An unpredicted extreme storm event (1 in 561 year event) hit Wirral on the evening of Friday 26th August 2011. It is believed to have tracked across the metropolitan borough in a narrow band from south-west to north-east, leading to flooding in low

30 https://www.wirral.gov.uk/sites/default/files/all/communities%20and%20neighbouhoods/Emergencies/Flooding/24%20September%202012%20Flood%20Investigation.pdf

31 https://www.wirral.gov.uk/communities-and-neighbourhoods/emergencies/flooding/flood-monitoring-and-reports

32 https://www.wirral.gov.uk/sites/default/files/all/communities%20and%20neighbouhoods/Emergencies/Flooding/Flood%20Investigation%20Aug%202011.pdf

lying locations in Heswall, Leasowe, Wallasey and New Brighton, with a maximum depth of 350mm. As a result, the sewer drainage capacity exceeded and consequently flooded 25 internal properties and 2 external (residential and commercial).

Actions taken, actions required, further investigation and further investigation for this event are in line with those in the previous two FIR's above.

4.7.5 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 SWMP Technical Guidance document[33], 2011, 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.

Defra's framework for carrying out a SWMP is illustrated by the SWMP wheel diagram, as shown in Figure 4-9. The first three phases involve undertaking the SWMP study, whilst the fourth phase involves producing and implementing an action plan which is devised based on the evidence gained from the first three phases.

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

Figure 4-9: Defra wheel (taken from SWMP Technical Guidance)

The LLFA is currently developing Surface Water Management Plans on a priority / risk basis. Current plans are in development for Heswall, North Cheshire Trading Estate, Pensby, Irby, Thingwall and Hoylake areas.

4.7.6 Critical Drainage Areas (CDAs)

CDAs can be designated by LPAs or LLFAs for their own purposes and at their own discretion. CDAs should be concerned with surface water (pluvial / sewer) flood risk only and are therefore not within the EA's remit. Any CDA policy is entirely at the discretion of the LPA and LLFA and can entail minimum requirements for runoff volumes from development sites; a preference for a certain type of SuDS; drainage strategies to be in place for larger development sites; stricter requirements on site-specific FRAs i.e. lowering the requirement for FRAs to sites greater than half a hectare in size rather than one hectare. The EA do not have to be consulted on sites that are within a CDA if such sites are in Flood Zone 1.

CDAs would usually entail areas that have significant risk of surface water flooding and were identified as the most obvious locations where flooding was either predicted to occur or had actually occurred in the past. Consultation with UU would be required to

draft any CDAs in Wirral, to ascertain any pinch points in the sewer network or areas with critical capacity issues.

Wirral however, at the time of writing, has not delineated any CDAs in the authority area.

4.7.7 Green Infrastructure Assessments

Open space, or 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.

Utilisation of open space for water in areas of greatest flood risk would be key to helping deliver sustainable development. Examples include (also see Section 5.7.4):

- 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[34]. 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.

Wirral Council Green Infrastructure Strategy

A GI strategy is not currently in place for Wirral Council; currently the Wirral Waters Green Infrastructure Framework is used as a reference for the council.

34 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

A partnership of LAs and Environmental Agencies came together in 2010 to commission a framework looking at the planning and coordination of GI across north east Wales, Cheshire and Wirral and was facilitated by the Mersey Dee Alliance (MDA). The Framework, published in 2011[35], assesses the natural environments of Denbighshire, Flintshire, Wrexham, Cheshire West and Chester, Cheshire East and Wirral and sets out how a healthy natural environment can help sustain economic growth and self-supporting communities.

The Framework's vision is:

- To identify priorities for management of the natural environment across each area;
- To support delivery of cross-boundary initiatives and local projects;
- To provide robust evidence for policy to protect and enhance the natural and historic environment in plans produced by the local authorities, community partnerships and infrastructure providers;

4.7.8 Wirral Waters

Wirral Waters is a programme of national significance in an area of high levels of deprivation and inequality and in need of investment for sustainable growth promoted by Peel Land and Property. The Wirral Waters GI scheme will underpin the quality of place and life around Wirral Waters. The masterplan design aims to create a mixed-use, high density, highly sustainable project that will elevate and regenerate the area to the benefits of its existing community. Outline planning permission for the East Float element of Wirral Waters was granted in June 2012.

Wirral Waters is a neighbourhood led project. Each neighbourhood will have its own function, identity and feel. It will be phased with early projects clustering in the Four Bridges, Northbank and Marine, Energy and Automotive (MEA) Park neighbourhood areas.

For more information, please visit:

https://www.wirralwaters.co.uk

4.7.9 Flood Risk Partnerships and Partnership Plans

WC has been involved in the development of several partnerships designed to provide collaboration between public agencies, businesses and the community. Partnerships and plans that affect the metropolitan borough include:

- Merseyside Local Resilience Forum - see Section 7.1.1,
- Wirral Metropolitan Borough Council Emergency Plan,
- Merseyside Community Risk Register – see Section 7.1.2,
- Merseyside Flood and Coastal Erosion Risk Management (FCERM) Partnership,
- North West Regional Flood and Coastal Committee (NW-RFCC),
- Wirral Flood and Water Management Partnership,
- Wirral Operational Group,
- Liverpool Bay Coastal sub-Group,
- Wirral Council Water Cycle Study (2013)[36] - see Section 4.7.3,
- Local flood plans – see Section 7.1.4,
- Flood warning and awareness,

35 http://www.merseydeealliance.org.uk/wp-content/uploads/2013/04/small_2230_Framework_Final_March_2011.pdf

36 https://democracy.wirral.gov.uk/documents/s50016953/Appendix%203%20-%20Wirral%20Council%20Water%20Cycle%20Study%20Outline%20Study%20-%20Technical%20Appendices.pdf

- Evacuation plans - see Section 7,
- Key businesses and organisations - WC has ongoing relations with major land owners, employers and organisations such as the Rivers Trust, National Trust, Natural England, Highways England, Mersey Rail and Network Rail.

See Section 7 on Emergency Planning for more information.

4.8 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.

4.8.1 EA as a RMA

- Has a strategic overview role for all forms of flooding;
- Provides and operates flood warning systems;
- Carries out work to manage flood risk from the sea and main rivers;
- Carries out work in estuaries to secure adequate outfalls for main rivers;
- Carries out surveys to inform FCERM (Flood and Coastal Erosion Risk Management) works and has the right to enter private land to carry out such works;
- Issue permits for works on or near main rivers, and works affecting watercourses, flood and see defences and other structures protected by its byelaws;
- Designates structures and features of the environment that affect flood or coastal flood risk;
- Has the power to request information from any partner in connection with its risk management functions;
- 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.

4.8.2 LPA as a RMA

- Has a duty to act in a manner that is consistent with the National Flood Risk Management Strategy and have regard to Local Flood Risk Management 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.

4.8.3 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;
- Should prepare and maintain preliminary flood risk assessment, flood hazard maps, flood risk maps and flood risk management plans;
- Is required to lead, 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 flood risk;
- Has powers to undertake works to manage flood risk from surface water, groundwater and from ordinary watercourses;
- Must exercise its flood and coastal erosion risk management functions in a manner consistent with the National Flood Risk Management Strategy and the Local Flood Risk Management Strategy;
- Can carry out work that may cause flooding or coastal erosion in the interests of nature conservation, preservation or cultural heritage or people's enjoyment of the environment or cultural heritage;
- Can acquire land in or outside of their district for use in flood risk management if necessary;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a Local Strategy) to other RMAs;
- Can take the lead on preparing SWMPs;
- Must aim to contribute to sustainable development;
- Should consider flooding issues that require collaboration with neighbouring LLFAs and other RMAs.

4.8.4 UU / DCWW 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.

4.8.5 Highways Authority (WC) 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.

4.8.6 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.
- Can form Flood Action Groups within communities to build resilience and understand of their local flood risk.

4.8.7 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 via:

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

4.8.8 Developers

Have a vital role in ensuring effective local flood risk management by avoiding development in areas at risk of flooding, by ensuring their development does not make flood risk worse on site or elsewhere and by using and ensuring lifetime maintenance of their sustainable drainage system. Local Flood Risk Management Strategies should form a material consideration of local planning policy and guidance, along with consultation of this SFRA.

5 Flood Risk Across Wirral

5.1 Flood risk datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within Wirral. The information contained is the best available at the time of publication and is intended to provide each LPA with an overview of risk. Further detail is provided within the Volume II reports.

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
Fluvial / tidal	EA Flood Map for Planning (Rivers and Sea) (April 2018 version)
	EA Risk of Flooding from Rivers and Sea map (defended)
	Latest available EA Flood Risk Mapping Studies
	EA Historic Flood Map
	EA Risk of Flooding from Surface Water dataset
	EA Recorded Flood Outlines
	EA Area Benefitting from Flood Defences
	EA Flood Warning Area
	Dee Catchment Flood Management Plan
	Mersey Estuary Catchment Flood Management Plan
Pluvial (surface water runoff)	EA Risk of Flooding from Surface Water (RoFSW)
	WC Preliminary Flood Risk Assessment 2011 and update 2017
Sewer	DCWW / UU Historical Flood Records and incident data
Groundwater	EA Groundwater Vulnerability Map
Reservoir	EA Reservoir Flood Maps (available online only)
All sources	North West and Dee Flood Risk Management Plan
	North West and Dee River Basin Management Plan
	Wirral Local Flood Risk Management Strategy
	WC Historic Flood Boundaries
	WC Level 1 SFRA 2009
Flood risk management	EA spatial flood defence data
	LLFA FRM asset register
	WC Flood Alleviation Schemes
	S19 FWMA investigations

5.2 Fluvial and Tidal flood risk

Fluvial flooding is associated with the exceedance of channel capacity during higher flows or as a result of blockage. 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.

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 Wirral's authority area.

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 uses its permissive powers to carry out maintenance, improvement or construction work on Main Rivers to manage flood risk and will carry out flood defence work to Main Rivers only.

As noted in Section 2, Wirral contains the Main Rivers of the Birket, Dibbin and Dee. The mechanisms of flooding along these watercourses and their tributaries can be described as fluvial and tidal in nature.

There are a number of Main River tributaries making up the Birket catchment, including Arrowe Brook, Fender and Greasby Brook. Furthermore, Dibbinsdale Brook is a main River separate to the Birket catchment.

Judging by the Flood Map for Planning, the majority of fluvial / tidal flood risk within Wirral comes from the River Mersey, which causes tidal flood risk along the north Wirral coast and the east of the borough, and the River Dee that runs to the west of the borough. The Birket can also be described as posing significant flood risk, particularly at the confluence with the Fender.

5.2.2 Ordinary watercourses

Ordinary watercourses are any watercourse not designated as Main River, e.g. the River Mersey. 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 have statutory permissive powers to carry out flood risk management work on ordinary watercourses, including Arrowe, Prenton, Greasby, Clatter, Newton and Dibbinsdale Brooks, and Raby Mere. The LLFA also have a regulatory role to ensure flood risk from activities on ordinary watercourses do not increase flood risk.

5.2.3 EA Flood Map for Planning (Rivers and Sea)

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 and tidal event (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 its flood zones with detailed hydraulic model outputs as part of their national flood risk mapping programme.

The 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. As directed by the FRCC-PPG, this SFRA subdivides Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (functional floodplain - see Section 5.2.4).

The EA also provides 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 defence infrastructure, 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 information to show the presence and effects of flood risk management infrastructure. This dataset is further discussed in Section 5.2.5.

This SFRA uses the Flood Map for Planning version issued in April 2018 to assess fluvial and tidal risk to assessed sites, as per the NPPF and the accompanying FRCC-PPG. 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 April 2018:

https://flood-map-for-planning.service.gov.uk/

5.2.4 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."

A technical note is provided in Appendix C which explains the methodology used in update the functional floodplain outline. The area identified as functional floodplain should take into account the effects 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.

The EA's most up-to-date Historic Flood Map (HFM), Area Benefitting from Defences (ABD), Recorded Flood Outlines (RFO) and Flood Storage Area (FSA) datasets were assessed with regards to using them to update the functional floodplain where appropriate. There are not however any FSAs in Wirral.

The Birket, Fender and Arrowe Brook Fluvial 2011 model (20 year undefended outlines), Wirral Tidal 2015 model (30 year undefended outlines) and Dibbinsdale Brook 2010 (20 year undefended outlines) were also used to update the functional floodplain. Flood Zone 3 and the previous functional floodplain were also used in this instance with Flood Zone 3 being used in areas where the functional floodplain outline exceeded Flood Zone 3 outlines.

Any site-specific FRAs should further assess areas of functional floodplain through detailed investigation and assessment of the actual risk.

The functional floodplain outline was assessed and agreed upon by the LPA, the LLFA and the EA, based on their local knowledge.

The EA acknowledged the approach undertaken for consideration of the functional floodplain in the absence of further detailed modelling at the time of creation, although advised the outlines did not look entirely accurate. The EA advise, at the time of writing, for the functional floodplain outlines to be considered in more detail through a Level 2 SFRA (if required), or if a site specific FRA is required. The EA note that some outlines appear to be on the ordinary watercourse network and would be very unlikely to update the models.

5.2.5 EA Risk of Flooding from Rivers and the Sea Map

The Risk of Flooding from Rivers and Sea map (RoFRS) 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 and is shown on the Appendix A maps. The RoFRS 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 RoFRS map 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 flood risk

Surface water flood risk should be afforded equal standing in importance and consideration as fluvial and tidal flood risk, given the increase in rainfall intensities due to climate change and the increase in impermeable land use due to development.

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

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

There are certain locations, generally 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, topography, and the location and condition of highway gullies all have a major role to play in surface water flood risk.

Paragraph 013 of the FRCC-PPG states that SFRAs should address surface water flooding issues by identifying areas of surface water flooding and areas where there may be drainage issues that can cause surface water flooding. The EA's Risk of Flooding from Surface Water (RoFSW) map along with the LFRMS (see Section 4.7.1 show and provide details of where surface water risk is most prevalent. Sections 6.11 and 6.13 provide guidance on surface water mitigation options and possible implementation of appropriate SuDS for developers.

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.

According to the 2011 Wirral PFRA, for a rainfall event with a 1 in 200 chance of occurring, it estimated that approximately 4,000 residential and 100 business (or critical services) properties are at risk from surface water flooding to a depth of 0.3m.

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 and tidal flood zones.

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

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. However, any sites identified to be at risk from surface water flooding should be assessed in more detail, following this SFRA, as the RoFSW is a national-scale dataset and may therefore over-represent results, the dataset is modelled on the worst case scenario.

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

- 1 in 30 AEP event (3.3%) (high risk)
- 1 in 100 AEP event (1%) (medium risk)
- 1 in 1000 AEP event (0.1%) (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 used as a measure of materials roughness and the subsequent effects upon flooding, i.e. lower manning's value results in less resistance to water flowing over it meaning increased flood extents. Use of OS MasterMap topography layers applied in the second generation surface water flood map allows for more precise applications of this value compared to blanket values for urban and rural land use being used.

The aim of the RoFSW map is to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW has proved extremely useful in supplementing the Flood Map for Planning, by identifying areas in Flood Zone 1 which may have critical drainage problems.

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.

5.3.2 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.

UU and DCWW are the water companies responsible for the management of the majority of the drainage networks across the LA.

5.3.3 Locally Agreed Surface Water Information

EA guidance on using surface water flood risk information recommends that WC, as a 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".

Following on from the LLFA consultation on the RoFSW in 2013 before its release, the EA stated that the Flood Map for Surface Water (2010) and the Areas Susceptible to

Surface Water Flooding (2008) maps do not meet the requirements of the Flood Risk Regulations and are not compatible with the 2013 RoFSW mapping. Consequently, these datasets cannot be used as 'locally agreed surface water information'.

Locally agreed surface water information either consist of:

- The RoFSW map, or
- Compatible local mapping if it exists i.e. from a SWMP, or
- A combination of both these datasets for defined locations in the LLFA area.

WC as LLFA should consider the RoFSW to be its locally agreed surface water flood information as this is the latest, most robust surface water flood map available for the borough, at the time of writing.

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 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 SuDS; however, this is dependent on detailed site investigation and risk assessment at the FRA stage.

The EA have provided WC with groundwater data, derived from the British Geological Survey (BGS) data, in the form of a groundwater vulnerability map, which provides key evidence for the EA's assessment of GW vulnerability. The data uses three categories to show this potential; high, medium and low vulnerability.

This dataset shows that the areas with high groundwater vulnerability are located mainly around the northern and north eastern coastline, particularly in Hoylake, Leasowe, New Brighton, along the Birket river corridor and Caldy, Thurstaston and Irby Hall. Other areas which are susceptible to high groundwater vulnerability include, locations within the settlements of Raby, Brimstage, Thornton Hough, Bidston, Claughton, and Bromborough/Eastham , specifically Eastham Woods, Long Plantation and Oak Wood, parallel to the Manchester Ship Canal.

It is important to ensure that future development is not placed at unnecessary risk therefore groundwater flood risk should be considered on a site by site basis in development planning.

Groundwater flood risk should be considered particularly when determining the acceptability of SuDS schemes as a way of managing surface water drainage. Developers should consult with the LPA, the LLFA and the EA at an early stage of the assessment.

The groundwater vulnerability dataset is shown on the SFRA Maps in Appendix A.

5.5 Canal and Reservoir Flood Risk

5.5.1 Canals

The risk of flooding along a canal is considered to be residual and is dependent on a number of factors. As canals are manmade systems that are 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 as highlighted in Table 5-2. Canals can also have a significant interaction with other sources, such as watercourses that feed them and minor watercourses or drains that cross underneath.

Table 5-2 Canal flooding

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

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[37] (log) arrangements, stop gates and the continued inspection and maintenance of such assets by the Canal & River Trust or private owners to help manage the overall risk of a flood event.

Within Wirral's authority area boundary, there are canalised areas located at Morpeth and Egerton Docks, Birkenhead. There is also a short section of the Manchester Ship canal, which is accessed via lock gates from the Mersey Estuary at Eastham and follows the rivers Mersey and Irwell upstream to Salford.

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. The LPAs should work with other members of the Merseyside Local Resilience Forum to develop these plans. See Section 7.1.1 for more information on the Merseyside Local Resilience Forum.

Paragraph 014 of the FRCC-PPG states that, in relation to development planning and reservoir dam failure:

37 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

"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 Map

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 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[38]' which provides information on how the maps were produced and what they contain.

The RFM can be viewed nationally at:

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

The RFM shows that there is one reservoir within Wirral's authority boundary, which meets the criteria for inclusion on the RFM, namely Crosshill Reservoir which is located near Thingwall. This is a covered reservoir which may pose a risk to the surrounding area and locations along the Fender river corridor, starting from the east of Prenton to Bidson. It is worth noting however that reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925

5.6 Historic Flooding

As LLFA, WC is required, under the FWMA, to maintain and update its historic flood incidents database as and when any flood incidents occur. The LLFA has a statutory responsibility to investigate and report upon any 'significant' flood events.

Prior to the introduction of the FWMA in 2010, Wirral did not have LLFA status, therefore there was no requirement to maintain a register of historic flood incidents. Records from WC suggest that local flooding has occurred in the past however the cause and type of these floods was not always recorded. The majority of the historic flooding in Wirral was mainly isolated, external to property, or restricted to the highway, open space and farmland, according to the LFRMS.

A major factor influencing the flooding that has occurred is the flood defences on the main river network, in particularly the Birket and Fender, which in places have been constructed higher than the surrounding area. Although, this allows the Main Rivers to carry and store additional flows it prevents many of the directly piped outfalls and critical and ordinary watercourses from discharging into them. This inevitably leads to flows backing up and subsequent flooding, which due to the low-lying nature of the area, can stretch well into the upstream catchments.

The 2017 PFRA review however, using all relevant current flood risk data and information provided information on past floods since 2011:

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

- 13th August 2012
- 15th August 2012
- 29th August 2012
- 24th September 2012
- 5th September 2013
- August and September 2015
- July 2017 (although outside of the PFRA Review period)

Historically, tidal flood risk has posed significant flood risk to Wirral. Coastal erosion and tidal flood risk is managed throughout the Council's responsibilities for coastal defence as a Coastal Protection Authority (CPA). WC is the major owner of the 42km of sea and river frontage between its boundaries on the Dee and Mersey Estuaries. Whilst most of this frontage is defended to reduce flood and coastal erosion risk after significant investment was provided during the 1970s and 1980s, particularly along the North Wirral Coast. However, according to the Wirral Coastal Strategy[39], since 2001 there has been no major capital investment in coastal defence measures across the Wirral frontage, apart from refurbishment of the outer wall of the Marine Lake an West Kirby in 2008. There has been however on-going revenue expenditure on the maintenance of existing coastal defence assets. A programme of regular inspection and monitoring is also in place.

There has also been significant risk associated with the interaction between tidal flood risk along the North Wirral Coast and fluvial flood risk from the Birket. Tidal flood risk precludes the greatest risks to settlements with the largest overall flood outline, however fluvial and tidal interactions along the North Wirral coastline and in areas along the Birket where there is increased susceptibility of fluvial and tidal flood risk influences.

The Wallasey Embankment provides a high standard of protection of tidal flood defence with a design standard of 200 years and is therefore described as providing a 1 in 200-year standard of protection. A breach analysis was completed as part of the 2009 Wirral SFRA which outlined the extensive potential tidal flood risk behind the Wallasey Embankment defence. There has also been potential for tidal floodwaters to become trapped behind existing fluvial flood defences at Leasowe, The Birkenhead Docks (very limited), Woodside, West Kirby (very limited) and New Brighton (limited) have been potentially susceptible to tidal flooding according to the previous SFRA.

During intense rainfall events, the effects of tidal flooding could create increased problems, as surface water may struggle to drain through the already exceeded drainage systems which discharge into the estuaries, because of the high tidal levels. Wave overtopping of existing coastal / tidal defences can create the potential to risk lives and properties in Wirral, if such receptors are near the coastline. This has been an issue at New Brighton at certain times, and could become more serious as sea level continues to rise.

5.6.1 Historic Surface Water Flooding

In recent years Wirral has been hit by several severe storms resulting in surface water flooding including one storm estimated to have a return period in excess of 1 in 550 years. In addition to internal and external property flooding, there have been a considerable number of reports related to highway flooding within the borough, causing traffic disruption. Many of the flood incidents are thought to be a result of a lack of maintenance, capacity issues or no drainage system existing in the area. In response,

[39] Wirral Coastal Strategy Executive Summary. April 2013

WC commissioned a surface water report to develop a programme of works to address surface water flooding.

This report is sensitive as it details individual properties, and therefore for the purpose of this SFRA, we will only discuss areas and not properties in relation to flood risk.

Lower Bebington has been noted to be a long standing problem area for the Council, although only four records of property flooding within this area. Highway flooding which has led to traffic disruption, however. The EA RoFSW mapping dataset supports this, with a defined surface water flow path which illustrates the potential for much greater flooding and public disruption in the future.

There are a number of areas across Wirral which have suffered from surface water flooding in the past including; Heswall, Gayton, Bidston, Eastham, Hoylake, New Brighton, Pensby and Irby, Moreton and Leasowe, Upton, West Kirby and Newton. Many of these locations are due to the drainage system and highway drainage being unable to cope with a 30 year event. Residents have noted highway flooding in Bidston and some external property flooding after a rainfall event, which has been attributed to the UU surface water sewer not having a free outfall into the watercourse as the channel has not been maintained and is heavily overgrown causing blockages to the sewer system.

According to Wirral Councils Surface Water Report, Greasby has one predominant flooding location with flood records from July and August 2007, July, August and September 2008, July 2009 and August 2012.

The identified storm events and data sources relating to the surface water flooding that has occurred in Wirral before 2011 are detailed in Table 5-3 below.

Table 5-3 Flooding Incident Data Sources

Incident date	Flooding information source
November 2000	Local newspaper reports and Wirral flooded area plans
August 2006	Wirral Council records
September 2007	Wirral Council records and political community groups
September 2008	Wirral Council records and political community groups
January 2008	Wirral Council records
July 2009	Wirral Council records
July 2010	Wirral Council records

Approximately two-thirds of the surface water flows generated within Wirral discharges into the River Birket and its tributaries. The Birket flows into a large diameter culvert known locally as 'The Great Culvert'. These flows are lifted into the dock system by UU pumping station and are also intercepted by an automatic, mechanically raked screen with a bypass overflow should the screen blind or suffer a mechanical failure, which has led to property flooding in the past.

UU / DCWW and WC historic data

WC provided their historic flood boundary data, with 199 incidents recorded from 2012-April 2018, which have been aggregated into polygon boundaries. Many of these incidents / boundaries are at the property level and as such are considered as sensitive information and have therefore not been included on the detailed large scale SFRA maps. They are however shown at the smaller scale of the whole authority area in

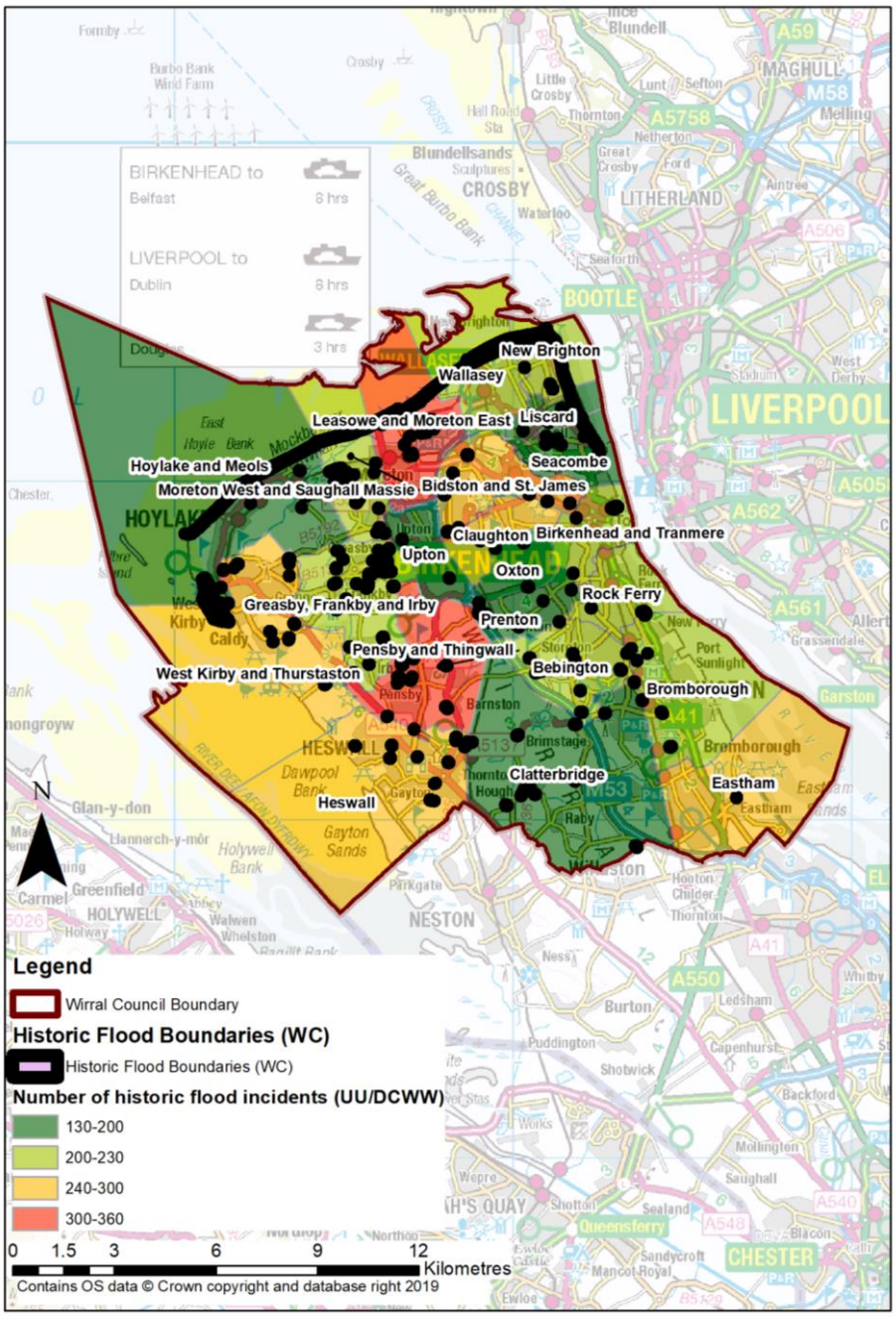
Figure 5-1 (and Appendix E), along with UU/DCWW's historic flood incident data, which has been aggregated into wards due to data sensitivity.

UU's and DCWW's flood records include multiple sources of flooding, mainly located along the eastern areas of Wirral. There is visible clustering of incidents around, Pensby, Thingwall, Leasowe and Moreton East.

The dates of these incidents have been recorded from August 1978 – April 2018. The recorded flood incidents include internal and external flooding (UU and DCWW), as well as UU's internal and external Flooding due to other Causes (FOC) dataset, and internal / external hydraulic flooding.

A number of rainfall and coastal storm surge events have occurred since 2011 which flooded 221 properties as a result of a combination of; overtopping of coastal defences and an incapacity within the public sewerage which put pressure on the highway or land drainage systems to deal with what were sometimes extreme events, according to the LFRMS.

Figure 5-1 UU / DCWW and WC Historic flood incidents



The locations of WCs flood boundaries are more dispersed than the flood incident data provided by UU/DWCC, however the majority are clustered along the northern coastline, West Kirby, west of Moreton and Brookway on Prenton Brook and sporadic across the rest of the metropolitan borough, attributable to pluvial and surface water flooding.

Flooding from Public Sewers

The majority of the public sewerage system in Wirral is owned and maintained by UU, however the southwest region of Wirral, around Heswall, is the responsibility of DCWW.

Much of the highway drainage system within Wirral discharges into either the public combined or surface water sewers. During high intensity storm events or extended periods of heavy rain the public sewerage system often becomes overloaded resulting in both surface water and foul flooding of properties and the highway.

5.6.2 EA Historic Flood Map

The Historic Flood Map (HFM) is a spatial dataset showing the maximum extent of all recorded historic flood outlines from river, sea and groundwater, and shows areas of land that have previously been flooded across England. Records began in 1946 when predecessor bodies to the EA started collecting information about flooding incidents. The HFM accounts for the presence of defences, structures, and other infrastructure where such existed at the time of flooding. It includes flood extents that may have been affected by overtopping, breaches or blockages. It is also possible that historic flood extents may have changed and that some areas would not flood at present i.e. if a flood defence has been built.

The HFM does not contain any information regarding flood source, return period or date of flooding, nor does the absence of the HFM in an area mean that the area has never flooded, only that records of historic flooding do not exist. The Recorded Flood Outlines (RFO) dataset however does include details of flood events. The difference between the two datasets is that the HFM only contains flood outlines that are 'considered and accepted' by the EA following adequate verification using certain criteria. For those areas not within an HFM or RFO outline, this does not mean these areas have never flooded, only that the EA does not have records of flooding in this area.

The HFM shows some areas of flooding in the north east region of Wirral, near the residential area of New Brighton, and either side of the M53, south of A553 / Fender Lane.

The HFM and RFO datasets are shown on the SFRA maps in Appendix A.

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. 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 (Spatial Flood Defences)

The EA maintain a spatial dataset called the Spatial Flood Defences dataset. This national dataset contains such information as:

- Asset type (flood wall, embankment, high ground, demountable defence, beach, dunes);
- Flood source (fluvial, tidal, fluvial and tidal);
- Design standard (SoP);
- Asset length;
- Asset age;
- Asset location; and

Asset condition. See Table 5-4 for condition assessment grades using the EA's Condition Assessment Manual[40] (CAM).

Table 5-4 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.

Table 5-5 Major flood defences in Wirral

Defence Location	Asset Type	Flood Source	Watercourse	Design Standard	Condition
Along the Birket from Pasture Road to the A554.	12 Flood Walls 23 Embankments	Fluvial / Tidal	The Birket	100 (35)	2 (3) - Good 3 (32) - Fair
Either side on Fender Lane / A553 and a small area of the M53	5 Embankments	Fluvial / Tidal	The Fender	100 (5)	3 (1) - Fair 4 (4) - Poor
North of Marine View coastline Wallasey Embankment*	1 Embankment	Coastal	Liverpool Bay	200	2 - Good
Manchester Ship Canal defence, south east Wirral	1 Embankment	Tidal	Manchester Ship Canal	0	3 - Fair
Seacombe Promenade	Masonry retaining wall	Tidal	River Mersey	5	3 – Fair
Number in brackets = number of assets *** Flood defence infrastructure belonging and maintained by WC**					

In total, there are 52 flood defence assets within Wirral, according the EA's spatial flood defence dataset. Table 5-5 highlights the main locations within the borough that have significant FRM assets, the majority of which are located along the Birket and Fender, defending the urbanised areas that are vulnerable to flood risk within Wirral.

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

Of the 52 constructed fluvial / tidal / coastal flood defence assets within Wirral, 13 are floodwalls and 39 are flood embankments. The floodwalls aim to prevent the Birket from flooding residential properties and infrastructure. All of the fluvial / tidal floodwalls that extend along the Birket have a design standard of 100 and can therefore be described as providing a 1 in 100-year standard of protection, with 3 floodwall assets having a 'good' condition according to the EA's Condition Assessment Manual (CAM) (as discussed in Table 5-4) with defences having 'minor defects that will not reduce the overall performance of the asset' and 9 floodwalls having a 'Fair' condition.

The remaining embankment defences, also mainly located along the Birket and Fender, look to be designed to protect the residential properties and agricultural land that could be affected by fluvial / tidal flooding. The fluvial / tidal defences have a design standard of 100 and a condition range of 3-4 (Fair/Poor). There is an embankment located on Prenton Brook, south of Woodchurch Road which has the lowest design standard of '5' out of all the assets, and a 'Poor' condition. The reliability of this defence is therefore questionable and further investigation is needed to ensure prevention of flood risk to the surrounding residential area.

The most common condition associated with the defences in Wirral is 3, which is considered 'Fair' according to the EA's Condition Assessment Manual (CAM) with defences 'having defects that could reduce the performance of the asset'.

Along Kings Parade New Brighton, Hoylake Promenade and West Kirby Marine Lake there are masonry walls which provide protection and a pedestrian walk way along the promenade.

5.7.2 WC assets

The LLFA own and maintain a number of assets throughout the borough which includes culverts, bridge structures, gullies, weirs and trash screens. The majority of these assets will lie along ordinary watercourses within smaller urban areas where watercourses may have been culverted or diverted, or within rural areas. All these assets can have flood risk management functions as well as an effect on flood risk if they become blocked or fail. In most 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 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. 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.

A number of flood defence infrastructure assets that belong to, and is maintained by the Council, e.g. the Wallasey Embankment and coastal masonry seawall (west of Backwood Hall Farm).

WC is also responsible for 19 miles of sea and river walls between borough boundaries at Eastham and Heswall.

WC's asset register is available to view via appointment at:

Wallasey Town Hall
51 Brighton Street
Wirral
Wallasey
CH44 8ED

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, vertical walls, sloped embankments, rock revetment and breakwaters, steps and slipways) and in particular the Wallasey Embankment, to be prioritised for designated works.

5.7.3 Water Company Assets

The sewerage infrastructure within Wirral was based on Victorian sewers from which there is a risk of localised flooding associated with the existing drainage capacity and sewer system. UU and DCWW are responsible for the management of the adopted sewerage system for their areas. This includes surface water and foul sewerage. There may however be some private surface water sewers in the borough as only those connected to the public sewer network that were transferred to the water companies under the Private Sewer Transfer in 2011 are likely to have been constructed since this transfer date. However, UU have undertaken many flood relief and water quality improvement schemes over the past decade which have replaced much of the Victorian assets. Surface water sewers discharging to watercourses were not part of this transfer and would therefore not be under the ownership of UU/DCWW, unless adopted under a Section 104 adoption agreement.

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

5.7.4 Natural Flood Management / Working with Natural Processes

Natural flood management (NFM) or Working with Natural Processes (WwNP) is a type of flood risk management used to protect, restore and re-naturalise 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 will be used throughout this report.

WC are actively engaged with the Lower Mersey and Tidal Dee Catchment Partnerships mentioned above and the Healthy Waterways Trust and Cheshire Wildlife Trust with a view to setting aside land for WwNP. 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 Wirral, include:

- 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
- Restoration and management of sand dunes, saltmarshes and mudflats on the coast
- Managed realignment of the coastline
- Beach nourishment

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.

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.

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 and Dee, 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.

Table 5-6: WwNP measures and data[41]

WWNP Type	Open data licence details
Floodplain reconnection	• Risk of Flooding from Rivers and Seas (April 2017) • Data derived from the Detailed River Network, which is not displayed, rescinding the licence requirements for displaying the dataset (to be superseded by OS Water Network but not available for project in time). • Constraints data
Run-off attenuation features	• Data derived from Risk of Flooding from Surface Water (Depth 1 percent annual chance and Depth 3.3 percent annual chance) (October 2013). The original data is not displayed, due to licensing restrictions.[2] • Constraints data • Gully blocking potential (a subset of run-off attenuation features on steeper ground) • Data derived from OS Terrain 50 (2016) to classify each run-off attenuation feature based on median slope.
Tree planting (3 categories)	• Floodplain: Flood Zone 2 from Flood Map for Planning (April 2016) and new constraints layer • Riparian: 50m buffer OS water features from Section 2.2.3 with constraints layer • Wider catchment woodland: - Based on slowly permeable soils. - BGS Geology 50,000 Superficial and Bedrock layers (both V8, 2017). Used with new science to derive new 100m gridded open data. This new layer can be used to signpost areas of SLOWLY PERMEABLE SOILS and can be checked in more detail on the BGS portal. - To the north of the line of Anglian glaciation, the presence of till-diamicton has been shown to be a strong predictor of slowly permeable soils. - To the south of this line, particular bedrock geologies have shown a similarly strong spatial relationship to the presence of slowly permeable soils.

The WwNP datasets are included on the SFRA Maps in Appendix A and should be used to highlight any sites or areas were the potential for WwNP should be investigated further as a means of flood mitigation:

41 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/677592/Working_with_natural_processes_mapping_technical_report.pdf

- Floodplain Reconnection:
  - Floodplain Reconnection Potential - areas of low or very low probability based on the Risk of Flooding from Rivers and Sea dataset (Section 5.2.5), which are in close proximity to a watercourse and that do not contain properties, are possible locations for floodplain reconnection. It may be that higher risk areas can be merged, depending on the local circumstances.

- Runoff Attenuation Features (Run-off attenuation features are based on the premise that areas of high flow accumulation in the RoFSW) maps are areas where the runoff hydrograph may be influenced by temporary storage if designed correctly):
  - Runoff Attenuation Features 1% AEP
  - Runoff Attenuation Features 3.3% AEP

- Tree Planting:
  - Floodplain Woodland Potential and Riparian Woodland Potential - woodland provides enhanced floodplain roughness that can dissipate the energy and momentum of a flood wave if planted to obstruct significant flow pathways. Riparian and floodplain tree planting are likely to be most effective if close to the watercourse in the floodplain, which is taken to be the 0.1% AEP flood extent (Flood Zone 2), and within a buffer of 50 metres of smaller watercourses where there is no flood mapping available. There is a constraints dataset that includes existing woodland.
  - Wider Catchment Woodland Potential - slowly permeable soils have a higher probability of generating 'infiltration-excess overland flow' and 'saturation overland flow'. These are best characterised by gleyed soils, so tree planting can open up the soil and lead to higher infiltration and reduction of overland flow production.

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.

WwNP in Wirral

According to the spatial model of slowly permeable soils there are areas within Wirral whereby removing existing defences and reconnecting the floodplain could create areas for potential without causing risk to properties. These areas are predominately located on Greasby Brook, along the majority of Dibbinsdale and Clatter Brooks, with the largest areas located in Hoylake on part of Municipal Golf Course and on the Fender at Noctorum. Reconnecting the river with its floodplain and naturalising the river itself should help to reduce peak flood levels which will help to protect properties and infrastructure in settlements 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 sites across Wirral that would benefit from tree planting, located along the entirety of Greasby

Brook, downstream of Arrowe Brook, upstream of Clatter Brook and along the West Kirby coast. Riparian tree planting is also available in urban and rural areas of Wirral, predominantly located to the western area of the town, which will assist in minimising the risk of flooding in the area.

WC should look to become actively engaged the Rivers Trust's NFM investigations with a view to setting aside land for NFM, as well as using the WwNP dataset as shown on the SFRA maps (Appendix A), to gauge possible land which could be set aside for NFM.

5.7.5 EA Flood Risk Management Activities and Flood and Coastal Erosion Risk Management Research and Development

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 channels.
- 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, i.e. through this SFRA.
- Operation of flood 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.

The FCERM Research and Development programme is run by the EA and Defra and aims to serve the needs of all flood and coastal operating authorities in England. The programme provides the key evidence, information, tools and techniques to:

- Inform the development of FCERM policy and strategy.
- Understand and assess coastal and flood risks and the processes by which these risks arise.
- Manage flood and coastal erosion assets in a sustainable way.
- Prepare for and manage flood events effectively.

Based on information publicly available from the EA, there are a number of completed, ongoing and proposed flood risk management work programmes applicable to Wirral. Follow the link below for the latest news:

https://www.gov.uk/government/publications/programme-of-flood-and-coastal-erosion-risk-management-schemes

Potential works in the borough, at the time of writing, associated with the FCERM Development Programme include:

- West Kirby Flood Alleviation has Flood Defence Grand-in-Aid (FDGiA) and Local Levy funding secured and moves towards construction this year (18/19)
- Wallasey Embankment has been accelerated into the current programme with delivery in 2020 (subject to business case approval)
- Arrowe Road / Rigby Drive, Greasby
- Coronation Park Surface Water Flooding, Greasby
- Wirral Surface Water Management – this focuses on 4 priority areas from Wirral Surface Water Catchment Flooding Investigation Study to further model and develop outline solutions (business case approved). Funding for this study has been approved and received and bids are currently being invited.

6 Development and Flood Risk

6.1 Introduction

This section of the SFRA provides a strategic assessment of the suitability, relative to flood risk, of the assessed SHLAA sites and Green Belt land parcels to be considered though the Local Plan.

The information and guidance provided in this chapter (also supported by the SFRA Maps in Appendix A and the assessment spreadsheets in Appendix B) can be used by the LPA to inform its Local Plan and provide the basis from which to apply the Sequential Approach in the development allocation and development management process.

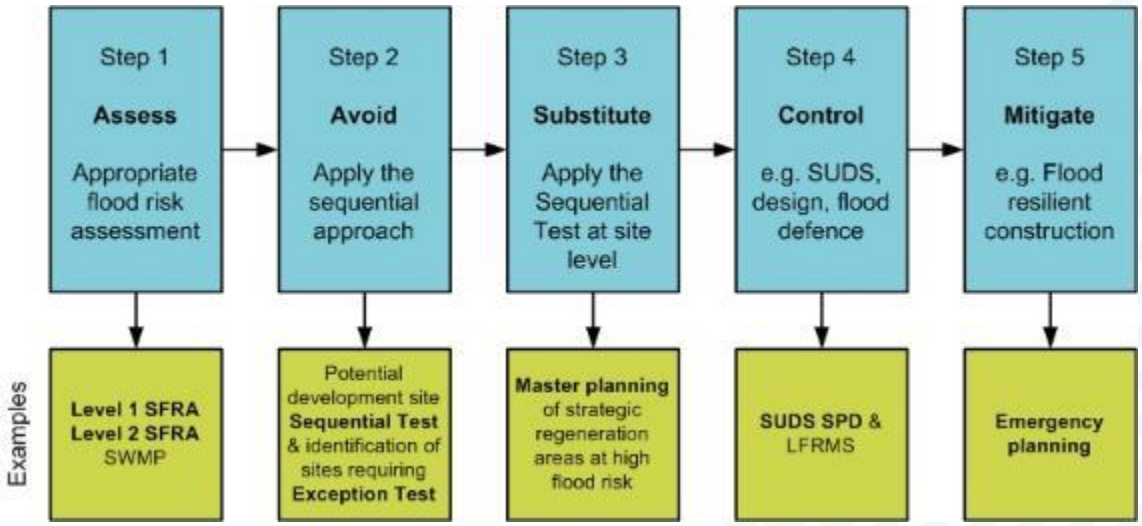
6.2 The Sequential Approach

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 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 each authority'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.

6.3 Local Plan Sequential & 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 the LPA's Local Plan. This should be done broadly by:

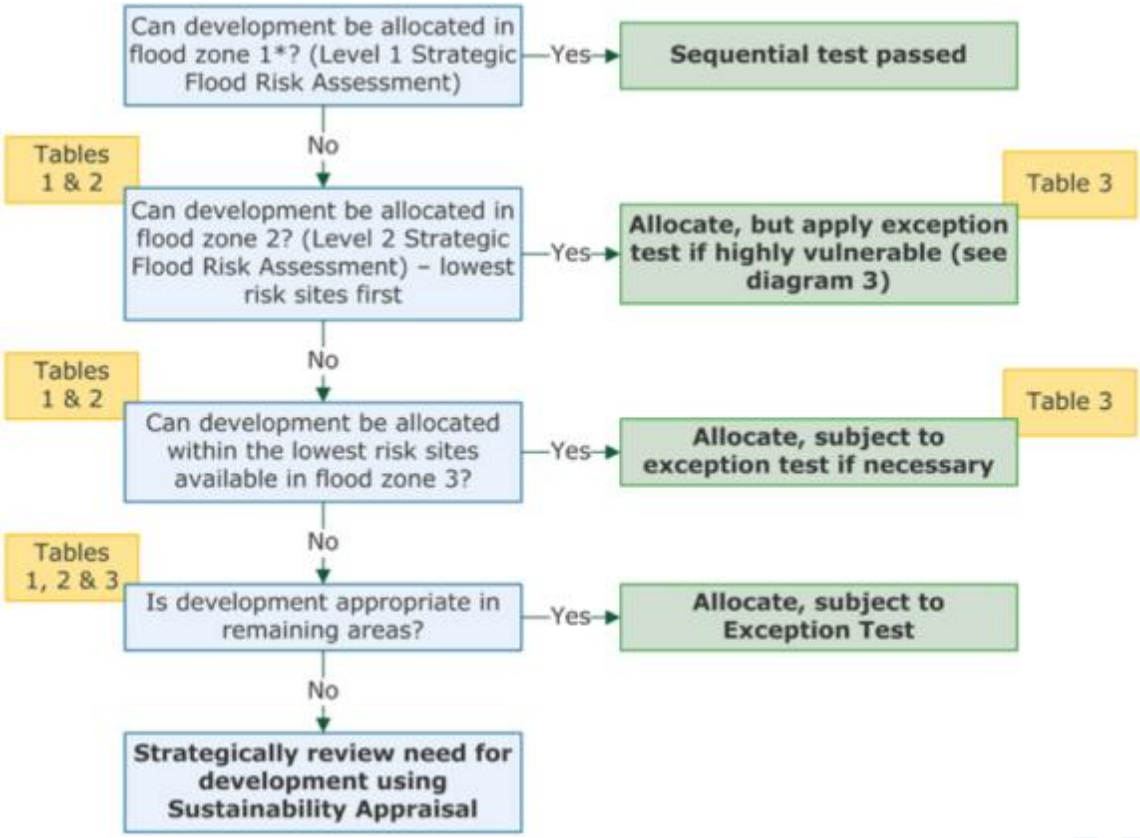
1. Applying the Sequential Test and if the Sequential Test is passed, applying and passing the Exception Test, if required;
2. Safeguarding land from development that is required for current and future flood management (i.e. using potential for WwNP data);
3. Using opportunities offered by new development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

Figure 6-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess sites put forward in the Local Plan 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 assessment spreadsheets in Appendix B. The spreadsheets will help show that the LPA, through the SFRA, has applied the Sequential Test for sites at fluvial / tidal risk and also considered surface water flood risk in equal standing and thus considered development consideration options for each assessed SHLAA site and Green Belt land parcel.

Figure 6-2: Local Plan sequential approach to site allocation[42]



*Other sources of flooding also need to be considered

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

The approach shown in Figure 6-2 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.

The NPPF para 160 states:

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

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

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

b. *the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both elements of the exception test should be satisfied for development to be allocated or permitted." (para 161).

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.

6.4 Local Plan Sites Assessment

WC provided a GIS layer of possible SHLAA development sites with potential to be included as site allocations in the new Local Plan. 771 assessed SHLAA sites have been provided, including the indicative land uses, detailed in Table 6-1. A GIS layer of 120 Greenbelt Land Parcels was also provided, detailed in Table 6-2:

Table 6-1: Indicative land uses (SHLAA) and flood risk vulnerability

Indicative land use	Flood risk vulnerability (Table 2 of FRCC-PPG)	Number of sites
Residential	More vulnerable	613
Employment	Less vulnerable	84
*Mixed Use	More vulnerable	74
***May also contain some elements of residential use, hence the more vulnerable category**		

Table 6-2: Indicative land uses (Green Belt Land Parcels) and flood risk vulnerability

Indicative land use	Flood risk vulnerability (Table 2 of FRCC-PPG)	Number of Parcels
Residential	More vulnerable	104
*Mixed use	More vulnerable	2
Hospital development	More vulnerable	3
Recreational / Open space	Water compatible	9
Caravan site	Highly vulnerable	2
***May also contain some elements of residential use, hence the more vulnerable category**		

In order to inform the Sequential Approach to the allocation of development through the Local Plan (as illustrated in Figure 6-2), this review entails a high-level GIS screening exercise overlaying the assessed SHLAA sites and Green Belt land parcels against Flood Zones 1, 2, 3a and 3b and calculating the area of each site at risk. Flood Zones 1, 2 and 3a are sourced from the EA's Flood Map for Planning (Rivers and Sea) and Flood Zones 3b (functional floodplain) has been delineated as part of this Level 1 SFRA. Surface water risk to assessed SHLAA sites and Green Belt land parcels is analysed by way of the EA's Risk of Flooding from Surface Water (RoFSW). Results for the SHLAA sites and Green Belt land parcels are presented separately in the two Assessment spreadsheets in Appendix B.

It is important to consider that each individual site will require further investigation, following this review, as local circumstances may dictate the outcome of the recommendation. Such local circumstances are discussed in the following section.

For this SFRA, surface water flood risk is afforded the equivalent level of importance as fluvial and tidal risk in terms of the strategic recommendations assigned to each potential development site.

6.5 Screening of assessed SHLAA sites and Green Belt land parcels

This section of the report draws together the results included in the assessment spreadsheets (Appendix B), produced from the GIS screening exercise. The LPA should use the spreadsheets 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 assessment spreadsheets provide a breakdown of each SHLAA site and Green Belt land parcel 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 6-3 and Table 6-4 show the number of

sites within each fluvial / tidal flood zone and Table 6-5 and Table 6-6 show the number of sites within each surface water flood zone.

Table 6-3: Number of assessed sites (SHLAA) at risk from Flood Map for Planning flood zones

Indicative land use	Number of sites within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	546	43	62	38
Employment	59	19	19	12
Mixed use	60	13	8	11
TOTAL	**665**	**75**	**89**	**61**
*Sites with 100% area within Flood Zone 1				

Table 6-4: Number of Greenbelt Land Parcels at risk from Flood Map for Planning flood zones

Indicative land use	Number of parcels within...			
	Flood Zone 1*	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	56	47	46	34
Mixed use	2	0	0	0
Hospital development	1	1	2	2
Recreational / Open Space	3	5	5	4
Caravan site	1	1	1	1
TOTAL	**63**	**54**	**54**	**41**
*Sites with 100% area within Flood Zone 1				

Table 6-5: Number of assessed sites (SHLAA) at risk from surface water flooding as per the RoFSW map

Indicative land use	RoFSW flood zone		
	Low risk (1 in 1000)	Medium risk (1 in 100)	High risk (1 in 30)
Residential	360	222	151
Employment	60	44	24
Mixed Use	45	30	17
TOTAL	**465**	**296**	**192**

Table 6-6: Number of Green Belt land parcels at risk from surface water flooding as per the RoFSW map

Indicative land use	RoFSW flood zone		
	Low risk (1 in 1000)	Medium risk (1 in 100)	High risk (1 in 30)
Residential	103	102	94
Mixed use	2	2	2
Hospital development	3	3	3
Recreational / Open space	9	9	8
Caravan site	2	1	1
TOTAL	**119**	**117**	**108**

The spreadsheets also include high level broad-brush strategic recommendations and consequential development considerations for each site. Development considerations are based on Tables 1, 2 and 3 of the flood risk and flood zone tables[43] of the FRCC-PPG (Paragraphs 065 - 067). The strategic recommendations are intended to assist the LPA in carrying out the Sequential Test and to highlight those sites at greatest flood risk. It is important to reiterate that surface water flood risk is afforded the equivalent level of importance as fluvial and tidal risk in terms of the strategic recommendations assigned to each assessed site. Table 6-7 and Table 6-8 show the number of sites each strategic recommendation applies to.

Strategic recommendations:

- Strategic Recommendation A – potentially unsuitable site based on significant level of fluvial / tidal or surface water flood risk; **(if development cannot be directed away from risk areas, the site will be unsuitable for development)**
- 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;
- Strategic Recommendation D - site-specific FRA required; and
- Strategic Recommendation E - site could be allocated or permitted for development on flood risk grounds due to little perceived risk, subject to consultation with the LPA / LLFA.

Table 6-7: Number of assessed sites (SHLAA) per strategic recommendation

Indicative land use	Number of sites within...				
	A	B	C	D	E
Residential	58	25	153	144	233
Employment	6	0	7	71	0
Mixed use	6	2	26	12	28

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

Indicative land use	Number of sites within...				
	A	B	C	D	E
TOTAL	**70***	**27**	**186**	**227**	**261**
*25 due to Flood Zone 3b					

Table 6-8: Number of Greenbelt Land Parcels per strategic recommendation

Indicative land use	Number of parcels within...				
	A	B	C	D	E
Residential	12	3	87	2	0
Mixed use	0	0	2	0	0
Hospital development	1	0	2	0	0
Recreational / Open space	0	0	0	9	0
Caravan site	1	0	0	1	0
TOTAL	**14***	**3**	**91**	**12**	**0**
*8 due to Flood Zone 3b					

It is important to note that each individual site will require further investigation before development is allocated or permitted, as local circumstances may dictate the outcome of the strategic recommendation. 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 currently, however using the EA's UKCP18 allowances once published), 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. The LLFA requires that all planning applications must be accompanied by an appropriate drainage strategy, independent of the requirement for a site-specific FRA.
- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finished floor levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been granted.
- 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 exist at all times during a flood event for emergency response and evacuation

- Current land use. A number of sites included in the assessment are likely to be brownfield, thus the existing development structure could be taken into account as further development may not lead to increased flood risk.
- 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/site specific FRA or drainage strategy, if required.

Surface water flood risk, which should be assessed with equal importance with fluvial flood risk. To check the surface water flood risk to a particular area, use the most up-to-date surface water map via:https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

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 WC'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 for each site.

6.5.1 Strategic Recommendation A – Potentially unsuitable site for development (consider removal if development cannot be directed away from areas at risk)

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 one or more of 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 allocated or permitted for sites within the highly, more or less vulnerable categories (see Table 6-1 and Table 6-2) 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 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 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 considered as undevelopable on flood risk grounds, based on the NPPF. However the 10% threshold is an approach that has previously been accepted and adopted in all other SFRAs undertaken by JBA in the north-west of England and therefore some confidence can be derived from past performance of its usage.

This 10% threshold does not account for local circumstances; therefore, it may be possible to deliver a site, upon more detailed investigation through a Level 2 SFRA or drainage strategy.

Depending on local circumstances, if it is not possible to adjust the site boundary to remove the developable area from Flood Zone 3b to a lower risk zone then development should not be allocated or permitted.

Within the SHLAA assessed sites, Strategic Recommendation A applies to 70 sites, of which 25 are located within the functional floodplain, (listed in Table 6-9) and a further 45 sites are subject to significant surface water flood risk (listed in Appendix D).

Within the Green Belt land parcels, Strategic Recommendation A applies to 14 sites, of which 8 are located within the functional floodplain, (listed in Table 6-10), and a further 6 sites are subject to significant surface water flood risk, listed in Table 6-11.

Any area within Flood Zone 3b must be left as open green space or the site boundary amended to remove the developable area from the risk area. If this is not possible, the site should be withdrawn. The EA supports recommendations for withdrawing sites within Flood Zone 3b.

Table 6-9: SHLAA sites that are potentially unsuitable for development based on fluvial / tidal flood risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)

Site ID	Indicative land use	Site area (ha)	% area in FZ3b
131	Residential	0.14	89.33
505	Employment	6.54	27.10

Site ID	Indicative land use	Site area (ha)	% area in FZ3b
639	Residential	0.14	38.81
754	Mixed use	5.50	14.53
755	Mixed Use	6.76	22.73
769	Employment	0.69	85.28
863	Residential	1.55	12.61
865	Residential	41.88	10.86
920	Residential	9.32	31.77
921	Residential	16.82	76.15
922	Residential	5.86	92.10
923	Residential	5.34	50.34
1486	Residential	2.76	17.78
1781	Residential	19.95	50.98
1855	Residential	5.74	71.42
1895	Residential	3.50	11.32
1976	Residential	7.04	82.26
1979	Residential	1.89	12.72
2019	Residential	0.36	33.82
2020	Residential	0.12	50.01
2050	Mixed use	4.75	20.62
2058	Employment	9.22	43.65
2066	Employment	14.22	23.91
2072	Employment	4.33	76.03
2080	Mixed use	0.56	39.58

Table 6-10: Green Belt land parcels that are potentially unsuitable for development based on fluvial / tidal flood risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)

Parcel ID	Indicative land use	Parcel area (ha)	% area in FZ3b
SP007	Residential	44.84	39.23
SP018	Caravan site	196.92	30.61
SP023	Residential	19.44	44.83
SP024	Residential	44.45	44.70
SP027	Residential	28.39	20.35
SP029	Residential	11.33	18.45
SP043	Residential	64.49	13.36
SP076a (Major developed site)	Hospital Development	26.21	14.43

Table 6-11: Greenbelt Land Parcels that are potentially unsuitable for development based on surface water risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)

Parcel ID	Indicative land use	Parcel area (ha)	% Area at medium risk (1 in 100 AEP event)	% Area at high risk (1 in 30 AEP event)
SP004	Residential	8.98	18.88	6.19
SP025	Residential	13.62	19.67	9.63
SP026	Residential	40.62	11.69	5.14
SP044	Residential	41.63	11.47	9.69
SP105	Residential	6.31	10.06	3.45
SP109	Residential	0.19	10.60	0.00

SHLAA sites

Of the 70 SHLAA sites recommended as being potentially unsuitable for development, 58 have an indicative residential use, six an indicative mixed use and six an indicative employment use. 25 sites have more than 10% of their site area within the functional floodplain. Ten of these 25 sites, namely sites 131, 769, 921, 911, 923, 1781, 1855, 1976, 2020, 2072, are extremely unlikely to be suitable for allocation due to the considerably large areas located within the functional floodplain (over 50%). Any area within the functional floodplain must either be removed from the site boundary (i.e. redrawn boundaries) or the risk area incorporated into the site design as open space / amenity areas free from development for the development's lifetime. For the smaller sites, particularly those with an indicative residential use, this approach is unlikely to be achievable compared to larger sites where there may be enough space to limit the impact on housing yields or employment units. Each site will require more detailed assessment to gauge the viability of development going forwards.

Of the 45 sites recommended as potentially unsuitable (if development cannot be directed away from flood risk areas, the site will be unsuitable for development) based on significant surface water risk (listed in Appendix D), 42 have an indicative residential use, two an indicative mixed use (and therefore each is classified as more vulnerable), and one is a less vulnerable indicative employment site. Indicative residential site 277 is at particularly significant risk from surface water with over 48% of its area within the 1 in 30 AEP event outline and 64% within the 1 in 100 AEP event outline. At 0.18 ha in size, this site may struggle to accommodate surface water on site. Similarly, indicative residential site 2004 is small in size at 0.3 ha with 42% of its area within the 1 in 30 AEP event and 73% within the 1 in 100 AEP event. Other sites with limited potential for development include indicative residential sites 775, 0642, 1771, 1816, 1890, and 2034 which are small sites of between 0.07 ha and 0.44 ha with 22% and 27% of their site areas within the 1 in 30 AEP event outline respectively.

It should be noted that there are a cluster of 10 strategically significant SHLAA sites with an indicative mixed use, located at Wirral Waters. Sites 754, 755 and 2080 have over 10% of the site footprint within FZ3b, and development has therefore been recommended as potentially unsuitable based on fluvial flood risk (if development cannot be directed away from risk areas then the sites will be unsuitable for development).

The remaining 7 Wirral Waters sites (434, 753, 2067, 2078, 2079, 2081 and 2082) with less than 10% within FZ3b and have been provided with strategic recommendation

C with the aim to consider site layout and design away from risk areas. All of the Wirral Waters sites are located within FZ3b and already have a number of planning permissions in place.

Green Belt land parcels

Fourteen Green Belt land parcels are recommended as being potentially unsuitable for development, of which 12 have an indicative residential use, one is an existing hospital and one includes a large existing caravan site. Eight parcels have more than 10% of their site footprint within the functional floodplain. Five of these eight parcels, namely SP007, SP018, SP023, SP024, SP027, are unlikely to be suitable for allocation due to the considerably large percentage of their areas located within the functional floodplain (20-45%).

Green Belt Parcel SP018 (which includes a large caravan site) has a large area of 197ha of which 31% is within the functional floodplain. The 31% must remain free of development. Each parcel will require more detailed assessment to gauge the viability of development going forwards.

The 6 parcels recommended as potentially unsuitable (if development cannot be directed away from flood risk areas, the parcel will be unsuitable for development) based on significant surface water risk have an indicative residential use, and are therefore classed as more vulnerable. Each of the 6 parcels have less than 10% of their areas within the 1 in 30 AEP event outline, however they have between 10%-20% of their area within the 1 in 100 year event and therefore are at significant surface water flood risk. In particular, parcel SP109 which is 0.19 ha in size, may struggle to accommodate surface water on site whereas parcels such as SP026 (40.62 ha) and SP044 (41.63 ha) may be able to provide areas for surface water.

With surface water flood risk, it is important to understand the spatial nature of the flood risk i.e. are there direct flow paths on site? Or is the risk sporadic with several areas of ponding in natural depressions? This must be assessed on a site by site basis through a Level 2 SFRA prior to allocation which will help determine if a site can be put forward for allocation.

All parcels will need to be reviewed on a site by site basis to determine whether any of these can be taken forward or whether they should be withdrawn.

6.5.2 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 the area of any more vulnerable site (residential and mixed use) is within Flood Zone 3a. Less vulnerable (employment) uses of land do not require the Exception Test.

NOTE: All development proposals in Flood Zone 3a 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 Recommendation B. It may also be possible to deliver part of some of the larger sites, dependent upon further investigation, where a significant area is not within the FZ3b.

Strategic Recommendation B applies to 26 SHLAA sites and three Green Belt land parcels.

SHLAA sites

Strategic Recommendation B applies to 27 assessed SHLAA sites. This is based on a significant area of the site (over 10%) being within Flood Zone 3a and the fact the site is proposed for more vulnerable development. All sites must pass both parts of the Exception Test in order to proceed (see Section 6.3 for information on the Exception Test). Out of the 27 sites to which Strategic Recommendation B applies, 17 sites have a significant area of the site (over 90%) within Flood Zone 3a, which will consequently be more difficult to pass the second part of the Exception Test.

Green Belt land parcels

Strategic Recommendation B applies to three Green Belt parcels, namely SP015, SP017 and SP028, which is based on significant areas of the parcel being located within Flood Zone 3a with an indicative residential use which is classed as more vulnerable development. These three parcels must also pass the Exception Test in order to proceed.

6.5.3 Strategic Recommendation C – consider site layout and design

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

Strategic Recommendation C applies to sites where one or more of the following criteria is true:

- <10% of the area of any site type is within Flood Zone 3b.
- <10% of the area of any residential or mixed use (more vulnerable) site is within Flood Zone 3a.
- <10% of the area of any more vulnerable site is within the high or medium risk surface water flood zone

For sites subject to Strategic Recommendation C , 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 the site to be allocated or permitted for development. Or it may be possible to incorporate suitable SuDS into the site layout to mitigate surface water risk on-site, following a detailed FRA or drainage strategy. Similarly, in line with the daylighting policy and where there may be opportunities to do so, there could be potential to remove culverts and restore watercourses to a more natural condition. In many cases, opening culverts can reduce flood risk when combined with SuDS. A Level 2 SFRA and/or detailed site-specific FRA would be required to help inform on site layout and design.

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 when less than

10% of the site area is at risk. This 10% threshold does not account for local circumstances.

Where Strategic Recommendation C applies to a potential site, the developer should consider the site layout with a view to excluding the developable area from the flood extent that is obstructing development. If this is not possible then the alternative would be to investigate the incorporation of on-site storage of water into the site design. Depending on local circumstances, if it is not possible to adjust the site boundary to confine the developable area to a lower risk zone then this part of the development should not be permitted (for any site in Flood Zone 3b), or the Exception Test should be undertaken and passed as part of a site-specific FRA for the more vulnerable sites within Flood Zone 3a.

Any site layout and design within 8 m of any flood defence structure or culvert on a main river or 16 m on a tidal river is likely to be a regulated flood risk activity under Schedule 25 of the Environmental Permitting (England and Wales) Regulations 2016. Site layout and design will have to take this into consideration for development proposals. This 8 m buffer is recommended by the EA to allow ease of access to watercourses for maintenance works. Any site redesign, where Flood Zones 3b and 3a, are included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of suitable SuDS.

Overall there are 186 potential SHLAA sites to which Strategic Recommendation C applies. 156 of these sites are entirely within Flood Zone 1, meaning surface water risk is what needs to be mitigated at these sites. Similarly, 57 out of the 91 Green Belt land parcels to which Strategic Recommendation C applies, are also entirely located within Flood Zone 1. For these sites, the developer should consider the site layout with a view to removing the developable area from the flood zone that is obstructing development i.e. the high and medium risk surface water flood risk zones. If this is not possible then the alternative would be to investigate the incorporation of on-site storage of water into the site design through appropriate SuDS.

Site 416, 'Land at Cavendish Quay, Birkenhead Docklands' is unique as the site has planning permission in place although there is 1.34% of the site footprint located within the functional floodplain.

6.5.4 Strategic Recommendation D – development could be allocated 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 or permitted 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 one or more of 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 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.
- Less vulnerable sites which are 100% within Flood Zone 1 where surface water flood risk is apparent but not considered significant.
- Any site which is 100% within Flood Zone 1 that is greater than or equal to 1 hectare in area.

SHLAA

Strategic Recommendation D applies to 227 assessed sites, 213 of which are 100% within Flood Zone 1. The surface water risk at these 213 sites will be nominal although will still require appropriate assessment through a FRA. The other 14 sites are at some risk from Flood Zone 2 or 100% within Flood Zone 3a and must therefore be subject to a FRA at planning application stage by a developer. Each site-specific FRA should investigate the risk and mitigate accordingly, including consideration of plans for site access and egress during a possible flood event.

Green Belt land parcels

Strategic Recommendation D applies to 12 potential land parcels, 6 of which are 100% within Flood Zone 1. The surface water risk at these 6 parcels will be nominal, with the exception of parcel SP047, which is proposed as a water compatible site and has 11% of the site area in the 1 in 30 year AEP event. These parcels will still require appropriate assessment through a FRA at planning application stage. Each site-specific FRA should investigate the risk and mitigate accordingly, including consideration of plans for site access and egress during a possible flood event.

6.5.5 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 could be allocated on flood risk grounds, based on the evidence provided within this SFRA. Further investigation (i.e. FRA) may be required by the developer at planning application stage if any further or new information becomes available since the publication of this SFRA. Recommendation E applies to 261 SHLAA sites, but does not apply to any Green Belt land parcels.

Strategic Recommendation E applies to any site with 100% of its area within Flood Zone 1 and not within any surface water flood zone.

6.5.6 Assessment of climate change

Modelled flood outlines accounting for fluvial / tidal climate change were not available for this SFRA. A precautionary approach to assessing future flood risk is therefore adopted for this SFRA whereby, the assumption is that the current day Flood Zone 2

will become Flood Zone 3a in the 2080s or longer term and Flood Zone 3a could become functional floodplain. This is within the 100 year assumed lifetime for residential development specified in the FRCC-PPG.

This precautionary approach to estimating the effects of climate change is considered to be the most pragmatic methodology available and is also consistent with other SFRAs and professional modelling experience. As such, for any site within Flood Zone 2, the possibility of these sites being within Flood Zone 3a in the 2080s or longer term should be considered. It is also important to consider that the sites that are partially within Flood Zone 3a and are also additionally at risk from Flood Zone 2 will have larger areas at risk from Flood Zone 3a in the future. For example, a site that may have 10% of its area currently within Flood Zone 3a and a further 60% within Flood Zone 2, may have 70% of its area within Flood Zone 3a in the 2080s or longer term. This would impact on the more vulnerable sites in particular with potentially further, more detailed mitigation techniques required to satisfy the second part of the Exception Test.

Predicting the future expansion of the functional floodplain would be more difficult due to the criteria used to define the functional floodplain outline.

It should however be noted that changes in flood zone extents in well-defined floodplains will be more negligible compared to very flat floodplains. However, changes in flood depth within the more well-defined floodplains will be greater. The expected increase in flood extents and depths as a result of climate change will have implications for the type of development that is considered appropriate according to its vulnerability. Flood risk to areas around estuaries may be more difficult to predict using this precautionary approach as estuarine flooding can result from the combined effects of high peak river flows and high tidal surges. In which case, the risk may be underestimated in areas around the coast such as West Kirby, Leasowe and Birkenhead for example when using Flood Zone 2 as a climate change proxy.

The same approach should also be applied to the surface water flood zones whereby the 1 in 100 AEP event outline (currently medium risk outline) may increase in the future to cover the extent of the 1 in 1000 AEP event outline (currently the low risk outline).

The Assessment spreadsheets (Appendix B) alongside the SFRA Maps (Appendix A) should be consulted to ascertain which sites may be at increased risk in the future based on the approach outlined above.

A more detailed assessment of the impacts of climate change on flooding from the land and rivers, and the coast if applicable, should be carried out as part of any Level 2 SFRA before allocation or FRA after allocation carried out by a developer. This should be carried out using the EA's allowances (see Section 6.12) which will provide an appropriately robust response to the uncertainty about climate change impacts on rainfall intensities, river flows and sea level rise.

The LFRMS states that the risk of future flooding to properties following the effects of climate change has established that approximately 13,100 properties within Wirral could be at risk following a 1 in 200 year rainfall event, although there is only a 0.5% chance of it occurring in any one year.

6.6 Summary of site assessment outcomes and sequential testing progress

There are several consequential development considerations which could come out of the site assessment sequential testing process. Each outcome is discussed below. The LPA should refer to Section 6.5 of this report, and Appendix B, for details on the site assessments carried out for this SFRA.

6.6.1 Rejection of site

A site which fails to pass the Sequential Test and / or the Exception Test should be rejected and development should not be permitted or allocated. Rejection would also apply to any more (residential, mixed use inclusive of residential) or less vulnerable (employment) sites within Flood Zone 3b where development should not be permitted or allocated. 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. However, 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.

In terms of surface water flood risk, if risk is considered significant, based on AEP or 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.

6.6.2 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 by altering the site boundary.

6.6.3 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 allocated or permitted. If it is not possible to adjust the developable area of a site to remove the indicative 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. Highly vulnerable sites would be rejected.

Any development within 8 metres of any flood defence structure or culvert on a Main River is likely to be regulated flood risk activity under Schedule 25 of the Environment Permitting (England and Wales Regulations 2016. 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 6.13) Similarly, any change or alteration to an ordinary watercourse within the site would need consent from the LLFA under the Land Drainage Act 1991[44].

44 https://www.legislation.gov.uk/ukpga/1991/59/contents

6.6.4 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 FRCC-PPG).*"

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

Whether an indicative 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 LPA and LLFA 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;
- Whether the development will be safe for its lifetime and pass the Exception Test, if applicable; and
- That an appropriate Emergency Plan is in place that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood.

When is a Site-Specific FRA Required?

According to the NPPF (2019) footnote 50, 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 on land which has been identified by the EA as having critical drainage problems (i.e. within a ACDP);
- Land identified in the SFRA as being at increased flood risk in future (i.e. based on RoFSW mapping; sites within Flood Zone 2 that may be within Flood Zone 3 in the longer term (in the absence of modelled climate change outputs));
- At risk of flooding from other sources of flooding, such as those identified in this SFRA; or
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding.

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

- Situated in an area currently benefitting from defences;
- At residual risk from reservoirs or canals;
- Within a council designated CDA; or
- 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[45] and also the EA guidance for FRAs for planning applications[46]. CIRIA's report 'C624 Development and Flood Risk[47]' also provides useful guidance for developers and the construction industry. Section 6.11 of this report provides further guidance on FRAs for developers.

6.6.5 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 indicative 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.

45 https://www.gov.uk/flood-risk-assessment-local-planning-authorities
46 https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications
47 CIRIA C624 Development and Flood Risk - guidance for the construction industry. 2004

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).

6.6.6 Surface water risk to assessed sites

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

- Possible withdrawal, redesign or relocation for those sites considered to be at significant risk. This applies to the sites listed in Table 6-11 and Appendix D;
- A detailed site-specific FRA incorporating surface water flood risk management;
- A FRA may want to consider detailed surface water modelling, particularly for the larger sites which may influence sites elsewhere;
- Ensuring future maintenance of surface water and sustainable drainage assets through s106 agreements;
- 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. The LLFA agree that 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 Sections 6.11 and 6.13 of this report;
- Runoff up to and including the 1 in 100 AEP event (1%) 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 CDAs may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the LLFA, UU/DCWW and any relevant Internal Drainage Board would be required.

It may then be beneficial to carry out a local SWMP or drainage strategy for targeted locations with any such critical drainage problems. Investigation into the capacity of existing sewer systems would be required in order to identify critical parts of the system i.e. pinch points. Drainage model outputs could be obtained from UU/DCWW 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.

6.7 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 6.5.1 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 (Section 6.5.3), 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 6.13.

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

6.8 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 assessed SHLAA sites and Green Belt land parcels 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.

Section 14 Paragraph 157 of the revised NPPF states that, to avoid where possible, flood risk to people and property they should manage any residual risk by,

'safeguarding land from development that is required, or likely to be required, for current or future flood management'

A strategic assessment has been made of the assessed SHLAA sites and Green Belt land parcels and their applicability for flood storage. Applicable sites include any current greenfield sites:

- That are considered to be large enough (>1 hectare) 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
- That are large enough and within a suitable distance to receive flood water from a nearby development site 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.

6.9 Phasing of development

Flood risk should be 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 flood risk, or by considering how changes in site layout can help to avoid those parts of a site at flood risk, the Council would be demonstrating a sustainable approach to development. In terms of surface water, for those sites at highest risk, more detailed and site-specific modelling of the risk will be required to determine the viability of development. For all sites at risk from surface water, site design and layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques (see Section 6.13).

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 to develop in Flood Zone 3, detailed modelling would be required to ascertain where water displaced by 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. Large strategic multiple development sites should also carry out development phasing within the overall site boundary so as to avoid cumulative impacts within the site, as well as off the site (see Section 5.7.4 for information on Natural Flood Management and Working with Natural Processes).

6.10 Cumulative impacts

The NPPF (2019) states that strategic policies…

"…should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant

flood risk management authorities, such as lead local flood authorities and internal drainage boards". (para 156)

Previous policies have relied on the assumption that if each individual development does not increase the risk of flooding, the cumulative impact will also be minimal. However, if there is a lot of development occurring within one catchment, particularly where there is flood risk to existing properties or where there are few opportunities for mitigation, the cumulative impact may be to change the flood response of the catchment.

This SFRA considers cumulative impacts of new development through much of the generic advice provided on mitigation throughout Section 6 of this report. Consideration is given to the following:

- The importance of phasing of development, as discussed in Section 6.9;
- Cross boundary impacts i.e. there should be dialogue between WC and neighbouring authorities upstream and downstream of Wirral, namely; Liverpool; Cheshire West and Chester and Flintshire. Decisions on flood risk management practices and development in these authorities should involve discussion with WC given the possible downstream impacts of development on flood risk;
- Leaving space for floodwater, utilising greenspace for flood storage and slowing the flow; and
- SuDS and containment of surface water on-site as opposed to directing elsewhere (see Section 6.13).

6.11 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 indicative 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***
    - *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 6.6.4 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 6-12 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.

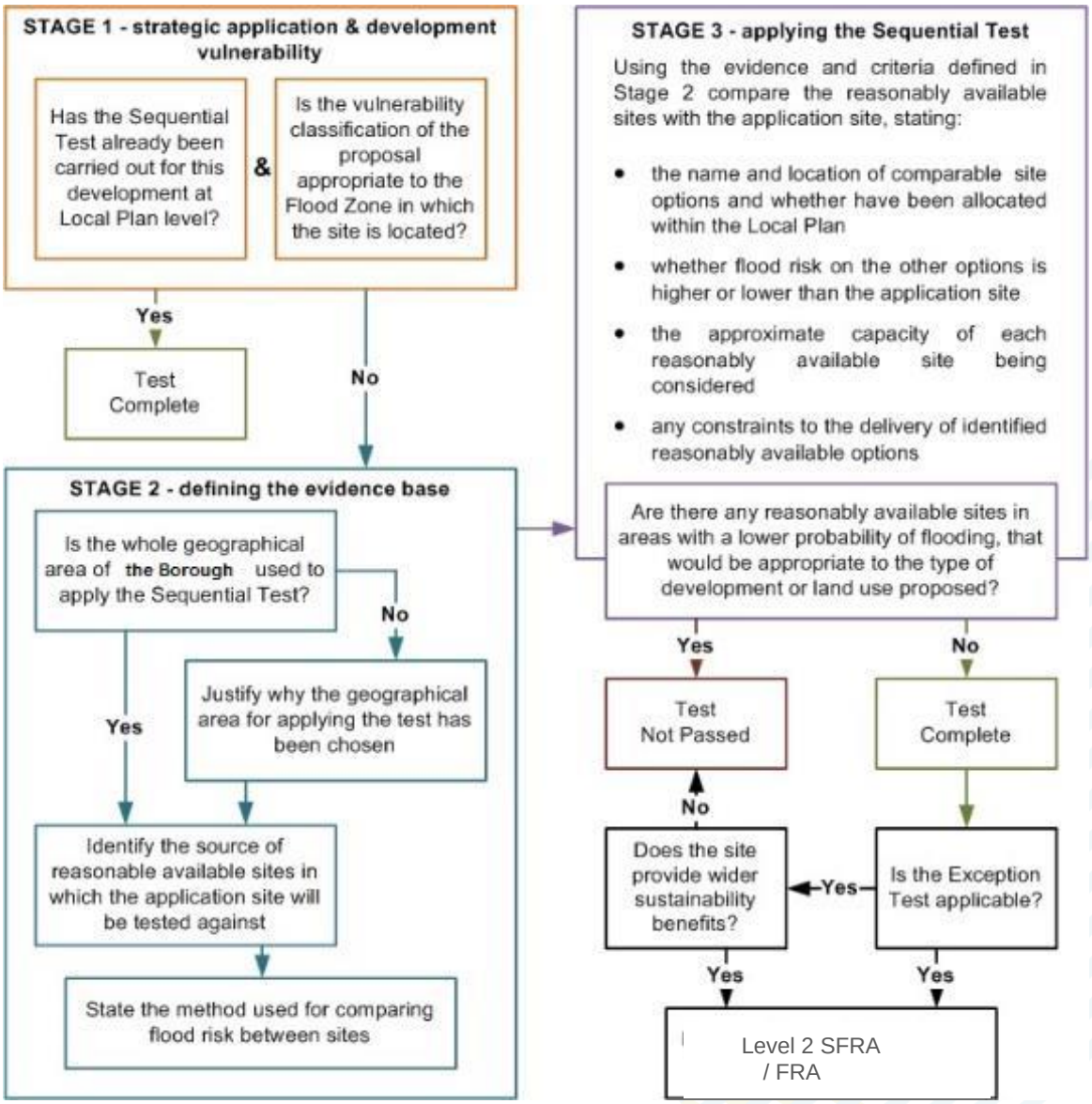
Table 6-12: Development types and application of Sequential and Exception Tests for developers

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	Developer provides evidence to the LPA that the test can be	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning

	use to land involving a caravan, camping or chalet site)	passed		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 that has been put forward in the Local Plan.

The LPA should now have sufficient information to be able to assess whether or not the indicative 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.

Developers should refer to the SFRA Maps in Appendix A to see if any indicative developments sites are within an ABD.

6.12 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 modelled climate change outputs 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 in the 2080s or longer term 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 5.2.4.

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 in the 2080s or longer term should be considered.

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, river flows and sea level rise.

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 +35 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).

6.12.1 Planning for climate change (NPPF, 2019)

In relation to flood risk and climate change in the planning system, the revised NPPF states:

"All plans should apply a sequential, risk-based approach to the location of development – taking into account the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property." (para 157).

Local plans should do this by safeguarding land from development that is required, or likely to be required, for current or future flood management; and to seek opportunities for the relocation of development, including housing, to more sustainable locations from areas where climate change is expected to increase flood risk.

6.12.2 EA climate change allowances

The EA revised the climate change allowances in 2016, 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). Climate change allowances for river flows are based on which River Basin District the river is located within. As discussed, Wirral is within the North West and Dee RBDs.

Table 6-13: Recommended peak river flow allowances for the North West and Dee RBDs

RBD	Allowance Category	Total Potential Change Anticipated for...		
		2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
North West	Upper end	+20%	+35%	+70%
	Higher central	+20%	+30%	+35%
	Central	+15%	+25%	+30%
Dee	Upper end	+20%	+30%	+45%
	Higher central	+15%	+20%	+25%
	Central	+10%	+15%	+20%

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 6-14: Peak rainfall intensity allowances 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 6-15. The number in brackets is the cumulative sea level rise for each year within each range.

Table 6-15: 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*[48], which uses science from UKCP09. This guidance is based on Government's policy for climate change adaptation and is specifically intended for projects or strategies seeking Government FDGiA funding. However, RMAs in England may also find it useful in developing plans and making FCERM investment decisions even if there is no intention of applying for central government funding. This is important for any future large scale

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

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 6-16 and Table 6-17 respectively.

UKCP18

In November 2018 Defra released a new set of UK Climate Projections (UKCP18). These projections replace the UKCP09 projections which have been used for the past ten years. The UKCP18 projections show that sea levels around the UK are expected to continue to rise compared to the historical baseline (1981-2000), up to and beyond the end of the 21st century. For the north east, sea levels are expected to increase by between 0.1m and 0.5m under the low emissions scenario and by between 0.3m and 0.9m under the high emissions scenario by 2100.

In terms of applying climate change to SFRAs and FRAs, the EA's February 2016 allowances are, at the time of writing, still the best representation of how climate change is likely to affect flood risk for peak river flows and peak rainfall intensities. Research that is due to be published in Spring 2019 may result in changes to these allowances. The climate change allowances for sea level risk will be updated and published as early as possible in 2019. Until then, it is reasonable to continue to use the sea level rise allowances in 'Flood risk assessments: climate change allowances' (February 2016) for planning decision making (Table 6-16 and Table 6-17), because the allowances that have been used to date represent the high end of the range of sea level rise projected by UKCP18.

Table 6-16: UKCP08 High++ allowances for peak river flood for North West and Dee RBDs.

RBD	Total Potential Change Anticipated for…		
	2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
North West	+25%	+45%	+95%
Dee	+20%	+30%	+60%

Table 6-17: 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 assessment, following on from this Level 1, could involve the modelling of appropriate climate change events, where fully functioning EA hydraulic models are available.

6.13 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 the local planning authority, in consultation with the LLFA, should be responsible for delivering SuDS[49] through the planning system. 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'[50], published in March 2015. A Practice Guidance[51] document has also been developed by the Local Authority SuDS Officer Organisation (LASOO) to assist in the application of the non-statutory technical standards.

Wirral Sustainable Drainage and Surface Water Management[52]

In order to manage flood risk all development, regardless of development type, flood zone and development size, must give priority use to SuDS. Particularly for major developments, there is a requirement to assess and include SuDS for managing surface water at the development unless it is demonstrated during the assessment that it is inappropriate for the site.

In order to satisfy the NPPF and its accompanying PPG, applicants must demonstrate that priority has been given to the use of sustainable drainage systems (SuDS) in their development proposals. SuDS should be provided by default unless demonstrated to be inappropriate. Where priority use of SuDS cannot be achieved, applicants must justify this by submitting robust and acceptable evidence.

6.13.1 SuDS and the revised NPPF, 2019

The Revised NPPF (2019), para 165, states:

"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a. *take account of advice from the lead local flood authority;*
a. *have appropriate proposed minimum operational standards;*
b. ***have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development;*** *and*
c. *where possible, provide multifunctional benefits*".

As since 2014, the NPPF still states only 'major' developments should incorporate SuDS. However, all developments, both major and minor, can include some kind of SuDS, providing multiple benefits that contribute to many other NPPF policies, including climate change. Where site conditions

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

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

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

52 https://www.wirral.gov.uk/sites/default/files/all/planning%20and%20building/planning/Wirral%20-%20Sustainable%20Drainage%20%26%20Surface%20Water%20Management%20-%20Guidance%20for%20Developers%20%5Bv05%5D%20%5B29.4.2016%5D.pdf

may be more challenging, the types of SuDS may need to be adapted to the site's opportunities and constraints. At a strategic level, this should mean identifying SuDS opportunities according to geology, soil type, topography, groundwater / minewater conditions, their potential impact on site allocation, and setting out local SuDS guidance and opportunities for adoption and maintenance.

In terms of what kind of evidence would show SuDS to be inappropriate for a certain site, it is possible that clarity on what evidence is required may be subsequently set out in the revised FRCC-PPG, and that these circumstances would be exceptional.

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.

Sustainable drainage should form part of an integrated design methodology secured by detailed planning conditions to ensure that the SuDS to be constructed is maintained to a minimum level of effectiveness.

6.13.2 SuDS hierarchy

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.

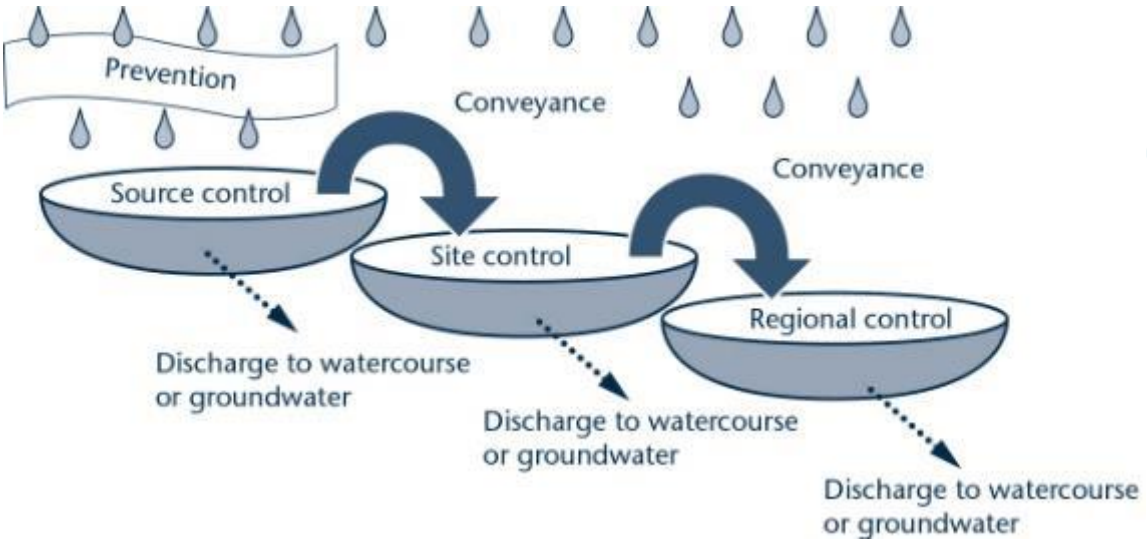
Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination. Developers should also establish that proposed outfalls are hydraulically capable of accepting the runoff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

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, using the Management Train principle (see Figure 6-4), will be required, where source control is the primary aim.

Figure 6-4: SuDS Management Train Principle[53]



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.

In addition to the national standards, the LPA may set local requirements for planning permission that include more rigorous obligations than the 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. Section 4.2 of the LLFA's Technical Guidance for Developers sets out the approach for previously developed sites which will offer a betterment of 30% with regard to rate of discharge. However, at the time of writing, the LLFA and UU are in discussions to implement an improvement of 50% in discharge rate.

The LPA should always be contacted with regards to its local requirements at the earliest opportunity in development planning.

The CIRIA SuDS Manual[54] 2015 should also be consulted by the LPA and developers. The SuDS manual (C753) is highly regarded and incorporates 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.

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

53 CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative
54 https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

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 and local authorities.

6.14.1 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 site-specific 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. **Finished floor levels (FFL) should always be set a minimum of 300 mm above the design water level** 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.

6.15 Property Flood Resilience (PFR)

The NPPF (2019) states that, where development must be located in an area of flood risk, following application and passing of the Sequential and Exception Tests (if applicable), the development must be appropriately flood resistant and resilient (para 163b).

Flood resilience and resistance measures are designed to mitigate flood risk and reduce damage and adverse consequences to existing property. Resistance and resilience measures may aim to help residents and businesses recover more quickly following a flood event.

It should be noted that it is not possible to completely prevent flooding to all communities and businesses.

Research carried out by the then DCLG (now the MHCLG) and the EA has recommended that the use of resistance measures should generally be limited to a nominal protection height of 600 mm above ground level, the lowest point of ground abutting the external property walls. This is because the structural integrity of the property may be compromised above this level.

It should be noted that PFR measures would not be expected to cause an increase in flood risk to other properties or other parts of the local community. They will help mitigate against flood risk but, as with any flood alleviation scheme, flood risk cannot be removed completely. Emergency plans should, therefore, be in place that describe the installation of measures and residual risks.

As the flood risk posed to a property cannot be removed completely, it is recommended that PFR products are deployed in conjunction with pumps of a sufficient capacity. Pumps will help manage residual flood risks not addressed by resistance measures alone such as rising groundwater.

6.15.1 Definitions

Flood resilience measures aim to reduce the damage caused by floodwater entering a property. Flood resilience measures are based on an understanding that internal flooding may occur again and when considering this eventuality, homes and businesses are encouraged to plan for flooding with an aim of rapid recovery and the return of the property to a habitable state.

For example, tiled floors are easier to clean than carpets, raised electricity sockets and high-level wall fixings for TVs / computers may mean that that power supply remains unaffected. Raising kitchen or storage units may also prevent damage that may not require replacement after a flood. There is a lot of information available about what items get damaged by floodwater and features that are considered to provide effective resilience measures that can be installed at a property.

Flood resistance measures aim to reduce the amount of floodwater entering the property. Obvious inflow routes, such as through doors and airbricks may be managed, for example, by installing bespoke flood doors, door flood barriers and automatic closing airbricks. However, the property's condition and construction are also key to understanding how floodwater may enter and move between buildings. For example, flood water can also flow between properties through connecting cavity walls, cellars, beneath suspended floors and through internal walls. Flood resistance measure alone may not keep floodwater out. Building condition is a critical component of any flood mitigation study.

6.15.2 Property mitigation surveys

To define the scale and type of resistance or resilience measures required, a survey will need to be undertaken to pick up property threshold levels, air brick levels, doorways, historic flood levels and a number of ground spot levels required to better understand the flood mechanisms for flood water arriving at the property (e.g. along road, pavements, etc.). The depth of flooding at each property will help guide the selection of resistance measures proposed. Surveys will need to include consideration of issues such as:

- Detailed property information
- An assessment of flood risk, including property (cross) threshold levels
- Routes of water ingress (fluvial, ground and surface water flooding)
- An assessment of impact of flood waters
- A schedule of measures to reduce risk (resistance and resilience)
- Details of recommendations (including indicative costs)
- Advice on future maintenance of measures
- Advice on flood preparedness

All sources of flooding will need to be considered, including a comprehensive survey of openings (doors, windows and air bricks), as well as potential seepage routes through walls and floors, ingress through service cables, pipes, drains and identify possible weaknesses in any deteriorating brickwork or mortar.

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[55]. 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 Government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies;
- Giving all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies;
- Establishing clear thresholds for emergency response arrangements;
- Placing proper emphasis on the multi-agency approach to managing flooding events;
- Providing clarity on the means of improving resilience and minimising the impact of flooding events;
- Providing 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 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)[56], the LLFA and LPAs are classified as Category 1 responders and thus have duties to assess the risk of emergencies occurring, and use this to:

- Inform contingency planning;
- Put in place emergency plans;
- Put in place business continuity management arrangements;
- Put in place arrangements to make information available to the public about civil protection matters;
- Maintain arrangements to warn, inform and advise the public in the event of an emergency;
- Share information with other local responders to enhance coordination; and
- 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.

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

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

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 Merseyside Local Resilience Forum

The role of the Merseyside Local Resilience Forum (LRF)[57] is to ensure an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities in Merseyside. 'Merseyside Prepared' provides this information. The LRF consists of Category 1 and 2 responders. Category 1 responders include: British Transport Police (BTP), the EA, The Maritime and Coastguard Agency (MCA), Merseyside Fire and Rescue Service, Maritime and Coastguard Agency, Merseyside Local Authorities, Merseyside Police, North West Ambulance Service, Mersey Port Authority, and Public Health England. Category 2 responders include: BT, NHS, Health and Safety Executive, Highways England, Liverpool John Lennon Airport, Merseyrail, Mersey Travel, National Grid, Network Rail, Scottish Power Energy Networks and UU. Other agencies include, the Armed Forces, Department for Communities and Local Government and Mersey Tunnels Police. The third sector can also provide an extensive and diverse range of operational and support skills and services to statutory responders; these include: British Red Cross, Churches Together in the Merseyside Region, Maritime Volunteer Service, RAYNET, Rotary International, Royal Voluntary Service, Salvation Army.

All of these responders work together to make sure they are prepared to provide an effective response to emergency incidents. To do this they have:

- Worked together to identify the risks that people may face;
- Worked together to write plans that will outline how to effectively response to any emergencies;
- Trained together to make sure they are able to respond;
- Tested the plans to ensure they can do what they say.

7.1.2 Merseyside Community Risk Register[58]

As a strategic decision-making organisation, the LRF prepared a Community Risk Register (CRR), which considers the likelihood and consequences of the most significant risks and hazards the area faces, including fluvial, coastal, surface water 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.

7.1.3 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 Government's website[59]. WC has provided

57 http://www.merseysideprepared.org.uk/about-us/
58 http://merseysideprepared.org.uk/media/1448/2018-merseyside-community-risk-register-public-facing.pdf
59 https://www.gov.uk/guidance/resilience-in-society-infrastructure-communities-and-businesses#community-resilience

information on protecting the community, which offers a range of advice before, during and after an emergency, which is available from:

http://www.merseysideprepared.org.uk/main-sections/protecting-your-community/

They have also provided advice on how to protect your home before, during and after an emergency. This can be found at:

http://www.merseysideprepared.org.uk/main-sections/protecting-your-home/

7.1.4 Local Flood Plans

This SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. The LPA will be unable to write their own 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.

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.

In relation to new development it is up to the LPA to determine whether the flood warning and evacuation plans, or equivalent procedures, are sufficient or not. If the LPA is not satisfied, taking into account all relevant considerations, that a indicative development can be considered safe without the provision of safe access and exit, then planning permission should be refused.

Whilst there is no statutory requirement on the EA or the emergency services to approve evacuation plans, LPAs are accountable under their 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 the

LPA 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, UU/DCWW, Internal Drainage Boards and Canal & River Trust (if applicable).

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. Merseyside 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 the LPA and LLFA 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 NRW offers a flood warning service that currently covers designated Flood Warning Areas in Wales. In these areas, they are able to provide a full Flood Warning Service.
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 NRW 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	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and

access routes, preparing evacuation routes and the identification of safe locations for evacuees	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 TAN15. 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 and flood awareness

The EA monitor river levels within the main rivers affecting the authority area 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 across Wirral. Six of the 20 FWA are large scale and run from the Irish Sea and Mersey Estuary from the head of Wirral to Runcorn and is implemented to protect the following risk areas; Hoylake, Meols, Moreton and Wallasey. The majority of FWA's are clustered at the head of Wirral, namely around Hoylake, Moreton, Leasowe and Bidston for example. They are located along the Birket and downstream of the Fender and Arrowe Brooke to ensure protection to properties and businesses in Wirral. Although around Rock Ferry and Bromborough to Eastham on the east coast are also protected within the Irish Sea and Mersey Estuary FWA

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

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

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 Flood Warning service[60].

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.

60 https://www.gov.uk/sign-up-for-flood-warnings

8 Conclusions and Recommendations

8.1 Conclusions

This SFRA provides a single repository planning tool relating to flood risk and development in the metropolitan borough of Wirral. Key flood risk stakeholders namely the EA, LPA, LLFA and UU/DCWW 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 potential Local Plan development sites and Green Belt land parcels, with subsequent strategic recommendations.

The flood risk information, assessment, guidance and recommendations of the SFRA will provide the LPA 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 preparation of its new Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas, in some locations where the council is looking for continued growth and/or regeneration, this will not always be possible. This SFRA therefore provides the necessary links between spatial development, wider flood risk management policies, local strategies and 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 a Level 1 assessment, if required.

The data and information used throughout the SFRA process is the most up-to-date data available at the time. Once new, updated or further information becomes available, the LPA should look to update this SFRA. The Level 1 SFRA should be considered to be, and maintained as, a live assessment which is updated as and when required (when new modelling or flood risk information becomes available). The LPA, LLFA can decide to update the SFRA, and the EA as a statutory consultee can also advice the LPA to update the SFRA.

8.2 Planning Policy and Flood Risk Recommendations

The following planning policy recommendations relating to flood risk are designed to enable the LPA 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 (2019) and FRCC-PPG, unless in exceptional circumstances such as for essential infrastructure, which must still pass the Exception Test, 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 the storage of floodwater. Sites within Flood Zone 3b may still be developable if the site boundary can be removed from the floodplain or the site can accommodate the risk on site and keep the area free from development.

Policy Recommendation 2: Consider surface water flood risk…

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

SuDS on all new development must adhere to industry standards and to the applicable runoff discharge rate and storage volume allowances stated by the LLFA.

Site specific FRAs should always consider surface water flood risk management and options for on site flood storage through appropriate SuDS. The LPA and LLFA must always be consulted during this process, as should UU/DCWW and the EA, if required.

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.

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, residual surface water and/or groundwater flood risk and the likelihood of meeting the requirements of the Exception Test, if required.

This SFRA, the NPPF and FRCC-PPG must be consulted throughout this process along with the LPA, LLFA, EA and UU/DCWW.

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

…from a developer when a site is:

- Within Flood Zone 1 where any part of the site is identified by the RofSW flooding maps as being at risk of surface water flooding.
- At risk from surface water flooding or on land which has been identified by the EA as having critical drainage problems
- Situated in an area currently benefitting from defences
- Situated over or within 8 metres of a culverted watercourse or where development will be required to control or influence the flow of any watercourse
- Land identified as being at increased flood risk in future
- At risk of flooding from other sources of flooding or at residual risk
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding
- Situated in an area currently benefitting from defences
- Within a council designated CDA; or
- 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.

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

Policy Recommendation 5: Use of appropriately sourced SuDS…

…required for all major developments of 10 or more residential units or equivalent commercial development. This is in accordance with the Para 163 of the NPPF (2019). Interim national standards published in March 2015.

As per the NPPF (2019), in terms of SuDS, development in areas at flood risk should only be permitted where SuDS are incorporated into the design, unless clear evidence suggests demonstrates this would be inappropriate.

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/DCWW and IDB (if appropriate) 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.

All SuDS must be designed to meet industry standards, as specified below, including any replacement standards/documents which update or are in addition to those listed:

- Technical Standards for SuDS (Defra)
- C753 The SuDS Manual
- Sewers for Adoption 8

Policy Recommendation 6: Natural Flood Management techniques…

…must be considered, where possible, to aid with flood alleviation and implementation of suitable SuDS, depending on the location.

The Council's Green Infrastructure Strategy and the national WwNP mapping (included in this SFRA) should be consulted in the first instance, followed by local investigation into whether such techniques are appropriate and whether the benefits are proportionate to the work required to carry out the identified WwNP approaches.

Policy Recommendation 7: Phasing of development…

…must be carried out by the LPA on a site by site based basis and also within sites by the developer to avoid any cumulative impacts of flood risk (reinforced by the revised NPPF (2019).

Using a phased approach to development, should ensure that any sites at risk of causing flooding to other sites are developed first to ensure that flood storage measures are in place and operational before other sites are developed, thus contributing to a sustainable approach to site development during all phases of construction. It may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

Development phasing within large strategic sites of multiple developments should also be considered where parts of such sites are at flood risk.

Policy Recommendation 8: 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, and UU/DCWW, where applicable
- The effects of climate change have been taken into account using the latest allowances developed by the EA
- There is no loss in floodplain storage resulting from the development
- The development will not increase flood risk elsewhere
- For previously developed sites, the development will offer a minimum betterment of 30% reduction in discharge rate (although WC and UU are, at the time of writing, looking at implementing an improvement of 50% in discharge rate), achieved through providing SuDS as appropriate or through the use of appropriate flow and volume control devices.
- 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 for its lifetime and has passed the Exception Test, if applicable
- An appropriate Emergency Plan is included that accounts for the possibility of a flood event and shows the availability of safe access and egress points accessible during times of flood.

8.2.1 Recommendations for Further Work

The SFRA process has developed into more than just a planning tool. Sitting alongside the SA, LFRMS and FRMP, 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 may be of benefit to the LPA, in developing their flood risk evidence base to support the delivery of their Local Plan, or to the LLFA to help fill critical gaps in flood risk information.

8.3 Data gaps

Table 8-1 lists a number of studies that could be carried out WC or by private developers in future to help fill data or knowledge gaps

Table 8-1: Recommended further work for WC or developers

Type	Study	Reason	Timeframe
Understanding of local flood risk	Level 1 SFRA update	As and when new sites to be assessed, flood risk information or policy becomes available	As required

Type	Study	Reason	Timeframe
	Level 1 SFRA update; Level 2 SFRA; site-specific FRA	Reviewing of EA flood zones in those areas not covered by existing detailed hydraulic models i.e. the Flood Map for Planning does not cover every watercourse such as those <3 km2 in catchment area or Ordinary Watercourses. If a watercourse or drain is present on OS mapping but is not covered by the Flood Map for Planning, this does not mean there is no potential flood risk. A model may therefore be required to ascertain the flood risk, if any, to any nearby sites	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	WC has not developed a SWMP for Wirral, nor for any areas or communities within Wirral. It is recommended that the LLFA uses information from this SFRA to ascertain whether certain locations at high surface water flood risk may benefit from a SWMP.	Short to Medium term
	Climate change assessment for Level 1 update or Level 2 SFRA (and FRAs)	Modelling of climate change, using EA's most up-to-date allowances. February 2016 allowances for updated EA models are currently used, however post UKCP18 allowances will need to be used when figures are published.	Short term
	Local Community Flood Plans	Produce local community flood plans covering key communities including: West Kirby, Heswall and Neston, as stated in the Dee RBD FRMP.	Medium Term
	Improve Flood Awareness Plans	Improve existing Flood Awareness Plans to encourage more people to sign up to and respond to flood warnings as well as using self-help methods to protect themselves and their properties, as stated in the Dee RBD FRMP.	Medium Term
	Possible CDA delineation	Whether the delineation of CDAs may be appropriate for areas particularly prone to surface water flooding. Detailed analysis and consultation with the LLFA, UU/DCWW and any relevant Internal Drainage Board would be required. It may then be beneficial to carry out a local SWMP or drainage strategy	Long term

Type	Study	Reason	Timeframe
		for targeted locations with any such critical drainage problems.	
Flood storage and attenuation	Community Infrastructure Levy (CIL) / Working with Natural Processes	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. Further assess WwNP options in upper catchments to gauge possible areas for Natural Flood Management.	Short term
	Natural Flood Management	Promote creation of floodplain and riparian woodland, floodplain reconnection and runoff attenuation features where the research indicates that it would have be beneficial in Wirral	Ongoing
Data Collection	Flood Incident Data	WC, as LLFA, has a duty to investigate and record details of significant flood events within their area. General data collected for each incident, should include date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any RMA.	Short Term
	FRM Asset Register	WC should update and maintain a register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Risk Assessment	Asset Register Risk Assessment	WC, as LLFA, should carry out a strategic flood risk assessment of structures and features on the Asset Register to inform capital programme and prioritise maintenance programme.	Short term / ongoing
Capacity	SuDS review / guidance	The LLFA should clearly identify its requirements of developers for SuDS in new developments in collaboration with WC and LPA. Internal capacity, within WC should be in place to deal with SuDS applications, set local specification and set policy for adoption and future maintenance of SuDS.	Short term-Long term
Partnership	UU / Welsh Water	The LLFA should continue to collaborate with UU/DCWW on sewer and surface water projects. The LPA should be kept informed Carry out an assessment of water company assets to ensure they are operational and	Ongoing

Type	Study	Reason	Timeframe
		resilient at all times across the catchment.	
	EA	WC should continue to work with the EA on fluvial and tidal flood risk management projects. Potential opportunities for joint schemes to tackle flooding from all sources should be identified.	Ongoing
	Community	Continued involvement with the community through WC's existing flood risk partnerships.	Ongoing

8.3.1 Level 2 SFRA

The LPA 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 and Green Belt land parcels spreadsheets 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 should also be taken account of when considering options for future work.

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 for its lifetime, once developed, and the likelihood of passing the Exception Test, if required, as part of a FRA.

As discussed in Section 6.12, a Level 2 assessment can be used to model the February 2016 climate change allowances, where current EA models are available. A Level 2 study may also further assess locations and options, in more detail, 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 housing numbers, economic needs 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.

Appendices

A Detailed interactive GeoPDF maps

Interactive GeoPDF Maps

Open the Overview Map in Adobe Acrobat (2018s0603_WC_SFCA_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 assessed 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

Two excel spreadsheets containing an assessment of flood risk to the assessed SHLAA sites and Green Belt land parcels based on Flood Zones 1, 2, 3a and 3b, as delineated through this SFRA, and also the Risk of Flooding from Surface Water (RoFSW).

C Functional Floodplain Update

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

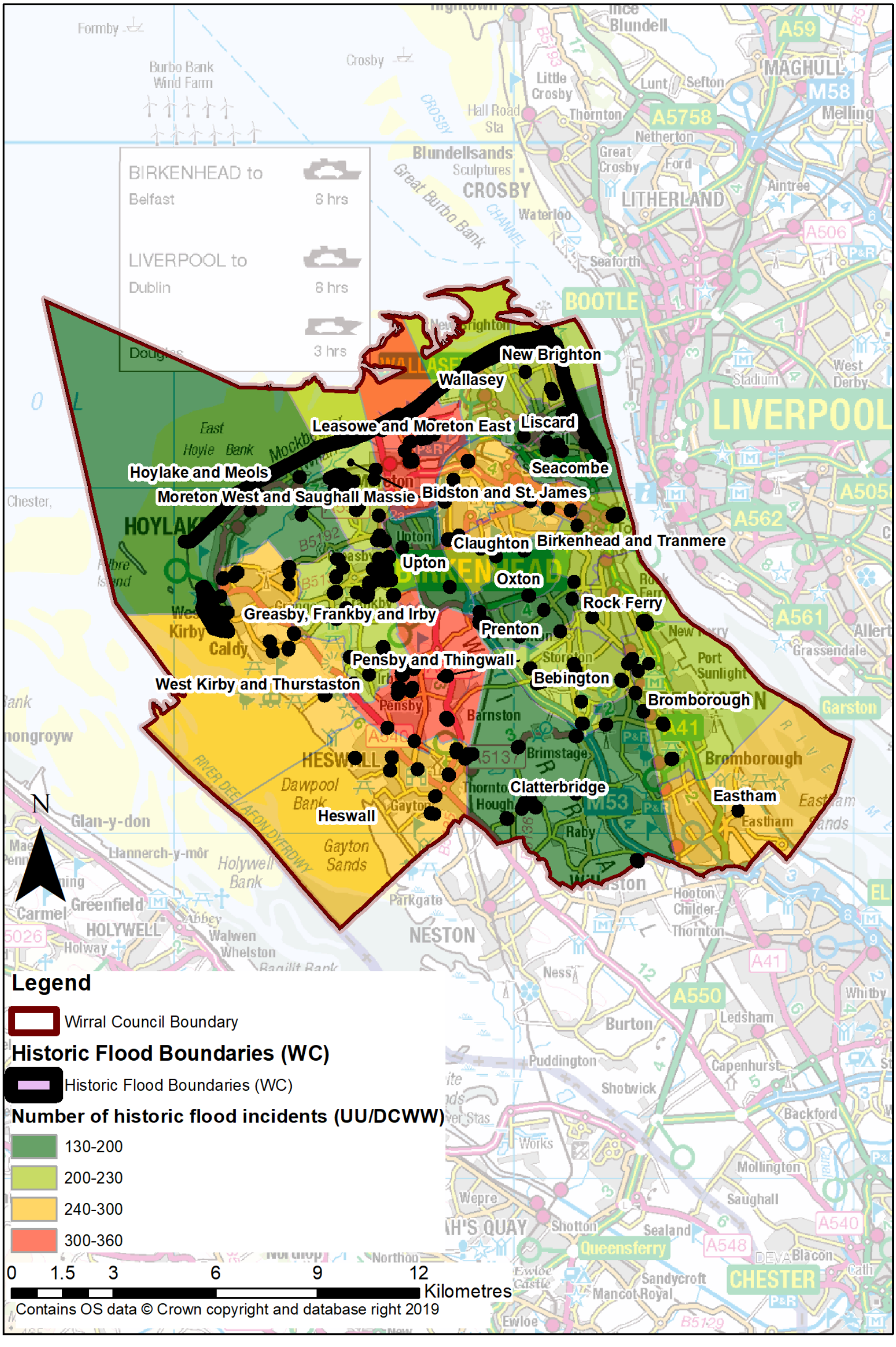
D SHLAA sites potentially unsuitable for development

SHLAA sites that are potentially unsuitable for development based on surface water risk (if development cannot be directed away from risk areas, the site will be unsuitable for development)

Site ID	Indicative land use	Site area (ha)	% Area at medium risk (1 in 100 AEP event)	% Area at high risk (1 in 30 AEP event)
277	Residential	0.18	64.11	48.85
313	Residential	0.11	18.23	0.00
526	Residential	2.56	20.83	5.73
626	Residential	0.08	22.35	12.96
643	Residential	0.10	22.34	1.87
650	Residential	0.52	18.00	11.92
693	Residential	0.57	35.39	4.85
721	Residential	0.17	11.59	1.91
725	Residential	0.09	16.30	2.78
742	Residential	7.76	11.13	8.71
743	Residential	0.58	19.24	0.00
775	Residential	0.07	38.39	26.85
890	Residential	0.33	12.24	3.31
902	Residential	0.19	10.82	0.00
925	Residential	9.08	16.46	2.65
932	Residential	2.82	15.53	11.05
1145	Residential	0.05	34.10	0.00
1191	Residential	0.11	24.50	0.00
1328	Residential	0.14	30.53	8.93
1408	Residential	0.16	12.69	9.29
1450	Residential	0.25	12.35	11.14
1454	Residential	0.08	14.42	0.00
1489	Residential	0.09	17.79	0.00
1606	Residential	0.10	43.04	0.33
1607	Residential	0.15	15.31	0.00
1642	Residential	0.07	32.98	22.97
1771	Residential	0.20	40.66	26.53
1785	Employment	27.28	10.31	6.46
1794	Residential	0.05	30.12	0.00
1816	Residential	0.44	49.47	23.07
1818	Residential	1.00	36.54	0.00
1890	Residential	0.07	37.98	26.72
1908	Residential	0.32	15.13	5.18
1929	Residential	0.41	20.81	12.63
1943	Residential	22.68	16.03	7.81
1983	Residential	1.43	31.16	4.51
2004	Residential	0.03	73.26	41.82
2029	Residential	0.24	14.45	10.20
2034	Residential	0.23	54.86	25.70
2071	Residential	0.09	12.91	0.00

Site ID	Indicative land use	Site area (ha)	% Area at medium risk (1 in 100 AEP event)	% Area at high risk (1 in 30 AEP event)
2084	Mixed Use	3.60	24.25	4.91
2085	Mixed Use	4.27	27.23	1.16
3004	Residential	5.61	10.13	8.39
3027	Residential	0.23	37.85	14.20
3037	Residential	3.22	10.50	4.84

E UU / DCWW and WC Historic flood incidents



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