Warrington Borough Council Strategic Flood Risk Assessment

Volume I - SFRA Guidance Report

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Contract

This report describes work commissioned by Kate Cowey, on behalf of Warrington Borough Council, by a letter dated 12/07/2010. Warrington Borough Council's representative for the contract was Kate Cowey and Melanie Hughes. Chris Isherwood and Peter Grace of JBA Consulting carried out this work.

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Purpose

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Executive Summary

Development and Flood Risk

Warrington Borough Council is required to undertake a Strategic Flood Risk Assessment as an essential part of the pre-production/evidence gathering stage of the Local Development Framework and in preparing their Development Plan Documents. The Strategic Flood Risk Assessment provides baseline information for use in the preparation of the Sustainability Appraisal of Local Development Documents for the scoping and evaluation stages.

The requirement for and guidance on the preparation of Strategic Flood Risk Assessments is outlined in Planning Policy Statement 25 Development and Flood Risk and its Practice Guide. This policy requires Local Planning Authorities to take a more dominant role in local flood risk management. They also need to demonstrate that due regard has been given to the issue of flood risk at all levels of the planning process to avoid inappropriate development.

Local authority planners must demonstrate that a risk based, sequential approach has been applied in preparing development plans and that flood risk has been considered during the planning application process. This is achieved through the application of the Sequential and Exception Test as outlined in Planning Policy Statement 25.

By providing a central store for data, guidance and recommendations on flood risk issues at a local level, the Strategic Flood Risk Assessment is an important planning tool that enables the Local Planning Authority to carry out the Sequential and Exception Test and to select and develop sustainable site allocations with regard to flood risk.

Strategic Flood Risk Assessments can also provide a much broader and inclusive vehicle for integrated, strategic and local Flood Risk Management assessment and delivery, by providing the linkage between Catchment Flood Management Plans, Regional Flood Risk Appraisals and Surface Water Management Plans. The suite of flood risk policy issues and information on the scale and nature of the risks in these various documents needs to be brought into "real" settings with the Strategic Flood Risk Assessment tasked with improving the understanding of flood risk across the districts.

Volume I: SFRA Guidance Report

Volume I introduces the process of the Warrington Borough Council Strategic Flood Risk Assessment. It is an excellent reference document for current flood risk management drivers, national regional and local planning policy and introduced Environment Agency policy such as the Mersey Estuary, Upper Mersey and Weaver Gower Catchment Flood Management Plans.

The report also provides a brief understanding of the mechanisms of flooding and flood risk for those new to the subject. It provides a comprehensive discussion on Planning Policy Statement 25, the Sequential and Exception Test and links the Flood Risk Management framework within national, regional and local flood risk assessments.

More importantly, this report provides guidance and recommendations to advise and inform Spatial Planners, Development Management and Developers of their obligations under Planning Policy Statement 25. This includes how to apply the sequential approach through the successful application of the Sequential and Exception Tests and how to use the detailed flood risk information provided in the Strategic Flood Risk Assessment Technical Report.

Volume II: SFRA Technical Report

Volume II of the Warrington Borough Council Strategic Flood Risk Assessment provides the detailed flood risk information collected and produced as part of the Level 1 and Level 2 assessment. It focuses on the main sources of risk in the borough including fluvial and tidal flooding along the River Mersey, its five key tributaries (Sankey, Padgate, Spittle, Penketh and Whittle Brooks), surface water flooding, sewer flooding and the residual risks associated

with artificial water bodies such as the Bridgewater, St Helens and the Manchester Ship Canal.

The majority of fluvial and tidal flood risk information has been extracted from the Environment Agency's Flood Map (June 2011) and Warrington Hazard Mapping study (March 2010). The Flood Map has been used to produce Flood Zones 2 and 3a. The hazard mapping outputs have been used to produce 3b as defined in Planning Policy Statement 25. These zones will assist Warrington Borough Council in applying the Sequential Test.

Both the current Environment Agency's Flood Map and Warrington Hazard Mapping study include the operation of the Manchester Ship Canal during fluvial flows. The current Environment Agency's Flood Map represents an undefended scenario (all sluice gates along the Manchester Ship Canal are closed), which results in an increased Flood Zone extent through Warrington. The Warrington Hazard Mapping study represents the Manchester Ship Canal as fully operational (all sluice gates along the Manchester Ship Canal are open), which could be viewed as providing a more realistic description of fluvial flood risk through Warrington. The detailed nature of the Warrington Hazard Mapping modelling has allowed flood extents, depths and hazards (including climate change) to be produced, which will aid Warrington Borough Council in the application of the Exception Test.

The Environment Agency's national Surface Water Maps along with information supplied by Untied Utilities on historical sewer flooding and sewer modelled outputs have been used to assess the risk of 'surface water flooding' in the borough and to identify Critical Drainage Areas.

The residual risks associated with the Bridgewater Canal have been assessed by the use of breach modelling at key raised embankments and aqueducts. Whilst no attempt has been made in this assessment to attribute a probability with these types of events, the breach outlines produced will provide a useful source of information for Warrington Borough Council's Emergency Planners.

The Strategic Flood Risk Assessment summarises risk to two key development areas within Warrington: the Central Warrington Strategic Site and the Warrington Waterfront. Links have also been made to possible flood risk management measures and the Environment Agency's Warrington Flood Risk Management Strategy. The Strategic Flood Risk Assessment concludes by recommending two further flood risk studies: a Surface Water Management Plan and Water Cycle Study, which will provide Warrington Borough Council with the full suite of risk information required to develop their knowledge of the Warrington water cycle and support their decision making process about allocating sustainable development sites.

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Abbreviations

ABD	Areas Benefiting from Defences
AEP	Annual Exceedance Probability
AStSWF	Areas Susceptible to Surface Water Flooding
BC	Borough Council
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plans
CLG	Communities and Local Government
CRR	Community Risk Register
CS	Core Strategy
DPDs	Development Plan Documents
EA	Environment Agency
EU	European Union
FAS	Flood Alleviation Schemes
F&WMA	Flood and Water Management Act
FEH	Flood Estimation Handbook
FCERM	Flood and Coastal Erosion Risk Management
FMfSW	Flood Map for Surface Water
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
FRR	Flood Risk Regulations
IMP	Indicative Floodplain Map
LDDs	Local Development Documents
LDF	Local Development Framework
LRF	Local Resilience Form
LLFA	Local Lead Flood Authority
LPAs	Local Planning Authorities
MSC	Manchester Ship Canal
MSCC	Manchester Ship Canal Company
NFCDD	National Fluvial and Coastal Defence Database
PFRA	Preliminary Flood Risk Assessment
PG	Practice Guide
PPS	Planning Policy Statement
RBD	River Basin District
RBMP	River Basin Management Plan
RFRA	Regional Flood Risk Assessment
RPB	Regional Planning Bodies
RPG	Regional Planning Guidance
RRF	Regional Resilience Forums
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SIRS	Sewerage Incident Register System
SoP	Standard of Protection
SPD	Supplementary Planning Document
SUDS	Sustainable (Urban) Drainage Systems
SWMP	Surface Water Management Plan
UKCIP	United Kingdom Climate Impacts Programme
UKCP	United Kingdom Climate Projections
UU	United Utilities
WCS	Water Cycle Study
WFD	Water Framework Directive
WIRS	Wastewater Incident Register System

1. Introduction

1.1 Commission

JBA Consulting was commissioned on the 12th July 2010 by Warrington Borough Council (BC) to undertake a review of the existing Warrington Strategic Flood Risk Assessment (SFRA) published in 2008.

The SFRA has been prepared in accordance with current best practice, Planning Policy Statement 25 Development and Flood Risk (PPS25)[1] and the PPS25 Practice Guide[2].

1.2 Local Planning Framework

Following the introduction of the Planning and Compulsory Purchase Act 2004, the way in which development plans are prepared has changed. With the aim of speeding up and simplifying plan preparation and improving community involvement, development plans in their current form are to be abolished and replaced with a new development plan system, the Local Development Framework (LDF).

The final LDF will take the form of a portfolio of plans and documents made up of several Local Development Documents (LDDs). Some of them will have statutory status (Development Plan Documents) and others will be adopted as local guidance documents. LDDs can deal with either different issues or different geographical areas, but when taken together they will set out the Council's policies for how it will assess development proposals and direct future growth.

As an essential part of the pre-production/evidence gathering stage of the LDF, Warrington BC is required to undertake a SFRA. JBA produced a SFRA for Warrington BC in 2008. Since 2008, there have been significant developments in flood risk management (FRM) and its policy as well as new and updated flood risk information.

The Pitt Review put the onus on SFRAs to provide the central holder for data, information and consideration for all flood risk issues relating to flooding from all sources at a local level. The SFRA should also provide a linkage between Catchment Flood Management Plans (CFMPs), Regional Flood Risk Appraisals (RFRAs), Surface Water Management Plans (SWMPs) and appropriate sustainable land uses over a number of planning cycles. SFRAs are proving a pivotal vehicle in the introduction and promotion of a local authority, post Pitt Review, role in local flood management.

As such, a combined Level 1 and Level 2 SFRA (discussed as the Warrington BC SFRA) has been undertaken to reflect these changes and to provide a spatial assessment of flood risk from all sources across Warrington BC. The SFRA will then provide the baseline information for use in the preparation of LDDs and the Sustainability Appraisal (SA) of LDDs for the scoping and evaluation stages.

1.3 Warrington BC SFRA

The Warrington BC SFRA has been produced over two volumes separating the discussion of flood risk policy and guidance with the detailed assessment of flood risk through Warrington. Whilst separated to help everyday users of the SFRA focus on areas of interest, there are still important links between the two, and one should not be read without the other. For instance Volume II assesses the spatial distribution of risk across Warrington, whilst Volume I provides the discussion and guidance needed in how 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).

[1] CLG (2010) Planning Policy Statement 25: Development and Flood Risk
[2] CLG (2009) Planning Policy Statement 25: Development and Flood Risk – Practice Guide

1.3.1 Volume I - Guidance Document

Volume I has been developed to provide guidance for Warrington BC officers on their roles and responsibilities in flood risk management (FRM) and the policy behind it. It provides tailored and supplementary information to national, regional and local guidance in order to help Warrington BC and other intended users extract the information contained in the SFRA effectively.

It also recognises wider FRM policy held within CFMPs and subsequently the Warrington Strategy, which are important in allocating and delivering sustainable development.

1.3.2 Volume II - Technical Report

Volume II has been produced as a central store of all flood risk information collected and produced during the Level 1 and Level 2 SFRA through Warrington. Whilst both the outputs from the Level 1 and Level 2 SFRA have been combined into one volume, there are two very different stages, which should be acknowledged.

Stage 1 (Level 1 SFRA) focused on collecting readily available flood risk information from a number of key stakeholders. The aim of which was to help identify the number of and spatial distribution of flood risk sources present through Warrington to inform the application of the Sequential Test. This included:

- Delineation of the Environment Agency Flood Map into PPS25 Flood Zones including the Functional Floodplain
- Identification of flood risk from 'other' sources including surface water, groundwater, sewers, reservoirs and canals
- Considering the impact of climate change
- Identification of Critical Drainage Areas (CDAs)
- Assessing the links between flood risk sources and potential development sites
- Producing a range of strategic flood risk maps based on this information

Stage 2 (Level 2 SFRA) then focused on the detailed nature of flood hazard taking account of the presence of flood risk management measures such as flood defences and the location of key development and regeneration areas in Warrington. The aim of which was to help increase the understanding of the level of risk in key areas to inform the application of the Exceptions Test where required. This included:

- Production of defended and undefended fluvial and tidal depth and hazard maps
- Improving the understanding of residual risks associated with reservoirs and the Bridgewater and Manchester Ship Canal
- Future FRM schemes in Warrington
- Possible development mitigation
- Recommendations for future work

2. The Planning Framework

2.1 Introduction

A whole host of policy guidance drives the land use planning process. Whilst the majority of these policies do not aim to mitigate flood risk, there are key links at all operational levels between land use and spatial planning, and flood risk management (FRM) planning, which should be considered as part of a planned and integrated approach to delivering sustainable development.

A core policy thread running through all current FRM drivers is the fundamental shift in emphasis from building defences to prevent flooding, to one of managing flood risk by using a suite of proactive measures including avoiding placing further receptors at flood risk. All operating authorities are required to invest in the provision of sustainable FRM and this includes LPAs adopting a FRM hierarchy of assessing, avoiding, substituting, controlling and mitigating flood risk through the land use planning system.

Central government does however; recognise that in some circumstances, appropriate mitigation measures may still involve new, or improving and maintaining existing flood defences where justified, to protect increasingly vulnerable communities. In these cases Environment Agency Catchment Flood Management Plans (CFMPs) and FRM Strategies provide local authorities with important and valuable knowledge on the appropriate strategic direction of flood risk management in their area which should assist their strategic land use planning decision making for re-generation, inward investment and growth.

The purpose of this section of the report is therefore to summarise those high-level documents that have informed and shaped the purpose and scope of this SFRA along with those, which are important for future flood risk management and planning within Warrington BC, from:

- Key legislation
- National planning policy
- Local planning policy
- Environment Agency FRM policy

2.2 Legislation

2.2.1 Flood & Water Management Act

The Flood and Water Management Act (F&WMA) was passed on the 8th April 2010. It aims to improve both flood risk management and the way we manage our water resources. The F&WMA creates clearer roles and responsibilities and instils a more risk-based approach. This includes a new lead role for local authorities in managing local flood risk (from surface water, ground water and ordinary watercourses) and a strategic overview role for all flood risk for the Environment Agency. The content and implications of the F&WMA provide considerable opportunities for improved and integrated land use planning and flood risk management by local authorities 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 re-generation and growth.

As of the 1st October 2010, only the first parts of the F&WMA have come into force implementing several provisions including definitions, the activation of statutory instrument making powers, and provisions requiring the Environment Agency and Lead Local Flood Authorities (LLFA) to develop strategies for risk management. A letter from Defra to LLFAs date 8th March 2011 identified a number of responsibility commencement dates identified in Table 2-1.

Table 2-1: Further Key LLFA Responsibilities under the F&WMA

LLFA Responsibility	Description	Legislation Commencement
Local Strategy for Flood Risk Management	A LLFA is required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	October 2010
Investigating Flood Incidents	A LLFA has a duty to investigate and record details of significant flood events within their area. This duty includes identifying risk management authorities and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	April 2011
SuDS Approving Body	The Act establishes each LLFA as a SuDS Approving Body (the "SAB"). The SAB would have responsibility for the approval of proposed drainage systems in new developments and redevelopments, subject to exemptions and thresholds. Approval must be given before the developer can commence construction. The SAB would also be responsible for adopting and maintaining SuDS, which serve more than one property, where they have been approved. Highways authorities will be responsible for maintain SuDS in public roads, to National Standards.	Expected April 2012
Works Powers	The Act provides a LLFA with powers to do works to manage flood risk from surface runoff, groundwater and on ordinary watercourses, consistent with the local flood risk management strategy for the area.	Implementation is planned to follow the national strategy coming into force later in the year
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Implementation is planned to follow the national strategy coming into force later in the year
Asset Register	A LLFA has a duty to maintain a register of structures or features, which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	April 2011

There are a number of tasks and clauses within the F&WMA, which have particular implications for Warrington BC, land use planning and related flood risk. These include:

- The Environment Agency will be given a strategic overview role covering all forms of flooding and will coordinate maps and plans in relation to the sea, main rivers and reservoirs; it will also be given the same powers as Councils to carryout coastal erosion works and may be a statutory consultee in respect of future coastal erosion planning applications
- The F&WMA provides a new role of the lead local flood authority, defined as LLFA for an area as the unitary authority or the county council (of which Warrington BC

is one). The F&WMA enables LLFA to delegate flood or coastal erosion functions to another risk management authority by agreement.

- Each LLFA must produce a Local Flood Risk Management Strategy
- The LLFA will be required to investigate flooding incidents in its area, to identify which authorities have relevant functions to deal with the flood and whether each of them intends to respond and maintain a register of structures or features, which they consider have a significant effect on flood risk in their area (including third party assets).
- The EA, local authorities and internal drainage boards will be able to manage water levels to provide leisure, habitat and other environmental benefits. This may include increasing flooding and coastal erosion where this would be beneficial.
- The Land Drainage Act has been altered, so that culverts can no longer be built on ordinary watercourses without permission.
- Right to Connect (Water Industry Act, 1991) S106 of the act has been amended by the F&WMA to now require developers where practical, to include sustainable drainage in new developments to reduce flood risk and improve water quality. drainage from new developments should incorporate storage, with residual discharge of surface water to the following networks in order of preference:
    a. Infiltration drainage (e.g. soak-a-ways)
    b. Discharge to a watercourse
    c. Discharge to a public sewer
- Surface water connection to public sewers will be conditional on meeting new national standards on SUDS and drainage, and the adoption of a SUDS approving body (LLFA) will be needed, and a certificate issued, before development can begin;
- The approving body (LLFA) must adopt the drainage system if it has been constructed to meet the sustainable drainage approval with exceptions for single properties and roads and then becomes responsible for maintaining the system.
- All relevant authorities will be required to cooperate and share information.

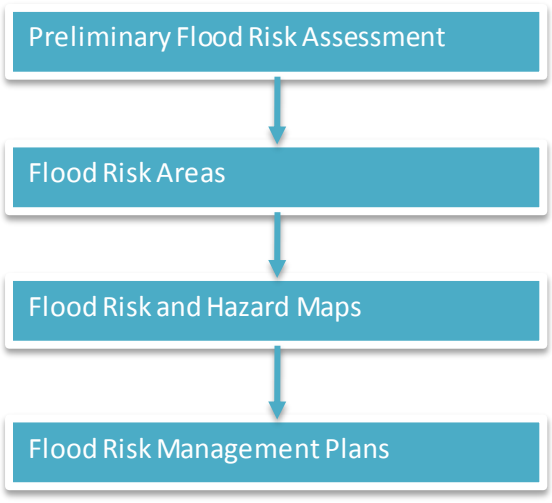
2.2.2 EU Floods Directive & the Flood Risk Regulations

The EU Floods Directive (2007) aims to improve the management of the risk floods pose to human health, the environment, cultural heritage and economic activity. England and Wales implemented the Flood Risk Regulations (2009), which came into force on the 10th December 2009, transposing the Directive into law.

These regulations outline the requirement for the Environment Agency and LLFA to create Preliminary Flood Risk Assessments (PFRAs), with the aim of identifying Flood Risk Areas.

LLFA will be tasked with completing a PFRA, which covers the entire borough, for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). The PFRA should be based on readily available information to help identify significant flood risk areas. For these significant flood risk areas, the LLFA will then need to undertake flood risk hazard mapping and Flood Risk Management Plans (FRMPs). The FRMP will need to

Figure 2-1: Requirements of the EU Floods Directive



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

The Environment Agency have implemented one of the exceptions for creating PFRAs etc for main rivers and coastal flooding, as they already have mapping (i.e. Flood Map) and plans (i.e. CFMPs) in place to deal with this. The Environment Agency therefore focused their efforts on assisting LLFAs, identifying indicative Flood Risk Areas and providing guidance on producing PFRAs.

Outside of the PFRA process, LLFAs are advised to establish governance and partnership arrangements with other Risk Management Authorities (RMAs) for delivering the PFRA, setting up frameworks and systems for managing flood risk data, assembling local data and analysing national data. Table 2-2 provides a timetable for these assessments and plans.

Table 2-2: LLFA Flood Risk Regulations Timetable

Assessment or Plan	Deadline to Environment Agency for Review	Completion
PFRA	June 2011	Dec 2011
Flood Hazard and Risk Maps	June 2013	Dec 2013
FRMP	June 2015	Dec 2015

The PFRA cycle will start again in 2016, so it will be important to ensure that information is maintained and kept up to date for future use and to support other assessments of flood risk (such as SWMPs, SFRAs) and as part of local strategies. In the next cycle, more information will be mandatory for floods that occur after 22 December 2011.

2.2.3 The Pitt Review

The Pitt Review followed the severe floods of summer 2007 and is a key document for local authorities in their consideration of flood risk management. Sir Michael Pitt was asked by Ministers to conduct an independent review of events and report on the lessons that should be learned.

In December 2007, the review team published an Interim Report. The Review collected evidence by visiting affected areas and examining over 600 written statements submitted by victims of the floods. In June 2008, Pitt's final report was released, containing detailed findings, conclusions and 92 recommendations for action, covering all aspects of strategic and local flood risk management. These interim conclusions are intended to shape the national approach to flood management and can be accessed via the Defra website. Some of the recommendations, which are relevant to this SFRA and the role of local authorities' in future local flood risk management include:

- **Recommendation 11** – Building Regulations should be revised to ensure that all new or refurbished development in high flood risk areas are flood resistant or resilient.
- **Recommendation 14** – Local Authorities should lead on the management of local flood risk, with support of the relevant organisations.
- **Recommendation 15** – Local Authorities should positively tackle local problems of flooding working with all relevant parties, establishing ownership and legal responsibility.
- **Recommendation 16** – Local Authorities should collate and map the main flood risk management and drainage assets (over and underground), including a record of their ownership and condition.
- **Recommendation 17** – All relevant organisations should have a duty to share information and cooperate with local authorities and the Environment Agency to facilitate the management of flood risk.

- **Recommendation 18** – Local Surface Water Management Plans, as set out under PPS25 and coordinated by local authorities, should provide the basis for managing all local flood risk.
- **Recommendation 19** – Local Authorities should assess and, if appropriate, enhance their technical capabilities to deliver a wide range of responsibilities in relation to local flood risk management.
- **Recommendation 20** – The Government should resolve the issue of which organisations should be responsible for the ownership and maintenance of sustainable drainage systems.
- **Recommendation 52** – In the short term, the Government and infrastructure operators should work together to build a level of resilience in critical infrastructure assets that ensures continuity during worst-case flood event.
- **Recommendation 57** – The Government should provide Local Resilience Forums with the inundation maps for both large and small reservoirs to enable them to assess risks and plan for contingency, warning and evacuation.

Pitt's findings, conclusions and recommendations for action are challenging but will be extremely important in guiding local authorities and other operating authorities in their consideration of future flood risk management activities, including land use planning. They have also been a key driver in shaping the content of the Flood and Water Management Act.

2.2.4 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD) is to deliver improvements across Europe in the management of water quality and water resources. The WFD requires all inland and coastal waters to reach "good ecological status" by 2015 through a catchment-based system of River Basin Management Plans (RBMPs), incorporating a programme of measures to improve the status of all natural water bodies. There is an exception for "heavily modified water bodies", which are required to achieve "good ecological potential".

The Water Environment Regulations (2003) transposed the WFD into law in England and Wales. The Environment Agency is leading on the delivery of the WFD.

Warrington is within the North West River Basin District and the Environment Agency published the final North West River Basin Management Plan in December 2009. The main responsibility for Warrington BC is to work with the Environment Agency to develop links between river basin management planning and the development of local authority plans, policies and assessments. In particular, the programme of actions (measures) within the RBMP highlights the need for:

- Water Cycle Strategies,
- Considering the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, including LDDs and Sustainable Community Strategies, and
- Promoting the use of Sustainable Drainage Systems (SUDS) in new development.

2.3 National Policy

2.3.1 PPS1: Delivering Sustainable Development

PPS1 sets out the overarching planning policies on the delivery of sustainable development through the planning system. It sets out how LPAs should prepare policies to avoid new development in areas of flood risk and sea level rise, and consider climate change impacts on the location and design of development.

PPS1 provides for LDDs to adopt a spatial planning approach that goes beyond traditional land use planning and which does not replicate, cut across or detrimentally affect matters within the scope of the other legislative requirements (e.g. the Building Regulations). The

accompanying policy statement "Planning and Climate Change" provides an expanded policy on planning contributions to mitigating and adapting to climate change.

2.3.2 PPS25: Development & Flood Risk

The aim of PPS25 is to ensure that at all stages in the planning process; flood risk is taken into account to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk.

In March 2010, Communities and Local Government (CLG) published a revised version to PPS25, which clarifies some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively. The key planning objectives of PPS25 relevant to Warrington BC are that LPAs should prepare and implement planning strategies that help to deliver sustainable development by:

- Identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;
- Preparing SFRAs as appropriate, as a freestanding assessment that contributes to the Sustainability Appraisal of their plans;
- Framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;
- Only permitting development in areas of flood risk when there are no suitable alternative sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding;
- Safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water, and flood defences;
- Reducing flood risk to and from new development through location, layout and design, incorporating SUDS;
- Using opportunities offered by new development to reduce the cause and impacts of flooding e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; re-creating functional floodplain; and setting back defences;
- Working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously; and
- Ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning.

In addition to setting out the roles and responsibilities for LPAs, PPS25 identifies that landowners also have a primary responsibility for safeguarding their land and other property against natural hazards such as flooding. Those promoting sites for development are also responsible for:

- Demonstrating that is consistent with PPS25 and Local Development Documents (LDDs); and
- Providing a Flood Risk Assessment (FRA) demonstrating whether the proposed development: is likely to be affected by current or future flooding; satisfies the LPA that the development is safe; and identifies management and mitigation measures.

2.3.3 PPS25: Development & Flood Risk Practice Guide

CLG published the Practice Guide to PPS25 in June 2008 and updated it in December 2009. It provides advice on the practical implementation of PPS25 policy and reflects extensive discussion with local authorities, the Environment Agency and other key stakeholders and practitioners. The guide provides further guidance on the preparation of

SFRAs and FRAs, the Sequential and Exception Test, outlines potential mitigation measures e.g. SUDS and risk management techniques.

Local Authority planners and developers are advised to refer to and use PPS25 and its Practice Guide in conjunction with the further advice and guidance contained within this SFRA.

The majority of the 2009 updates are relatively minor acknowledging material such as the Pitt Review and new flood risk information such as the Environment Agency national Areas Susceptible to Surface Water Flooding map. Some of the most important changes relevant to this SFRA are highlighted below:

- Additional advice on applying the sequential approach at the regional level over a longer time frame;
- Further advice on the issues relating to guidance provided within SFRAs, including on the role of surface water management plans;
- Updated guidance on climate change impacts;
- Updated guidance on applying the sequential approach to other sources of flooding;
- Further advice on the application of the Sequential Test, including the availability of alternative sites; and
- Further clarification on defining functional floodplains.

2.4 Regional Policy

2.4.1 Regional Spatial Strategy

The Regional Spatial Strategy (RSS) for the North West was approved in September 2008. The document contains Policy EM5: Integrated Water Management, which sets out that plans and strategies, should have regard to River Basin Management Plans, Water Company Asset Management Plans, Catchment Flood Management Plans and Regional Flood Risk Appraisals. It also sets out that local planning authorities and developers should protect the quantity and quality of surface, ground and coastal waters and manage flood risk by:

- Working with water companies and the Environment Agency when planning the location and phasing of development.
- Producing sub-regional or district level Strategic Flood Risk Assessments.
- Designing appropriate mitigation measures into any scheme, which exceptionally must take place in current and future flood risk areas.
- Requiring new development to incorporate SUDS and water efficiency within existing developments.
- Raising people's awareness of flood risk and the impacts of their behaviour and lifestyles on water consumption.

As of July 2010, the Secretary of State made its first steps in delivering their commitment to the coalition agreement in revoking Regional Strategies by "abolishing Regional Spatial Strategies and to return decision-making powers on housing and planning to local councils."

It is expected that the removal of Regional Strategies will provide a clear signal of the importance attached to the development and application of local spatial plans, in the form of LDF Core Strategies and other Development Plan Documents.

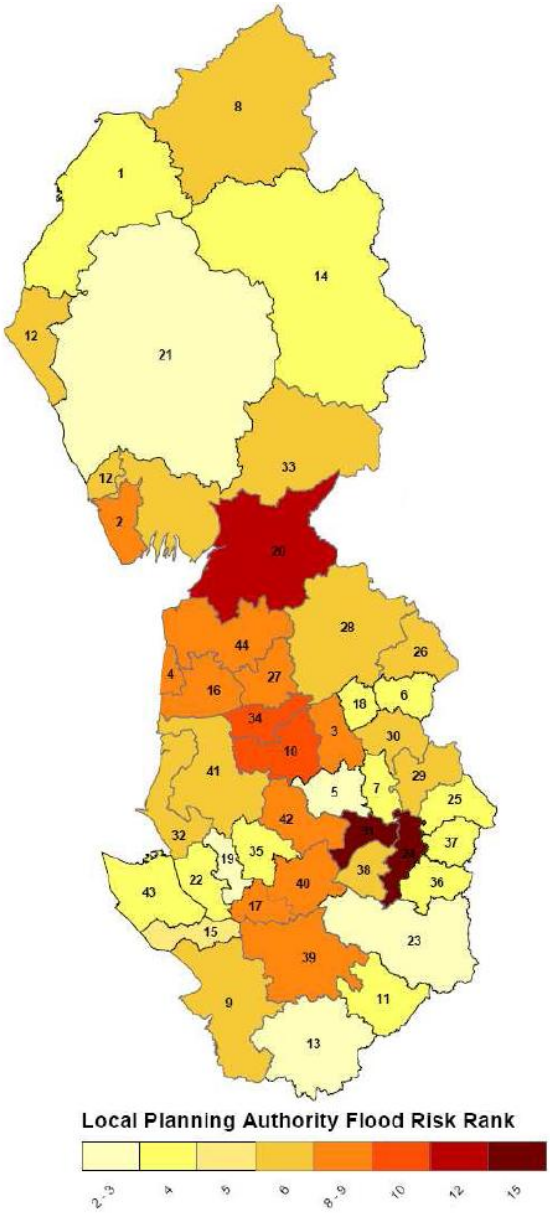
The revocation of Regional Strategies is set out in the "localism Bill", which was published in November 2010. The Localism Bill aims to introduce new ways for local authorities to address strategic planning and infrastructure issues based on cooperation in the local area.

2.4.2 Regional Flood Risk Appraisal

The North West Regional Flood Risk Appraisal (RFRA) for the North West RSS was published in October 2008. The appraisal covers five main aspects:

- A survey of all local planning authorities in the North West to gauge their broad assessment of flood risk issues including surface water flooding;
- Work undertaken by the Environment Agency to evaluate the potential impact of fluvial and coastal flooding in relation to the proposed housing figures set out in the draft RSS;
- An assessment of any potential flood risk implications related to regionally significant economic developments;
- An overview of the issue to consider with other aspects of flooding, namely groundwater and sewer flood risk, and
- The potential impacts of climate change.

The RFRA identifies the potential flood risk issues that are of regional significance as illustrated in the adjacent figure. It also sets out flood risk rankings produced by the Environment Agency which, although have their limitations, provide local authorities with an indication of the type and scale of fluvial and tidal flood risk management challenge they face.



Although the RSS may be abolished at some point in the future, the mechanisms of flood risk have not changed and they will still need to be addressed at a strategic level.

As illustrated in this SFRA and the RFRA, flood risk does not respect administrative boundaries and there are a number of local authorities in the North West that are hydraulically connected. Strategic flood risk management studies such as CFMPs and SMPs provide some of this evidence base. However, they are mainly focused on providing a long-term direction of travel of flood risk management and subsequent action will still be required depending on a number of factors including available resources or schemes qualifying for funding.

There are also clear links between the RFRA and the Warrington SFRA with the flood risk data it provides across the North West and regional guidance it offers. The Coalition agreement is clear that the best plan of action is avoidance and we should prevent unnecessary building in areas of high flood risk. The RFRA therefore still has a major role to play in influencing local planning by considering flood risk strategically and helping to developing regional approaches and establishing partnerships.

Local authorities already have a duty to co-

operate under the Flood and Water Management Act with the responsibility of managing local flood risk issues growing. Whilst the Environment Agency will continue to work with local authorities individually and/or jointly to provide technical support on these matters, the RFRA could still end up providing this mechanism, and assisting local authorities and the Environment Agency in future work.

Whilst the regional strategies may be abolished at some point in the future, evidence available to inform the regional strategy, such as the RFRA, can still be referred to however, the regional plan making will not continue. It is also important for local authorities to understand the background in which RFRA were born and the connection between SFRAs and the hierarchy of flood risk assessment and wider flood risk management studies.

2.5 Local Policy

Following the introduction of the Planning and Compulsory Purchase Act 2004, the way in which development plans are prepared has changed. The aim of the new system is to speed up and simplifying plan preparation, improving community involvement throughout the process.

The LDF takes the form of a portfolio of plans and documents made up of several Local Development Documents (LDDs). Some of them will have statutory status (Development Plan Documents, DPDs) and others will be adopted as local guidance documents. LDDs can deal with either different issues or different geographical areas, but when taken together they will set out Warrington BC's policies for how it will assess development proposals and direct future growth. At the time of this SFRA, Warrington BC is currently preparing their Core Strategy. A draft Core Strategy is intended to be published in early 2011 with a view to submit the draft by summer 2011.

In order to give further advice to applicants, and to maximise the effectiveness of policies, Warrington BC has prepared supplementary planning documents on a number of topics. These go into more detail than is possible within the Development Plan and aim to clarify specific aspects of policies and their application. These currently include the:

- **Design and Construction SPD**, which expands Development Plan policies to make clear the Council and wider stakeholders in relation to the design and construction of new development within the Borough, and
- **Bank Park SPD**, which highlights development opportunities and provides detail on the range of land uses considered suitable within the area of Bank Park.
- **Bridge Street SPD**, which highlights development opportunities and provides detail on the range of land uses considered to be suitable within the areas of the upper and lower Bridge Street area, the Market, Academy Way, Academy Street, Mersey Street and Time Square.

The LDF Evidence Base is a collection of studies, reports and surveys undertaken by Warrington BC to gather information for the LDF. The LDF evidence base currently includes the:

- Affordable Housing Viability Assessment
- Gypsy and Traveller Accommodation Assessment
- Renewable Energy Study
- Strategic Housing Market Assessment 2009
- Warrington Employment Land Review and Employment Land Availability Statement 2010
- Warrington Local Centre Study 2009
- Warrington Retail and Leisure Study 2006
- Warrington Strategic Housing Land Availability Assessment 2010
- Warrington Town Health Check 2010

The SFRA will form part of this evidence base to inform policy development and the application of the Sequential Test and Exception Test, where necessary, when allocating sites for development.

2.6 Environment Agency FRM Policy

2.6.1 Catchment Flood Management Plans

The Environment Agency produced CFMPs as a tool for helping to understand the factors that contribute to flood risk and to determine how best to manage future flood risk within a particular catchment. They consider flooding from main and non-main rivers, with each catchment divided into a series of policy units. For each unit there are a series of policy options for flood risk management provided in Table 2-3.

Table 2-3: CFMP Policy Options

Policy Option	Description
Policy option 1: No active intervention	No active intervention (including flood warning and maintenance), but continue to monitor and advise. Suitable for natural catchments where the river is connected to the floodplains and flooding has beneficial effects for habitats.
Policy option 2: Reduce existing flood risk management actions	Reduce existing flood risk management actions (accepting that flood risk will increase over time). Suitable where the current and future risks in all or part of these areas do not warrant as much intervention (for example on maintenance) and we can allow the risk of flooding to increase naturally over time.
Policy option 3: Continue with existing or alternate actions to manage flood risk at the current level	Continue with existing or alternative actions to manage flood risk at the current level. Suitable where the risks are currently managed appropriately and where the risk of flooding is not expected to increase significantly in the future.
Policy option 4: Take action to sustain the current scale of flood risk into the future	Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change). Suitable where the risks are deemed to be currently managed in an appropriate manner, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to reduce the increases in risk.
Policy option 5: Take further action to reduce flood risk	Take further action to reduce flood risk. This policy is about reducing the flood risk in areas where the existing flood risk is too high. Suitable in the short term to reduce this level of risk. Alternatively it may be about reducing flood risk in locations where the future flood risk is high. We will need to take longer-term action to reduce flood risk in these locations.
Policy option 6: Take action with others to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment	The aim of this policy is to attenuate water in those parts of the sub-area where there are multiple benefits from doing so. This could include storing water in part of the catchment in order to reduce flood risk to downstream communities. Alternatively it could include reducing runoff, restoring floodplains and improving habitats that contribute to reduce the risk elsewhere.

CFMPs are a key tool within spatial planning. As well as providing a detailed overview of flood risk from multiple sources, they indicate a long-term direction of travel within flood risk management. This is critical when areas under development pressure coincide with high flood risk. Chosen policies and actions highlight where to avoid development in those areas where deemed inappropriate to reduce flood risk now and in the future. They also

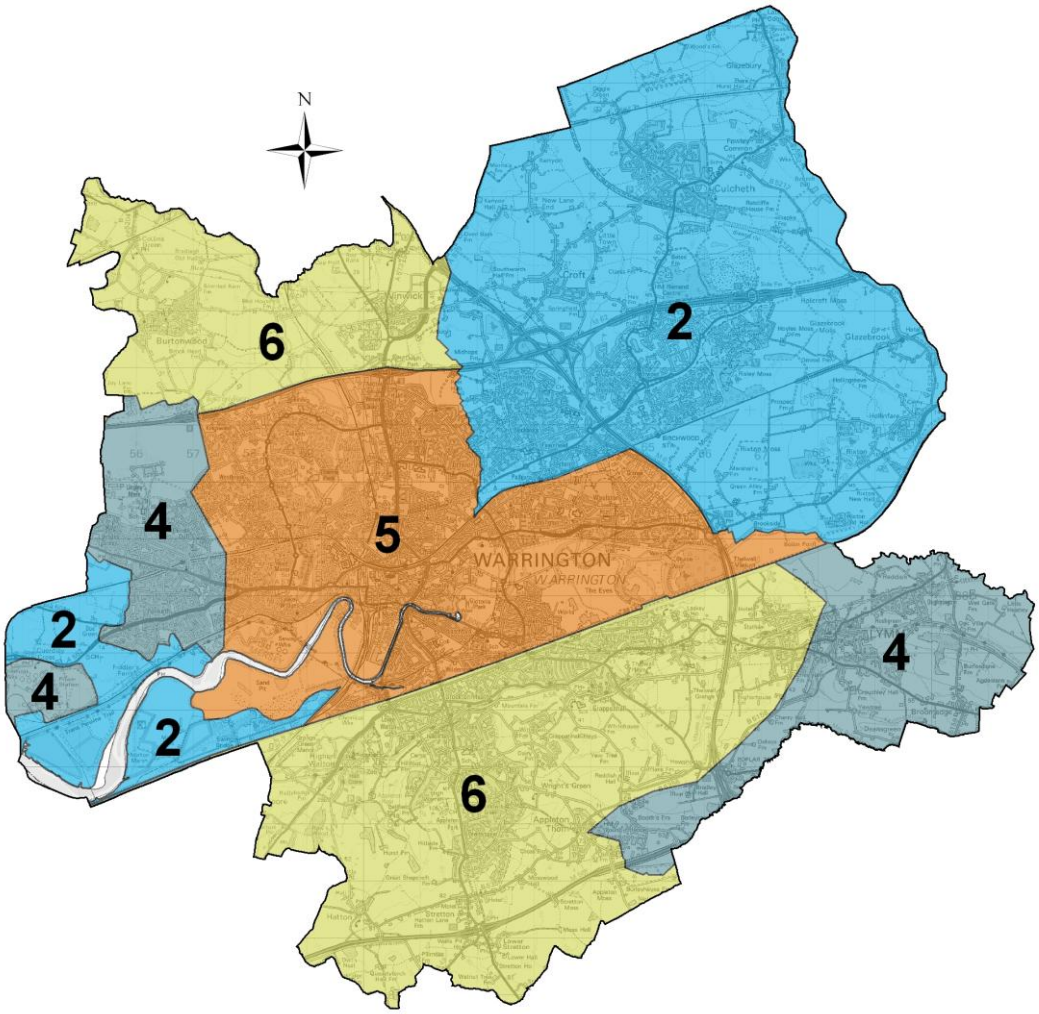
indicate when water should be allowed to flood or where current flood risk measures should be reduced. Development should therefore be focused towards the more 'sustainable' areas in terms of lower risk of flooding or where flood risk management is considered viable within the short and long-term plans.

Therefore if development has been proposed in flood risk areas and the chosen policy is not to take further action to reduce flood risk, then developments will find it difficult to rely on Environment Agency led FRM infrastructure investment and there will be a great reliance on private (developer) funding to reduce risk. In this instance, development may not be viable.

There are three CFMPs covering Warrington BC as listed below. The CFMPs split Warrington between nine Policy Units, as illustrated in Figure 2-2 (see Table 2-3 for FRM policy descriptions).

- Mersey Estuary CFMP (September 2008)
- Upper Mersey CFMP (August 2008)
- Weaver Gower CFMP (December 2008)

Figure 2-2: Warrington CFMP Policies



It is important to note that Policy Options 4 and 5 do not automatically equate to the Environment Agency, or others, taking action on the ground. Policy responses indicate a long-term direction of travel and do not reflect the likelihood of any particular area

qualifying for funding for a scheme under the priority scoring system. In addition, CFMP policy units simplify direct policy action over vast areas of land. In reality, the chosen policy may only focus on a small urban or rural area within that policy unit.

Along with each Policy Option, there are a number of direct actions to be taken required in order to achieve the policy aim. Table 2-4 lists those actions relevant to Warrington. These actions range from further investigations and strategies by the Environment Agency and Warrington BC but also include making use of data from United Utilities and informing the public.

Table 2-4: Warrington CFMP Actions

Policy Unit	Actions
Penketh	• Deliver the FRM Strategy for Warrington. This includes the Penketh Brook catchment and will consider the justification for reducing flood risk in Great Sankey and Penketh and look at appropriate ways of doing it, including environmental benefits and the promotion of green corridors. • Develop System Asset Management Plans for key systems, in order to identify opportunities to mitigate for future increase in flood risk. • United Utilities to implement their recent proposals for remedial works to reduce sewer flooding issues in this sub-area. • Look to encourage the use of flood resilience and flood-proofing to existing properties in Penketh through the provision of information and advice and seek appropriate opportunities for funding these measures. • Encourage the use of appropriately designed SUDS to control run-off at source. • Review outcomes of groundwater resource investigation and look to enhance the monitoring network in areas susceptible to groundwater emergence.
Lower Sankey, Padgate and Woolston	• To liaise with Peel Ports Group regarding flood risk and the maintenance of the Manchester Ship Canal and its assets. • Develop a FRM Strategy for Warrington. • Encourage LPA to produce SFRAs to minimise future flood risk from all sources. Seek to ensure that where exceptional development must take place in flood risk areas, that it is adequately designed. • Encourage the use of appropriately designed SUDS to control run-off. • Review and update the Warrington Flood Warning Management Plan and review the Multi Agency Flood Response Plan for Warrington to ensure safe access and evacuation can be provided during flood events. • Review the outcomes of the groundwater resource investigation in the Lower Mersey Basin with regard to the effect on flood risk.
Middle Sankey and Rural Areas	• To identify areas for reducing the flood flow, by storing excess floodwater in ponds/reservoirs in the Sankey catchment. • Work with local and national Government to create economic and social conditions that encourage appropriate land use and land management. • Consider appropriate detention times and maximum run-off rates and produce a map to help increase the take up of SUDS to mitigate flood risk downstream. • Review the outcomes of the groundwater resource investigation in the Lower Mersey Basin and assess the effect on flood risk.
Glaze	• To develop a maintenance plan for the area that will identify locations where it is sensible to reduce our existing level of maintenance. • To work with land managers through the Entry and High Level Environmental Stewardship schemes to reduce run off in rural areas within the upper catchment.
Bollin	• Identify the maintenance/capital works associated with flood risk management assets that will be required over the future 100-year horizon. This will identify areas where maintenance and resources can be redirected, to provide greatest flood risk benefit from expenditure in the sub-area. • Improve understanding of surface water/sewer flooding by working with flood risk partners.
Knowsley and	• Review the North Merseyside and Lower Mersey Basin groundwater

Policy Unit	Actions
Moss Side	resource investigation outcomes and look to enhance existing groundwater monitoring network targeting areas susceptible to groundwater emergence. • Investigate how the environmental value within the Inner Mersey Estuary can be preserved and improved within this sub-area. • Consider the programme and findings of the SMP2. • Encourage the use of flood resilience and flood-proofing to existing properties by providing information and advice, and looking for appropriate opportunities for funding these measures within the community. • Promote and work with land managers through the environmental stewardship schemes to reduce run-off in rural areas within the upper catchment reaches.
Weaver and Gower Rural Areas	• Carry out specific studies aimed at identifying flood storage or beneficial land use change upstream of major flood risk areas in the catchment. • Work in partnership with Natural England and Defra to link flood risk benefit to agricultural subsidies by catchment sensitive farming practices and Environmental Stewardship Schemes. • Encourage targeted woodland creation to reduce run-off, liaising with initiatives such as the North West Cheshire Forest Strategy. • Use SFRAs to inform future development and minimise flood risk. • Encourage local authorities covering properties at risk to consider extending eligibility for home improvement grants and home loans to encompass flood protection and resilience products.

Leading on from actions made in the Mersey Estuary CFMP, specifically those associated with the Lower Sankey, Padgate, Penketh and Woolston Policy Unit, the Environment Agency has developed the Warrington FRM Strategy. Volume II Section 6 of this SFRA provides further detail on Flood Risk Management.

3. The Sequential Approach

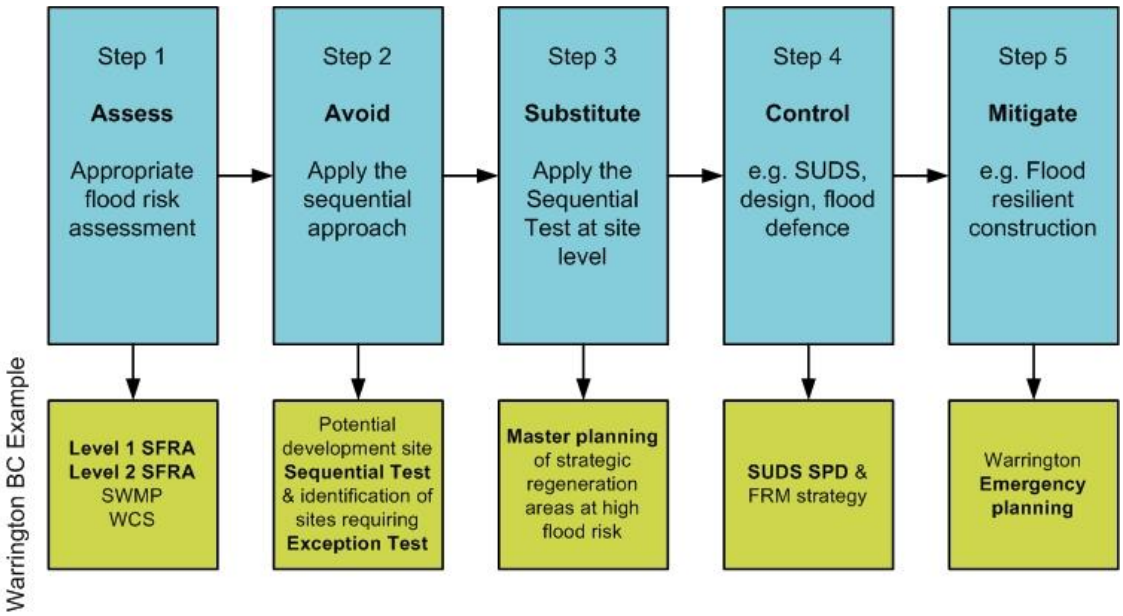
3.1 Introduction

PPS25 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, their property and the environment to acceptable levels.

The approach is based around the flood risk management hierarchy, in which actions to avoid substitute, control and mitigate flood risk is central. It is important initially to assess the level of risk at an appropriate level to the decision making process, hence the development of this SFRA. Once this evidence has been provided, positive planning decisions can be made and effective flood risk management opportunities identified.

Figure 3-1 illustrates the FRM hierarchy with an example of how these may translate into Warrington BC management decisions and actions.

Figure 3-1: Flood Risk Management Hierarchy



The sequential approach is achieved through the **successive** application of the Sequential Test and Exception Test. The SFRA provides the evidence base for this decision making process.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system it is being carried out i.e. spatial planning or development management. The next report sections are split between the two key users to provide a more guided discussion on why and how the Sequential Approach should be applied and individual steps in which to carry out the Sequential and Exceptions Tests. Firstly, this chapter introduces both the Sequential and Exception Tests.

3.2 The Sequential Test

When allocating land for development in flood risk areas, it will be the responsibility of spatial planners as part of the LDF process, to demonstrate that there are no suitable alternative development sites (of the type and nature proposed by the Core Strategy) located in lower flood risk areas (see Section 3.4).

As part of the planning application/FRA process when applying for development planning in flood risk areas, it will be the responsibility of individual developers to demonstrate and

provide evidence that there are no suitable alternative development sites (of the type and nature proposed by the Core Strategy) located in lower flood risk areas (see Section 3.5).

Section 3.4 considers the allocation of development land.

PPS25 introduces a Sequential Test that is core to this process. The Environment Agency Flood Zone Map provides the foundation of the Sequential Test, on the basis of the Flood Zones provided in Table D.1 of PPS25. According to PPS25,

"The overall aim of decision-makers should be to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, decision-makers identifying broad locations for development and infrastructure, allocating land in spatial plans or determining applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zone 1 or 2 should decision-makers consider the suitability of suites in Flood Zone 3, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required."

In order to assess the Sequential Test, Warrington BC needs to know:

- The spatial extent of flood risk across their borough;
- PPS25 Flood Zone extents;
- Location of flooding from other sources and extent if available; and
- Location of proposed development sites and the proposed vulnerability of that development in flood risk terms (Table D.2 of PPS25 and Appendix B of this report).

There are a number of challenges faced in applying the Sequential Test in accordance with PPS25 and its Practice Guide. Currently, the Sequential Test is purely based on the Flood Zones as defined by Table D1 of PPS25, but these zones only take account of fluvial and tidal flooding, which ignore the presence of flood risk management measures such as defences and do not take account of other sources of flooding.

It is important however that other sources of flooding are considered in the spatial distribution of development. The challenge here is that it is not always possible to map the spatial extent of flooding from other sources, given the strategic nature of flood risk information provided and limited scope of the SFRA, and then matching the level of that flood risk source with appropriate development. For instance, Flood Zone 3 cannot be directly related to a high susceptible area at risk of surface water flooding as the probability and consequences are significantly different.

It is therefore critical that whilst it may not be appropriate to avoid development at risk from other sources of flooding, these sources should be considered during the substitution, control and mitigate stages of the Sequential Approach.

3.3 The Exception Test

There maybe circumstances once the Sequential Test has been successfully applied, that Warrington BC cannot avoid all development at risk. In these cases, it will be important to match the vulnerability of proposed land use (Table D.2 of PPS25 and Appendix B of this report) with the PPS25 Flood Zone in which they lie (see Table D.1 of PPS25 and Appendix A of this report).

Table D.3 of PPS25 illustrates which land use vulnerability classifications are appropriate in each flood zone. Table 3-1 provides a copy of PPS25's Table D.3. As illustrated in Table 3-1, in some circumstances it is inappropriate to place certain land use vulnerability within some flood zones. In others, the Exception Test is required and must be passed in order for development to be deemed appropriate.

Once the requirement of the Exception Test has been identified, three stringent conditions must be met in order to pass the Test. If not all conditions of the Exception Test can be

met, planning permission cannot be granted. These conditions (see Paragraph D9 of PPS25) are as follows:

a. *It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared. If the LDD has reached the 'submission' stage (see Figure 4.1 of PPS12: Local Development Frameworks) the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal (SA);*

b. *The development must be on developable previously-developed land or, if it is not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land; and*

c. *A site-specific Flood Risk Assessment must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Table 3-1: Where the Exception Test Applies

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	✗	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	✗	✗	✗

Key:

✔ Development is appropriate

✗ Development should not be permitted

3.4 Spatial Planning Guidance

This section provides guidance on how Spatial Planners are to apply the Sequential and Exception Test within the Sustainability Appraisal of LDDs. When allocating land for development in flood risk areas, those responsible for making decisions are expected to demonstrate that there are no suitable alternative development sites (of the type and nature proposed by the Core Strategy) located in lower flood risk areas.

Once the Sequential Test has been applied, and flood risk areas cannot be avoided, the Exception Test should be undertaken. At the Policy Planning stage, only the likelihood of passing the Exception Test can be assessed, as actually passing the test will require the completion of a site specific FRA to determine if the development site and its occupiers will be safe during times of flood. What should be done at this early stage is to identify those sites in which the Exception Test is required and to avoid those sites in which flood risk is deemed too great or there is no overriding planning objectives for that development.

PPS25 does not provide systematic guidance on how to apply each Test rather the broad approach to follow. What this SFRA guidance below will do, if followed appropriately, is produce clear and transparent evidence that both the Sequential and Exception Test have

been applied. This evidence can then feed into the Sustainability Appraisal process of LDDs. This can be reported within either the Sustainability Appraisal itself or a supporting stand-alone document, which then feeds into the Sustainability Appraisal.

The guidance provided in this SFRA should not supersede PPS25 or other plans and policies, but should be seen as a practical approach as to how the LPA should apply the Sequential and Exception Tests within the preparation of the LDF. The SFRA will provide the relevant information on flood risk to allow Warrington BC spatial planners to:

- Produce appropriate policies for the allocation of sites and development management which avoids flood risk to people and property,
- Produce appropriate flood risk indicators, and
- Undertake the Sequential Test and Exception Test

3.4.1 Spatial Planning Flow Diagrams and Tables

Figure 3-2 illustrates the accountability of flood risk within LDDs and the use of SFRA information. The flow diagram has been adapted from PPS25 Practice Guide (Figure 2.4 p.18) to link in with guidance provided within the below Sections.

Figure 3-2 is a generic flow diagram. Warrington BC are currently in the process of producing the Core Strategy with allocation documents to follow. Warrington BC will therefore apply the sequential and exceptions tests utilising the information in the SFRA once this stage is reached. PPS25 Practice Guide assumes a strong link with the Sustainability Appraisal, and the SFRA should influence all stages of this. Therefore, Figure 3-2 should be amended to take account of steps that may have previously been taken within the first pass of the Sustainability Appraisal stage. Warrington BC are currently working towards their Core Strategy and the results of this SFRA will be taken into account in both the production of LDDs and future DPDs.

The flow diagrams and tables thereafter provide a recommended approach for Spatial Planners in applying the Sequential and Exception Tests, keeping in mind the flood risk management hierarchy of avoid, substitute, control and mitigate, whilst identifying and allocating sustainable development sites.

Colours have been used to represent key stages in the sequential approach process. The same colours are used in all flow diagrams and tables below, the aim of which is to make it easier to identify what guidance relates to individual steps within the sequential approach sequence.

Figure 3-3 below, illustrates the Sequential and Exception Tests as an input, process and output flow diagram. The main inputs being the evidence provided in both the Level 1 and Level 2 SFRA and the LPA Core Strategy and Sustainability Appraisal. The flow diagram begins by the LPA assessing alternative development options at a strategic scale using the Sustainability Appraisal. This then works down using evidence provided in the Level 1 and Level 2 SFRA to avoid inappropriate development sites, substitution within the site boundary and identifying those sites requiring the Exception Test. The flow diagram ends by revisiting and updating the Sustainability Appraisal with the allocation of development sites. Figure 3-3 can be linked to Table 3-2, which provides a more detailed descriptive systematic guidance of the flow process illustrated.

During the Sequential Test process, there is a need to identify which sites should be avoided, substituted, those that can go forward, or once complete, how to assess which sites at risk will remain safe during the Exception Test. This is a stepwise process and must be documented, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement.

Figure 3-4 provides more guidance on using the Sequential Test Spreadsheet produced in the SFRA during Steps 1 to 8. Figure 3-5 provides guidance on how to assess the likelihood of sites passing the Exception Test using key questions and evidence provided in the SFRA in assessing whether a site will remain safe or not during Steps 9 to 10.

Figure 3-2: Taking Flood Risk into account in LDDs

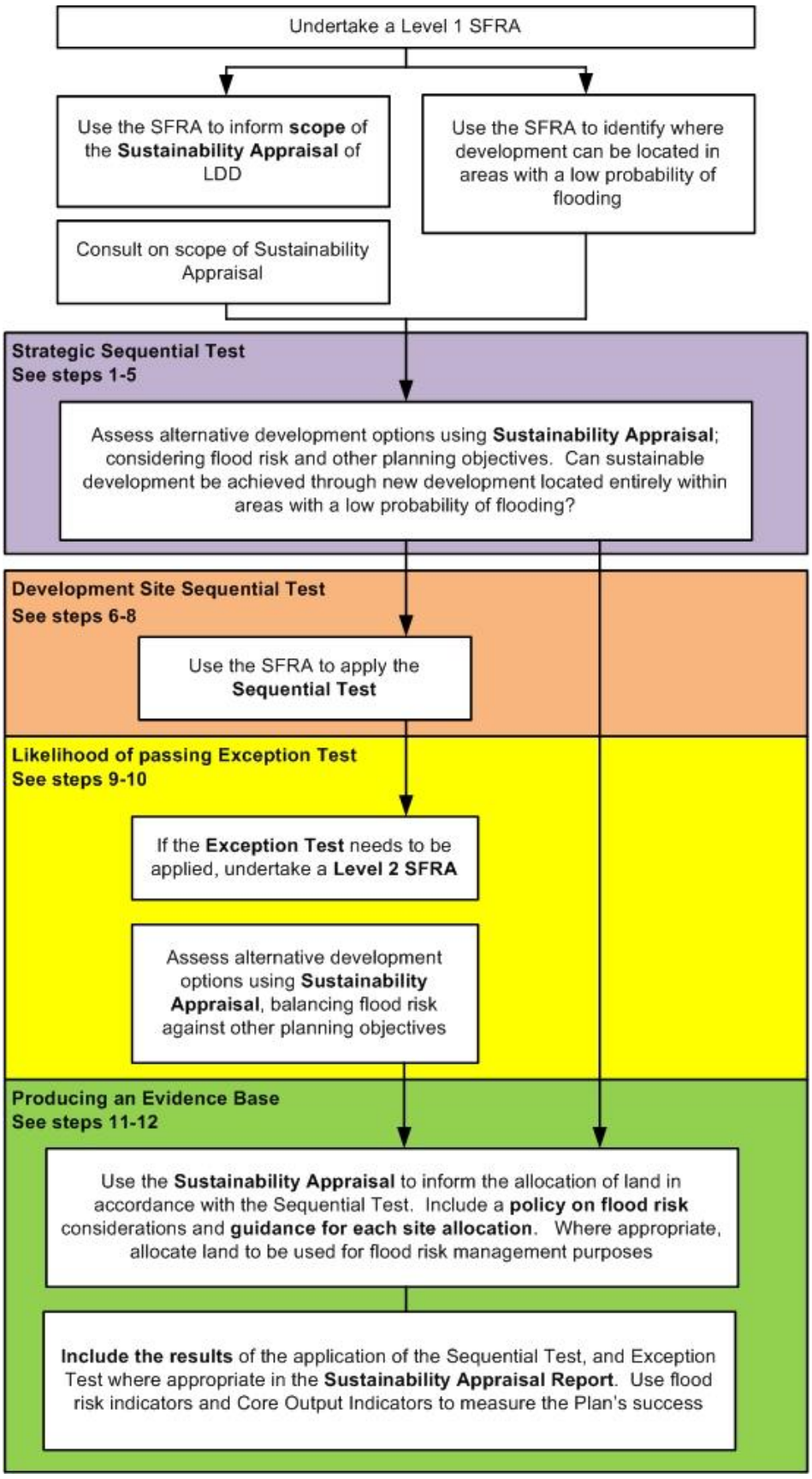


Figure 3-3: Sequential Approach Sieving Process

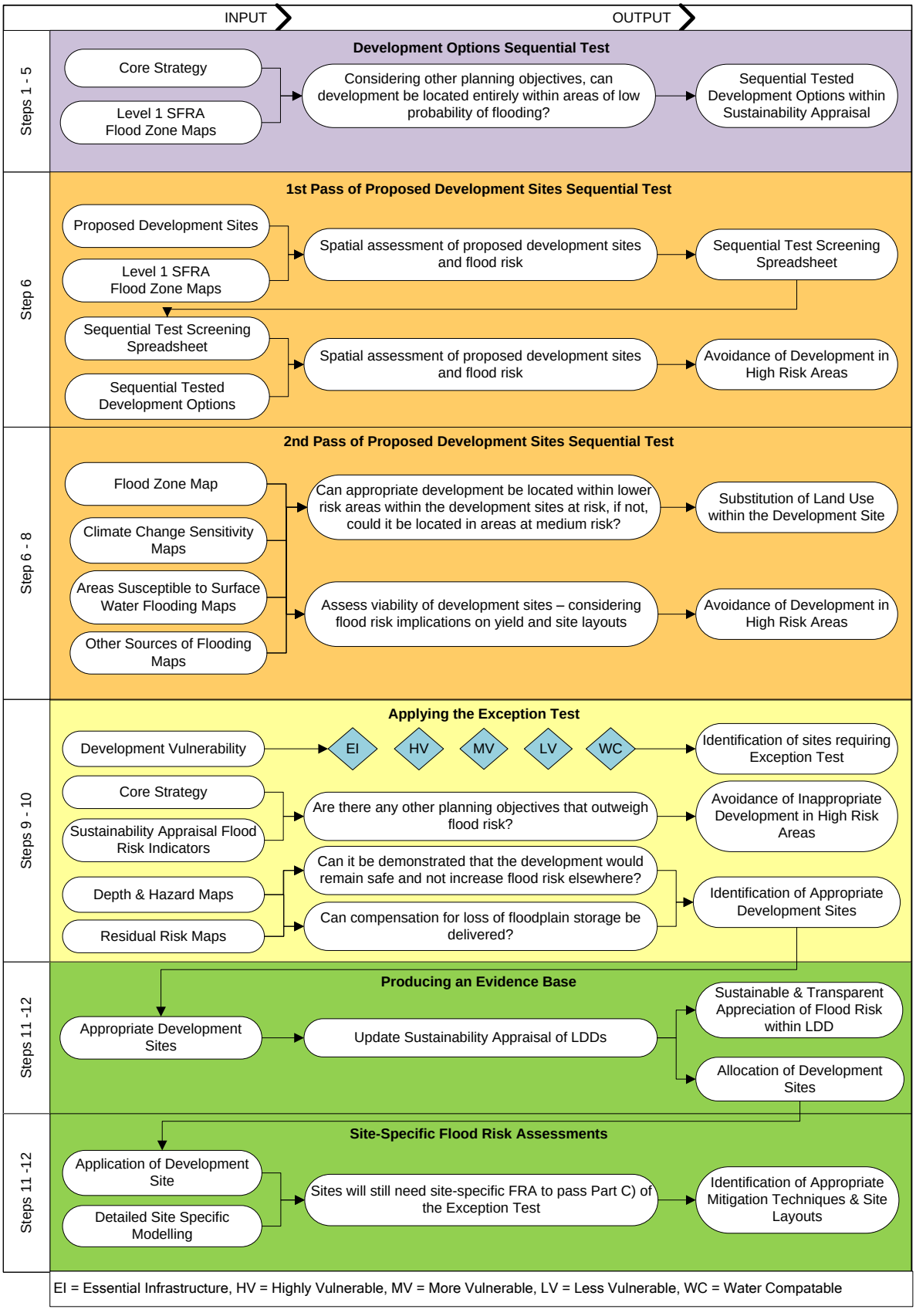


Table 3-2: Sequential and Exception Tests Key Steps

Applying the Sequential Test during the SA of Development Options	
STEP 1	State the **geographical area** over which the Sequential Test is to be applied. This can be over the entire LPA area but will usually be reduced to communities to fit with functional requirements of development or objectives within RSS or Core Strategy
STEP 2	Identify reasonably available areas of strategic growth
STEP 3	Identify the presence of **all sources of risk** using the evidence provided in this SFRA
STEP 4	**Screen available land** for development in ascending order from Flood Risk Zone 1 to 3, including the subdivisions of Flood Risk Zone 3 *This can be achieved using the information provided in the* **Sequential Test Spreadsheet** *(See Volume II Section 5). The screening spreadsheet provides a spatial assessment of each proposed development site provided by the LPA against Flood Zones and SFRA surface water susceptibility zones*
STEP 5	Could all development be located in lower risk areas? If not, move onto the next Steps
1st and 2nd Pass of the Proposed Development Sites Sequential Test	
	Follow Figure 4-3 using the Sequential Test Spreadsheet to:
STEP 6	Identify those sites which should be **avoided** where risk is considered too great and there is no strategic planning objectives identified in Core Strategy
STEP 7	Identify those sites in which the consequence of flooding can be reduced through **substitution** within the site boundary
STEP 8	Assess yield and layout issues for remaining high risk sites to check viability of development
Identify the Likelihood of passing the Exception Test	
	Follow Key Questions imbedded within Figure 4-3 and Level 2 SFRA evidence (if produced) to identify the likelihood of those sites remaining at risk passing the Exception Test.
STEP 9	Assess the compatibility of the **development vulnerability** using Table D.2 of PPS25 and identify the requirement of passing the **Exception Test using** Table D.3 of PPS25
STEP 10	Use the SA to assess alternative development options by balancing flood risk against other planning constraints. **Proposed sites should be avoided and removed if it is unlikely to pass the Exception Test** i.e. if: *- Key Questions in Figure 4-3 attributes a significant negative response* *- Where development will require significant mitigation measures to make the site safe* *- Where the requirement of loss of floodplain compensation cannot be delivered*
Producing an Evidence Base	
	The following steps should be used within the SA to produce the evidence that all Tests have been applied:
STEP 11	**Produce a supporting stand alone document** recording all decisions made during Steps 1 to 10. Each proposed development site should be referenced and the decisions made to avoid, substitute, or allocate the site and the evidence used. This can be incorporated within the appendix of the SA
STEP 12	**Allocated development allocations within the SA**, including appropriate flood risk policies and development guidance on each allocated site. Guidance should include the need for appropriate site-specific FRAs. *The Environment Agency and other relevant stakeholders (such as Northumbrian Water) should be consulted on any policies drafted that inform the application of the Exception Test and the production of FRAs*

Figure 3-4: 1st and 2nd Pass of Proposed Development Sites Sequential Test

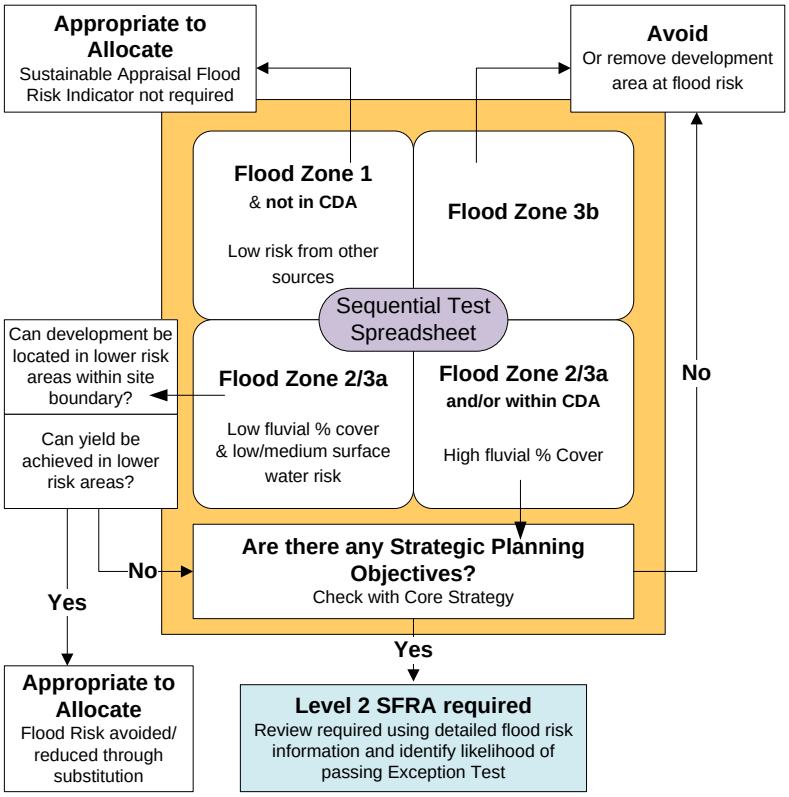
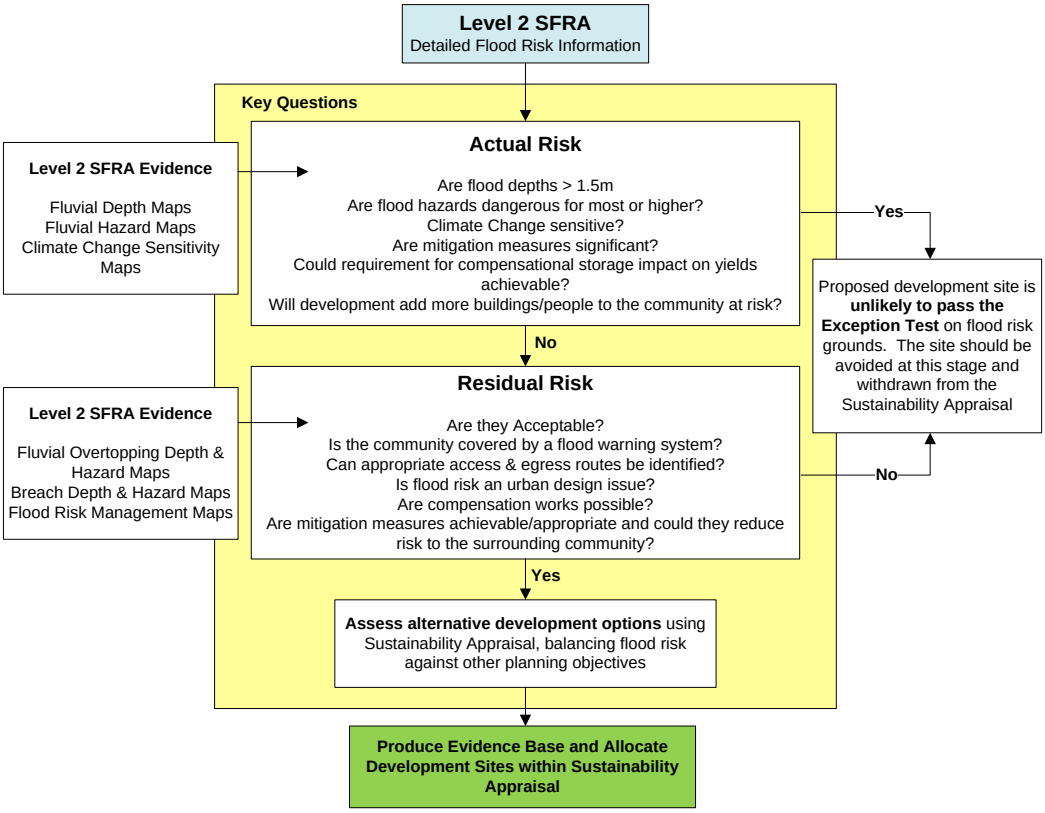


Figure 3-5: Identifying the Likelihood of Passing the Exception Test



3.5 Development Management and Developer Guidance

Warrington BC will be the decision-maker on applications for new development, a process carried out through Development Management. Whilst it is the overall responsibility of the developer to consider flood risk issues regarding their proposed development site, Warrington BC should be involved at the earliest possible stage during pre-application discussions along with other appropriate drainage colleagues, the Environment Agency, United Utilities and the MSCC if appropriate.

Following on from recommendations made in the Pitt Review, Development Management must take some of the roles and responsibilities from the Environment Agency as the first point of call in Flood Risk Management and planning applications.

If an individual site has been identified for development, Development Management must check that the development is sound regarding flood risk i.e. it has passed the Sequential Test and is likely to pass the Exception Test where applicable and that it is supported by a coherent FRA that meets PPS25 requirements.

Development Management officers must always consider development from a strategic view point and the cumulative effect of all proposed development taking place, even though applications for developments are submitted at a site level. It should not be presumed that flood risk has been understood at a strategic high level and that one application may need to fit within a flood risk management strategy for an area.

3.5.1 Applying the Sequential and Exception Test

It is important that all proposed development is supported by evidence that the Sequential Test has been applied. In those instances where allocated sites come forward, these should have been sequentially appraised in the relevant DPD before allocated and this should be used as evidence. Developers should still apply the sequential approach to site layout when matching land use vulnerability to flood risk areas within allocated sites, as described in PPS25.

Where a site has not been identified within a Sequentially Tested DPD, the Sequential Test will need to be applied i.e. the developer will need to provide evidence to Warrington BC that there are no other reasonable available sites where the development could be located. Development Management officers should then use this information to apply the Sequential Test. This particularly applies to Windfall Sites.

Some locations may require a strategic approach when it comes to planning development, due to the possibility of large off site impacts caused by piecemeal development. This is one of the reasons why clear and robust cross-boundary working arrangements are needed to effectively manage risk internally and with neighbouring authorities.

Table 3-3 identifies when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who need to apply the tests.

Table 3-3: Sequential and Exception Tests Requirements

Development Type	Sequential Test	Exception Test
Allocated Sites	Warrington BC should have already carried out the test during the allocation of development sites within their LDD	Warrington BC to advise on the likelihood of passing test if required. But the developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Developer provides evidence that the test can be passed to Warrington BC. An area of search to be agreed, but should be within local community boundary.	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Regeneration	Not required	Warrington BC to advise on the

Development Type	Sequential Test	Exception Test
Sites Identified Within LDD		likelihood of passing test. But the developer must provide evidence that the Test can be passed by providing planning justification and producing a detailed FRA
Renewable Energy Projects	PPS22 Renewable Energy advises not to use a sequential approach in the consideration of such proposals	Warrington BC to advise on the likelihood of passing test. But the developer must provide evidence that the Test can be passed by providing planning justification and producing a detailed FRA. Part B of the Exception Test may not apply in accordance with PPS22.
Redevelopment of Existing Single Properties	Not required	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Changes of Use	Not required	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

For all proposed sites in flood risk areas, a site-specific FRA must accompany the development proposal. Development Management should be involved at the earliest stage of consultation in the scope and development of a FRA with the Environment Agency and other relevant stakeholders. Both Development Management officers and Developers should refer to Section 4 regarding the requirement for FRAs.

3.6 The Partnership Approach

As discussed in PPS25, it is important to share expertise and information to be able to deliver effective and timely planning policy and decisions. Given the cross cutting nature of flood risk (administrative boundaries, internal council services and wider stakeholder responsibilities) it is essential that effective communication protocols and working arrangements are developed and maintained.

The linkages between Policy Planning and Development Management are well established, but between Policy Planning, Emergency Planning and Drainage Engineering may be less so. Engagement with external stakeholders such as the Environment Agency, United Utilities and the MSCC, as well as the emergency services, should also be included as appropriate.

It will be important that everyone's roles and responsibilities are fully understood, where key information is held and by whom. The strategic nature of this study has allowed this partnership approach to develop. All relevant flood risk stakeholders have been consulted and guidance has been provided into the immediate responsibilities and linkages of Strategic Planners and Development Management.

4. Flood Risk Assessments

4.1 Introduction

Flood Risk Assessments (FRAs) are site or project specific and are the responsibility of those proposing development to prepare. The principal aims of a FRA are to determine the acceptable management of flood risk to the development proposal itself and any impacts elsewhere, and to ensure that the development and its users/occupants remain safe in times of flood.

The FRA will determine any effective flood mitigation measures necessary and include these in the development proposal. The FRA needs to demonstrate that the proposed development will not increase flood risk either upstream or downstream of the site considering all sources of flood risk, including fluvial, surface water runoff and drainage.

Those carrying out FRAs should follow the methodology recommended in the below documents and websites. Each source of guidance describes when a FRA is required, what it should contain and are extremely helpful in guiding developers to produce a "fit for purpose" FRA and are commensurate with the advice given in this SFRA.

- **Environment Agency Standing Advice**[3]
- **PPS25 and its Practice Guide**
- **CIRIA Report C624 Development and Flood Risk**

The developer should consult Warrington BC, the Environment Agency and other relevant flood risk consultees, such as United Utilities and the Manchester Ship Canal Company, to identify known flood-related site constraints and agree the scope of an appropriate FRA. This SFRA and flood risk maps provide a good source of information to the developer. The completed FRA should be submitted to Warrington BC in support of the developers outline and/or detailed planning application.

4.1.1 When is a FRA Required?

The list below provides a number of considerations, which should trigger the start of the FRA process:

- The development (other than minor development) is situated in Flood Zone 2 and 3
- The development exceeds 1ha in Flood Zone 1
- The development exceeds 0.5ha and is within a Critical Drainage Area (CDA) as defined in the SFRA
- The development is at risk of flooding from other sources of flooding as identified in the SFRA
- The development is situated behind flood defences
- The development is within 20m of the bank top of a Main River
- Any culverting operation or development which controls the flow of any river or stream or the development could potentially change structures known to influence flood flow

4.2 Levels of FRA

There are principally three levels of FRA:

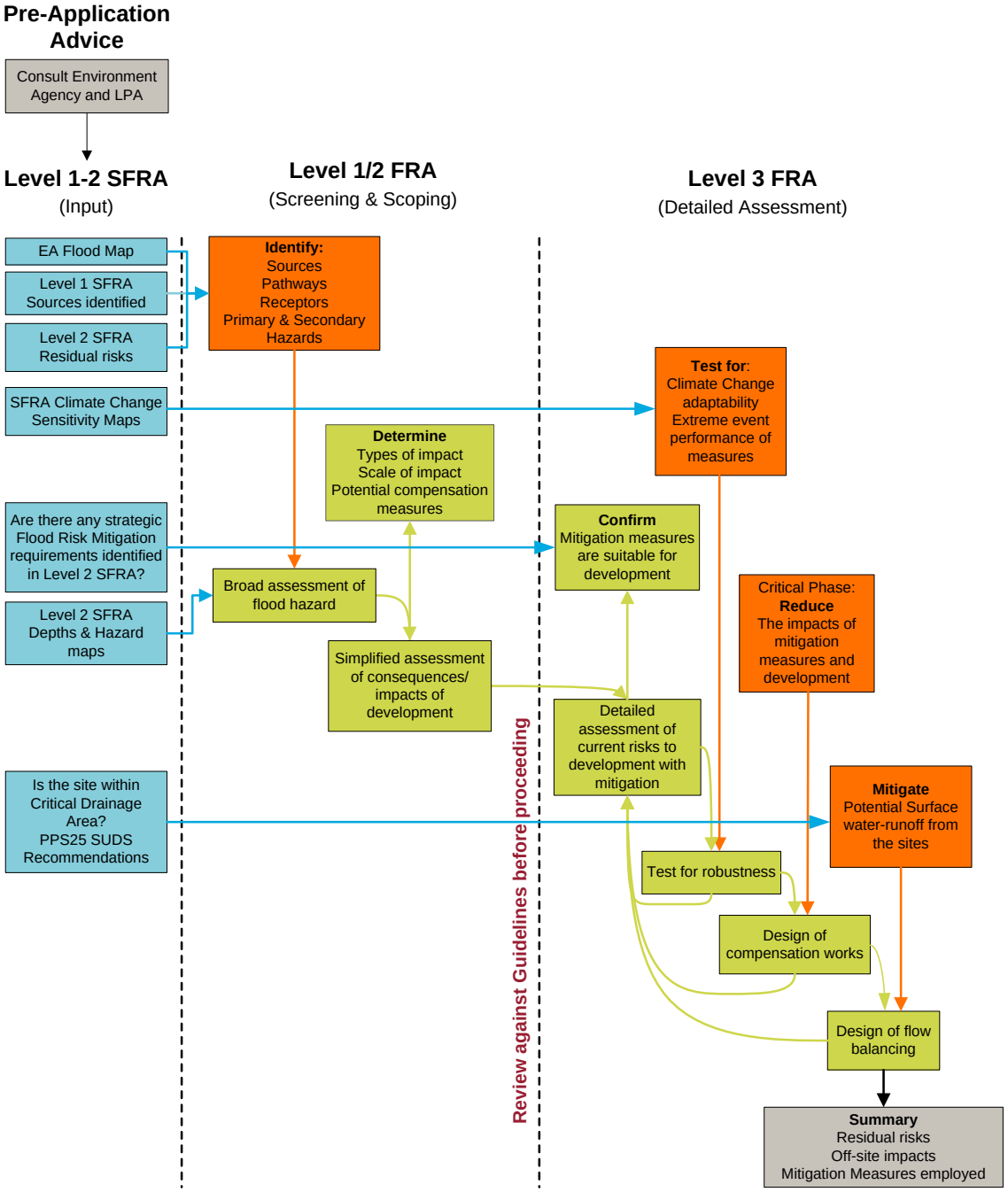
- **Level 1** - Screening study, to identify whether there are any flooding or surface water management issues that need to be considered further;

[3] http://www.environment-agency.gov.uk/research/planning/82584.aspx

- **Level 2** - Scoping study, to be undertaken if the Level 1 FRA indicates that there are flood risk issues needing further consideration and these risk can be readily quantified; and
- **Level 3** - Detailed study, where further quantitative analysis is required to appropriately assess flood related issues and determine any effective mitigation measures needed to be put in place.

The production of a site-specific FRA is a hierarchical process, carrying out a Level 1 FRA before moving on to a Level 2 and finally a Level 3. It is appropriate to review the level of risk present at each stage to assess whether development is appropriate and achievable before moving onto the next. Figure 4-1 illustrates this hierarchical process.

Figure 4-1: FRA preparation



4.3 Assessment of Risk

As mentioned, each FRA should be "fit for purpose" in that the detail of assessment and proposed mitigation techniques should be appropriate to the degree of risk and appropriate to the scale, nature and location of the proposed development.

PPS25 Practice Guide (Appendix B) provides a Flood Risk Assessment Checklist, which should be used to guide those involved in preparing a planning application in which a FRA is required.

It should be recognised that this SFRA has assessed flood risk at a strategic level, which can be used to provide evidence for a Level 1 and Level 2 FRA. However, where a more detailed FRA is required the developer should undertake a detailed assessment of the flood risk to the site, using this SFRA to identify flood risk issues and refer to the guidance in this report, PPS25, its Practice Guide and CIRIA Report Development and Flood Risk to scope the FRA.

Guidance is provided below into each source of flooding and how these should be assessed within a site-specific FRA.

4.3.1 SFRA Flood Risk Information and FRA Preparation

There are a number of data sources available to assess the level of flood risk from fluvial and tidal sources. These mainly relate to main rivers, which have been assessed by the Environment Agency. Whilst information may not be available on ordinary watercourses, these will still need to be assessed within the FRA and is more likely to require new detailed modelling.

Surface water flooding, in the context of the Warrington BC SFRA, includes surface water run-off, sewer flooding and flooding from groundwater. Each of these sources need to be considered and identified within any FRA, especially how proposed mitigation techniques can help reduce risk to the surrounding community. Volume II of the SFRA has identified surface water flood risk areas using a variety of information sources. These have also been overlapped to identify Critical Drainage Areas (CDAs).

It will be critical that developers work closely with Warrington BC, the Environment Agency and United Utilities over surface water flooding problems that could affect the site, how the site may contribute to existing flooding problems and the most appropriate measure to reduce risk post development (i.e. SUDS).

The flood risk from reservoirs and canals are residual in nature. It is mainly associated with lower probability events, such as overtopping or breaching and as such is more likely to influence mitigation measures and emergency planning, rather than the spatial location of development.

Table 4-1 below provides a list of flood risk information available either through this SFRA, the Environment Agency or Warrington BC and how these should be used within a Level 1 or Level 2 FRA.

Table 4-1: SFRA Flood Risk Information

Flood Risk Information	Use of Data within FRA
SFRA Volume II	Volume II of the SFRA provides a detailed discussion of each source of flooding and the data used to carry out this interpretation. This includes fluvial, tidal, surface water, reservoirs and canals.
Environment Agency Flood Map	The flood zones should be used to identify the extent of fluvial and tidal risk. These should also be used to carry out the Sequential Test and identify the need for the Exception Test. The difference in source (fluvial and tidal) should also be identified as this will influence possible mitigation measures and the requirement for compensational storage discussed in Section 7.4.5.
PPS25 Flood Zones	PPS25 flood zones are based on the Environment Agency Flood Map (February 2011). One difference is that they identify the extent of Flood Zone 3b the Functional Floodplain which should be used in carrying out the

Flood Risk Information	Use of Data within FRA
	Sequential Test and identify the need for the Exception Test.
Flood Risk Management Measures	This SFRA map should be used to identify any flood defence assets on or near to the site, which could influence the level of risk. If these are identified it is more likely a Level 3 FRA will be required to assess residual risks
Environment Agency Surface Water Maps	This SFRA has provided both Environment Agency Surface Water Maps: the Areas Susceptible to Surface Water Flooding (AStSWF) and the Flood Map for Surface Water (FMfSW). The AStSWF map was produced at a national scale. It does however provide a good correlation with historical flood incidents. It should be used to identify possible surface water flow paths areas at risk of flooding. The FMfSW provides useful local data, however is more appropriate to SWMPs than the SFRA.
United Utilities SIRS & WIRS	This map should be used to identify historical flood incidents located in and around the site and the cause and effect of the incident. This information should be used to support the identification process.
United Utilities DG5	This map illustrates the location of DG5 records in Warrington and the overall Drainage Area level. This map should be used to identify the possible risk of sewer flooding.
United Utilities Hydraulic Model Output	This map should be used to identify areas at risk from sewer flooding during a 1 in 30-year rainfall event. In these cases, surface water flooding will be an issue and will have to be considered in a more detailed FRA. The map does not show additional areas at risk once water starts to flow over land.
CDAs	CDAs identified in the SFRA should be used initially as an FRA trigger. Sites within CDAs should give greater attention to surface water as a source of flooding. It is more likely that SUDS will have to be incorporated into the detailed design stage to help reduce runoff rates.
Bridgewater Canal Hazard Zones	Breach outlines have been provided as part of the SFRA at a number of raised locations along the canal. No attempt is made to assess the probability of such an event and is purely provided to identify the source of risk and potential areas flooded. These maps have been provided within this SFRA for emergency planning purposes only.
Reservoir Flood Maps	Reservoir flood maps illustrate the possible inundation extents if the reservoirs were to breach. The maps do not give any information about the depth or speed of the floodwaters, rather the largest area that might be flooded if a reservoir were to fail and release the water it holds. These maps have been provided within this SFRA for emergency planning purposes only.
Site/area investigations	The site investigation should help identify any structures on site, which may influence flood flow. Consultation with the Environment Agency and Warrington BC should also help identify these.
Flood Depth and Hazards	These detailed SFRA maps are based on detailed 1D-2D hydraulic river models supplied by the Environment Agency. They should be used to asses the level of risk to a site within the flood zone and likelihood of passing the Exception Test i.e. could the site be safe or will sacrificial land reduce required yields. Hazard to people should be used for this process also along with identifying areas where development should not take place due to significant hazards or lack of access and egress routes. Defended and undefended maps have also been provided to illustrate the difference between actual and residual risks. Where sites benefit from current assets greater analysis will be required in to the residual risks present and the impact of that development of the surrounding community.

It must be remembered that the SFRA was produced at a strategic basis, and whilst the information listed above provides a useful dataset for a Level 1 or 2 FRA, in areas at high

risk of flooding a detailed Level 3 FRA will be required which will require all new site specific data collection and investigation. In this case, Table 4-2 provides a list of further considerations.

Table 4-2: Further Flood Risk Information

Flood Risk Information	Use of Data within FRA
Consultation	All information discussed above should be used to kick-start discussions with Warrington BC, the Environment Agency and United Utilities on drainage constraints, runoff rates and appropriate connections (SUDS-watercourse-sewers) before moving onto a Level 3 FRA.
Hydraulic River Models	In any case where fluvial and tidal flood risk has been identified as significant using the information above or there is a lack of information to support the FRA, detailed modelling must take place. There are a number of detailed models available from the Environment Agency. These have been listed in Volume II. These should be used and updated where necessary, especially reviewing their hydrology, with guidance from the Environment Agency. Where no model is available, new modelling must take place using guidance and specification supplied by the Environment Agency. For sites within the densely urbanised area of Warrington, 2D modelling must take place to assess the impact of the development on flood risk to surrounding properties. Within rural areas 1D modelling is sufficient however the impact of development must also take place. Modelling must include present case and post development (including potential mitigation measures) to help asses the risk to the site and community. Other scenarios should be investigated such as the overtopping or breaching of flood defences.
Surface Water Runoff Calculations	For those sites identified at risk of surface water flooding or located within CDAs, calculations must be made of surface water runoff rates entering and leaving the site. Runoff must then be controlled to agreed rates with Warrington BC and United Utilities.
Site/area investigations	The risk of groundwater flooding should be assessed using site investigations. Groundwater flooding is expected to be a design issue. For example, basements should not be considered in areas at risk of flooding from groundwater rebound or in the floodplain of watercourses where there might be alluvial groundwater flooding. Ground conditions should also be investigated to help assess the suitability for SUDS.
Warrington BC Emergency Plan	Developers should liaise with Warrington BC Emergency Planners to identify potential evacuation measures that should be taken to protect against the unlikely event of a major reservoir breach or canal overtopping or breaching. Where there is significant flood hazard identified to the site from such failure, the developer should liaise closely with Warrington BC about the suitability of the site for development.

4.4 Flood Risk Management

Following the flood risk management (FRM) hierarchy described in PPS25, developments should always be located in areas of lowest flood risk first. Only when it has been established that there are no suitable alternative options in lower risk areas should design solutions be considered to allow exceptional development to proceed in flood risk areas. In other words, FRM by design should only be considered once the sequential approach, mainly avoidance option, has been applied.

Mitigation measures must be designed to provide an appropriate level of protection to a site for the lifetime of the development. At many sites, it may be technically feasible to mitigate or manage flood risk. However, the potential impacts of mitigation measures on flood risk to the surrounding community must always be considered and where the depth

of flooding is substantial, these mitigation measures may result in practical constraints to development with significant financial implications.

It may be technically possible to engineer the way out of a flood risk situation but this could increase flood risk elsewhere and/ or have significant negative outcomes for local place-making. The SFRA provides evidence to facilitate the right development in the right place – this means that there are some areas of significant risk where it may not be possible to prove that residential development can be made safe from flooding and where lower vulnerability land uses will need to be considered.

4.4.1 Taking a Strategic Perspective

There is a wide range of FRM, resistance and resilience measures that can be adopted at an individual site basis to help avoid or reduce the consequence of flooding. However, what maybe considered viable for individual developments may not be appropriate for the wider community as flood risk can easily to transferred or exacerbated through inconsistent or unsustainable techniques.

Appropriate FRM measures may be located outside of development site and can often be overlooked when focusing on individual boundaries. Carefully planned development can have a positive impact on flood risk not just for the site in question but for the community and in some instances can reduce risk and expose previously undeliverable sites.

By considering these factors at such a high level, a strategic and coherent vision can be developed avoiding a piecemeal approach and usable recommendations and guidance to be provided, advocating partnership between Warrington BC, the Environment Agency and the developer and integrating wider CFMP policies, the Warrington FRM Strategy, adopting SUDS and preparing emergency flood plans.

4.4.2 Place Making and Sustainable Design

Choosing appropriate FRM measures is just as much to do with place-making and sustainable design as it is to do with mitigating risk and some thought has to be considered to the urban environment which is left and how this will function. According to the Royal Institute of British Architects (RIBA);

"Standard responses to the risk of flooding include flood defences, barriers to flood pathways and raising accommodation above potential water level onto columns or stilts. These measures are often not well integrated with the overall architecture and landscape design, resulting in poor quality and badly functioning neighbourhoods and streetscapes.

Flood barriers limit opportunities for linkage as they are often both physically and visually isolating which can result in poor quality public and private spaces. Also, developments characterised by empty undercrofts or dominated by car parking at ground level tend to lack identify and a sense of neighbourhood.[4]*"*

New or existing properties and landscapes that are not designed with adequate resistance and resilience in flood risk areas cannot be considered sustainable on a number of levels. The physical impact of flooding on properties and possessions may currently be viewed as an insurable risk; however, this stance is increasingly unsustainable, both economically and practically. The social impact caused by flooding on people's lives, involving temporary relocation, is not compatible with the goal of creating sustainable communities and neighbourhoods.

4.4.3 Appropriate Mitigation Measures Guidance

Site Layout and Design

Flood risk should be considered at an early stage in deciding the layout and design of a site to provide an opportunity to reduce flood risk within the development. The PPS25 Practice Guide states that a sequential, risk-based approach should be applied to try to locate more vulnerable land use to higher ground, while more flood-compatible

[4] RIBA (2009) Climate Change Toolkit - Designing for Flood Risk

development (e.g. vehicular parking and recreational space) can be located in higher risk areas.

Waterside areas, or areas along known flow routes, can be used for recreation, amenity and environmental purposes, allowing the preservation of flow routes and flood storage, and at the same time providing valuable social and environmental benefits contributing to other sustainability objectives. Landscaping should ensure safe access to higher ground from these areas, and avoid the creation of isolated islands as water levels rise. The Environment Agency will have to consent to any works within 5 metres of a main river. It is likely that they will object in principle to any development within these areas.

The Royal Institute of British Architects (RIBA) have produced a guidance document 'Designing for Flood Risk' which can aid this process. The guidance document can be found at:

www.architecture.com/FindOutAbout/Sustainabilityandclimatechange/Flooding/DesignGuide.aspx

Ground Levels

Modifying ground levels to raise the land above the required flood level is a very effective way of reducing flood risk to the site in question, especially in tidal flood risk areas. However, in most areas of fluvial flood risk, conveyance or flood storage would be reduced by raising land above the floodplain, adversely influencing flood risk downstream.

Raised Defences

Construction of raised floodwalls or embankments to protect new development is not a preferred option, as a residual risk of flooding will remain. Compensatory storage must be provided where raised defences remove storage from the floodplain. Temporary or demountable defences are not acceptable flood protection for a new development unless flood risk is residual only.

In some cases, it may be necessary for the developer to make a contribution to the improvement of flood defence provision that would benefit both the development in question and the local community.

Building Design

The raising of floor levels within a development avoids damage occurring to the interior, furnishings and electrics in times of flood. If it has been agreed with the Environment Agency that, in a particular instance, the raising of floor levels is acceptable, they should be raised to 600mm above the maximum water level during a 1 in 100-year fluvial or 1 in 200-year tidal flood event plus climate change. The additional height that the floor level is raised is referred to as the 'freeboard'.

Depth information provided in the SFRA could provide an indication of the height of land raising required to lift the development out of the 1 in 100-year fluvial or 1 in 200-year tidal event plus climate change. Whilst this will provide an early indication, detailed modelling will still be required during a site-specific FRA to define these levels further.

Making the ground floor use of a building water compatible (e.g. a garage), is an effective way of raising living space above flood levels.

Putting a building on stilts is not considered an acceptable means of flood mitigation for new development. However, it may be allowed in special circumstances if it replaces an existing solid building, as it can improve flood flow routes. In these cases, attention should always be paid to safe access and egress and legal protection should be given to ensure the ground floor use is not changed.

Compensatory Storage

Where development is proposed in undefended areas of floodplain the implications of ground raising operations for flood risk elsewhere needs to be considered. Raising existing ground levels may reduce the capacity of the floodplain to accommodate floodwater and increase the risk of flooding by either increasing the depth of flooding to

existing properties at risk or by extending the floodplain to cover properties normally outside of the floodplain.

In undefended tidal areas, raising ground levels is unlikely to impact on maximum tidal levels so the provision of compensatory storage should not be necessary. Compensation may be appropriate in locations prone to sewer and overland flooding. United Utilities and Warrington BC should take the lead on this.

Compensatory flood storage should be provided on a 'direct' level for level, volume for volume basis or 'indirectly' relying on water entering a storage area which then releases water at a slower rate, akin to a surface water attenuation scheme. Direct schemes would be preferable in all cases. In both cases, storage should be provided near the site and within the red line of the planning application boundary before other locations are identified. The location of the compensation works must relate hydraulically and hydrologically to the location of the site

Where the site is entirely within the floodplain, it is not possible to provide compensatory storage at the maximum flood level and this will not be a viable mitigation option. Compensation schemes must be environmentally sound.

The need for compensatory storage must be discussed at the earliest stage of planning, as this will be a major constraint as this requirement may have significant implications for the yields achieved for individual sites due to the associated land take this may require. The developer must prepare suitably detailed plans and calculations to show in their FRA how they will achieve the 'no net loss' condition. The calculations must include the upper and lower levels over which the compensation works will apply the slice thickness to be used and the general location of the works.

Resistance and Resilience

There may be instances where flood risk remains to a development. For example, where the use is water compatible, where an existing building is being changed, where residual risk remains behind defences, or where floor levels have been raised but there is still a risk in a 1 in 1000-year event. In these cases (and for existing development in the floodplain), additional measures can be put in place to reduce damage in a flood and increase the speed of recovery. These measures should not be relied on as the only mitigation method. The 2007 document 'Improving the Flood Performance of New Buildings' provides further details on possible resistance and resilience measures[5].

Temporary Barriers

Temporary barriers consist of moveable flood defences, which can be fitted into doorways and/or windows. The permanent fixings required to install these temporary defences should be discrete and keep architectural impact to a minimum. On a smaller scale temporary snap-on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

Permanent barriers

Permanent barriers can include built up doorsteps, rendered brick walls and toughened glass barriers.

Wet-proofing

This involves designing interiors to reduce damage caused by flooding, for example:

- Electrical circuitry installed at a higher level with power cables being carried down from the ceiling rather than up from the floor level
- Water-resistant materials for floors, walls and fixtures

Resilience measures will be specific to the nature of flood risk, and as such will be informed and determined by the FRA.

[5] Communities and Local Government (2007) Improving the Flood Performance of New Buildings – Flood Resilient Construction

4.4.4 Making Development Safe

Safe Access and Egress

The developer must ensure that safe access and egress is provided to an appropriate level for the type of development. This may involve raising access routes to a suitable level.

As part of the FRA, the developer should review the acceptability of the proposed access in consultation with the Environment Agency. For the purpose of the SFRA, it is considered appropriate to provide a low hazard environment in access and egress routes associated with new housing developments. Environment Agency guidance suggests that all development should have a dry access and egress in the 1 in 100-year event. Greater depth and velocity may be permitted where elevated and safe access/egress to safe ground is provided.

Flood Warning and Evacuation

Emergency/evacuation plans should be in place for all properties, large and small, at residual risk of flooding; those developments, which house vulnerable people (i.e. care homes and schools), will require more detailed plans.

4.4.5 Making Space for Water

River Restoration and Enhancement

All new development close to rivers should consider the opportunity presented to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwater creation, de-silting, in-channel habitat enhancement and removal of structures. When designed properly, such measures can have benefits such as reducing the costs of maintaining hard engineering structures, reducing flood risk, improving water quality and increasing biodiversity. Social benefits are also gained by increasing green space and access to the river.

Floodplain Restoration

It is an objective of PPS25 to safeguard land from development that may be required for current or future flood management. In areas of very high flood risk, there may be a strong case for allowing previously developed sites to return to Functional Floodplain in urban areas where they can act to convey and store floodwater and reduce risk to current development.

In such cases all stakeholders must be consulted over the possibility, as there may be some concerns in certain areas i.e. sewers often closely follow the banks of urban watercourses and river restoration may not be possible.

Buffer Strips

Developers should set back development from the landward toe of fluvial defences (or top of bank where defences do not exist) and this distance should be agreed with the Environment Agency. This provides a buffer strip to ‘make space for water’, allow additional capacity to accommodate climate change and ensure access to defences is maintained for maintenance purposes

4.5 Managing Surface Water and SUDS

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.

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 Planning System has a key role to play in settings 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 and new capacity by United Utilities.

Sustainable drainage and the use of Sustainable Drainage Systems (SUDS) is supported by the policy direction in Future Water, Making Space for Water, the Pitt Review and the Flood and Water Management Act that provides for more sustainable management of the water cycle, working in partnership across different agencies and new responsibilities for local flood risk management. In particular, the Flood and Water Management Act requires developers to include sustainable drainage in new developments. As part of their new responsibility for local flood risk management, local authorities will be responsible for approving SUDS for new developments and adopting and maintaining them.

Cognising the above, drainage from new developments should incorporate storage, with residual discharge of surface water to the following networks in order of preference:

- Infiltration drainage (e.g. soakaways)
- Discharge to a watercourse
- Discharge to a public sewer

4.5.1 Development Sites in the Wider Warrington BC Area

Developers should use the following guidance regarding surface water runoff from new developments:

Allowable Discharge Rates

- Development should deliver Greenfield runoff on Greenfield sites up to a 1 in 100-year storm event, considering climate change
- Development should aim for a reduction in surface water runoff rates for Brownfield sites up to a 1 in 100-year storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 1 in 30-year event and so that there is no property flooding in a 1 in 100-year plus climate change event.
- Flow routes on new development where the sewerage system surcharges as a consequence of exceedance of the 1 in 30-year design event should be retained.
- There may be local variations on this where outfalls are directed to larger watercourses and hence surface water discharges from development sites can pass downstream before the main peak on the watercourse

Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites.

Warrington BC, as the LLFA, will be the SUDS Approval Body as defined in the Flood and Water Management Act. The future ownership and maintenance of SUDS systems should be discussed at the planning application stage with the relevant sections of Warrington BC (including Highways and Drainage), United Utilities and the Environment Agency.

The developer should liaise closely with the Warrington BC drainage engineer, United Utilities and the Environment Agency to determine:

- Appropriate discharge rates/reduction
- Appropriate drainage route - SUDS, watercourse of sewerage system

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 for exceedance. This should be considered alongside any surface water flows likely to enter a development site from the surrounding area.

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

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography, geology (soil permeability), development density, existing drainage networks within the site and 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.

4.5.2 Critical Drainage Areas

Critical Drainage Areas (CDAs) have been identified in the SFRA to illustrate particular areas, which are at high risk from surface water flooding and therefore particularly sensitive to an increase in the rate of surface water runoff and/or volume from new development. Specific drainage requirements should be placed on these areas to help reduce local flood risk and should be more stringent to development in the wider Warrington BC area.

Within CDAs, a detailed FRA is required regardless of which Flood Zone that applies for all developments over 0.5 hectares. This should demonstrate that new development is not at risk from flooding from existing drainage systems or potential overland flow routes. It should also demonstrate that the development would not adversely affect existing flooding conditions by the use of appropriate mitigation measures. The FRA should define and address the constraints that will govern the design of the drainage system and layout of the development site.

FRA Guidance Note 1 requires FRAs to provide 'Proposals for surface water management that aims to not increase, and where practicable reduce the rate of runoff from the site as a result of the development (in accordance with sustainable drainage principles, and the Local Planning Authority's published SFRA).'

Proposals for development in CDAs as defined by this SFRA should follow the guidance and standards as set out below.

Allowable Discharge Rates

Over time, it is envisaged that local authorities will commission drainage strategies to determine in more detail and establish the evidence base for set reductions in surface water runoff from development sites. With regard to this, the developer should liaise closely with Warrington BC, United Utilities and the Environment Agency as soon as possible to determine an appropriate reduction in runoff rate and volume with reference to discharge limits as laid down by any completed SWMP or drainage strategy for that area. It will be the responsibility of Warrington BC, as the LLFA, to make this decision.

It is recommended within CDAs a reduction of 50% in surface water discharge rates from new development on brownfield sites and a reduction to greenfield rates on all other development sites. Wherever possible, this should be achieved through the implementation of SUDS. Source control should be considered firstly. There may be opportunities to deliver SUDS though integrated solutions for collections of strategic sites. The future ownership and maintenance of SUDS systems should be discussed at the

planning application stage with the relevant sections of Warrington BC (including Highways and Drainage), United Utilities and the Environment Agency. This approach should be taken unless the developer can demonstrate that this is not feasible and that there will be no adverse impact caused by the development elsewhere.

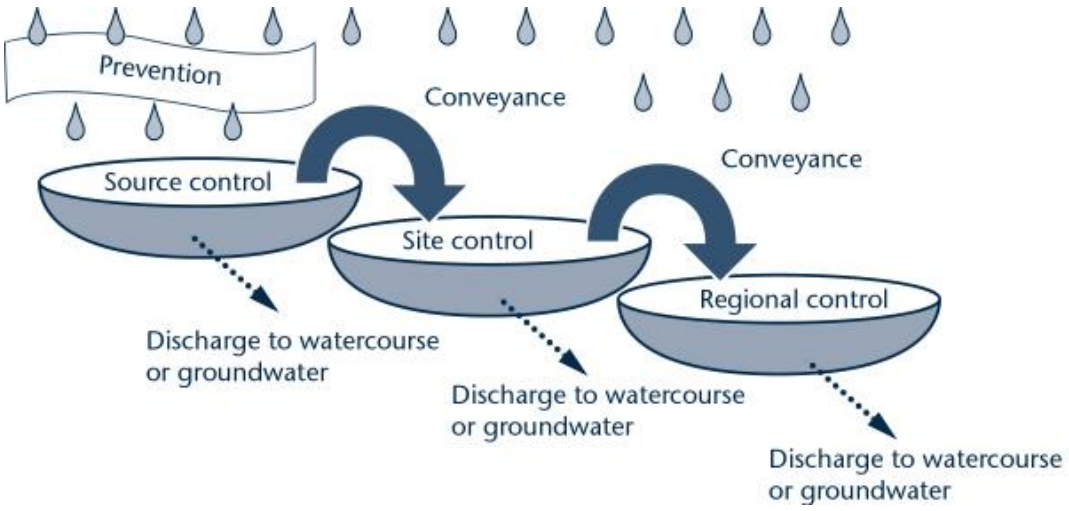
Category 4 of the Code for Sustainable Homes, which requires developers to ensure that peak run-off rates and run-off volumes will be no greater than the pre-development conditions as a minimum, supports this. However, the code recommends that attenuation of the additional flows caused by development should be related to the degree of flood risk in an area and in 'high flooding risk areas', 100% of the additional volume should be attenuated[6]. PPS1[7] allows local planning authorities to stipulate high levels of the code where there are local circumstances that allow and warrant it. The SFRA has designated CDAs as high flood risk areas.

4.5.3 Sustainable Drainage Systems

Sustainable Urban Drainage Systems (SUDS) are management practices, which enable surface water to be drained in a more sustainable manner. Many different SUDS techniques can be implemented. As a result, there is no one correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle, will be required. Figure 4-2 shows the SUDS Management Train principle, where source control is the primary aim.

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 (soil permeability), and available area. In addition to potential ground contamination associated with urban and formerly industrial sites with concern being placed on the depth of the local water table and potential contamination risks. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined, and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential. Additionally, for infiltration SUDS it is imperative that the water table is low enough and a site specific infiltration test is undertaken.

Figure 4-2: SUDS Management Train Principle[8]



Regarding flood risk, those SUDS with a high/primary process for dealing with water quantity should first be investigated, before other benefits such as water quality and environmental befits are included. SUDS can reduce the amount and rate of runoff by a combination of:

[6] DCLG (2006) Code for Sustainable Homes
[7] DCLG (2007) Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1
[8] CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative

- Infiltration - infiltration of rainwater into the ground
- Storage - holding water in storage areas
- Conveyance - slowing down the movement of water
- There are a number of SUDS techniques which could be used individually or as part of a management train, however their suitability relies on the site and catchment descriptors discussed above but also their intended purpose (as shown in Table 4-3).

Table 4-3: Suitability of SUDS Techniques

SUDS Technique	Infiltration	Storage	Conveyance
Green Roofs	×	✓	✓
Permeable Paving	✓	×	✓
Rainwater Harvesting	×	✓	×
Swales	✓	✓	✓
Detention Basins	✓	✓	✓
Ponds	×	✓	✓
Wetlands	×	✓	✓
Source: PPS25 Practice Guide			

Using information provided in the SUDS Manual[9] on design criteria, Table 4-4 has been produced in order to identify available SUDS techniques when designing for a range of hydraulic conditions and objectives. These criteria are purely based on flood risk and others such as water quality, amenity and ecology should also be considered at a site level.

Table 4-4: SUDS Hydraulic Design Criteria

Criteria	Design Event	Design Objective	Available Techniques
Protect against flooding from watercourse	1 in 100/200 year event	Control risks to people and property	Preservation of riverside buffers and natural floodplain
Protect against flooding from drainage system	Site 1 in 10/30 year event	No flooding on site, except where planned and approved	Adequate site drainage and flapped outfalls
	Site 1 in 100/200 year event	Control risks to people and property	Subsurface storage, increase floor levels and retention ponds
Protect against flooding from overland flows	Site 1 in 100/200 year event, short duration events	Planned flood routing and temporary storage accommodation on site	Open channels such as swales or use of road network
Protect receiving drainage system/watercourse from rate of discharge	Catchment 1 in 1 year event	Attenuation storage to control 1 year site discharge rate to ≤ 1 in 1 year greenfield peak rate	The majority of SUD techniques will help achieve this aim
	Catchment 1 in 100/200 year event	100/200 year site discharge rate to ≤ 1 in 100/200 year greenfield peak rate	Retention and detention
	All events	Where possible, interception	Source control

[9] CIRIA (2007) The SUDS Manual Table 3.5

Criteria	Design Event	Design Objective	Available Techniques
		storage to prevent runoff from first 5mm of rainfall	
Protect receiving drainage system/watercourse from volume of discharge	Catchment 1 in 100 year event	Where possible, long term storage/ infiltration to control 1 in 100 year discharge volume to ≤ 1 in 100 year greenfield volumes. Usually applied to 6hr event.	Infiltration and source control

Adoption and future maintenance of above ground SUDS facilities by Warrington BC as public open space requires early discussion between the developer, the Council and United Utilities. Adoption must be agreed at an early stage and ideally discussed in advance of the planning application to allow a contribution from the developer to be ring fenced specifically for the facility. A number of models are available to fund maintenance and should be investigated by Warrington BC. If future maintenance arrangements are to be assigned to a Management Company, this should be discussed at an early stage with United Utilities. This can have implications on the adoption of the remaining site drainage and consequently adoption of any highways on the development.

Allowance should be made by whomever is to take future responsibility for the SUDS facilities, for checking the SUDS designs and for inspection during construction, if necessary employing competent individuals to perform this task.

Information should be provided to make the end-users of the development aware of SUDS and in particular, their responsibilities to maintain and not to remove any privately owned SUDS facilities. If deemed necessary the removal of permitted development rights or the inclusion of covenants in the deeds of properties could be considered.

4.6 FRM Contributions

Flood risk management measures, whilst often focused on protecting single developments can often contribute to reducing risk to the wider community.

When it comes to reducing the risk of main river flooding to the community, the Environment Agency takes the lead with support from Warrington BC and other stakeholders. Whilst Environment Agency CFMPs, Strategies and Pre-Feasibility Studies identify the most appropriate way forward, on the groundwork will still need to compete with other schemes across England and Wales for public funding using a system of outcome measures and prioritisation scoring. With the current economic climate and government cut backs in flood defence funding, a gap appears between what the Environment Agency can afford to do from existing public funds and what they can justify to manage flood risks.

The need for additional investment in FRM and the gap in available funding is an important consideration not only for high level spatial planning but also with single site development. This is especially the case when considering how both fit into the future aspirations and long-term direction of travel of the Environment Agency. Section 2.4 has already discussed CFMPs covering Warrington and the Environment Agency's Warrington FRM Strategy, which should influence the spatial location of development as well as identifying future Environment Agency FRM schemes planned.

When it comes to individual development, it will be important to make the link with Environment Agency and Warrington BC FRM aspirations. Whilst remembering that proposed Environment Agency schemes intend to protect current properties only, private development can help contribute to reducing risk to the community in which they lie either through their own on site mitigation of contributing to the wider scheme. This approach could potentially help fill the gap in investment and reduce ad hoc FRM techniques being adopted on a site-by-site basis.

Alternative contributions options could include:

- a single payment towards the capital cost of a project;
- a commuted sum to fund future costs;
- public sector funding to allow sustainable development or regeneration;
- an agreement to carry out maintenance over a defined period of time;
- an agreement not to seek compensation for disruption caused by the construction or maintenance of a scheme;
- the purchase of equipment to extend a service locally;
- a gift of land or a benefit in kind which will reduce the cost of a project or extending a service; or,
- a grant towards specific planned outcomes.

Contributors can come from businesses in the private sector, or from public sector funds. Communities and voluntary groups will also be able to contribute. Some of the Environment Agency planned work may also be eligible for grants from bodies such as the European Union and the National Lottery. Contributions from more than one sector should be co-ordinated by Warrington BC.

Looking for alternative funding options requires fair and consistent policy from the Environment Agency and Warrington BC.

The Environment Agency has a Flood and Coastal Risk Management (FCRM) external contributions policy (284_09) which should be used by both the Environment Agency and Warrington BC to identify and assess the potential for external contributions. This document can be found at:

http://www.environment-agency.gov.uk/research/planning/116707.aspx

Warrington BC has their policy towards developer contributions (identified in their UDP as Policy DCS2) which provides the basis for negotiating developer contributions. Policy DCS2 has been included in Appendix C. Warrington BC also has a Supplementary Planning Document (SPD), adopted in September 2007, and deals with Planning Obligations and which sets out when and where negotiations will be undertaken with developers and for some issues sets out the scale of contributions that will be sought. The SPD can be found at:

http://www.warrington.gov.uk/Environmentandplanning/Planning/Supplementary_Planning_Documents___Planning_Advice_Notes.aspx

Using this Warrington BC will ensure that through the planning process negotiations will be carried out for such sites to secure planning obligations which will contribute to the constructions and/or maintenance of the FRM proposals.

It will be important that both the Environment Agency and Warrington BC developer contribution policies are considered strategically at an early stage during spatial planning especially when considering the sustainability of development in high risk communities. Development management must also have a good understanding of these polices when implementing planning conditions in certain locations and work closely with the Environment Agency on the suitability of development in locations which are currently or planed to be protected under the Warrington FRM Strategy.

5. Emergency Planning

5.1 Introduction

The aim of the SFRA so far has been to try to avoid development in flood risk areas in the first instance. However, it has also been accepted that there is current development in flood risk areas and there will need to be a level of continued regeneration. Minimising flood risk to people, property and the environment should be considered.

Flood defences go some way in reducing the current flood risk by providing a standard of protection, however there is still residual risk associated with them as they can be overtopped or be breached. Flood Warnings are an integral part of flood risk management, for which the Environment Agency is the lead authority responsible for warning the public, local authorities and emergency services.

Along with the Environment Agency Flood Warning systems, there is 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 detailed maps and GIS layers provided should be made available for consultation by emergency planners during an event and in the planning process.

5.1.1 Civil Contingencies Act

Under the Civil Contingencies Act (2004)[10], Warrington BC is classified as a Category 1 responder. During an emergency such as a flood event, the local authority must co-operate with other Category 1 responders (such as the emergency services and the Environment Agency) to provide the core response.

Under the Civil Contingencies Act, Warrington BC holds a statutory duty to provide civil protection to their communities to ensure human welfare, environmental stability and UK security are not affected. Under the Act, risk assessments and emergency planning are arranged through Local and Regional Resilience Forums (LRF/RRF).

Warrington BC is part of the Cheshire Local Resilience Forum (LRF)[11]. The role of the LRF is to ensure that there is an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the communities of Cheshire. The LRF consists of representatives from the Emergency Services, Local Authorities, Health, Environment Agency and other professional and voluntary agencies. As a strategic decision-making organisation, the LRF has prepared a Community Risk Register (CCR)[12], which considers the likelihood and consequences of the most significant risks the area faces including tidal fluvial and urban flooding. The latest version of the CRR was published in July 2010. The CCR also identifies the number of controls in place one of which is the Warrington Local Flood Response Plan.

5.2 Local Flood Plans

The SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. Plans currently in place or under preparation that affect Warrington BC include the:

- Environment Agency Flood Warning Plan
- Multi-Agency Flood Response Plan

[10] http://www.cabinetoffice.gov.uk/ukresilience/preparedness/ccact.aspx
[11] http://www.cheshireresilience.org.uk/
[12] http://www.cheshireresilience.org.uk/your_community/risk_register.aspx

The SFRA data can be used 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 Reservoirs 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.
- Engage local communities.
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk.
- Provide flood risk evidence for further studies such as SWMPs

5.3 Flood Warning and Evacuation Plans

According to PPS25 Practice Guide, 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.

Warrington BC will be unable to write specific flood plans for new developments at flood risk. Developers should write their own. Guidance can be found in both PPS25 and on the Environment Agency web site[13]. Alternatively, Warrington BC should recommend Emergency Management Consultants who will design flood plans for new and existing developments. 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.

Whilst there is no statutory requirement on the Environment Agency or the emergency services to approve evacuation plans. Warrington BC is accountable via planning condition or agreement to ensure that plans are suitable. This should be done in consultation with Warrington BC development management officers. Given the cross cutting nature of flooding, it is recommended that further discussions are held internally to Warrington BC between emergency planners and policy planners/development management officers and drainage engineers and to external stakeholders such as the emergency services, the Environment Agency, United Utilities and the MSCC.

It may be useful for both emergency and spatial policy planners to consider whether as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. The application of such a condition is likely to require policy support in LDDs, and discussions with the Cheshire LRF 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 LDFs, 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 into place, and liaise with the council regarding maintenance and updating of the plan.

[13] http://www.environment-agency.gov.uk/homeandleisure/floods/38329.aspx

5.3.1 What should the Plan Include?

According to the PPS25 Practice Guide, flood warning and evacuation plans should include the information highlighted in Table 5-1. The table also provides links to data provided in the SFRA, which should be used to inform their preparation. Analysis that is more detailed should be done within a site-specific FRA that should inform these plans.

Table 5-1: Flood Warning and Evacuation Plans

Consideration	Purpose
Availability of existing flood warning system	The Environment Agency offer a flood warning service that currently covers designated Flood Warning Areas in England and Wales. In these areas they are able to provide a full Flood Warning Service. All flood warning areas in Warrington have been identified in Volume II.
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 prepare and respond effectively for a flood. This is an important factor within Emergency Planning in assessing the response time available to the emergency services. The Warrington Flood Hazard modelling produces flood animations for a range of events. These should give an indication of the rate of onset of flooding and flow routes in particular areas model. They should also show time taken for flood waters to reseed.
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 Environment Agency service. Where applicable, the display of flood warning signs should be considered. In particular sites which will be visited by members of the public on a daily basis; 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 on the level or risk and procedures if 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 flood wardens should also be considered.
Designing and locating safe access routes, prepare evacuation routes and the identification of safe locations for evacuees	Dry routes will be critical for people to evacuate as well as emergency services entering the site. The extent, depth and flood hazard rating should be considered when identifying these routes. Flood animations will also help identify which routes will be inundated first and the formation of dry islands.
Vulnerability of occupants	Table D.2 of PPS25 identifies vulnerability classifications associate with development. This is closely linked to its occupiers.
How easily damaged items will be relocated and 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.

5.4 Flood Awareness

Emergency planners should also use the outputs from SFRA to raise awareness within local communities. This should include raising awareness of measures that people can take to make their homes more resilient to flooding from all sources and encouraging all those at fluvial flood risk to sign up to the Environment Agency's Floodline Warnings Direct service. It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas.

Appendices

A. PPS25 Flood Risk Zones

Flood Zone 1 - Low Probability

Definition

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river and sea flooding in any year (<0.1%).

Appropriate uses

All uses of land are appropriate in this zone

FRA requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in an FRA [Flood Risk Assessment]. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E (of PPS25) for minimum requirements

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and the appropriate application of sustainable drainage techniques.

Flood Zone 2 - Medium Probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) and between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure listed in… [The Flood Risk Vulnerability Classification, see Table A-2] are appropriate in this zone.
Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 (of PPS25 and Table B-2 of this report) are only appropriate in this zone if the Exception Test is passed

FRA requirements

All development proposals in this zone should be accompanied by a FRA, See Annex E (of PPS25) for minimum requirements

Policy Aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques.

Flood Zone 3a - High Probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) and a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table A-2 of this report) are appropriate in this zone. The highly vulnerable uses listed in Table D.2 (of PPS25 and Table A-2 of this report) should not be permitted in this zone.

The more vulnerable and essential infrastructure listed in the Table D.2 (of PPS25 and Table B-2 of this report) should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for user in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA, See Annex E (of PPS25) for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:

- Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- Relocate existing development to land in lower Flood Zones; and
- Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocation and safeguarding open space for flood storage.

Flood Zone 3b - The Functional Floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

FRA requirements

All development proposed in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy Aims

In this zone, developers and local authorities should seek opportunities to:

- Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and
- Relocate existing development to land with a lower probability of flooding.

B. Flood Risk Vulnerability Classification

Classification	Description
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent[14]. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'[15]).
More Vulnerable	• Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste.[16] • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	• Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in 'more vulnerable'; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible Development	• Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves.

[14] See Circular 04/00: Planning controls for hazardous substances (paragraph 18) at: www.communities.gov.uk/publications/planningandbuilding/circularplanningcontrols

[15] In considering any development proposal for such an installation, local planning authorities should have regard to Planning Policy Statement 23, 'Planning and Pollution Control'.

[16] See Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10 for definition. www.communities.gov.uk/index.asp?id=1500757

Classification	Description
	• Navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

Notes

1. This classification is based partly on Defra/Environment Agency research on Flood Risks to People (FD2321/TR2)[17] and also on the need of some uses to keep functioning during flooding.
2. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.
3. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

[17] See website for further details.
www.defra.gov.uk/science/Project_Data/DocumentLibrary/FD2320_3364_TRP.pdf

C. Warrington BC Developer Contributions Policy

The Unitary Development Plan adopted in January 2006 includes a policy (DCS2) which provides the basis for negotiating developer contributions:

DCS2 PLANNING OBLIGATIONS

Where necessary to the grant of planning permission, and when the use of a planning condition would not be appropriate, the Council will negotiate with developers to secure agreements under Section 106 of the 1990 Act to meet needs arising directly from the development in question. Provision to meet the need, commensurate with the scale and nature of the development, will be sought through negotiation based on the provisions of the development plan. Provision may be made on-site, or a contribution may be made to the provision or improvement of facilities elsewhere, provided their location would adequately serve the development site.

The need for a planning agreement will be considered in the following circumstances:

1. where the proposed development gives rise to transport impacts that are unacceptable unless the developer provides or contributes to additional transport infrastructure or services in line with the Council's transport priorities;
2. where the proposed development gives rise to the need for the provision or enhancement of local public services or community facilities, including schools and health care facilities, outdoor and indoor recreation facilities, community meeting places and other essential amenities where existing facilities are inadequate to cope with additional demand likely to arise from the development proposed
3. where the proposed development is not serviced by foul sewers and treatment works of adequate capacity and design, or adequate water supplies;
4. where it is necessary to ensure an appropriate mix of uses in a development scheme and to agree the balance of uses, including the safeguarding of land required for public purposes;
5. where it is necessary to secure an appropriate density and mix of dwellings by type, size, and affordability, to ensure that the development provides for identified local needs, and the continued availability of affordable housing in perpetuity;
6. where it is necessary to ensure that an edge-of-centre or out-of-centre retail development does not change in nature or character by virtue of the type of goods offered for sale or the number of occupiers, to an extent that would harm the vitality and viability of town centres;
7. where it is necessary to secure the provision or retention and enhancement, and future management of, a site of importance for nature conservation, threatened habitat, or important landscape feature, including woodland planting as part of the Mersey Forest initiative;
8. where it is necessary to secure satisfactory provision for aftercare and maintenance of open space and landscaping provided in the development;
9. **where it is necessary for the developer to carry out flood protection and mitigation measures, or measures to mitigate other adverse impacts of surface water run-off on the environment;**
10. in pursuance of the need to secure the conservation of heritage assets.

D. Glossary of Terms

Terms	Definition
Attenuation	Reduction of peak flow and increased duration of a flow event
Breach of Defences	A structural failure at a flood defence allowing water to flow through
Catchment Flood Management Plans (CFMP)	A strategic planning tool through which the Environment Agency will seek to work with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management
Climate Change	Long-term variations in global temperatures and weather patterns, both natural and as a result of human activity
Consequence of flooding	Health, social, economic and environmental effects of flooding, of flooding, some of which can be assessed in monetary terms, while other less tangible impacts are more difficult to quantify. Consequences depend on the hazards associated with the flooding and the vulnerability of receptors
Compensation storage	A floodplain area introduced to compensate for the loss of storage as a result of land raising for development purposes
Conveyance	When a river overflows its banks, it continues to flow over the floodplain, conveying water down-stream, as well as storing water where the flood[lain may be obstructed and releasing it slowly
Design event	A historic or notional flood event of a given annual flood probability, against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed
Design flood level	The maximum estimated water level during the design event
DG5 register	Register held by water companies on the location of properties at risk of sewage related flooding problems
Extreme Flood Outline	Flood 'zone' maps released by the Environment Agency to depict anticipated 0.1% (1 in 1000 year) flood extents in a consistent manner throughout the UK
Flooding (or inundation)	Flooding is the overflowing of water onto land that is normally dry. It may be caused by overtopping of breach of banks or defences, inadequate or slow drainage of rainfall, underlying groundwater levels or blocked drains and sewers. It presents a risk only when people, human assets and ecosystems are present in the areas that flood
Flood Alleviation Scheme (FAS)	A scheme designed to reduce the risk of flooding at a specific location
Flood defence	Flood defence infrastructure, such as flood walls and embankments, intended to protect an area against flooding to a specified standard of protection
Flooding from Artificial drainage systems	This occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, becomes blocked or when the system cannot discharge due to a high water level in the receiving watercourse
Flood Hazard	The features of flooding which have harmful impacts on people, property or the environment (such as the depth of water, speed of flow, rate of onset, duration, water quality etc)
Flood Map	A map produced by the Environment Agency providing an indication of the likelihood of flooding within all areas of England and Wales, assuming there are no flood defences. Only covers river and sea flooding
Floodplain	Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would flow but for the presence of flood defences where they exist
Flood Risk	An expression of the combination of the flood probability or likelihood and the magnitude of the potential consequences of the flood event
Flood Risk Assessment (FRA)	A study to assess the risk to an area or site from flooding, now and in the future, and to assess the impact that any changes or development on the site or area will have on flood risk to the site and elsewhere. It may also identify, particularly at more local levels, how to manage those changes to ensure that flood risk is not increased. PPS25 differentiates between regional, sub-regional/strategic and site- specific flood risk assessments

Terms	Definition
Flood Risk Management (FRM)	The introduction of mitigation measures (or options) to reduce the risk posed to property and life as a result of flooding. It is not just the application of physical flood defence measures
Flood risk management measure	Any measure which reduces flood risk such as flood defences
Flood risk management strategy	A long-term approach setting out the objectives and options for managing flood risk, taking into account a broad range of technical, social, environmental and economic issues
Flood Storage	The temporary storage of excess runoff or river flow in ponds, basins, reservoirs or on the floodplain
Flood Zone	A geographic area within which the flood risk is in a particular range, as defined within PPS25
Fluvial	Flooding caused by overtopping of rivers or stream banks
Freeboard	The difference between the flood defence level and the design flood level, which includes a safety margin for residual uncertainties
Indicative Floodplain Map (IFM)	A map that delineates the areas estimated to be at risk of flooding during an event of specified flood probability. Being indicative, such maps only give an indication of the areas at risk but, due to the scale and complexity of the exercise, cannot be relied upon to give precise information in relation to individual sites
ISIS	ISIS is a software package used for 1-Dimensional river modelling. It is used as an analysis tool for flood risk mapping, flood forecasting and other aspects of flood risk management analysis
Likelihood (probability) of flooding	A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or a frequency of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is based on the average frequency estimated, measured or extrapolated from records over a large number of years and is usually expressed as the chance of a particular flood level being exceeded in any one year. For example, a 1 in 100 or 1% flood is that which would, on average, be expected to occur once in 100 years, though it could happen at any time
Local Development Framework (LDF)	A non-statutory term used to describe a folder of documents which includes all the local planning authority's Local Development Documents (LDDs). The local development framework will also comprise the statement of community involvement, the local development scheme and the annual monitoring report
Local Development Documents (LDD)	All development plan documents which will form part of the statutory (LDDs) development plan, as well as supplementary planning documents which do not form part of the statutory development plan
Ordinary watercourse	All rivers, streams, ditches, drains, cuts, dykes, sluices, sewers (other than public sewer) and passages through which water flows which do not form part of a Main River. Local authorities and, where relevant, Internal Drainage Boards have similar permissive powers on ordinary watercourses, as the Environment Agency has on Main Rivers
Pathways	These provide the connection between a particular source (e.g. high river or tide level) and the receptor that may be harmed (e.g. property). In flood risk management, pathways are often 'blocked' by barriers, such as flood defences structures, or otherwise modified to reduce the incidence of flooding.
Pluvial flooding	Usually associated with convective summer thunderstorms or high intensity rainfall cells within longer duration events, pluvial flooding is a result of rainfall-generated overland flows which arise before runoff enters any watercourse or sewer.
Precautionary approach	The approach to be used in the assessment of flood risk which required that lack of full scientific certainty, shall not be used to assume flood hazard or risk does not exist, or as a reason for postponing cost-effective measures to avoid or manage flood risk
Resilience	Constructing the building in such a way that although flood water may enter the building, its impact is minimised, structural integrity is maintained and repair, drying & cleaning are facilitated

Terms	Definition
Resistance	Constructing a building in such a way as to prevent flood water entering the building or damaging its fabric. This has the same meaning as flood proof
Receptors	Things that may be harmed by flooding (e.g. people, houses, buildings or the environment)
Residual risk	The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented
Runoff	The flow of water, caused by rainfall, from an area which depends on how permeable the land surface is. Runoff is greatest from impermeable areas such as roofs, roads and hard standings and less from vegetated areas - moors, agricultural and forestry land.
Sequential approach	The sequential approach is a risk-based method to guide development away from areas that have been identified through a flood risk assessment as being at risk from flooding. Sequential approaches area already established and working effectively in the plan-making and development management processes.
SoP	SoP refers to the design event or standard to which a building, asset or area is protected against flooding. When allocating or designing development in flood risk areas, freeboard should also be taken into account. Freeboard is a 'safety margin' and is the difference between the design level that something should be built to (e.g. a defence crest level or property Finished Floor Level (FFL)) and the estimated flood level for the design flood event. It includes a safety margin for uncertainties in water level prediction and/or structural performance. The water level component of freeboard accounts for uncertainty in computer river/sea model inflows (hydrology), model accuracy, survey accuracy (including flood defence levels) and the quality of the digital elevation models upon which 2D models are based. A quoted SoP usually takes freeboard and climate change considerations into account.
Source	Source refers to a source of hazard (e.g. the sea, heavy rainfall).
Source-pathway-receptor model	For there to be flood risk, the three components of flood risk - the source or the hazard, the receptors affects by the hazard and the mechanism of transfer between the two - must all exist.
Surface water management	This activity focuses on the assessment and management of flood risk within the urban environment from sources primarily resulting from intense rainfall. Surface water management should understand the performance of the urban drainage network, where exceedance flow routes would form and what impact this would have. Solutions to surface water flood risk can involve green infrastructure provision to capture and direct these exceedance flows to lower vulnerable areas or open space. New development can provide solutions to reducing runoff not only from the proposed development but also from existing areas. This should be considered in the SFRA in critical areas where development is planned upstream of flooding hotspots.
Sustainable Drainage Systems (SUDS)	A sequence of management practices and control structures, often referred to as SUDS, designed to drain water in a more sustainable manner than some conventional techniques. Typically these are used to attenuate runoff from development sites.
Sustainability Appraisal (SA)	An integral part of the plan-making process which seeks to appraise the economic, social and environmental effects of a plan in order to inform decision-making that aligns with sustainable development principles
TUFLOW	TUFLOW is a software package used for 2-Dimensional river modelling. It is used as an analysis tool for flood risk management analysis.
Vulnerability Classes	PPS25 provides a vulnerability classification to assess which uses of land maybe appropriate in each flood risk zone.

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