Appendices

A . Flood Risk Concepts

A.1 Introduction

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people, infrastructure and development and environmental assets are present in the area which floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and the environmental and cultural heritage.

Climate change predictions are that flood risk will increase due to more frequent severe storms bringing higher intensity rainfall and increasing run-off from land and buildings. This will cause rivers and streams to experience higher than normal flood flows and levels, and sewers and drains to surcharge more frequently than at present. The focus of activity in meeting these challenges in the future will be on flood risk management as opposed to simply providing flood defences. It is now widely recognised that whilst we cannot always prevent flooding we can manage the risks of it happening and reduce the consequences when flooding does happen.

As authorities the EA and LPA, should embrace effective flood risk management issues and actions. The focus should aim to reduce flood risks through a variety on measures including:

- Through the planning process ensuring that vulnerable land uses are located away from high flood risk areas;
- Providing flood warning and emergency planning in flood risk areas;
- Raising awareness of flood risks amongst vulnerable communities;
- Constructing and maintaining appropriately designed surface water sewers and culverts;
- Using temporary and demountable flood defences and various flood prevention systems to buildings where appropriate;
- Constructing new flood defences where they are sustainable, and improving and maintaining those already existing; and
- Constructing weirs, sluices and other flood flow control and management structures.

Pro-active land use planning has a key role to play in flood risk management as it is one of the few activities that can result in the avoidance of flood risk as opposed to other activities that can only hope to reduce it. Effective flood risk management through the planning system is achieved through a hierarchy where:

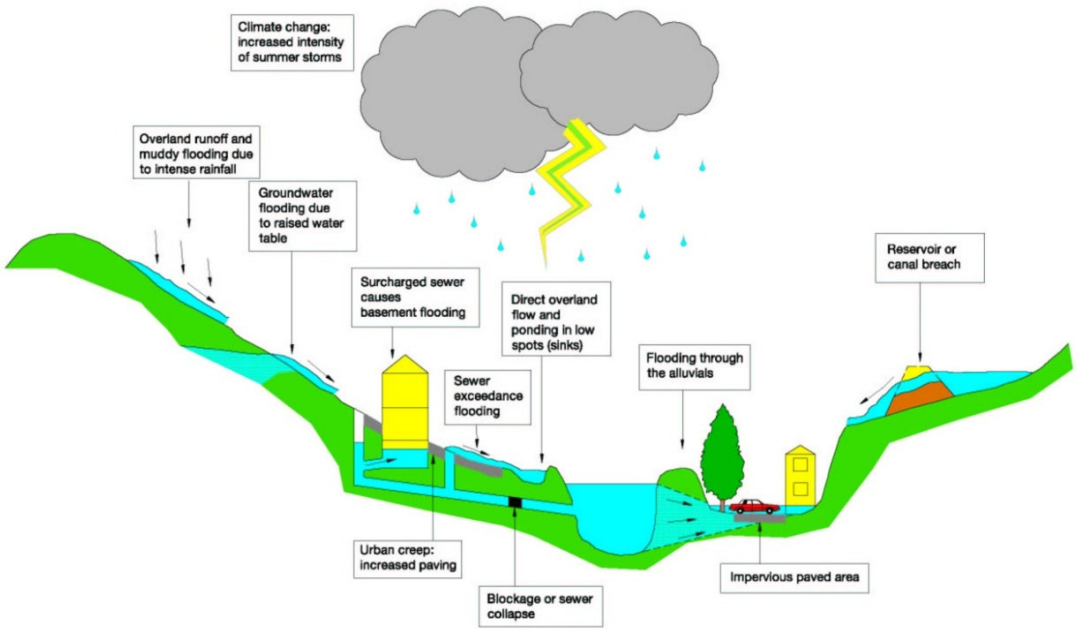
- Avoidance of inappropriate development in high risk zones takes priority;
- Substitution of lower vulnerability uses when avoidance is not considered possible; and
- Mitigation if avoidance and substitution are not possible, then mitigation of risks using a variety of techniques may be considered.
- Flood risk assessment at all levels of planning and for all major developments is critical to inform decision-making by planners and developers.

A.2 Sources of Flooding

Flooding can occur from many different sources and may be experienced in isolation or as a combined flooding event. Different types and forms of flooding present a range of different risks. The associated hazards of speed of inundation, depth and duration of flooding can vary greatly (See Figure A-1).

With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging with time.

Figure A-1: Flooding From All Sources



Major causes of flooding are:

- Coastal flooding is caused by higher sea levels than normal causing tidal water to overflow onto the land;
- Inland flooding is caused by prolonged and/or intense rainfall resulting in excess water flowing overland, ponding in natural hollows and low-lying areas or behind obstructions;
- River flooding occurs when the capacity of a watercourse is exceeded or a channel is blocked and excess water spills out from the channel onto adjacent low lying areas or floodplain;
- Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse;
- Groundwater flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall to ground level;
- Estuarial flooding may occur due to a combination of tidal and fluvial flows, with tidal levels being dominant in most cases; and
- A less frequent form of flooding arises from the failure of infrastructure designed to store or carry water (for example, the breach of a dam, a leaking canal or a burst water main), or to protect an area against flooding (e.g. breach of a flood defence, failure of a flap valve or pumping station or blockage of a pipe or culvert). Because of the sudden onset, the impacts of this form of flooding can be severe.

Prior to the major flood events in summer 2007, non Main River flooding was based on anecdotal evidence or described with Critical Ordinary Watercourse (COW) investigations undertaken by the Environment Agency. Little data could be abstracted from the water companies on sensitive drainage catchments where runoff impacts of new development could be significant on combined sewer systems. However, a significant proportion of recent flood insurance claims are due to flooding from non main river sources, so this issue is likely to increase with a more energised climate.

Historically the adopted approach in many SFRAs has been not to consider other sources of flooding as a spatial or strategic issue. Through good design and attenuation of drainage inputs to sensitive watercourses, mitigation was the accepted way forward.

Summer 2007 provided a stark reminder that the significance of capacity exceedance of artificial and natural drainage systems can be severe for many communities. Therefore, a clear example was provided that flooding from all sources should be included in SFRAs, and that new methods of rapid screening of these risks are required. Following the Pitt Review, the EA has prepared a national map showing areas vulnerable to surface water flooding. This was developed by Jeremy Benn Associates Ltd from research into the Making Space for Water programme.

Increases in flooding impacting on people and property, due to development can be caused:

- Upstream by restricting the capacity and conveyance function of the watercourse and floodplain system;
- Downstream by decreasing the volume available for flood storage on the floodplain, altering flow routes on the floodplain or by changes to the channel which can increase the flow discharged to downstream locations; and
- By increasing runoff from reduced permeability surfaces, such as roads, roofs and car parks.

Fluvial Flooding

Flooding from watercourses is associated with the exceedance of channel capacity during higher flows. The process of flooding from watercourses depends on a number of catchment characteristics including; geographical location, variation in rainfall, steepness of the channel and surrounding floodplain and infiltration and rate of runoff (linked to land use i.e. degree of urbanisation). It is possible to generalise catchments into; large and relatively flat or small and steep, the two giving very different responses during large rainfall events.

According to PPS25, ***"in a large, relatively flat catchment, flood levels will rise slowly and natural floodplains may remain flooded for several days, acting as the natural regulator of the flow. In small, steep catchments, local intense rainfall can result in the rapid onset of deep and fast-flowing flooding with little warning. Such "flash" flooding, which may only last a few hours, can cause considerable damage and possible threat to life."***

The form of the floodplain, either natural or urbanised, can influence flooding from watercourses. The location of buildings and roads can significantly influence flood depths and velocities by altering flow directions and reducing the volume of storage within the floodplain. Critical structures such as bridge and culverts can also significantly reduce capacity creating pinch points within the floodplain. These structures are also vulnerable to blockage by natural debris within the channel or by fly tipping and waste.

Surface Water Flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours and follows natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains in low lying areas. Hence any area at risk of fluvial flooding will almost certainly be at risk of surface water flooding.

Flooding in urban areas can also be attributed to sewers. Sewers are normally designed to a maximum of a 1 in 30 year design standard and hence sewer flooding problems will often be associated with more frequent storm events, when sewers can become blocked or fail. In the larger events that are less frequent but have a higher consequence, surface water will exceed

the sewer system and flow across the surface of the land, often following the same flow paths and ponding in the same areas as overland flows.

Both 'Making Space for Water' and 'Future Water' recognise the importance of integrated urban drainage and the summer flooding of 2007 highlighted that surface water flooding can cause mass distress, damage and disruption. The Foresight Report (2004) estimated that 80,000 properties are at very high risk from surface water flooding (1 in 10 chance of occurring in any one year).

Groundwater Flooding

The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can persist for a long period and cause significant damage to property, especial in urban areas, if not considered in development planning. In most cases groundwater flooding cannot easily be eliminated although the impact on buildings can be mitigated to some extent through various measures.

Flooding from Drainage Systems

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its discharge capacity, it becomes blocked or it cannot discharge due to a high water level in the receiving watercourse.

Foul sewers and surface water drainage systems are spread extensively across the urban areas with various interconnected systems discharging to treatment works and into local watercourses.

Typically foul systems will comprise a network of drainage sewers, sometimes with linked areas of separate and combined drainage, all discharging to sewage treatment works. Combined Sewer Overflows (CSOs) provide an overflow release from the drainage system into local watercourses or surface water systems during times of high flows.

Surface water systems will typically collect surface water drainage separately from the foul sewerage and discharge directly into watercourse.

A major cause of sewer flooding is often due to the connection of surface water drains to discharge into the combined sewer systems. Sewer capacity can then become an issue in large rainfall events causing the backing up of flood waters internally within properties or discharging through manholes.

Insufficient capacity can also become an issue where urban areas develop over time, with improved sewerage infrastructure provision not always provided to accommodate the additional flows.

English and Welsh water companies are required to maintain a register of flooding incidences due to hydraulic capacity problems on the sewage network. This database identifies properties where flooding has occurred on a frequency of 1 in 5 years and 1 in 10 years. The database is known as DG5 and DG10 registers. A register for 1 in 20 years is also recorded which includes properties under investigation.

Whilst this data can give an idea of those areas with limited drainage capacity, it must be acknowledged that it is a register of properties that have flooded due to the hydraulic inadequacies of the sewer systems, not properties at risk of flooding. Therefore it has limiting usefulness in predicting future flooding.

Data generated using hydraulic network models such as InfoWorks potentially provides a very useful tool with which to predict more widespread potential for sewer flooding and the use of such tools should be investigated during a Surface Water Management Plan.

Flooding from Reservoirs

Reservoirs can be a major source of flood risk, as experienced during the 2007 summer floods, where 18 reservoirs were affected across England. Whilst the probability of dam failure or breaching occurring is very small, the consequences of such an event can be devastating thereby presenting a risk of flooding which has to be considered.

Flooding from reservoirs is noted as an issue within the Pitt Review Recommendations and acknowledged by Hilary Benn, the Secretary of State for Environment, Food and Rural Affairs. £1million has been pledge to improve reservoir safety specifically to produce inundation mapping for all reservoirs falling under the Reservoirs Act (i.e. those with a capacity of over 10,000 cubic metres).

Reservoirs are classified on a consequence of failure basis outlined below in Table A-1 and it is now suggested that a better risk-based approach to reservoir safety is needed, focusing on those reservoirs that pose the greatest risk to the public, even if they are not currently covered by the Act.

Table A-1: Reservoir Consequence Classification

Dam Category	Potential Consequence of Reservoir Failure
A	At least 10 lives at risk and extensive property damage
B	Fewer than 10 lives at risk or extensive property damage
C	Negligible risk to human life but some property damage
D	Negligible risk to human life and very limited property damage

The Environment Agency has produced simplified inundation maps for all reservoirs under the Reservoirs Act as required by Recommendation 57 of the Pitt Review. Trial projects were run in the North West to develop the specification for these maps and the Environment Agency produced maps for all reservoirs under the Act during 2009.

The Water Act 2003, which amended the Reservoirs Act 1975, requires all reservoir undertakers to prepare Flood Plans for those reservoirs where the dam failure could put people's lives at risk or lead to major damage.

The reservoir Flood Plans will include:

- An inundation analysis to identify the extent and severity of flooding which could result from an uncontrolled release of water (i.e. breaching or failure)
- An on-site plan setting out what the undertaker would do in an emergency to try and to contain and limit the effects of the incident
- A communications plan with external organisations, mainly the emergency services

Defra is currently funding a project to produce a 'Guide to Emergency Planning for UK Reservoirs', which will ultimately use the Flood Plans.

Any allocations or applications for development immediately downstream of a reservoir should be considered carefully in liaison with the Environment Agency. It should be noted that the hazard is well managed through legislation and it is unlikely that the impact zone downstream of a reservoir would be a reason to stop permitted development. It is likely that the flood risk would be mitigated through emergency planning.

Flooding from Canals

Canals are artificial navigable watercourses, many of which date back to the 18th century. In many places they are embanked and raised above the surrounding land. Locks on canals help pass boat traffic up and down slopes. Canals are fed from reservoirs and watercourses and have overflow structures that pass water out of the canal when levels are high to lower level watercourses. Many of the inflow and outflow structures on canals are over 200 years old when they were designed to a 'rule of thumb'.

Flooding from canals can be caused by a variety of circumstances:

- During times of high flows in feeder watercourses, excess water can enter canals
- Reservoir failure could divert excess water into a canal
- Canals can intercept surface water running off from higher ground

- Surface water or excess water in a culverted watercourse that crosses under a canal can build up behind an embanked section of canal, which then causes the canal to fail or excess water to enter a canal
- The clay lining of a canal could fail, resulting in failure of an embanked section, dependent on local geology – relatively permeable materials such as sand are more prone to failure than impermeable clay

In the event that a canal does fail, the height that the canal is elevated above surrounding land will affect to some degree the amount of flood hazard that could be caused by deep or fast flowing debris laden water, alongside the cause of failure (there will be a greater volume of water from failures caused by water building up behind an embankment). The amount of water that can escape depends on the pound length, which is the distance between two locks because the maximum volume of water that will outflow will be contained between the two locks or time taken for an operator to react to a failure to prevent further escape. The risk of flooding from canals is reduced by regular inspection by British Waterways or others to identify any problems with inflow and outflow structures, canal lining or embankments.

Defence Failure

The condition of existing flood defences is an important consideration for local authority planners when allocating new development. PPS25 considers that defended areas (i.e. those areas that are protected to some degree against flooding by the presence of a formalised flood defence) are still at risk of flooding, and therefore sites within these areas must be assessed with respect to the adequacy of the defences.

The condition of existing defences is provided in the form of a 'rating' (1 to 5), and is a reflection of any signs of 'obvious' structural problems. The condition rating is determined on the basis of visual inspection, focussing on obvious signs of structural defect (e.g. slippage, cracking, poor maintenance), designed to inform the maintenance programme. The Environment Agency's National Flood and Coastal Defence Database (NFCDD) condition ratings are shown in Table A-2.

Table A-2: NFCDD Condition Ratings for Flood Defences

Condition Rating	Condition	Condition Description
1	Very Good	Fully serviceable.
2	Good	Minor defects.
3	Fair	Some cause for concern. Requires careful monitoring.
4	Poor	Structurally unsound now or in the future.
5	Very Poor	Completely failed and derelict.

The condition of existing flood defences and whether they will continue to be maintained and/or improved in the future, is an issue that needs to be considered as part of the risk based sequential approach and in light of this, whether proposed land allocations are appropriate and sustainable. In addition, detailed FRAs will need to explore the condition of defences thoroughly, especially where these defences are informal and contain a wide variation of condition grades.

Defences that are not in good condition could be prone to failure during a flood event. Defences that offer a low standard of protection are likely to overtop during flood events that are more extreme than the event that they were designed to protect against. Flood risk associated with defence infrastructure is residual; however, the risks can be significant due to sudden onset and velocities reached by flood waters should a defence overtop or fail.

Flood Warning

The Environment Agency has the lead role in providing flood warnings in England and Wales. The aim of the flood warning service is to reduce risk to life, distress to people and damage to

property caused by flooding by providing accurate, timely flood warnings to residents within the floodplain of rivers, estuaries and coasts; to the media and partner organisations.

It is crucial that people at risk receive appropriate flood warnings and take action to protect themselves and their property. Within the Environment Agency corporate plan "Creating a Better Place[18]" the Agency has highlighted three main targets:

- To have 80% of properties at risk in the floodplain in England and Wales receiving and appropriate flood warning service
- 75% of people who live in flood risk areas take appropriate action by 2011
- To have major incident plans in place for high flood risk areas

Flood Warning Codes include:

Flood Alert		Flooding is possible. Be prepared.
Flood Warning		Flooding is expected. Immediate action required.
Severe Flood Warning		Severe flooding. Danger to life.

The flood warnings are used to reduce the overall impact of flooding of people and property by lowering the vulnerability of the receptor. This is done by providing a warning which can then be used to remove people at risk or to relocate valuable possession to higher levels.

Overview

Flooding in urban areas can come from a variety of sources and when flooding occurs it is often not clear where the water has come from. The Flood and Water Management Act defines local flood risk, for which local authorities will have a local leadership role, as the risk of flooding from ordinary watercourses (smaller watercourses that are not under the jurisdiction of the Environment Agency), surface water and groundwater.

Prior to the major flood events in summer 2007, the understanding of non Main River flooding was based on anecdotal evidence or described within Critical Ordinary Watercourse (COW) investigations undertaken by the Environment Agency. Little data could be abstracted from the water companies on sensitive drainage catchments where runoff impacts of new

[18] Environment Agency (2006) Creating a Better Place: Corporate Strategy 2006-2011

development could be significant on combined sewer systems. However, a significant proportion of recent flood insurance claims are due to flooding from non Main River sources, so this issue will become larger with a more energised climate.

Historically the adopted approach in many SFRAs has been not to consider other sources of flooding as a spatial or strategic issue.

Summer 2007 provided a stark reminder that the significance of capacity exceedance of artificial and natural drainage systems can be severe for many communities. Therefore a clear example was provided that flooding from all sources should be scoped into a SFRA and they should be taken into account through the planning system, and that new methods of rapid screening of these risks are required. On the back of the Pitt review, the Environment Agency has prepared a national map showing areas susceptible to surface water flooding. This was developed by JBA from research for the Making Space for Water programme and has been used within this SFRA.

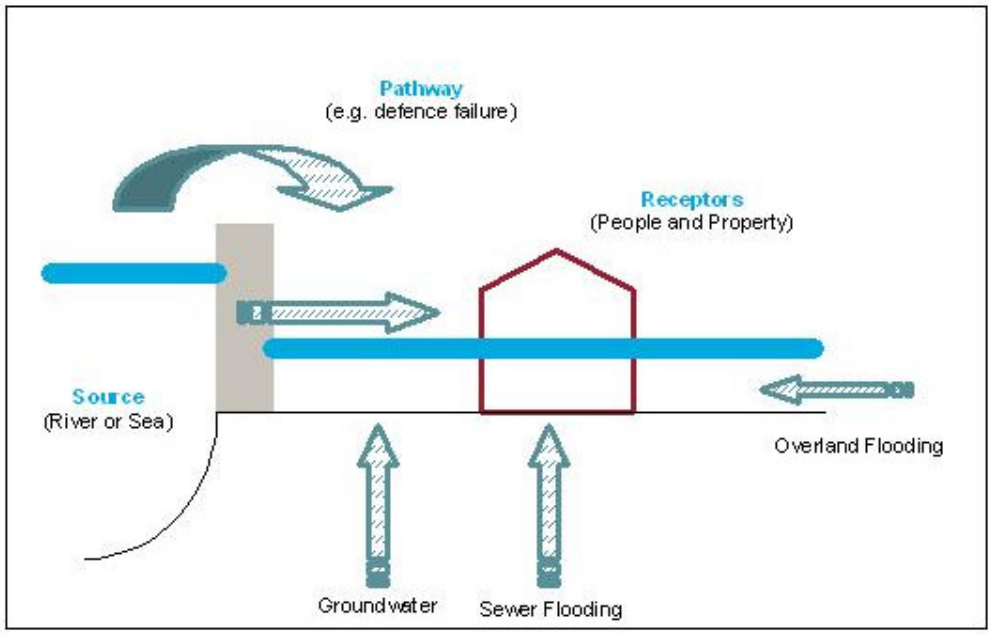
Development can increase flood risk elsewhere in the following ways:

- Upstream by restricting the capacity and conveyance function of the watercourse and floodplain system
- Downstream by decreasing the volume available for flood storage on the floodplain, altering flow routes on the floodplain or by changes to the channel which can increase the flow discharged to downstream locations
- By increasing run-off from reduced permeability surfaces, such as roads, roofs and car parks

A.3 Flooding Likelihood & Consequence

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

Figure A-2: (Source-Pathway-Receptor model)



The principal sources of flooding are rainfall or higher than normal sea and river levels, the principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains

and their defence assets. The receptors may include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk.

It is important to define the components of flood risk in order to apply this guidance in a consistent manner.

Likelihood

Likelihood of flooding is normally expressed as a percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 chance of occurring in any one year.

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

Consequence

Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age and structure, of the population, presence and reliability of mitigation measures etc).

Flood risk is then normally expresses in terms of the following relationship:

- Flood risk = Probability of flooding x Consequences of flooding

A.4 Flooding Impacts on Property, People & the Environment

Flooding has a wide range of social impacts which may be difficult to delineate as they are interconnected, cumulative and often not quantifiable.

In small urban or steep upland catchments which have a very rapid response to rainfall, or with flooding due to infrastructure failure, flood waters can rise very quickly and put life at risk. Even shallow water flowing at 2m/s can knock children and many adults off their feet and vehicles can be moved by water of 300mm depth. The risks rise if the flood water is carrying debris.

The impact on people as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense. This also extends to whole communities. Long term impacts can arise due to chronic illnesses and stress. Flood water contaminated by sewage or other pollutants (e.g. chemicals stored in garages or commercial properties) is particularly likely to cause such illnesses, either directly as a result of contact with the polluted flood water or indirectly as a result of sediments left behind.

The degree to which populations are at risk from flooding is, therefore, not solely dependent upon proximity to the source of the threat or the physical nature of the flooding. Social factors also play a significant role in determining risk. Although people may experience the same flood, in the same area, at the same time, their levels of suffering are likely to differ greatly as a result of basic social differences. These differences will affect vulnerability in a variety of ways including an individuals or community's response to risk communication (flood warning) and physical and psychological recovery in the aftermath of a flood. How individuals and communities experience the impact will also vary depending on their awareness of the risk of flooding, preparedness for the flood event and the existence or lack of coping strategies.

Flood hazard is based on a multiplier of flood depth, flood velocity and a debris factor[19] and is presented on the following scale:

Table A-3: Flood Hazard ratings

Hazard to people	Hazard to people classification
No Hazard	
Very Low Hazard "Flood zone with shallow flowing water or deep standing water"	Caution
Danger for some "Danger: flood zone with deep or fast flowing water"	Includes children, the elderly and the infirm
Danger for most "Danger: flood zone with deep fast flowing water"	Includes the general public
Danger for all "Extreme danger: flood zone with deep fast flowing water"	Includes the emergency services

Flooding Impacts on Property

Flooding can cause severe property damage. Flood water is likely to damage internal finishes, contents, electrical and other services and possibly cause structural damage. The physical effects can have significant long-term impacts, with reoccupation sometimes not being possible for over a year. The costs of flooding are increasing, partly due to increasing amounts of electrical and other sophisticated equipment within developments.

The damage flooding can cause to businesses and infrastructure, such as transport or utilities like electricity and water supply, can have significant detrimental impacts on local and regional economies. The long-term closure of businesses, for example, can lead to job losses and other economic impacts.

Placing new development or regenerating in flood risk areas has its additional short and long-term costs. The need to build resistant and resilient properties could significantly increase overall costs of development, whilst ongoing maintenance and insurance increase future expenditure.

Flooding Impacts on the Environment

Environmental impacts can be significant and include soil erosion, bank erosion, landslips and damage to vegetation as well as the impacts on water quality, habitats and flora and fauna caused by bacteria and other pollutants carried by floodwater.

Flooding can have a beneficial role in natural habitats. Many wetland habitats are dependent on annual flooding for their sustainability and can contribute to the storing of flood waters to reduce flood risk elsewhere. It is important to recognise the value of maintenance or restoration of natural riparian zones such as grasslands which protect the soils from erosion and 'natural' meadows which can tolerate flood inundation. The use of Green Infrastructure throughout the river corridor can also play a vital role in enhancing the river environment as

[19] Defra and Environment Agency (2006) The Flood Risks to People Methodology, Flood Risks to People Phase 2, FD2321 Technical Report 1, HR Wallingford et al. wrote the report for Defra/EA Flood and Coastal Defence R&D Programme, March 2006.

well as safeguarding land from future development, protecting people and buildings from flooding and reducing flood risk downstream.

A natural floodplain can help accommodate climate change and improve the quality of rivers and associated wetlands to help achieve 'good ecological status' by 2015 under the Water Framework Directive (WFD). Meeting WFD objectives involves not only ecosystems, water quality, drought and flood impact considerations but also the physical characteristics and morphology of the river channel, floodplain and associated structures.

B . Flood Risk Assessment Hierarchy

Flooding is a natural process and does not respect political demarcations or administrative boundaries; it is influenced principally by natural elements of rainfall, tides, geology, topography, rivers and streams and manmade interventions such as flood defences, roads, buildings, sewers and other infrastructure. As was seen in the summer 2007 floods, flooding can cause massive disruption to communities, damage to property and possessions and even loss of life.

For this reason it is important to avoid developing in flood risk areas in the first instance. Where this is not possible development should be directed to areas with the lowest possible level of flood risk. Having exhausted all opportunities to direct development away from areas of flood risk then the allocation of land for development must consider the vulnerability of the proposed land use to flooding and take measures to minimise flood risk to people, property and the environment. This is the thrust of the risk based sequential approach to managing flood risk and it is the backbone of PPS25.

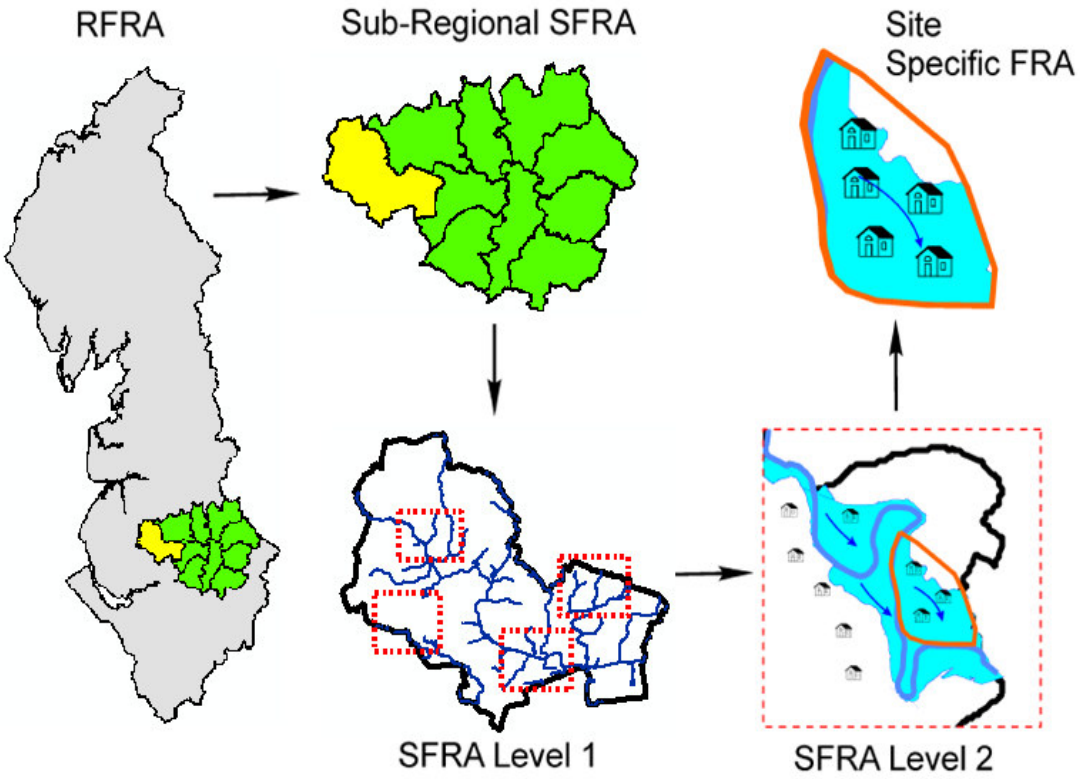
Current Government policy requires local authorities to demonstrate that due regard has been given to the issue of flood risk as part of the planning process. It also requires that flood risk is managed in an effective and sustainable manner and where new development is as an exception necessary in flood risk areas, the policy aim is to make it safe without increasing flood risk elsewhere and wherever possible reduce flood risk overall.

Within the hierarchy of regional, strategic and site-specific flood-risk assessments, a tiered approach ensures that the level of information is appropriate to the scale and nature of the flood-risk issues and the location and type of development proposed, avoiding expensive flood modelling and development of mitigation measures where it is not necessary. Figure B-1 highlights the hierarchical approach to flood risk assessment.

As stated in PPS25 the three principle levels of assessment comprise:

- **Regional Flood Risk Appraisal (RFRA)** – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth.
- **Strategic Flood Risk Assessment (SFRA)** – an assessment of all types of flood risk informing land use planning decisions. This will enable the LPA to apply the Sequential Test in PPS25 and allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk.
- **Site Specific Flood Risk Assessment (FRA)** – site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from the site to an acceptable level.

Figure B-1: Hierarchical Approach to Flood Risk Assessments[20]



Implementation of the sequential risk-based approach requires forward planning. Policy decisions are best made within LDF/LDDs, guided by information on flood risk, ensuring that the allocation of land inappropriate for development does not unnecessarily raise expectations of landowners and developers. Policy decisions should be informed through the preparation of RFRAs and SFRAs. These assessments are broad-brush assessments of the risk of flooding, to guide strategic planning decisions. They involve the collection and collation of data on flooding and flood-risk management to provide information at the appropriate level of detail to allow decision-makers to:

- Prepare appropriate policies for flood-risk management within LDFs
- Produce a strategic understanding of the scale, extent and nature of the flood risk at a community level and how that would alter with any proposed development
- Apply a risk-based, sequential approach, providing risk data to confirm the compatibility between the flood risk vulnerability and inform the Exception Test and of the proposed allocation and the Flood Zone
- Inform the strategic environmental assessment of LDFs
- Translate the national guidance into locally specific guidance, including the identification of areas of floodplain that should be safeguarded for flood management purposes
- Identify the level of detail required for site-specific flood-risk assessments in particular locations
- Determine the acceptability of flood risk in relation to emergency planning capability and how the existing and proposed community would respond to a flood event

B.1 Greater Manchester Sub-Regional SFRA

[20] AGMA (2008) Greater Manchester Sub-regional Strategic Flood Risk Assessment

The Greater Manchester sub-regional SFRA was published in August 2008 on behalf of the Association of Greater Manchester Authorities (AGMA). The main objective of the SFRA was to ***"bring together existing information and identify where further, more detailed assessments are required."***

The Greater Manchester sub-regional SFRA was undertaken to provide a baseline and scope from which more detailed District-Level assessments can be completed. The principal aims of the SFRA were to:

1. To assess and identify the different levels of flood risk (high, medium or low) and sources of flooding (main river, surface water, canal, reservoir etc) across Greater Manchester, at both the sub-regional level (using river catchments) and District level and to map these for statutory land use planning purposes.
2. To undertake District flood risk assessments that will supplement current policy guidelines (i.e. PPS25) and provide a 'risk based' approach to policy making and development management within Greater Manchester. This was intended to provide clarity and inform both local authority officers and developers, ensuring that, where flood risk is identified as a relevant issue that must be addressed as part of the application process, the degree of mitigation required is appropriate to the scale of development and/or risk faced.

The Greater Manchester sub-regional SFRA is an excellent example of a high level document, which introduced the concept of flood risk to all Greater Manchester authorities and the hydrological connectivity that links each council together. By carrying out such a strategic document, it has allowed a partnership and familiarity to be created between the local authorities and key stakeholders in flood risk issues and the need for a greater understanding and single belief in flood risk management.

The Greater Manchester sub-regional SFRA carried out important ground work and data collection, which has been used in the development of the SFRA. However, where there were data gaps (such as at Snipe Clough and risk from other sources), part of the SFRA remit has been to build on the AGMA work. Therefore, the SFRA is a 'Hybrid' SFRA as it fills the gaps in the sub-regional SFRA and also fulfils the criteria for a Level 2 SFRA.

It was also recommended that the Greater Manchester sub-regional SFRA be kept as a 'living' document and to help facilitate the process, a 'Flood Risk Library' be created. This should be used as "a single point within AGMA for the collection and cataloguing of flood risk data relevant to the sub-region." This information would include completed FRAs, records of flood events and updated flood risk information and studies for the Environment Agency and other organisations. This SFRA should fit into the Flood Risk Library and be used to update the Greater Manchester sub-regional SFRA data gaps if required or simply used as separate source of flood risk information.

C . The Planning Framework

C.1 Introduction

The purpose of this section of the report is to identify and outline those high level documents which must be taken into account in preparing this SFRA, from a national to a local level.

The land use planning process is driven by a whole host of policy guidance on a national, regional and local level. Whilst the majority of these policies are not aimed at mitigating flood risk, there are key links at strategic, tactical and operational levels between land use and spatial planning (Regional and Local Government), and Flood Risk Management (FRM) planning (Environment Agency), which should be considered as part of a planned and integrated approach to delivering sustainable development.

The sustainability appraisal will help draw together these links and balance the application of wider social, economic and environmental planning policy and guidance. Flood risk assessment is required at all levels of the planning process and for all major developments in flood risk areas; these play an increasingly important role in assisting effective delivery of key planning objectives.

C.2 Flood Risk Management Drivers

The principal FRM policy drivers are brought together in the Government's recently released Flood and Water Management Act and it is an important part of the Government's response to Sir Michael Pitt's Report on the summer 2007 floods. It also gives effect to a number of commitments in the Government's "Future Water" strategy document. In addition, the Act responds to a number of climate change challenges including more frequent extreme weather events causing a greater risk of flooding and drought, increased population, increased water demand and more water quality problems. It provides the Environment Agency with a strategic overview role for all sources of flood risk in England and Wales and gives local authorities in England a clear leadership role in local flood risk management. An improved integrated and risk based approach is proposed for the future management of flood risk and this requires other concerns such as sustainability, biodiversity and the whole water cycle to be taken into account by local authorities and other relevant organisations.

A core policy thread running through all current policy drivers is the fundamental shift in emphasis from building defences to prevent flooding, to one of managing flood risk by using a suite of measures. All operating authorities are required to invest in the provision of sustainable flood risk management and this includes LPAs adopting a flood risk management hierarchy of assessing, avoiding, substituting, controlling and mitigating flood risk through the land use planning system. They should have regard to flooding from all sources (particularly surface water and not just from rivers and the sea). 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.

Current key policy related documents provide LPAs with important and valuable knowledge on the strategic direction of flood risk management and assist their strategic land use planning decision making for re-generation, inward investment and growth etc.

Key documents currently influencing FRM policy are:

- EU Floods Directive – EU (2007)
- Floods and Water Management Act – Defra (2010)
- Future Water – Defra (2008)
- Improving Surface Water Drainage – Defra (2008)
- Making Space for Water – Defra (2005)
- Planning Policy 25: Development & Flood Risk – CLG (2006)
- Planning Policy 25: Development & Flood Risk Practice Guide –CLG (2008)

- Learning Lessons from the 2007 Floods – Sir Michael Pitt (2008)
- Catchment Flood Management Plans – currently being implemented
- Shoreline Management Plans – currently being revised

C.3 EU Floods Directive

The "EU Floods Directive" aims to reduce and manage the risk floods pose to human health, the environment, cultural heritage and economic activity. Member States have two years in which to transpose its provisions into domestic legislation and the first requirements of the Directive begin at the end of 2011. By this date, an evidence base for flood risk should be developed to map the risk and then produce plans to manage it. Preliminary Flood Risk Assessments (PFRAs) for all sources of flooding need to be prepared showing the impact of historic flooding and the potential impact of a repeat event. Following this, areas of potentially Significant Flood Risk (SFR) need to be defined. In addition, and by the end of 2013, flood hazard and flood risk maps for the SFR areas are required and should be co-ordinated with, and possibly integrated into, the reviews of River Basin Districts under the Water Framework Directive (WFD). Finally, by the end of 2015, Flood Risk Management Plans (FRMPs) must be established, which aim to reduce the potential adverse consequences of flooding and/or reduce its likelihood.

The Government proposes to use existing flood risk planning outputs of RFRAs and SFRAs to deliver the requirements of PFRAs. It is also proposed that local authorities extend their Level 2 SFRAs to look at the impact of flooding on the environment and cultural heritage when determining SFR areas. In addition, it is proposed that SWMPs will be FRMPs under the Directive, and will also be a tool more generally for local flood risk management. This integrated approach will underpin the planning system and guide the location of future development to avoid and minimise flood risk, whilst also meeting the requirements of the Floods Directive. Local authorities, through their land use planning activities, have a key role to play.

The Flood Risk Regulations transpose the EU Floods Directive into UK law and were introduced on 10 December 2009. These confirm the lead local flood authority role and require specific tasks to be undertaken by these authorities this year, with completion of Preliminary Flood Risk Assessments and identification of Flood Risk Areas due by June 2011.

C.4 Flood & Water Management Act 2010

The Flood and Water Management Act[21] received Royal Assent on 8th April 2010. The Act creates unifying legislation covering all forms of flooding and shifting the emphasis from building defences to managing risk. The Act creates clearer roles and responsibilities and provides for a more risk-based approach. Local authorities have a new lead role 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 (EA).

Risk management authorities will be expected to begin putting in place the organisational framework and strategic development ahead of the anticipated commencement date of April 2011.

The Act aims to:

- Reduce the likelihood and impacts of flooding
- Improve the ability to manage the risk of flooding, by clarifying who is responsible for what
- Reduce pollution and improve water quality
- Give water companies better powers to conserve water during drought
- Reduce red tape and other burdens on water and sewerage companies,

21 http://www.defra.gov.uk/environment/flooding/policy/fwmb/key-docs.htm

- Improve the overall efficiency of the industry

The content and implications of the Act 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. Key areas of the Act have particular implications for local authorities, land use planning and related flood risk. These include:

- To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods.
- Local authorities will have an enhanced leadership role in local flood risk management which includes ensuring that flood risk from all sources, including from surface run-off, groundwater and ordinary watercourses, is identified, taken account of in the spatial planning process and managed as part of locally agreed work programmes
- Local authorities will develop a suite of measures for managing local flood risk, for example, surface water mapping, appropriate development planning and collating information on flood risk and drainage assets
- County and unitary authorities will be responsible for local flood risk assessment and lead in ensuring the production of SFRAs and SWMPs
- SFRAs will provide the evidence to allow LPAs to factor flood risk into their LDFs, DPDs and individual planning proposals, and help to determine where SWMPs are needed
- County and unitary authorities will lead new local partnerships and have responsibility for adopting and maintaining sustainable drainage systems (SUDS) in new development, where they affect more than one property
- County or unitary authorities, the Environment Agency and IDBs will have powers to formally designate natural and man-made features (similar in principle to the Listed Buildings classification), which help to manage flood or coastal risk; they will give formal consent before anyone can change or remove the feature and use enforcement powers where needed
- To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.
- Surface water connection to public sewers will be conditional on meeting new national standards for SUDS, and the approval of a SUDS approving body will be needed, and a certificate issued, before development can begin
- Increased emphasis is needed on enabling flood water to safely flow overland with green infrastructure and safe flow routes being identified as part of flood risk assessments
- All relevant authorities will have a duty to cooperate and share information
- Right to Connect (Water Industry Act, 1991) S106 of the act has been amended by the FWM Act so that for new developments the approved sustainable drainage system must be constructed to connect to the public sewer network.
- This will need to be approved to the new National SUDS standards (currently being devised) by the Lead Local Flood Authority (LLFA – County or Unitary Authority)
- Once constructed, the LLFA will adopt the system and becomes responsible for maintaining it.

Improving Surface Water Drainage

The “Improving Surface Water Drainage” consultation document was produced in support of the Government’s water strategy and in line with Sir Michael Pitt’s initial conclusions. Many of the proposals identified have been carried forward into the new Flood and Water

Management Act. The consultation considers policy measures to improve the way surface water runoff is managed. In particular, it proposes:

- Using SWMPs as a tool to improve co-ordination between stakeholders involved in drainage and local management of flood risk
- Increasing uptake of SUDS by clarifying responsibilities for adoption and management
- Reviewing the ability for premises to connect surface water drainage automatically into the public sewer system

Current roles and responsibilities were considered along with various options for improving the current surface water drainage situation. In particular the document recognises that SFRAs and SWMPs already form part of the PPS25 planning framework and there is an aim to enhance their role and make stronger links between surface water drainage and strategic planning.

Making Space for Water Strategy

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

The 2004 consultation document "Making Space for Water" sets out the following vision:

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

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

Section 7 of the consultation document deals with measures to reduce flood risk through land-use planning, which emphasises the Government's commitment to ensuring that the planning system aims to reduce flood risk wherever possible and, in any event, should not add to it. However, it is acknowledged that 10% of England is already within mapped areas of flood risk and that contained within these areas are some of the Brownfield sites which other areas of Government policy has identified as a priority for future housing provision. The document asserts that over the past five years, 11% of new houses were built in flood-risk areas. The document identifies three sets of measures which may be undertaken to manage flood risk when development is sited in such areas:

- Protection measures to provide, at minimum, the standards of protection specified in PPS25
- Provision of features such as sacrificial areas and compartmentalisation to reduce the consequences of a flood event should one occur (such as functional floodplain)
- Use of construction techniques that increase the flood resistance and resilience of buildings

The document proposes that LDFs should take full account of flood risk and incorporate the sequential approach in PPS25. Moreover, the document encourages integration with other planning systems, in particular Catchment Flood Management Plans. Use of European Union (EU) funding streams, such as Interreg IIIB is recommended where applicable, to enable Local Authorities to undertake projects aimed at advancing knowledge and good practice in flood risk management.

Making Space for Water: Programme of Work

The "Making Space for Water: Programme of Work" was developed following consultation and takes account of any relevant recommendations that emerged from the Pitt Review into the 2007 floods that affected many parts of England.

One of Defra's and CLG's early outputs from the Making Space for Water Programme was the publication of PPS25 in December 2006. This work, together with the Practice Guide forms the Governments required approach to managing and reducing flood risk through the land use planning system.

A valuable piece of work looking at "Developing a Broader Portfolio of Options to Deliver Flooding and Coastal Solutions" has been carried out as part of this programme and is very useful to local authorities and other operating authorities, in their strategic planning of flood risk management. Outputs from this work are available from Defra.

Quarterly update reports are released providing details of progress made and key achievements. These reports can be access via the Making Space for Water website at

http://www.defra.gov.uk/environ/fcd/policy/strategy.htm

The Pitt Review

The "Pitt Review" was carried out following 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. The Review collected evidence by visiting affected areas and examining over 600 written statements submitted by victims of the floods.

The final report was released in June 2008 and contains 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 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 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 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 draft Flood and Water Management Act.

C.5 Flood & Water Management Act 2010

The Flood and Water Management Act22 received Royal Assent on 8th April 2010. The Act creates unifying legislation covering all forms of flooding and shifting the emphasis from building defences to managing risk. The Act creates clearer roles and responsibilities and provides for a more risk-based approach. Local authorities have a new lead role 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 (EA).

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- Improve the overall efficiency of the industry

The content and implications of the Act 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. Key areas of the Act have particular implications for local authorities, land use planning and related flood risk. These include:

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- Local authorities will develop a suite of measures for managing local flood risk, for example, surface water mapping, appropriate development planning and collating information on flood risk and drainage assets
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- To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.

22 http://www.defra.gov.uk/environment/flooding/policy/fwmb/key-docs.htm

- Surface water connection to public sewers will be conditional on meeting new national standards for SUDS, and the approval of a SUDS approving body will be needed, and a certificate issued, before development can begin
- Increased emphasis is needed on enabling flood water to safely flow overland with green infrastructure and safe flow routes being identified as part of flood risk assessments
- All relevant authorities will have a duty to cooperate and share information
- Right to Connect (Water Industry Act, 1991) S106 of the act has been amended by the FWM Act so that for new developments the approved sustainable drainage system must be constructed to connect to the public sewer network.
- This will need to be approved to the new National SUDS standards (currently being devised) by the Lead Local Flood Authority (LLFA – County or Unitary Authority)
- Once constructed, the LLFA will adopt the system and becomes responsible for maintaining it.

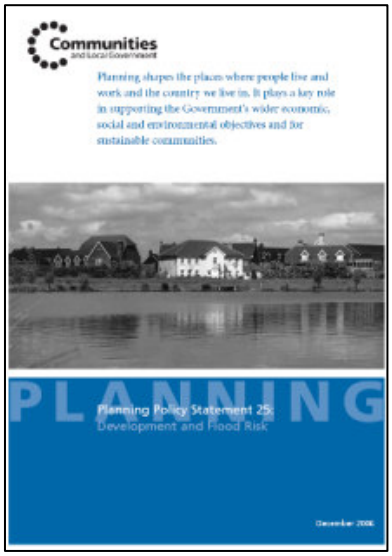
National Planning Policy

This SFRA has been prepared in a period during which planning authorities have been implementing the provisions of the Planning and Compulsory Purchase Act 2004 and accompanying planning guidance, including PPS1 Delivering Sustainable Development and PPS12 Local Development Frameworks. This affected all tiers of the planning system and has necessitated major changes at both the regional and local level which will impact on the way in which planned development is approached in the regional strategy and delivered locally.

PPS25 Development and Flood Risk

In December 2006 the Government published PPS25: Development and Flood Risk.

The aim of PPS25 is to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. The key planning objectives are that ***"Regional Planning Bodies (RPBs) Local Planning Authorities (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 Regional or Strategic Flood Risk Assessments (RFRAs / 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 sustainable drainage systems (SUDS);

- Using opportunities offered by new development to reduce the cause and impacts of flooding e.g. SWMPs; 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 and RPBs, 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)
- 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

PPS25 also introduces an amendment to Article 10 of The Town and Country Planning (General Development Order) 1995 which makes the Environment Agency a Statutory Consultee on all applications for development in flood risk areas and those within 20m of a Main River.

The Direction also introduces the requirement for LPAs to notify the Secretary of State where they are minded to approve a planning application contrary to a sustained objection by the Environment Agency.

The introduction of PPS25 enables local authorities to make a direction under Article 4 of the Town and County Planning (General Permitted Development) Order 1995. This will enable Local Authorities to remove permitted development rights where those rights threaten to have a direct, significant and adverse effect on a flood risk area, or its flood defences and their access, or the permeability and management of surface water, or flood risk to occupants.

PPS25 Development and Flood Risk Practice Guide

The Practice Guide to PPS25 was published by the Department for Communities and Local Government (CLG) in June 2008. 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 SFRA's and FRA's, the Sequential and Exception Test and 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 the practice guide in conjunction with the further advice contained within this report.

Proposed Updates to PPS25 Practice Guide

On 11 August 2009, CLG published a Consultation Paper on proposed amendments to PPS25. The consultation relates to proposed clarifications to some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively.

The proposed amendments affect tables D.1 (Flood Zones) and D.2 (Flood Risk Vulnerability Classification) in Annex D of PPS25.

It is proposed that the definition of the functional floodplain is updated to:

"..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"

The reasoning behind this was that by simply stating it should be based on probability rather than local circumstance, leads to areas of land that are not intended to allow for floodwater to flow or be stored being inappropriately identified as functional floodplain, and potentially also for areas that are designed to flood being wrongly excluded from identified functional floodplain.

There are four amendments proposed in Table D.2 including:

1. Moving water treatment and sewage treatment works from 'less vulnerable' to 'essential infrastructure'. This means they will now need to pass the Exception Test if planned in Flood Zone 3a rather than just Flood Zone 3b. As usual, they will have to be designed to the appropriate uses and policy aims within Table D.1
2. Allowing police, ambulance and fire stations to be defined as 'less vulnerable' only if they are not required to be operational during flooding. This will stop the exclusion of new emergency services facilities from communities they service in high flood risk areas.
3. To allow facilities requiring hazardous substances consent, which are required to be located in flood risk areas, due to their need to be co-located with other facilities (i.e. the need to be located near ports, or processed or manufactured facilities) to be defined as 'essential infrastructure' rather than 'highly vulnerable'.
4. Adding wind turbines to the 'essential infrastructure' category. However, in keeping with PPS25, the Sequential Test is not required but Parts A) and C) of the Exception Test would need to be passed if located in Flood Zone 3a and 3b.

Until the proposed changes have been agreed and PPS25 updated, the current PPS25 (2006) and its Practice Guide (2008) should be used for planning policy guidance, but users should be aware of possible future changes.

Other Planning Policy Statements

PPS1 Delivering Sustainable Development published in February 2005 sets out the overarching planning policies for the delivery of sustainable development across the planning system and sets the tone for other planning policy statements. PPS1 explicitly states that development plan policies should take account of flooding, including flood risk. It proposes that new development in areas at risk from flooding should be avoided. Planning authorities are also advised to ensure that developments are "sustainable, durable and adaptable" including taking into account natural hazards such as flooding.

PPS1 also places an emphasis on 'spatial planning' in contrast to the more rigid 'land use planning' approach which it supersedes. Planning authorities will still produce site specific allocations and a proposals map as LDDs, but their Core Strategy will be more strategic and visionary in content and will take into account the desirability of achieving integrated and mixed use development and will consider a broader range of community needs than in the past. With regard to flood risk, it will be important for the Core Strategies and accompanying Supplementary Planning Documents to recognise the contribution that non-structural measures can make to flood management.

Planning Policy Statement: Planning and Climate Change, a supplement to PPS1, published in December 2007, sets out how the Government expects the planning system to address climate change. It explains that there is a compelling scientific consensus that human activity is changing the world's climate. The evidence that climate change is happening, and that man-made emissions are its main cause, is strong. The Intergovernmental Panel on Climate Change highlights that we are already experiencing the effects of climate change and if these changes deepen and intensify, as they are predicted to do without the right responses locally and globally, we will see even more extreme impacts.

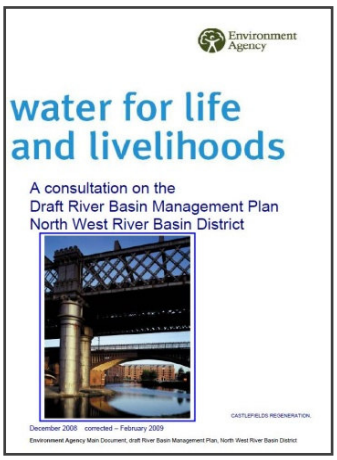
One of the predicted impacts of climate change is more intense periods of rainfall and consequent flooding. The PPS1 supplement requires Regional Spatial Strategies and Local Development Frameworks to shape sustainable communities that are resilient to such effects.

A key objective of the planning system is securing new development and shaping places that minimise vulnerability and provide resilience to climate change in ways that are consistent with social cohesion and inclusion. Accordingly new development should be planned to minimise future vulnerability in a changing climate. The SFRA incorporates Sequential and Exception Test information that is essential in meeting the objectives of the PPS1 supplement Planning and Climate Change.

Planning Policy 12 (PPS12) Local Spatial Planning advocates the importance of considering flooding when local authorities are preparing their development documents. The SFRA provides the evidence on flood risk to feed in the application of LDF and adopted proposals maps.

Whilst not directly relevant to the development of an SFRA, it is important to recognise that the exercise takes place within the context of other planning policy guidance and statements, some of which also require sequential testing of site allocations and development proposals. PPS3 (Housing), emerging PPS4 (Planning for Sustainable Economic Development) and PPS6 (Planning for Town Centres) are intrinsic within the planning process and, therefore, an understanding of the constraints faced as a result of this additional policy guidance is required.

North West River Basin Management Plan



In accordance with the Water Framework Directive (WFD), implemented in December 2000, a River Basin Management Plan (RBMP) must be produced for each of the 11 River Basin Districts by 2009. The Environment Agency state that:

"RBMPs will have a number of functions, but are primarily intended:

To establish a strategic plan for the long term management of the River Basin District.

To set out objectives for waterbodies and in broad terms what measures are planned to meet these objectives

Act as the main reporting mechanism to the European Commission"

A draft RBMP for the North West was prepared in December 2008 and is currently out for consultation until June 2009.

According to the draft plan it ***"focuses on achieving the protection, improvement and sustainable use of the water environment - surface freshwaters (including lakes, streams and rivers), groundwater, and ecosystems such as some wetlands that depend on groundwater, estuaries and coastal waters out to one nautical mile."***

The main actions proposed in Annex C relevant to this SFRA include:

"A commitment to deliver Catchment Flood Management Plans (CFMPs) to identify and agree policies for sustainable flood risk management for the next 100 years. By employing sympathetic flood risk management, such as that done at Long Preston Deeps in the Ribble catchment, opportunities to enhance sites either designated for their conservation status or to help restore more natural flows to river systems can be created.

Working closely with partners to deliver Shoreline Management Plans (SMPs) to manage the current and future flood risk to the North West coast lines.

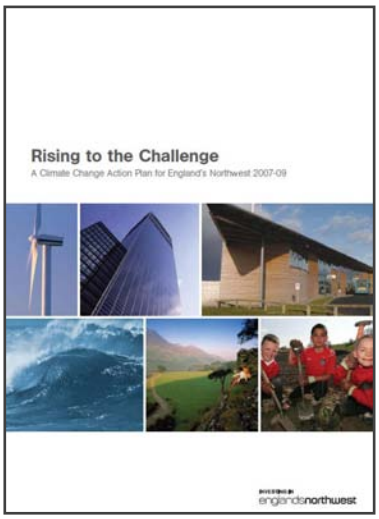
Our inputs to the Local Development Framework will ensure that Water Cycle strategies are incorporated in major planning initiatives. We shall continue to influence planners and developers to incorporate sustainable water use in construction/maintenance projects and also follow the Code for Sustainable Homes.

More use of sustainable drainage systems in new developments.

Local Development Frameworks should include policies that address the potential impacts of proposed levels of development to water resources, water quality, biodiversity, river restoration, green infrastructure, contaminated land and managing surface water and flood risk.[23]***"***

Climate Change Action Plan for the North West

In 2006, the North West Development Agency (NWDA) launched the regions Climate Change Action Plan "Rising to the challenge: A Climate Change Action Plan for England's North West".



The Action Plan sets out the North West's vision and outlines the associated outcomes to be achieved by 2020. In order to achieve these outcomes, the plan recognises that it must focus on twin objectives of reducing regional greenhouse gas emissions and more importantly to this SFRA, adapting to those effects of climate change that are now unavoidable. One of the unavoidable effects of climate change is its impact on flood risk.

Flood risk related climate change issues are extremely important to the future management of flood risk in the UK and beyond. These issues need to be taken seriously and mitigation and adaptation measures planned and adopted by Regional and Local Authorities.

Principle adverse flood risk effects of climate change threatening people and property include:

- More frequent and intense rainfall events causing flash flooding to low lying areas
- More and faster surface water runoff and overland flows causing sewers, drains, rivers and streams to overflow
- Increased sea level rise, storminess and frequency of storm surges threatening low lying coastal communities
- Rising groundwater levels causing increased spring source activity and higher spring flows, increasing the risk of flooding

If not addressed, these effects are likely to have a significant impact on many communities and in particular new developments in areas at high risk of flooding. Recent climate change trends are contained within a UK Climate Impacts Programme document: "The Climate of the United Kingdom and Recent Trends", which was published in December 2007. The next UKCIP09 report, that will include revised climate change predictions, is planned for launch in late 2009.

In recognition of the Governments' increasing concerns about the effects of climate change on flood risk management, Defra produced a "Supplementary Note to Operating Authorities – Climate Change Impacts" in October 2006 in which they updated the climate change policy for flood and coastal management. This document is available on the Defra website. In conjunction with Defra, CLG then provided the recommended climate change contingency allowances for sea level rise and precautionary sensitivity ranges for peak rainfall intensities and peak river flows etc. in Annex B of PPS25. These figures should be used in all aspects of flood risk management including the consideration of new developments and changes of land use in flood risk areas.

RFRA – 4 North West

The North West Regional Flood Risk Appraisal was prepared in October 2008 for 4NW, which is the Regional Planning Body in the North West.

[23] Environment Agency (2008) A Consultation on the Draft River Basin Management Plan North West River Basin District

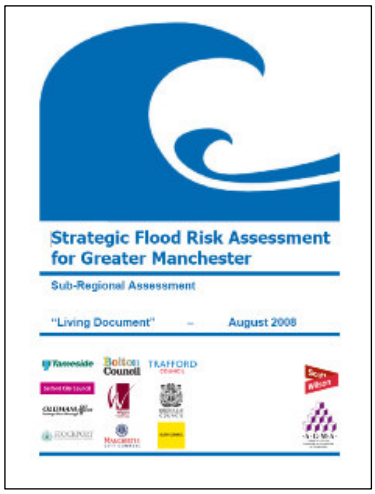
The primary objective of a Regional Flood Risk Appraisal (RFRA) is to provide an appraisal of strategically significant flood risk issues in a region in order to guide strategic planning decisions.

The RFRA assists decisions on key land use factors such as the need for employment, inward investment, re-generation, provision of housing and open/green space, major road and other infrastructure development provision to deliver sustainable growth whilst taking full account of flood risks, now and in the future. The appraisal should also assist local authority planners in their consideration and implementation of land use policies in Local Development Frameworks (LDFs) and Local Development Documents (LDDs). In addition, it provides important strategic flood risk input to the Regional Sustainability Appraisal (RSA) and the Strategic Environmental Assessment (SEA).

The outputs of the RFRA help to identify where there may be a need for further flood risk assessment work to be undertaken, particularly in respect of Strategic Flood Risk Assessments (SFRAs) and where strategically significant developments are proposed in areas currently at risk of flooding. Even where SFRAs already exist, the RFRA helps to place specific local authority flood risks into a regional context, showing the variation of risk and the interdependency between neighbouring authorities and river sub-catchments. Flooding does not respect local authority administrative boundaries and the RFRA provides a mechanism to help local authorities work better together, and with key stakeholders, to consider, communicate and share common or similar flood risk management policy objectives, opportunities and constraints.

The RFRA assessed significant flood risk by:

- Undertaking a survey of local authorities to gauge their broad assessment of flood risk issues
- Reporting on the work undertaken by the Environment Agency to evaluate the potential impact of fluvial and coastal flooding
- Assessing any potential flood risk implications related to regionally significant economic development
- Considering other sources of flooding, such as sewers and groundwater
- Considering the potential impacts of climate change



AGMA SFRA

The Greater Manchester sub-regional SFRA was published in August 2008 on behalf of the Association of Greater Manchester Authorities (AGMA). The main objective of the SFRA was to ***"bring together existing information and identify where further, more detailed assessments are required."***

The SFRA looks into flood risk issues across the AGMA area and considers linkages in the river systems between different local authority boundaries. It provides recommendations for further work in local authority SFRAs, including filling in data gaps, such as surface water flooding.

Local Planning Policy

Following the introduction of the Planning and Compulsory Purchase Act 2004, the way in which development plans are prepared is changing. 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 Emerging Local Development Framework

The UDP is currently in the process of being replaced by the Local Development Framework (LDF). The 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, DPDs) and others will be adopted as local guidance documents. LDDs can either deal with 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.

The LDF includes a Statement of Community Involvement (SCI) that describes how the local planning authority intends to carry out its public consultation arrangements. The SCI and all other DPDs will be submitted to the Secretary of State. They will be subject to an independent examination that is led by a planning inspector.

The Local Development Framework is currently being prepared. Wigan Council is currently finalising their Core Strategy following consultation on the preferred option.

Environment Agency Policy

Catchment Flood Management Plans

The SFRA area is covered by the River Douglas and Mersey Estuary CFMPs.

CFMPs investigate what factors influence flood risk at the catchment scale and will assess the impacts that climate change, land use change and urbanisation may have on flood risk over the next 50 to 100 years.

The CFMP will establish a policy framework for flood risk management across the catchment through which future flood defence management strategies and programmes will be formulated. Recognition of these strategic plans is very important to local authority planners when planning for the future and considering long term land use options for re-generation, inward investment and growth.

The CFMPs help to prioritise activities, focus resources where there is greatest need and determine what flood risk management responses need to be considered further (and which responses will not be effective). The responses to flood risk will be broader than those traditionally used for flood defence to reflect the full range of management options available. CFMPs support an integrated approach to spatial planning and river basin management, in line with the Water Framework Directive and the EU Directive on the assessment and management of flood risk; they cover all geographical areas in England and Wales and are crucial in the planning of sustainable flood risk management.

There are a number of sustainable flood risk management policies relating to the areas within Wigan, which have been identified in the SFRA. Defra has assigned a national indicator (NI

189 - Flood and coastal erosion risk management) to record the progress of local authorities in delivering agreed actions to implement long term flood and coastal erosion risk management (FCERM) plans; this includes the actions within CFMPs.

Summary

In accommodating future development in Wigan there is a range of planning policies to consider and balance on a national, regional and local level. Future development needs have been broadly specified in regional plans and are being refined on a local level in the emerging LDF.

PPS25 and its Practice Guide provides the overarching national guidance with respect to development and flood risk, emphasising the need to effectively manage flood risk within the planning system, rather than relying on reactive solutions to flooding. This includes a responsibility for LPAs to reduce flood risk to people and property as a result of new development. It also identifies the preparation of SFRAs as a key process in the understanding and management of flood risk for planning purposes.

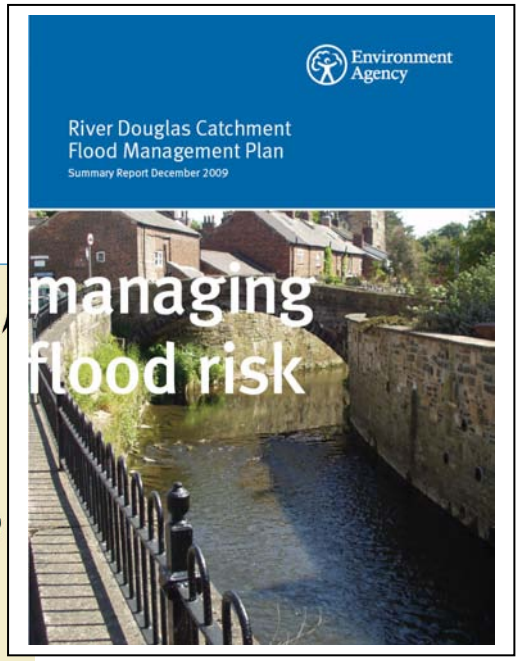
It is widely recognised that flood risk is one of a whole raft of policy constraints placed upon the local planning system. Development must facilitate the socio-economic needs of a community, and spatially must sit within an existing framework of landscape and infrastructure. For this reason, a balance must be sought between development need and the risk it may pose upon existing and future dwellers of the area as a result of flooding.

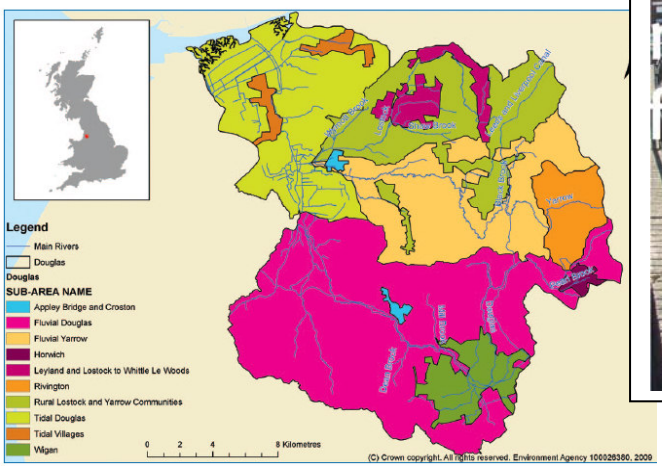
The aim of this SFRA is to provide a better understanding of flood risk in Wigan that can feed into the emerging LDF alongside the Greater Manchester Sub-Regional SFRA and North West RFRA and enable informed and balanced planning decisions to be made.

C.6 River Douglas Catchment Flood Management Plan

http://publications.environment-agency.gov.uk/pdf/GENW0309BPTQ-E-E.pdf

CFMPs, published by the EA help explain the scale and extent of flooding now and in the future, and set policies for managing flood risk within the catchment.
The Douglas CFMP area has been divided into ten distinct sub-areas that have similar physical characteristics, sources of flooding and levels of risk.





C.7 Wigan

'Wigan is the largest town in the CFMP area. There is a history of flooding in the town centre from the River Douglas and from smaller watercourses elsewhere in the town. Wigan has seen a decline in its traditional industry and parts of the town, including parts of the town centre within the floodplain of the River Douglas, have been identified as regeneration areas. The rivers in Wigan are restricted by urban development including culverts and other structures. There is a risk of flooding from surface run-off, drains and sewers. Areas at risk of flooding include places with very high social vulnerability. There are 961 properties at risk of flooding from rivers in a 1% event and the average flood depth in properties is 0.6m. Infrastructure at risk includes health centres, the law court, electricity and gas sites. Two percent of the community is at risk of flooding, although this is concentrated in particular areas including Poolstock and Scholes where the proportion is much greater. Wigan generates more than 50% of the cost of flood damage in the CFMP area. There are some raised defences in Wigan which reduce risk in smaller flood events. A scheme is proposed at Water Heyes which will reduce flood risk from the River Douglas but this would still leave 874 properties at risk of flooding in a 1% event in the future. There is a flood warning service, but uptake of this is only 37%.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

Wigan is an important residential and industrial town and parts of the town are often exposed to flooding. The proposed Water Heyes scheme will reduce some of the risk from the River Douglas but will still leave hundreds of properties at risk of flooding in the future including areas at risk from tributaries of the Douglas, culverts, drains and sewers. Our vision is to reduce the current level of risk in the future by targeting key areas. Reduction of risk from smaller watercourses will involve a range of measures which may include additional

defences, flood warning and sewer and drainage improvements. This will result in a safe environment in which people can live and work.

The key messages

- *Finalise Flood Risk Management scheme for Wigan.*
- *Continue to maintain defences and major assets.*
- *Undertake risk assessments on culverts and other flow restrictions.*
- *Minimise inappropriate development in areas at risk of flooding.*
- *Continue with flood warning programme of information and education.*
- *Proposed actions to implement the preferred policy*
- *The essential actions to achieve our policy aim are listed below:*
- *Complete Water Heyes scheme for Wigan.*
- *Undertake a risk assessment on culverts and other flow restrictions in the Wigan sub-area. Prioritise these structures for redesign, replacement or removal according to the flood risk. Relevant sites include, Ince Brook, Hawkley Brook and Smithy Brook.*
- *Develop a communication plan for reservoir maintenance and management of emergency release from Rivington reservoirs.*
- *Investigate the standard of protection provided by the existing main river network and seek to reduce flood risk in a sustainable way. This is likely to be achieved through maintenance works and targetted improvements to structures and river channels, but will consider other approaches where appropriate.*
- *River Douglas through Wigan town centre"*

C.8 Appley Bridge and Croston

"This sub-area contains two villages with similar flood risk characteristics. The village of Croston is located on the River Yarrow just upstream of its confluence with the River Lostock. Appley Bridge is located on the River Douglas and Calico Brook.

In these two villages, 450 properties are at risk in a 1% APE, 406 of them in Croston, which is one third of the properties in the village, this could rise to 417 properties in the future due to climate change. Croston floods directly from the River Yarrow and also from culverted watercourses, drains, sewers and surface runoff. Appley Bridge floods at Millbank Estate from Calico Brook, although there is some risk elsewhere in the town from the River Douglas. There are 42 properties at risk in a 1% APE, increasing to 60 in the future.

There are some flood defences on the River Yarrow in Croston which reduce risk in smaller flood events and the village may benefit from rural defences in the surrounding area. Flood risk will increase in the future although not by a large amount. The frequency of smaller flood events may increase, as the defences are likely to be overtopped more frequently.

Flooding in Appley Bridge from the tributaries is deep (0.9m), fast onset and fast flowing and poses a risk to life. Some flooding is associated with undersized culverts. There is a temporary scheme in place. Calico Brook is diverted into the East Quarry at times of high flow. This substantially reduces risk but there have been some reports of groundwater flooding which may be linked to the increased water level in the quarry. There is a flood warning service in Croston and for the River Douglas.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

Action is required to better protect these two villages from flooding now and in the future. The risk of flooding from drains, sewers and surface run-off is likely to increase due to the effects of climate change. Defences in Croston are likely to be overtopped more frequently in the future and the risk in Appley Bridge is likely to increase as the current temporary scheme reaches the end of its life.

Our vision is to reduce the current level of risk. In Croston, the reduction in flood risk is linked to the policy to increase flooding in the tidal Douglas and River Yarrow sub-areas. If additional flooding elsewhere is unable to deliver all the reduction in flood risk required, then other local measures may be needed. In Appley Bridge, we plan to reduce risk from current levels using either the current scheme or an alternative more sustainable solution.

The key messages

- ***Avoid inappropriate development in areas at risk of flooding.***
- ***Investigate alternative sustainable flood risk measures for Appley Bridge and Croston.***
- ***Continue to maintain existing defences.***
- ***Undertake risk assessments on culverts and other flow restrictions.***
- ***Continue with flood warning programme of information and education.***
- ***Proposed actions to implement the preferred policy***

The essential actions to achieve our policy aim are listed below:

- ***Carry out study for potential schemes to reduce flood risk in Croston. The study will include technical and economic investigation of a number of more local schemes which are likely to be in the Yarrow sub-area.***
- ***Investigate alternative sustainable flood risk reduction measures for Appley Bridge, including the potential for formalising the current temporary scheme or alternative solutions.***
- ***Undertake a risk assessment on culverts and other flow restrictions in the sub-area. Prioritise these structures for redesign, replacement or removal according to the flood risk.***
- ***Undertake a study to improve understanding of interaction between river flow and tide in the sub-area and their impact on flood risk. The study should make use of modelling, surveys and historical information, and determine the current and future risk in Croston from combined fluvial and tidal events.***
- ***Investigate the standard of protection provided by the existing main river network and seek to reduce flood risk in a sustainable way. This is likely to be achieved through maintenance works and targeted improvements to structures and river channels, but will consider other approaches where appropriate."***

C.9 River Douglas

The River Douglas sub-area covers the River Douglas between the outlet of Rivington Reservoir and the tidal limit at Rufford. In the rural areas, the main flood risk is from rivers. In the built-up areas, the risk is mainly associated with culverts and other flow restrictions. There is also a flood risk in the built up areas from surface run-off, drains and sewers. There are 68 rural properties at risk of flooding from rivers and there may be an additional 21 properties at risk in the future. Critical infrastructure at risk of flooding includes electricity supply sites and a water treatment works. The sub-area contributes 23% of the total agricultural damage in the CFMP area. Risk is forecast to increase in the future, with additional flooding of rural property and high grade agricultural land mostly in the Abbey/ Eller Brooks and River Tawd catchments. In the built up areas there will also be a increase in flood risk in the future associated with urban runoff and channel restrictions which may not be able to cope with the intense rainfall events which are expected to become more frequent. Flood defences in the lower part of the sub-area protect agricultural land and rural property. There is some flood risk associated with rapid releases from Rivington Reservoirs, to allow maintenance work, which may increase flood risk, particularly if they occur during a wet period. The Environment Agency is working with United Utilities to ensure any such releases do not unduly increase flood risk.

The vision and preferred policy

Policy option 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.

This sub-area covers both towns and rural areas in the Douglas Valley. With the effects of climate change, the flood risk will increase particularly in the urban areas (21 additional properties at risk of flooding from rivers). Our vision for this sub-area is that we will take targeted action as needed. The increase in risk may be scattered around the sub-area and may require a range of actions. Maintenance of defences, channels, structures and the urban drainage network will continue. We may consider improved land management (including targeted flooding of additional areas, if appropriate), flood resilience in properties or localised defences and flood warning. In built-up areas, measures could include improvements to the urban drainage network, increased channel and structure maintenance and opening up channels where restrictions are leading to flooding. There may be a reduction of risk in the downstream part of this sub-area as a consequence of our actions in the River Yarrow and tidal Douglas sub-areas.

The key messages

- ***Continue to maintain defences and major assets.***
- ***Undertake risk assessments on culverts and other flow restrictions.***
- ***Investigate alternative actions to manage flood risk at the current level in the future.***
- ***Avoid inappropriate development in areas at risk from flooding.***
- ***Continue with flood warning programme of information and education***
- ***Proposed actions to implement the preferred policy***

The essential actions to achieve our policy aim are listed below:

- ***Develop a communication plan for reservoir maintenance and management of emergency release from Rivington reservoirs.***
- ***Undertake a risk assessment on culverts and other flow restrictions in the sub-area. Prioritise these structures for redesign, replacement or removal according to the flood risk. Relevant sites include the River Tawd and Abbey Brook.***
- ***Investigate the standard of protection provided by the existing main river network and seek to reduce flood risk in a sustainable way. This is likely to be achieved through maintenance works and targeted improvements to structures and river channels, but will consider other approaches where appropriate.***
- ***Encourage partner organisations to collaborate to produce Surface Water Management Plan to better manage flooding in key urban locations such as Skelmersdale, Burscough, Parbold and Standish.***

C.10 Rural Lostock and Yarrow Communities

"This sub-area includes the town of Chorley and the smaller communities of Euxton, Eccleston, Heskin Green and Wrightington Bar on the River Yarrow catchment and the rural area of the River Lostock and its tributaries upstream of its confluence with the Yarrow.

In total there are 22 properties at risk in a 1% APE. Current flood risk is low and future changes (by 2100) in flood risk are likely to be small (3-4 properties).

Chorley has a history of flooding from surface water. The town is located on the side of a hill and water flows down to the River Chor in the valley. The river is culverted and surface flow ponds behind restrictions, including the railway embankment. Flood risk will increase in the future, particularly associated with urban drainage.

In the rural areas of the Lostock, eight properties are at risk from river flooding. Some defences are in place, mostly to protect agricultural land.

The vision and preferred policy

Policy option 3: Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.

The routine and reactive maintenance work which we and our partners (including the local authority, United Utilities and Network Rail) carry out plays a key role in managing flood risk in this sub-area. The current level of maintenance work however in the rural areas of the Lostock is low. Our vision is to continue with this work to manage risk at the current level. We may consider alternative more sustainable measures if appropriate. If further work identifies that the defences do not have a significant impact on flood risk in Croston, we may then consider alternative more sustainable measures in the rural areas. We will achieve this vision under our preferred approach of policy three.

The key messages

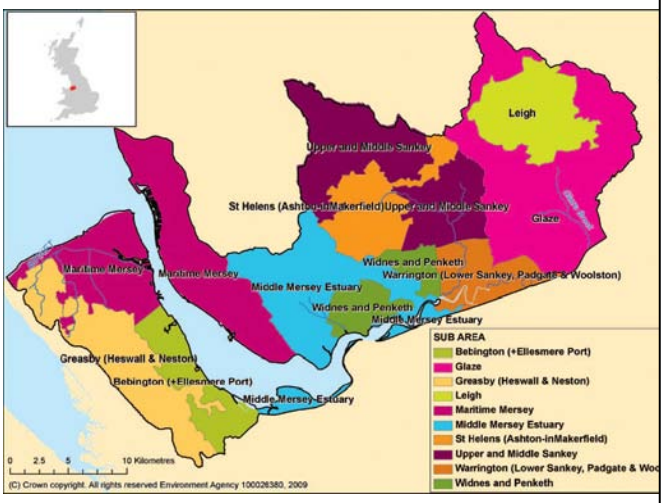
- ***Continue to maintain our existing assets.***
- ***Investigate and address the causes of urban drainage flooding.***
- ***Undertake risk assessments on culverts and other flow restrictions.***
- ***Improve understanding of interaction between river flow and the tide in the downstream parts of the sub-area.***
- ***Investigate alternative actions to maintain risk at the current level in the future.***
- ***Avoid inappropriate development in areas at risk of flooding.***
- ***Proposed actions to implement the preferred policy***

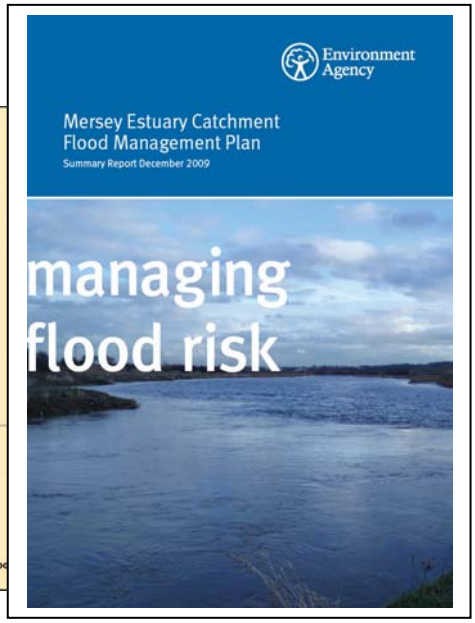
The essential actions to achieve our policy aim are listed below:

- ***Undertake a risk assessment on culverts and other flow restrictions in the sub-area. Prioritise these structures for redesign, replacement or removal according to the flood risk. This includes the River Chor in Chorley.***
- ***Investigate the standard of protection provided by the existing main river network and seek to reduce flood risk in a sustainable way. This is likely to be achieved through maintenance works and targeted improvements to structures and river channels, but will consider other approaches where appropriate.***
- ***Work in partnership with the local authority and United Utilities to address sewer and local surface water flooding and promote joint solutions where surface water and sewer flooding is known to exist.***
- ***Develop a communication plan for reservoir maintenance and management of emergency release from Rivington reservoirs.***
- ***Undertake a study to improve understanding of interaction between river flow and tide in the downstream parts of the sub-area and their impact on flood risk. Determine current and future risk to property and high grade agricultural land from combined events.***
- ***Investigate opportunities to remove or realign embankments, create flood storage areas or other alternative means of flood risk management. Changes in land use may provide flood risk benefits and create habitat."***

C.11 Mersey Estuary Catchment Flood Management Plan

http://publications.environment-agency.gov.uk/pdf/GENW0309BPKS-E-E.pdf





C.12 Glaze

"This sub-area is one of the largest in the Mersey Estuary CFMP area. It covers most of the lower reaches of the River Glaze catchment, and is connected to the uppermost reaches by a narrow rural corridor to the west of Abram. This area is mainly low risk but includes the communities of Golborne, Culcheth, Worsley and Boothstown, which generally have little or no flood risk. It includes the environmentally designated SSSI sites of Abram Flashes, Astley and Bedford Mosses, Risley Moss, Rixton Clay Pits and Holcroft Moss.

Approximately 190 properties are at risk of flooding in the 1% annual probability event. Key infrastructure at risk includes one waste management site, one power station, two sewage and water treatment plants. There is also approximately 5.5km of rail and road network at risk. Parts of the Abram Flashes SSSI are also at risk of flooding, together with two pollution inventory sites. Sewer flooding is an issue in Golborne and Worsley.

The vision and preferred policy

Policy option 2: Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.

Overall flood risk is considered to be low in this sub-area. Future changes in flooding will be driven by climate change resulting in increases in properties at risk and economic damages. Our vision is to reduce existing flood risk management actions, accepting that flood risk will increase with time. We estimate by 2100, 230 properties will be at risk in a 1% annual probability event (APE).

The key messages

- ***Future flood risk management will be targeted at areas that are economically justifiable; this may mean a reduction of maintenance in some low risk areas.***
- ***Future development should avoid flood risk areas.***

- *The wetland nature of the environmentally designated sites at Astley, Bedford, Risley and Holcroft Mosses could withstand increased inundation which may lead to enhancement / creation of further Bio-diversity Action Plan (BAP) habitat.*
- *Proposed actions to implement the preferred policy*

The essential actions to achieve our policy aim are listed below:

- *To develop a maintenance plan for the area that will identify locations where it is sensible to reduce our existing level of maintenance, this will include Jennets Lane Pumping Station.*
- *To investigate the potential for flood storage in rural areas to reduce flood risk in the urban area of Leigh.*
- *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."*

C.13 Leigh

"This sub-area covers the largely urbanised upper reaches of the River Glaze and includes the towns of Hindley, Atherton, Tyldesley, Westhoughton, Leigh and Abram. Approximately 2000 properties are currently at risk from a 1% annual probability event, which represents 9% of the total properties at risk within the CFMP area. Notably 17 community assets, comprising of schools, colleges, surgeries, health centres, residential homes, and six recreational sites in the area of Hindley, are at risk. Six kilometres of transport infrastructure is also at risk. Sewer flooding is an issue in Astley, Atherton, Leigh, Hindley, Westhoughton and Abram.

Flood risk is currently managed through routine maintenance, and the Lilford Park flood alleviation basin and associated sluice gates on Penleach Brook. In this sub-area, mining has led to widespread subsidence, most notably the formation of Pennington Flash Reservoir in Leigh. Bedford and Pennington pumping stations help to drain areas affected by mining subsidence. The key flood warning areas are Bedford and Lilford in Leigh. There are no environmentally designated sites in this area.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

It is recognised that flood risk is currently very high in this sub-area and is expected to rise due to increased urbanisation and climate change. By 2100 we estimate 2,300 properties will be at risk of flooding in a 1% APE. Our vision is to take further action to reduce flood risk now and into the future.

The key messages

- *Flood risk is currently very high. Reducing the level of flood risk will provide greater protection to people and the economy. Hindley and Leigh will require specific attention for actions.*
- *Future development should avoid flood risk areas.*
- *To engage with Local Resilience Forums to improve our understanding of flood risk, then take appropriate action to reduce this risk.*
- *To investigate sewer flooding and implement improvement schemes to deal with drainage issues identified on the United Utilities sewer flooding register.*
- *Proposed actions to implement the preferred policy*

The essential actions to achieve our policy aim are listed below:

- *Develop a Flood Risk Management Strategy for the Glaze catchment.*
- *Encourage and assist the Regional Assembly and Local Planning Authorities to produce Regional and Strategic Flood Risk Assessments to inform future development. Look to minimise flood risk from all sources.*

- ***Seek to ensure that where, exceptionally, development must take place in flood risk areas, flood resilience is incorporated into buildings and safe access and evacuation can be provided during flooding.***
- ***Encourage the use of sustainable drainage systems (SUDS) to control run-off at source.***
- ***Investigate methods to provide protection or resilience to key infrastructure.***
- ***Review and update the Sankey and Glaze Flood Warning Management Plan to consider the impact of climate change and urban development."***

D . Stakeholder Engagement and Data Management

D.1 Introduction

The majority of data provided in both the SFRA has been obtained through consultation with those stakeholders with specific interest in or knowledge of sources of flooding within the study area.

PPS25 outlines a number of key consultees to the planning process. Stakeholders and their involvement within the preparation of the SFRA are discussed in Table D-1.

Table D-1: Stakeholder Involvement

Stakeholder	Involvement
LPA	Wigan Council was the main stakeholder for the preparation of this SFRA. They focused the scope of the SFRA and provided the detail needed for its production. An initial SFRA meeting was held to discuss the requirements of PPS25 in producing the SFRA and to determine the main tasks that needed to be completed. The meeting also outlined the council's own timetable relating to preparing an evidence base for their LDF process. There have been regular progress meetings outlining progress to date and further data requests. A member of the Environment Agency has always been present to inform the decision making process.
Environment Agency	The Environment Agency is a statutory consultee for LDDs, Sustainability Appraisals and Strategic Environmental Assessments. They are also a statutory consultee for planning applications. With regards to the SFRA, the Environment Agency has discretionary powers under the Water Resources Act (1991) to manage flood risk and, as a result, hold the majority of flood risk data in the UK. Separate departments were consulted via the External Relations Team including Development Management, Flood Risk Mapping and Data Management and Reservoir Safety Teams on the SFRA approach and available data. The Environment Agency was also one of the main consultees throughout the preparation of the SFRA and their comments and guidance have been included within report revisions.
United Utilities	The main source of information requested from United Utilities was DG5 records, location of drainage areas and sewers networks. United Utilities sewer network data was not made available. The council should continue to liaise with United Utilities in conjunction with the Environment Agency and the wider Greater Manchester Authorities to explore how they can contribute to the understanding of flood risk now or in the future.
British Waterways	Flood risk from British Waterways Canals was highlighted in the Greater Manchester sub-regional SFRA as a major source of residual risk as flooding has been known to occur, but information on the risk is relatively unknown. An initial meeting was held between British Waterways and a Chartered Engineer from JBA to discuss the risk associated with canals. British Waterways supplied very helpful information including historical flood locations, the location of critical embankments and overflow structures. This information shaped the methodology of assessing flood risk from canals discussed in the SFRA.

D.2 SFRA Data Management

The SFRA should be viewed as a 'living' document for use in the day-to-day process of planning and development. It is therefore important that datasets collected for the SFRA are transparent and accessible. A Data Register has been produced and supplied to the individual Councils listing all data received throughout the SFRA process.

All data was reviewed on receipt and its quality and confidence rated for use in the SFRA. This process was purely based on professional judgement and rated on a high to low scale.

Most data requested was of the quality and accuracy expected. Whilst the majority of the datasets could be mapped geographically using Geographic Information Systems (GIS), helping to visualise the risk of flooding, others were not, reducing the quality score. Historical flooding information was generally marked as both medium quality and confidence, as whilst it could be placed on a map, there was generally information on the source of flooding. The confidence in its precision was also questionable, as expected for historical flood records.

The Data Register will allow intended users of the SFRA to review the accuracy, currency and relevance of all datasets used and for a central group to manage and update datasets when needed. The Data Register also provides details of contacts who supplied the data. The organisations listed should be the first contact for any update to the SFRA to make sure the most up-to-date datasets are used.

D.3 Supplying SFRA Data

Whilst all data collected and produced during the SFRA process has been supplied to each LPA (report, maps, GIS, modelled output, data register) there should be controls on its use. It is anticipated that the SFRA report and associated maps will be published on the Council website as PDFs as the central source of SFRA data and available to download.

The LPA will be able to use the modelled output (depths, hazards and outlines) for internal use. This use of this information must consider the context within which it was produced. The use of this data will fall under the license agreement between the LPA and the Environment Agency as it has been produced using Environment Agency data. It should be remembered that the modelling undertaken for the SFRA is of a strategic nature and more detailed FRAs should seek to refine the understanding of flood risk from all sources to any particular site.

SFRA data should not be passed on to third parties outside of the LPA. Any third party wishing to use existing Environment Agency flood risk datasets should contact External Relations in the Environment Agency North West Region. A charge is likely to apply for the use of this data.

E . Flood Risk Zones

Appendix E provides Flood Zone categorisations in accordance with PPS 25 and the EA's Flood Zone Maps. The EA maps provide an indication of the likely extent of flooding in the absence of flood defences. The flood limiting impact of defences can be determined with reference to the "Areas Benefiting from Defences" mapping. In Wigan, existing defences generally assist in managing flood water to a 2% or 2.5% AEP event scenario.

The EA do not have any detailed mapping that defines areas of functional floodplain (Zone 3b). The SFRA includes mapping of potential FZ3b areas (and associated hazard mapping data) **in the absence of defences**. Flood mapping of a potential 5% AEP event, in the absence of defences is included as drawing number D001_010a. All other mapping includes for the presence of flood defences in accordance with the design maintenance outlined in the EA NFCDD database.

Inspection of the defence asset data provided by the EA indicates that the majority of watercourses within the Wigan area are defended to some extent in excess of the 5% AEP criteria. It should be noted that issues such as structural integrity of these defences, variations in crest levels and levels of maintenance have not been considered as part of the SFRA.

Areas of low-lying land behind defences, which are defended to a level in excess of the 5% AEP criteria, have been classified as FZ3. The FZ3 categorisation allows the Council to considered development proposals within existing defended areas. Residual risks associated with proposed development, located behind defences, needs to be considered in detail as these risks are potentially significant due to the rate and depth of inundation if a defence were to fail.

Inspection of the mapping including "Areas Benefiting from Defences" indicates that the maximum extent of Flood Zone 3 is not influenced, to any significant extent, by the presence of existing defences.

Similarly the EA do not have flood zone outlines that including the impact of climate change. Climate change outlines, including a 20% increase in design flows have been developed for this SFRA using strategic mapping techniques. Where more detailed modelling results exist, climate change scenarios including a 50% increase in design flow rates have also been included as a means of demonstrating the impact on the likely extent of flooding in the absence of any defences.

E.1 Flood Zone Definitions from PPS25

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.

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] are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 (of PPS25 and Table F-1 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.

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 F-1 of this report) are appropriate in this zone.
The highly vulnerable uses listed in Table D.2 (of PPS25 and Table F-1 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 F-1 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.

Zone 3 with climate change: 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%), plus a climate change sensitivity allowance as outlined in Table B.2 of Annex B of PPS25, in any given year. Appropriate uses The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table F-1 of this report) are appropriate in this zone. The highly vulnerable uses listed in Table D.2 (of PPS25 and Table F-1 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 F-1 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 3 Plus Additional Climate Change: 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%), plus an additional climate change sensitivity allowance, giving a 1 in 150 or greater annual probability flood.

Appropriate uses
The water-compatible and less vulnerable uses of land listed in Table D.2 (of PPS25 and Table F-1 of this report) are appropriate in this zone.
The highly vulnerable uses listed in Table D.2 (of PPS25 and Table F-1 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 F-1 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.

Zone 3b: The Functional Floodplain

Definition
This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (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, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

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 designate 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.

F . Flood Risk Vulnerability Classification

Flood risk vulnerability classifications are provided in Table D.2 of PPS25. These provide recognition that not all land uses have the same vulnerability to flooding. Some land uses such as residential developments are more vulnerable to the potential loss of life and damage to personal property and possessions than say shops and offices. Five flood risk vulnerability classifications are contained in PPS25 and these are:

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development

Flood Zone 1 – Low Probability

From a flood risk perspective all land uses are acceptable within Flood Zone 1. Flood risk is not considered to be a significant constraint to development and all land uses listed below are appropriate in this zone.

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development.

A Screening Study, as per PPS25 Practice Guide, will be required for development in this zone. This will determine whether further assessment of flood risk is required. This will take account of historical flood records of localised flooding, site specific considerations and the surface water proposals for the development, including mitigation.

However, due to their potential impact on the local flood risk, a full FRA will be required for all developments greater than 1ha in size. This will include further consideration of surface water drainage and onsite mitigation measures that may be required, particularly where the capacity of the surface water sewer or receiving watercourse is limited. This assessment will be undertaken by the developer of the site and should be appropriate to the scale, nature and location of the development. The Council's Drainage Engineers and the EA will be able to advise potential developers as to their specific requirements on a site by site basis.

Flood Zone 2 – Medium Probability

Subject to the application of the Sequential Flood Risk Test, PPS25 specifies suitable types of development in Flood Zone 2 as:

- Essential infrastructure
- More vulnerable
- Less vulnerable
- Water compatible development.

Highly vulnerable uses should only be permitted in this zone if the Exception Test is passed. The SFRA is unable to assess whether the site will pass parts a. and b. of the Exception Test. However, the Council must be able to demonstrate the need for development through the spatial planning process.

An FRA will be required for all development in this zone. The FRA will need to assess the current level of flood risk as well as the level of flood risk following development. Development plans for the site will need to demonstrate that flood risk can be effectively and safely managed without increasing flood risk elsewhere.

Proposals will also need to demonstrate that access and egress to the development can be maintained during an extreme flood event and that development is set at an appropriate level. A further level of analysis may be required where development is planned behind or adjacent to existing defences in order to test the sustainability and robustness of the mitigation measures. In keeping with Flood Zone 1 other flood risk constraints, such as incidents of localised flooding and other site-specific considerations will need to be addressed. Again, detailed FRAs will be undertaken by the developer of the site and the EA will be able to advise potential developers as to their specific requirements on a site by site basis. The FRA will need to address part c of the Exceptions Test and should only be commenced when the planning justification is clearly established.

Flood Zone 3 – High Probability

A Sequential Flood Risk Test is used to prioritise sites in order of vulnerability to flood risk and their acceptability for development. Developers should primarily focus on lower Flood Zones in preference to Flood Zone 3. Any proposals for development within Flood Zone 3 will require developers to undertake a detailed FRA. It should be noted that constraints to development are likely to be significant and developers should seek advice from the Council and the EA as to the specific requirements for assessment.

Flood Zone 3 is subdivided into Zones 3a and 3b. Flood Zone 3b is the portion of floodplain that provides natural and/or managed attenuation. It can be all or part of the flow area and owing to the frequency of inundation, Zone 3b areas are considered to be Functional Floodplain. Urban areas are generally considered to be Zone 3a, so for the purpose of this SFRA, Brownfield sites will be assumed Zone 3a.

Zone 3a is potentially suitable for water-compatible and less vulnerable land uses. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Highly vulnerable development should not be permitted in this zone.

In Zone 3b, only essential infrastructure (subject to Exception Testing) and water-compatible uses may be permitted. Where sites are partially located within Flood Zone 3b, it is recommended that Council should avoid development by specifying water-compatible uses or public open space for these areas.

Land use vulnerability classifications and flood zones are carried forward into Table D.3 for application of the Exception Test.

Proposed Updates to PPS25 Practice Guide Vulnerability Classification

On 11 August 2009, CLG published a Consultation Paper on proposed amendments to PPS25. The consultation relates to proposed clarifications to some aspects of the existing national spatial planning policy on development and flood risk, to help ensure the policy is applied effectively. The consultation process is due to end in November 2009.

There are four amendments proposed in Table F-1 including:

5. Moving water treatment and sewage treatment works from 'less vulnerable' to 'essential infrastructure'. This means they will now need to pass the Exception Test if planned in Flood Zone 3a rather than just Flood Zone 3b. As usual, they will have to be designed to the appropriate uses and policy aims within Table F-1
6. Allowing police, ambulance and fire stations to be defined as 'less vulnerable' only if they are not required to be operational during flooding. This will stop the exclusion of new emergency services facilities from communities they service in high flood risk areas.
7. To allow facilities requiring hazardous substances consent, which are required to be located in flood risk areas, due to their need to be co-located with other facilities (i.e. the need to be located near ports, or processed or manufactured facilities) to be defined as 'essential infrastructure' rather than 'highly vulnerable'
8. Adding wind turbines to the 'essential infrastructure' category. However, in keeping with PPS25, the Sequential Test is not required but Parts A) and C) of the Exception Test would need to be passed if located in Flood Zone 3a and 3b.

Until the proposed changes have been agreed and PPS25 updated, the current PPS25 (2006) and its Practice Guide (2008) should be used for planning policy guidance, but users should be aware of possible future changes.

Table F-1: Land Use Classifications

Classification	Description
Essential Infrastructure	• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk and strategic utility infrastructure, including electricity generating power stations and grid and primary substations. • 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 (1)
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. (2) • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan
Less Vulnerable	• 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 plants. • Sewage treatment plants (if adequate pollution control measures 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. • 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.

Note 1: This classification is based on advice from the Environment Agency on the flood risks to people and the need of some uses to keep functioning during flooding.
Note 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 sensitivity.
(1)DETA Circular 04/00 – para. 18: Planning controls for hazardous substances.
(2)See Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10 for definition.

G . Sustainable Drainage Systems

G.1 Assessment of the Application of SUDS

Sustainable Drainage Systems (SUDS) are management practices which enable surface water to be drained in a more sustainable manner.

For Greenfield developments, the aim is to not increase runoff from the undeveloped situation; for Brownfield re-developments, the aim is to reduce existing runoff rates. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention systems, constructed within the boundaries of the development site.

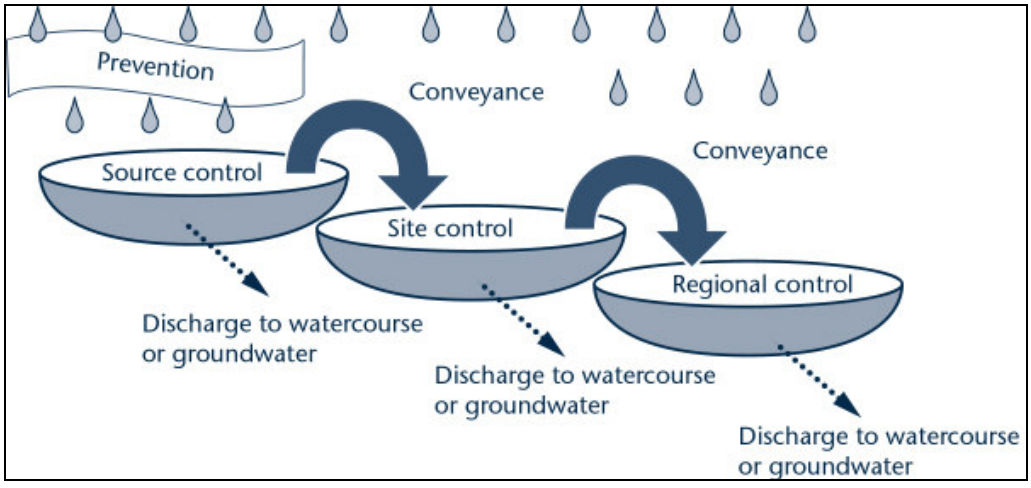
There are many different SUDS techniques. As a result, there is no one correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle, will be required. Figure G-1 shows the SUDS Management Train principle where source control is the primary aim.

Just as in a natural catchment, drainage techniques can be used in series to change the flow and quality characteristics of the runoff in stages. The management train starts with **prevention**, for individual premises, and progresses through local **source controls** to larger downstream **site and regional controls**. Runoff need not pass through all the stages in the management train. It could flow straight to a site control, but as a general principle it is better to deal with runoff locally, returning the water to the natural drainage system as near to the source as possible. Only if the water cannot be managed on site should it be conveyed elsewhere. This may be due to the water requiring additional treatment before disposal or the quantities of runoff generated being greater than the capacity of the natural drainage system at that point. Excess flows would therefore need to be routed off site.

The design of SUDS will require active decisions between different options, often depending on the risks associated with each course of action. The risks of an area flooding have to be balanced with the costs of protecting the area from different levels of floods.

The management train concept promotes division of the area to be drained into **sub-catchments** with different drainage characteristics and land uses, each with its own drainage strategy. Dealing with the water locally not only reduces the quantity that has to be managed at any one point, but also reduces the need for conveying the water off the site.

Figure G-1: SUDS Management Train Principle[21]



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

SUDS can reduce the amount and rate of runoff by a combination of: Infiltration, Storage, and Conveyance

There are a number of SUDS techniques which may be. However their suitability relies on site conditions, such as permeability and ground water levels, as summarised in Table G-1.

Table G-1: Suitability of SUDS Techniques

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

PPS25 stresses that Local Planning Authorities (LPAs) should:

- Promote the use of SUDS for the management of run-off
- Ensure their policies and decisions on applications support and complement the Building Regulations on sustainable rainwater drainage, giving priority to infiltration over first watercourses then sewers
- Adopt policies for incorporating SUDS requirements in Local Development Documents
- Encourage developers to utilise SUDS wherever practicable, if necessary through the use of appropriate planning conditions
- Develop joint strategies with sewerage undertakers and the Environment Agency to further encourage the use of SUDS

The Wigan SFRA includes a SUDS site suitability table for each identified development site. This information should be treated with caution. Its inclusion does not negate the need for site-specific investigations as to the suitability of SUDS within a development site.

G.2 SUDS Guidance

For further information on the design of SUDS see CIRIA publications (**www.ciria.org**):

- Interim Code of Practice for SUDS
- C521 : SUDS design manual for Scotland and N. Ireland (2000)
- C522 : SUDS design manual for England and Wales (2000)
- C523 : SUDS - best practice Manual (2001)
- C582 : SUDS - Source control using constructed pervious surfaces (2002)
- C609 : SUDS - hydraulic, structural and water quality advice (2004)
- C625 : Model Agreements for SUDS (2004)
- C697 : The SUDS Manual (2007)
- C698 : Site Handbook for the Construction of SUDS (2007)

It is expected that further national guidance on SUDS standards will be release next year.

G.3 Drainage for new developments

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure. It should be borne in mind that the sewer network in places across

the Wigan area were designed to drain less development than exists today. Development has added flow over time and the network is known to be at capacity in many places.

Controlling surface water discharges from new development is a crucial consideration if flood risk to new and existing development is to be effectively managed. Planned development can also play a role in reducing the number 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 plan their investment on a five year rolling cycle, in consultation with key partners, including the Environment Agency.

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 the LPA (including Highways and Drainage), United Utilities and the Environment Agency.

The developer should liaise closely with the local authority drainage engineer, the Environment Agency and United Utilities to determine appropriate discharge rates. The developer should prove that surface water discharges from the site will not have an adverse impact on flood risk elsewhere, with reference to investment planning by United Utilities that may increase the capacity of the sewer network in the area.

The Council have made clear its approach to surface water management. All proposals for development must consider how surface water will be effectively controlled, and also propose SUDS techniques to fully attenuate surface water generated on the development site. The aim of this approach is to prevent any increase in surface water discharge to receiving watercourses or drainage infrastructure and prevent any increase in flood risk as a result of development.

The planning system has a key role to play in settings standards for SUDS from new developments and ensuring that developments are designed to take account of the risk from surface water flooding. Sustainable drainage and the use of SUDS is supported by the policy direction in Future Water[24], Making Space for Water[25], the Pitt Review[26] and the Flood and Water Management Act[27] 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 where practical, to include sustainable drainage in new developments to reduce flood risk and improve water quality. It includes '***a requirement on developers to demonstrate that they have met national standards for the application of SUDS techniques before they can connect any residual surface water drainage to a public sewer (amending section 106 of the Water Industry Act 1991).***' 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.

Recognising 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

[24] Defra (2008) ***Future Water***
[25] Defra, Department for Transport, HM Treasury and Office of the Deputy Prime Minister (2005) ***Making Space for water: Taking forward a new Government strategy for flood and coastal erosion risk management in England; First Government response to the autumn 2004 Making space for water consultation exercise***
[26] The Pitt Review (2008) ***Learning lessons from the 2007 floods***
[27] Defra (2010) ***Flood and Water Management Act*** © Crown Copyright

The choice of system will be determined by local ground conditions (including groundwater levels). Whilst infiltration SUDS may be the most suitable for new development, developers must consider the risk of contamination to underlying aquifers

Local flood risk management will be an important responsibility for local authorities in the future, which includes managing the risk of flooding from surface water, groundwater and ordinary watercourses. Many of the localised flooding problems can be related to local watercourses that have been culverted as past development has taken place. The condition and standard of protection of these watercourses are unknown but they can be a significant source of flood risk. Flooding in the urban environment is difficult to separate into distinct sources and in reality surface water flooding will be from a combination of overland flows, sewers and highways gullies backing up and surcharging at manholes, local watercourses overtopping, culverts surcharging and potentially high groundwater levels. This is one reason why it is important for one body (the local authority) to take the lead in local FRM delivery.

G.4 Suitability of Sites for Infiltration/SUDs

The potential suitability of sites identified in this SFRA, in terms of infiltration/SUDs, has been categorised as being at high, medium or low suitability. This designation is based on typical soil types/maps and no detailed site assessment or ground investigation has been undertaken as part of the SFRA.

The suitability of ground conditions including, for example, seasonal groundwater levels and soil permeability will need to be determined prior to development.

Sites confirmed to be of low suitability will need to include sustainable solutions that do not depend on infiltration. As indicated in Annex F of PPS25, several SUDs storage alternatives may be suitable for sites where permeability is poor, and infiltration is not deemed appropriate. There include:

- Source control measures including rainwater recycling and drainage
- Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns
- Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding.

G.5 Critical Drainage Areas

Certain locations are particularly sensitive to an increase in the rate and volume of surface water runoff from new development. There are generally known local flooding problems associated with these areas. These areas have been defined as Critical Drainage Areas (CDAs) in the SFRA. Specific drainage requirements are required in these areas to help reduce local flood risk. The SFRA has designated CDAs as high flood risk areas.

These are areas with complex surface water flooding problems that would benefit from a drainage strategy, which is most effectively done in a Surface Water Management Plan.

The CDAs provided in the SFRA should be refined over time as more detailed information on flood risk and local flood management assets, including sewered catchments, becomes available.

In these areas, 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 will 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.

The Environment Agency Standing Advice allows developers to screen online for the level of flood risk assessment that is appropriate for a development with regard to the PPS25 Flood Zones. This highlights the need for a FRA in Flood Zones 2 and 3 and in Flood Zone 1 where

there are critical drainage problems. The Standing Advice notes that for developments in Flood Zone 1 FRA Guidance Note 1[28] should be followed:

'In areas where the Local Planning Authority has identified drainage problems through a Strategic Flood Risk Assessment or Surface Water Management Plan and they have indicated that a formal flood risk assessment is required'. 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 Critical Drainage Areas as defined by this SFRA should follow the guidance and standards as set out below for developments that are within any flood zone.

Development should seek to reduce existing local flooding problems and not add to them. The following guidance should be followed:

- Development should deliver Greenfield runoff on Greenfield sites up to a 1% equivalent storm event, considering climate change
- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1% equivalent storm event, considering climate change
- Development should be designed so that there is no flooding to the development in a 3.33% year event and so that there is no property flooding in a 1% (plus climate change) event

Over time, it is envisaged that local authorities will commission drainage strategies (see below) 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 the Environment Agency, United Utilities and LPA 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.

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 the LPA (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.

[28] Environment Agency. Flood Risk Assessment (FRA) Guidance Note 1, Development Greater Than 1 Hectare (ha) in Flood Zone 1 (and Critical Drainage areas less than 1ha) Can be accessed online athttp://www.environment-agency.gov.uk/static/documents/Research/FRAGuidanceNote1.pdf

H . Flood Risk Mitigation

H.1 Introduction

Throughout the risk-based sequential approach, opportunities should be taken to minimise flood risk at every stage of the planning process. Mitigation measures should be seen as a last resort to address flood risk issues.

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

The minimum acceptable standard of protection against flooding for new property within flood risk areas is the 1% AEP flood event for fluvial flooding, including allowance for climate change over the lifetime of the development.

H.2 Strategic Approach

Mitigation measures should be considered on a strategic basis to avoid a piecemeal approach and partnership is advocated between the LPA and EA. Measures should also be integrated with wider EA flood risk management works and strategies such as the CFMP.

Outline flood risk mitigation strategies should consider the wider, cumulative impacts of mitigation. This requires master-planning an area from a flood-risk perspective.

In summary, taking a strategic approach to flood risk management involves consideration of:

- Avoidance of development in flood risk areas;
- Implementing a sequential approach to site layout, substituting higher vulnerability development in lower flood risk areas;
- Considering flooding from all sources;
- Wherever possible, using open land or green infrastructure to reduce risk, (e.g. by providing compensatory flood storage);
- Adopting mitigation measures that contribute to the wider community objectives for flood risk management in risk areas, (developers should aim to reduce risk to the wider community);
- The design and use of SUDs; and,
- Preparing emergency flood plans.

H.3 EU Floods Directive

The “EU Floods Directive” aims to reduce and manage the risk floods pose to human health, the environment, cultural heritage and economic activity. Member States have two years in which to transpose its provisions into domestic legislation and the first requirements of the Directive begin at the end of 2011. By this date, an evidence base for flood risk should be developed to map the risk and then produce plans to manage it. Preliminary Flood Risk Assessments (PFRAs) for all sources of flooding need to be prepared showing the impact of historic flooding and the potential impact of a repeat event. Following this, areas of potentially Significant Flood Risk (SFR) need to be defined. In addition, and by the end of 2013, flood hazard and flood risk maps for the SFR areas are required and should be co-ordinated with, and possibly integrated into, the reviews of River Basin Districts under the Water Framework Directive (WFD). Finally, by the end of 2015, Flood Risk Management Plans (FRMPs) must be established, which aim to reduce the potential adverse consequences of flooding and/or reduce its likelihood.

The Government proposes to use existing flood risk planning outputs of RFRAs and SFRAs to deliver the requirements of PFRAs. It is also proposed that local authorities extend their Level 2 SFRAs to look at the impact of flooding on the environment and cultural heritage when determining SFR areas. In addition, it is proposed that SWMPs will be FRMPs under the Directive, and will also be a tool more generally for local flood risk management. This integrated approach will underpin the planning system and guide the location of future development to avoid and minimise flood risk, whilst also meeting the requirements of the Floods Directive. Local authorities, through their land use planning activities, have a key role to play.

The Flood Risk Regulations transpose the EU Floods Directive into UK law and were introduced on 10 December 2009. These confirm the lead local flood authority role and require specific tasks to be undertaken by these authorities this year, with completion of Preliminary Flood Risk Assessments and identification of Flood Risk Areas due by June 2011.

H.4 Reducing Flood Risk through 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 development (e.g. vehicular parking, 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, whilst 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 EA will have to consent any works within 5 metres of a main river. It is likely that the EA will require an unobstructed access and maintenance easement within these areas."

H.5 Modification of ground levels

Modifying ground levels to raise the land above the required flood level is an effective way of reducing flood risk to the site in question.

However, in most areas of fluvial flood risk, conveyance or flood storage may be reduced by raising land within the floodplain, adversely impacting on flood risk downstream. Compensatory flood storage must be provided, in general, on a level for level, volume for volume basis on land that does not currently flood but is adjacent to the floodplain. In general it should be in the vicinity of the site and within the red line of the planning application boundary (unless the site is strategically allocated).

Where the site is entirely within the floodplain it is not possible to provide onsite compensatory storage.

The need for compensatory storage must been 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.

H.6 Local flood storage

Where development reduces the volume of floodplain storage it will be necessary to provide compensatory storage locally. This could be an environmental wetland area, designated washland (designed to flood) or a flood basin. This can also be considered within urban design if areas are designated to flood in a flood event (e.g. ground floor of a development with residential on first floor).

On a strategic catchment-wide scale, appropriately located flood storage basins and washlands can not only provide a reduction in flood risk, but can also enhance and contribute to wetland restoration and habitat creation as well as potentially increasing the recreational value of many river corridors. For upstream flood storage schemes to maximise benefits downstream, they need to be located in suitable areas of the catchment. Locating flood storage basins too high in the catchment could mean that a large proportion of a flood event is still able to travel downstream from other areas in the catchment.

The need for compensatory storage must been 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.

H.7 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.

H.8 Developer Contributions to Flood defences

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 and local community.

H.9 Building Design

Raising of floor levels within a development avoids damage to the interior, furnishings and electrics in times of flood. If it has been agreed with the EA that, in a particular instance, the raising of floor levels is acceptable, they should normally be raised to 600mm above the maximum water level during a 1% AEP event including allowance for climate change.

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

Constructing 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.

H.10 Resistance and Resilience

The 2007 document 'Improving the Flood Performance of New Buildings' provides further details on possible resistance and resilience measures[29].

H.11 Temporary Barriers

Temporary barriers consist of moveable flood defences that can be fitted to doorways and windows. On a smaller scale it is likely that the EA will require an unobstructed access and maintenance easement within these areas, temporary snap-on covers for airbricks and air vents can also be fitted to prevent the entrance of flood water.

H.12 Permanent barriers

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

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

H.13 Wet-proofing

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

- Installing electrical circuitry at a higher level with power cables being carried down from the ceiling rather than up from the floor
- Using water-resistant materials for floors, walls and fixtures

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

H.14 Making Development Safe

Safe Access and Egress

The developer must ensure that safe access and egress can be provided to an appropriate level for the type of development.

As part of the FRA, the developer should review the acceptability of the proposed access with the EA.

For the purpose of the SFRA it is considered appropriate to provide low hazard 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% AEP event.

H.15 Making Space for Water

Opportunities for River Restoration and Enhancement

All new development close to rivers should consider the opportunity to improve and enhance the river environment. Developments should look at opportunities for river restoration and enhancement as part of the development. Options include backwaters, 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.

Opportunities for 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 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 convey and store flood water reducing the risk of flooding to development.

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 EA. This provides a buffer strip to ‘make space for water’, and ensure access to defences is maintained.

H.16 Recommendations for Surface Water Management

It is understood that Wigan Council are currently progressing a SWMP as part of AGMA.

Wigan Council and the Environment Agency should work closely with United Utilities, using the outputs from the SFRA as a starting point, to identify the potential locations of and priorities for SWMPs. They should identify particular hotspots where surface water solutions can be identified or more detailed modelling is needed. A Drainage Strategy should be undertaken as part of or alongside this for key development areas to identify locations suitable for SUDS and how flood risk can be managed and reduced downstream.

The Council, as the lead for local flood risk management, should co-ordinate any future surface water management work. The recent Defra Surface Water Management Plan Guidance (2010) supports the use of SFRAs in providing the evidence base for where SWMPs are required.

Surface water management needs to take a holistic approach, taking into account all the sources of local flood risk, including from sewers, overland flow, culverted and open watercourses and groundwater. A suite of options are available for surface water management including source control, such as the implementation of SUDs, increasing the capacity of sewers or watercourses, storing excess water and managing exceedance flows through urban design and "Green Infrastructure". SWMPs should provide the opportunity to undertake detailed sewer modelling and pool together the knowledge and understanding from different organisations to help assess options to reduce surface water flood risk to new and existing development.

Options to reduce flood risk in one location should not increase risk upstream or downstream. SWMP areas may cross one or more local authority area and different local authorities, the Environment Agency and United Utilities can be brought together in a SWMP partnership to develop sustainable options to manage surface water flood risk.

There is the potential for groups of development sites coming forward to share a central and integrated solution for managing surface water runoff. This is best investigated further through a SWMP or a Drainage Strategy, which may or may not be undertaken at the same time as a SWMP. Such solutions can provide great benefits besides water management, including providing recreational facilities, improving biodiversity and making communities a better place to live. Where there are several sites that would share a communal facility, such sites may be funded through developer Section 106 or Community Infrastructure Levy payments. Drainage Strategies can be particularly useful for considering, recommending the implementation of, and long term management arrangements for, SUDS and setting appropriate runoff rates from new development.

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