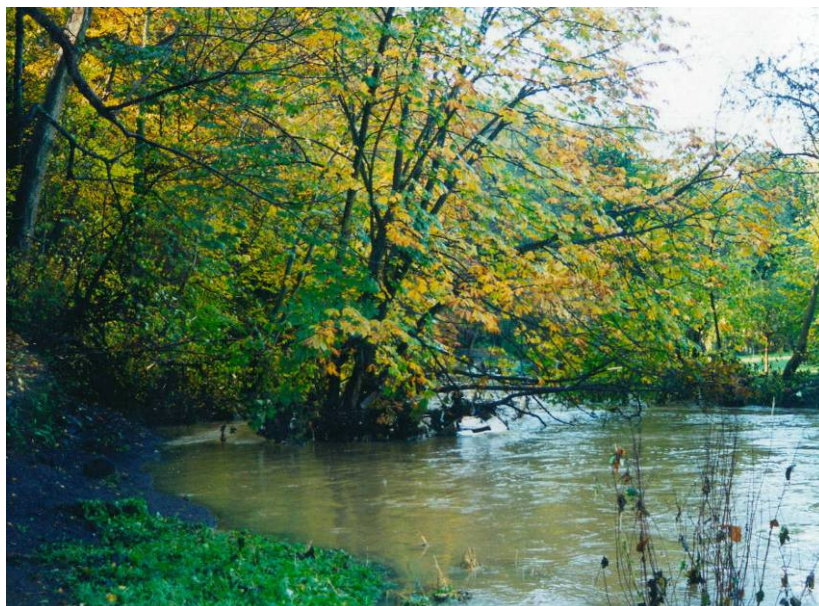


Wiltshire Council

Strategic Flood Risk Assessment

High Level Executive Summary

Final Report
June 2009



Prepared for:

Revision Schedule

Level 1 SFRA High Level Executive Summary June 2009

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03	June 2009	Minor amendments incorporating additional Environment Agency comments	Mark Crussell Assistant Hydrologist	Dr Rob Sweet Senior Flood Risk Specialist	Jon Robinson Associate Director

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Abbreviations

Acronym	Definition
FRA	Flood Risk Assessment
GIS	Geographical Information Systems
KDC	Kennet District Council
LPA	Local Planning Authority
LPD	Local Planning Documents
NFCDD	National Flood and Coastal Defence Database
NWDC	North Wiltshire District Council
PPS25	Planning Policy Statement 25: Development and Flood Risk
SDC	Salisbury District Council
SPZ	Source Protection Zone
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WWDC	West Wiltshire District Council

Glossary

Term	Definition
1 in 100 year event	Event that on average will occur once every 100 years. Also expressed as an event, which has a 1% probability of occurring in any one year.
1 in 100 year design standard	Flood defence that is designed for an event, which has an annual probability of 1%. In events more severe than this the defence would be expected to fail or to allow flooding.
Flood Zone 1	This zone comprises of land assessed as having a less than 1 in 1000 annual probability of fluvial or tidal flooding in any year (0.1%).
Flood Zone 2	This zone comprises land assessed as having between a 1 in 100 year and 1 in 1000 year annual probability of fluvial flooding (1% - 0.1%) or between a 1 in 200 year and a 1 in 1000 year annual probability of tidal flooding (0.5% - 0.1%) in any year.
Flood Zone 3a	This zone comprises land assessed as having a 1 in 100 or greater annual probability of fluvial flooding (>1%) or a 1 in 200 or greater annual probability of tidal flooding (>0.5%) in any year.
Flood Zone 3b – Functional Floodplain	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).
Flood defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.
Flood storage area	A temporary area that stores excess runoff or river flow often ponds or reservoirs.
Fluvial flooding	Flooding by a river or a watercourse.
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Risk	The probability or likelihood of an event occurring.
Sustainable drainage system	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations meeting their own needs.

1 Introduction

1.1 Background

- 1.1 Scott Wilson Ltd was commissioned in December 2008 to provide a high level executive summary for the commencement of Wiltshire Council (April 2009). This summary draws together the information provided in the Level 1 Strategic Flood Risk Assessments (SFRAs) produced for the individual Local Planning Authorities (LPAs) that are being integrated to form a single unitary authority of Wiltshire Council. The LPAs being integrated are:
- North Wiltshire District Council (NWDC);
 - Kennet District Council (KDC);
 - West Wiltshire District Council (WWDC); and
 - Salisbury District Council (SDC).
- 1.2 This report summarises information on the application of the Sequential Test, a broad scale assessment of flood risk for potential strategic developments, flood risk management measures for consideration for new developments, recommendations for flood risk policy and site specific Flood Risk Assessment (FRA) guidance.
- 1.3 In addition, there will be a brief overview of the collation of the datasets and the accompanying Geographical Information System (GIS) layers for use by Wiltshire Council along with recommendations on the maintenance and update of data sources for future decision making.
- 1.4 The accompanying GIS layers will also be used to inform the Minerals and Waste Local Development Framework and the Minerals and Waste Level 1 SFRA is being updated in tandem with this document. This will ensure that the available data is consistent across the Wiltshire Council administrative area, providing continuity in the decision making process.

2 Sequential Test

2.1 What is the Sequential Test?

2.1.1 The Sequential Test refers to the application of the sequential approach by LPAs. This allows the determination of site allocations based on flood risk and vulnerability (see Table 2-1 and Table 2-2, provided below). Development should be directed to Flood Zone 1 wherever possible, and then sequentially to Flood Zone 2 and then Flood Zone 3. Where a site lies spans different flood zones, a sequential approach based on vulnerability of development should be undertaken steering development to the areas of least risk.

Table 2-1: PPS25 Flood Zone Definitions (These ignore the presence of defences)

Flood Zone	Definition
Flood Zone 1	Low probability - less than 0.1% (1 in 1000 year) probability of flooding each year from fluvial or tidal flooding.
Flood Zone 2	Medium probability - between 0.1% and 1% (between 1 in 1000 and 1 in 100 year) probability of fluvial flooding each year and between 0.1% and 0.5% (between 1 in 1000 and 1 in 200 year) probability of tidal flooding each year .
Flood Zone 3a	High probability - 1% or greater (1 in 100 year or greater) probability of fluvial flooding each year and a 0.5% or greater (1 in 200 year or greater) probability of tidal flooding each year.
Flood Zone 3b	Functional floodplain - land where water has to flow or be stored in times of flood. Defined as the 5% (1 in 20 year) annual probability floodplain or an area designed to flood in an extreme (0.1%) flood, or another probability agreed between the LPA and the Environment Agency. (The Environment Agency do not currently produce Flood Zone 3b mapping for England and Wales).

2.1.2 The application of the Sequential Test aims to manage the risk from flooding by avoidance. This avoids the promotion of sites that are inappropriate on flood risk grounds. The application of the Exception Test, where required, through a Level 2 SFRA will ensure that new developments in flood risk areas will only occur where flood risk is clearly outweighed by other sustainability drivers.

2.1.3 The LPA must demonstrate that it has considered a range of possible sites in conjunction with the Flood Zone information from the SFRA and applied the Sequential Test, and where necessary, the Exception Test, in the site allocation process.

2.1.4 PPS25 acknowledges that some areas will (also) be at risk of flooding from flood sources other than fluvial or tidal systems. Consequently all sources of flooding must be considered when looking to locate development in any of the flood zones. The other sources of flooding requiring consideration when situating new development allocations include:

- Surface water;
- Groundwater;
- Sewers; and,
- Artificial sources.

2.1.5 These sources (as sources of flooding) are typically less well understood than tidal and fluvial sources. Data often only exists as point data or through interpretation of local conditions. In addition, there is no guidance on suitable return periods to associate with floods arising from these sources. When assessing these sources through the Sequential Test, if a location is recorded as having experienced significant flooding from other sources or repeated flooding from the same source this should be investigated further.

Table 2-2: Flood Risk Vulnerability Classification (from PPS25, Table D2)

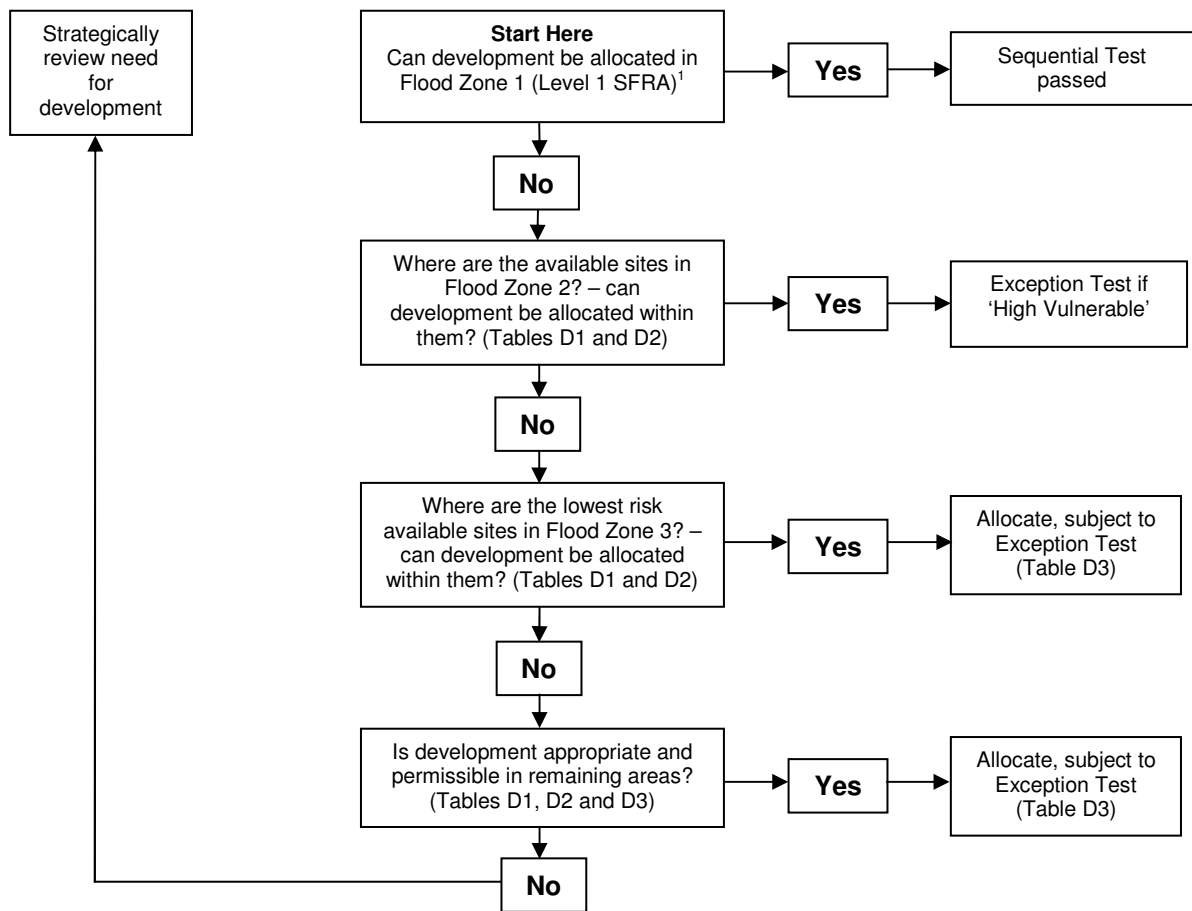
Essential Infrastructure	<ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	<ul style="list-style-type: none"> • 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.
More Vulnerable	<ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Less Vulnerable	<ul style="list-style-type: none"> • 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 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 treatments plants (if adequate pollution control measures are in place).
Water-compatible Development	<ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings.

	<ul style="list-style-type: none">• 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.
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2.2 Application of the Sequential Test

- 2.2.1 The Sequential Test should be undertaken by the LPA and be accurately documented to ensure the decision process is transparent and reviewed where necessary. The Sequential Test should be carried out on all development sites, seeking to balance the flood probability and development vulnerability of sites throughout the administrative area. Only where there are no reasonably available alternative sites should development be considered in Flood Zones 2 and then Flood Zone 3. The Sequential Test also applies to any new planning application including allocated sites that pre-date PPS25 and all windfall sites (see Section 2.4). The Environment Agency has recently revised their Flood Risk Standing Advice for LPAs regarding the Sequential Test and is available from their website¹.
- 2.2.2 Paragraph 4.15 of the PPS25 Practice Guide identifies that at a local level, the Sequential Test should be applied to the whole LPA area. In this instance, although the new boundary of the Wiltshire Council will be the administrative area, the application of the Sequential Test should be undertaken based on the existing district administrative boundaries prior to the commencement of the single unitary authority. The reasoning for this is because the draft RSS has identified the number of dwellings per annum required for KDC, WWDC, NWDC and SDC. This is not being altered to reflect the change to a single unitary authority of Wiltshire Council.
- 2.2.3 The Sequential Test can also be applied within an individual allocation with development being steered to the parts of the site least at risk from flooding, where achievable. Areas intended for green open space could be utilised for flood water storage or conveyance positioned within areas with greater risk of flooding. This strategy allows a sustainable approach to development allocation within the floodplain.
- 2.2.4 The integrated GIS mapping (see Chapter 3) provides updated information for application of the Sequential Test. A review of strategic potential development options based on information provided within the existing Level 1 SFRA is provided in Chapter 4, this information will also help guide recommendations for individual sites. The flow diagram provided in Figure 1 identifies recommended steps for undertaking the Sequential Test. This is based on the Flood Zone and Flood Risk Vulnerability summarised in Table 2-3.

¹ <http://www.environment-agency.gov.uk/research/planning/82584.aspx>



¹ Other sources of flooding need to be considered in Flood Zone 1.

Figure 1: Decision flow chart illustrating the application of the Sequential Test (adapted from Figure 4.1 from PPS25 Practice Guide).

Table 2-3: Flood Risk Vulnerability and Flood Zone 'Compatibility' (from PPS25, Table D.3)

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
	Zone 3b (Functional Floodplain)	Exception Test Required	✓	x	x	x

✓ - Development is appropriate

x - Development should not be permitted

2.3 Recommended Stages in Application of Sequential Test

2.3.1 A sequence of stages are presented that provide a step by step application of the Sequential Test (based on Figure 1) to guide the LPAs through the Sequential Test. The steps are designed to ensure land allocations are primarily allocated in line with the principles of the Sequential Test or failing this the requirement for application of the Exception Test is clearly identified.

Recommended Stages for the LPAs

1. Assign all potential allocations with a vulnerability classification (Table 2-2). Where development is proposed to be mixed, this should be moved to the higher classification;
2. The location and identification of potential development should be recorded e.g. SS 970461, Trowbridge #1;
3. The flood zone classification of potential allocations should be determined based on a review of the flood zones for fluvial and tidal sources as provided in accompanying GIS layers. Where these span more than one flood zone, all zones should be noted;
4. The design life of the development should be considered with respect to climate change:
 - 60 years – for commercial / industrial developments;
 - 100 years – for residential developments; and,
 - The design life should begin from 2026 which is consistent with the duration of the Core Strategy.
5. Identify if there are existing flood defences serving the potential development sites based on accompanying GIS layers;
6. Highly vulnerable developments to be accommodated within the LPAs area should be located within Flood Zone 1. If these cannot be located in Flood Zone 1, because the identified sites are unsuitable or there are insufficient sites in Flood Zone 1, sites in Flood Zone 2 can then be considered. If sites in Flood Zone 2 are inadequate then the LPAs may have to identify additional sites in Flood Zones 1 or 2 to accommodate development or seek opportunities to locate the development outside their administrative area;
7. Once all highly vulnerable developments have been allocated to a development site, the LPAs can consider those development types defined as more vulnerable. More vulnerable development should be located in any unallocated sites in Flood Zone 1. Where these sites are unsuitable or there are insufficient sites remaining, sites in Flood Zone 2 can be considered. If there are insufficient sites in Flood Zone 1 or 2 to accommodate more vulnerable development, sites in Flood Zone 3a can be considered. More vulnerable developments in Flood Zone 3a will require application of the Exception Test;
8. Once all more vulnerable developments have been allocated to a development site, the LPAs can consider those development types defined as less vulnerable. Less vulnerable development should be located in any remaining unallocated sites in Flood Zone 1, continuing sequentially with Flood Zone 2, then Flood Zone

3a. Less vulnerable development types are not appropriate in Flood Zone 3b (functional floodplain);

9. Essential infrastructure should be preferentially located in the lowest flood risk zones, however, this type of development may be located in Flood Zones 3a and 3b, provided the Exception Test is fulfilled;

10. Water compatible development has the least constraints with respect to flood risk and it is considered appropriate to allocate these sites last;

2.3.2 For the above stages, it will also be necessary to consider the risks posed to the site from other flood sources and where comparable, development sites in the same flood zone may be more suitable due to:

- Flood risk management measures;
- The rate of flooding;
- Flood water depth; or,
- Flood water velocity.

2.3.3 Where the development type is highly vulnerable, more vulnerable, less vulnerable or essential infrastructure and a site is found to be impacted by a recurrent flood source (other than tidal or fluvial), the site and flood sources should be investigated further regardless of any requirement for the Exception Test. These may be assessed either through a Level 2 SFRA, Surface Water Management Plan or a site specific FRA.

2.3.4 The effect of climate change for potential allocations should be considered for those located within fluvial and tidal flood zones, these are provided in the accompanying GIS layers. It is recommended that where required, a Level 2 SFRA or a site specific Flood Risk Assessment should investigate the effects of climate change in greater detail.

2.4 Windfall Sites

2.4.1 PPS25 requires the application of the Sequential Test to all planning applications in flood risk areas, including those on previously developed land, unless the area or site has already been allocated through a Sequential Test informed by an SFRA. Windfall sites are sites that become available for development during plan period but have not been allocated within a development plan that has been sequentially tested. The LPA should develop policies in their LDDs on how windfall sites should be treated in flood risk terms.

2.4.2 The PPS25 Practice Guide indicates that LPAs should identify areas where windfall development would be constituted as appropriate development i.e. defining the type of windfall development which would be acceptable in certain flood risk areas and what the broad criteria should be for submitting a planning application under these circumstances. It is suggested that where a windfall site becomes available, appropriate development options should take into account the vulnerability classification (Table 2-2) and the availability of sites with lower flood risks.

2.4.3 Planning Policy Statement 3 (PPS3): Housing indicates that LPAs should not make allowances for windfalls in their plans for the first 10 years of land supply. Only where LPAs can demonstrate genuine local circumstances that prevent specific sites being identified

should windfall sites be considered within this timeframe. Windfall sites should be subject to the same consideration of flood risk as other housing development.

- 2.4.4 The Sequential Test should be applied to windfall sites, unless the area in which they occur has been sequentially tested on the basis of a SFRA. If the Sequential Test has not been applied to the area, proposals will need to be dealt with on an individual site basis and the developer will need to provide evidence to the LPA that they have adequately considered other reasonably available sites. This will involve considering the windfall site against other sites allocated in plans.

3 Collation and Review of Datasets

3.1 Overview

- 3.1.1 This chapter provides details on the collation of the GIS datasets accompanying the existing Level 1 SFRAs. The datasets have been integrated to provide an accessible format which will enable Wiltshire Council to determine flood risk to future development sites across the Wiltshire Council administrative area. The integrated datasets will allow Wiltshire Council to undertake the Sequential Test and identify where the Exception Test may be required.

3.2 Collation of GIS Datasets

- 3.2.1 The integrated datasets are shown in Table 3-1. Due to variation within each district of the availability of data collected during the Level 1 SFRA process, some integrated datasets are shown to cover only parts of the study area.
- 3.2.2 It is important that the methodologies and limitations of the datasets are understood before the mapping is used for planning purposes. The existing Level 1 SFRAs provide a detailed description, including the methodologies used to generate the GIS datasets shown in Table 3-1.

Table 3-1: Key Level 1 SFRA GIS datasets provided by the LPAs

Key Datasets	Kennet	North Wiltshire	Salisbury	West Wiltshire
Current Flood Zones 2 and 3 a/b	✓	✓	✓	✓
Climate Change Flood Zone 3 a/b	✓	✓	✓	✓
Main Rivers	✓	✓	✓	✓
Sub-catchment Boundaries	✓	✓	x	✓
Artificial Flood Source	✓	✓	x	✓
NFCDD Structures	✓	✓	x	✓
NFCDD Defences	✓	✓	✓	✓
Flood Storage Areas	✓	✓	✓	✓
FRIS Incidents	✓	✓	✓	✓
FRIS Properties	✓	x	✓	x
Groundwater Flooding Database	✓	✓	x	x
Localised Flooding Database	✓	x	✓	x
Sewer Flooding Wessex Water	✓	✓	✓	✓
Historic Flood Outlines	✓	✓	✓	x

Key Datasets	Kennet	North Wiltshire	Salisbury	West Wiltshire
Reservoirs	✓	✓	✓	✓
Flood Warning	✓	✓	✓	✓
Flood Watch (Hampshire Avon)	✓	✗	✓	✓

3.3 Review of GIS Datasets

3.3.1 The Environment Agency updates their flood maps on a quarterly basis, incorporating the results of detailed studies where relevant. Wiltshire Council have provided updated extents (dated October 2008) of the Environment Agency flood maps to ensure any revisions are included in the integrated GIS datasets produced for this high level executive summary.

3.3.2 A comparison of existing individual Level 1 SFRAs Flood Zones 2 and 3 with the updated Flood Zones 2 and 3 provided by the Environment Agency has been undertaken. Although the majority of the flood zones are unchanged, flood zone revisions have been noted and updated in the following areas:

- River Ebbles – Flood Zone 3 extent north east of Nunton (Salisbury);
- Middle River Kennet – Flood Zone 2 and 3 extent within Marlborough, including areas upstream and downstream of the settlement (Kennet);
- Middle River Kennet – Flood Zone 2 and 3 extent in the vicinity of Mildenhall, Axford, Ramsbury and Chilton Foliat (Kennet);
- Upper River Thames – Flood Zone 3 extent in the vicinity of Ashton Keynes (North Wiltshire).

3.4 Update and Maintenance

3.4.1 SFRAs should be considered as ‘live’ documents where regular review and monitoring should be undertaken to ensure that the best available data on flood risk issues is being used to inform Wiltshire Council planning decisions.

3.4.2 It is suggested that the GIS layers should form the ‘live’ part of the document. GIS layer updates should run parallel with the Annual Monitoring Report that typically provide information on progress of Local Development Documents, local economy and environment.

3.4.3 It is understood that the Environment Agency update their Flood Zone mapping on a quarterly basis and this is distributed to LPAs. It is recommended that a comparison of existing and updated Flood Zones is undertaken to identify significant changes in Flood Zone 2 and 3. This is particularly important where these have been used as surrogates for either climate change or Functional Floodplain (Flood Zone 3b) as described within the existing Level 1 SFRAs.

3.4.4 It is recommended that where Functional Floodplain (Flood Zone 3b) is disputed and changes agreed, these should be recorded to ensure ongoing data maintenance. Where a surrogate has been used to define Functional Floodplain i.e. the whole of Flood Zone 3 has been considered as Functional Floodplain (Flood Zone 3b) in the absence of detailed

- modelling data, it is suggested that a three way discussion between the Developer, Environment Agency and Wiltshire Council is undertaken. Where revisions are agreed that do not affect the extent of Flood Map outline reference to Paragraphs 4.78 to 4.86 in the PPS25 Practice Guidance should be made to substantiate these changes.
- 3.4.5 It is recommended that where hydraulic modelling has been undertaken to revise the extent of Flood Zone 3a and Functional Floodplain (Flood Zone 3b), a joint agreement process between Wiltshire Council and the Environment Agency Flood Risk Mapping and Data Management Team should be undertaken. Where a challenge to the areal extent of a Flood Zone is successful, the Environment Agency Flood Map and SFRA Map should illustrate the same outline in future updates. These should be identified through an annual appraisal of major planning applications within flood risk areas and reported.
- 3.4.6 It is recommended that a data request to the relevant Environment Agency Offices is undertaken on an annual basis to identify additional information of flooding from other sources such as groundwater, surface water, sewers and artificial sources.
- 3.4.7 In addition, it is recommended that a data request to the relevant Statutory Water Undertakers is undertaken on an annual basis to identify additional information on sewer flooding from their DG5 register. This may identify where either new issues have been identified or known issues have been resolved.
- 3.4.8 It is recommended that during the Annual Monitoring Report process, a review of existing Planning Policy Statements or associated guidance is undertaken to identify where significant updates may require significant revision of the SFRA.

4 Broad Scale Assessment of Flood Risk

4.1 Overview

- 4.1.1 This chapter provides a broad-scale assessment of flood risk at the district level based on information provided within the existing Level 1 SFRA. As discussed within Chapter 2, due to the housing allocation structure within the draft RSS the application of the Sequential Test should be undertaken based on the existing district administrative boundaries.
- 4.1.2 Each district level broad-scale assessment includes an overview of flood risk posed to potential development sites within the main settlements, identified within the existing Level 1 SFRA. Guidance on where there may be a requirement for further work in the form of a Level 2 SFRA and/or Surface Water Management Plans (SWMPs) is also provided.

4.2 District Level Broad Scale Assessment

Kennet District

- Residential and commercial properties, transport links and agricultural land have been subjected to damage and disruption by fluvial, surface water, sewer and groundwater flooding. Specific areas where groundwater flooding has been recorded include villages in close proximity to the Hampshire River Avon, River Bourne and the River Og;
- Eleven properties (September 2007) have been identified as being currently at risk from sewer flooding. Wessex Water are currently undergoing works to eliminate the majority of foul sewage flooding incidents by 2010;
- There are two reservoirs that are considered under the Reservoir Act 1975 (volume greater than 25000 m³). There are no potential development sites, identified within the KDC Level 1 SFRA, located directly downstream of a reservoir. However, if future development is proposed downstream of these reservoirs a site specific FRA will be required to assess the potential flood risk;
- All of the main settlements, as identified in Table 4-1 have potential development sites (identified by KDC) located within Flood Zone 1. Four of the main urban settlements have potential development sites entirely, or part located within Climate Change Flood Zones 3b and 3a;
- The Environment Agency Flood Zone 2 and 3 extents (see Section 3.3) in the vicinity of Marlborough have been updated since the publication of the KDC Level 1 SFRA. A review of the potential development sites within Marlborough, as identified within Appendix E of the KDC Level 1 SFRA, indicates that the extent of Flood Zone 2 and 3 across certain sites has changed (see Figure 2). It is important that the updated GIS layers accompanying this high level executive summary are used to ensure strategic planning decisions are made using the best available information.

Table 4-1: Flood zone classification for the potential development sites within the main urban areas within KDC

Settlement	Potential development sites intersect with Flood Zone 1	Potential development sites intersect with Climate Change Flood Zone 3b	Potential development sites intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Devizes	✓	✗	✗	✓
Marlborough	✓	✓	✓	✓
Tidworth	✓	✓	✓	✓
Pewsey	✓	✓	✓	✓
Market Lavington	✓	✓	✗	✓
Ludgershall	✓	✗	✗	✗

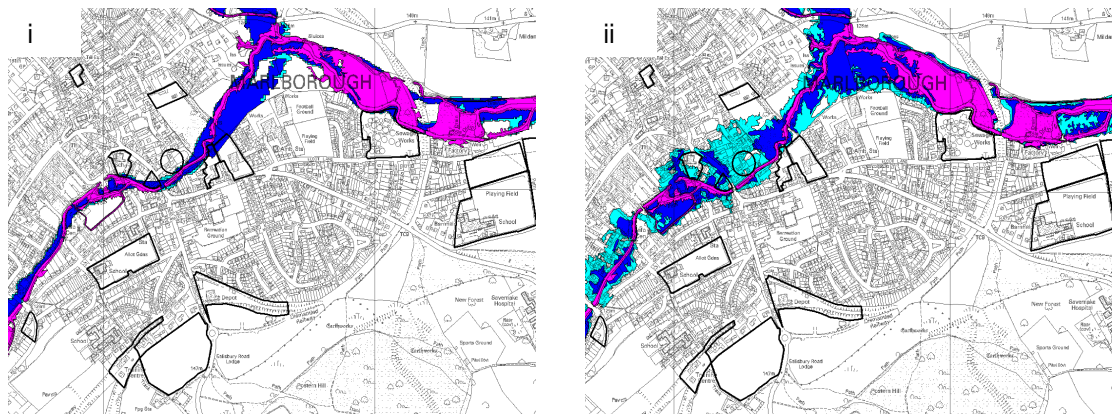


Figure 2: Revised extent of Environment Agency Flood Zone 2 (light blue) and Flood Zone 3 (dark blue) across potential development sites within Marlborough. The Functional Floodplain, Flood Zone 3b (Pink) extent remains unchanged. (i) Flood zone extents as presented within the KDC Level 1 SFRA (ii) Updated (October 2008) flood zone extents accompanying this high level executive summary.

North Wiltshire District

- Fluvial flooding has been experienced within Chippenham, Calne, Malmesbury and Cricklade in recent years. Properties, transport links and agricultural land has been subject to damage and disruption;
- Surface water flooding has been experienced in Wootton Bassett, Calne, Malmesbury and Marston Meysey affecting properties and transport links. The nature of the underlying geology means that groundwater flooding is less significant than other sources, although isolated occurrences have been recorded;
- Twenty six properties have been identified as being currently (September 2007) at risk from sewer flooding. Wessex Water are currently undergoing works to eliminate the majority of foul sewage flooding incidents by 2010;
- There are four reservoirs that are considered under the Reservoir Act 1975 (volume greater than 25000 m³). There are no potential development sites, identified within the NWDC Level 1 SFRA, located directly downstream of a reservoir. However, if future development is proposed downstream of these reservoirs a site specific FRA will be required to assess the potential flood risk;
- Four of the main settlements identified in Table 4-2 have potential development sites that intersect with Climate Change Flood Zone 3b and 3a. All of the main settlements have potential development sites located within Flood Zone 1;
- The Environment Agency Flood Zone 2 and 3 extents (see Section 3.3) in the vicinity of Ashton Keynes have been updated since the publication of the NWDC Level 1 SFRA. A review of the potential development sites within the vicinity of Ashton Keynes, as identified within Appendix D of the NWDC Level 1 SFRA, indicates that the revised flood zone extents within the identified sites are unchanged.

Table 4-2: Flood zone classification for the potential development sites within the main urban areas within North Wiltshire

Settlement	Potential development sites intersect Flood Zone 1	Potential development sites intersect with Climate Change Flood Zone 3b	Potential development sites intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Chippenham	✓	✓	✓	✓
Calne	✓	✓	✓	✓
Wootton Bassett	✓	✓	✓	✓
Corsham	✓	✗	✓	✓
Malmesbury	✓	✓	✓	✓

Settlement	Potential development sites intersect Flood Zone 1	Potential development sites intersect with Climate Change Flood Zone 3b	Potential development sites intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Cricklade	✓	x	x	x

Salisbury District

- Domestic and commercial properties, transport links and farmland have been subjected to damage and disruption by fluvial, surface water and groundwater flooding;
- Four properties (September 2007) have been identified as being currently at risk from sewer flooding. Wessex Water are currently undergoing works to eliminate the majority of foul sewage flooding incidents by 2010;
- There are 21 reservoirs, five of which are considered under the Reservoir Act 1975 (volume greater than 25000 m³). Proposed development downstream of these reservoirs will require a site specific FRA to assess the potential flood risk;
- Flood depth maps for the 1 in 100 year event within Tisbury, Downton and Salisbury are provided within the existing Level 1 SFRA. These maps can be used as an indication of where to direct development to reduce flood risk;
- Within SDCs administrative area, areas of search have been identified by the original housing topic paper², which supports the Core Strategy Preferred Options document³. A preliminary review undertaken, as part of the existing Salisbury Level 1 SFRA indicates that four out of seven 'Areas of Search for Development' intersect with Climate Change Flood Zones 3b and 3a. A similar approach was undertaken for the existing urban areas within Salisbury identified in Table 4-3 below. This indicates that all the main settlements have urban areas located within Flood Zone 1 although potential development sites within these towns have not been identified within the Level 1 SFRA.

Table 4-3: Flood Zone classification for the main urban areas within Salisbury

Settlement	Urban area intersect with Flood Zone 1	Urban area intersect with Climate Change Flood Zone 3b	Urban area intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Salisbury	✓	✓	✓	✓
Tisbury	✓	✓	✓	✓
Wilton	✓	✓	✓	✓
Mere	✓	✓	✓	✓

² <http://www.salisbury.gov.uk/topic2-housing.pdf>

³ <http://www.salisbury.gov.uk/core-strategy-preferred-options.pdf>

Settlement	Urban area intersect with Flood Zone 1	Urban area intersect with Climate Change Flood Zone 3b	Urban area intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Downton	✓	✓	✓	✓
Amesbury	✓	✓	✓	✓
Bulford	✓	✓	✓	✓
Durrington	✓	✓	✓	✓
Shrewton	✓	✓	✓	✓

West Wiltshire District

- Fluvial and surface water flooding has been experienced in Bradford on Avon, Melksham, Trowbridge, Warminster and Westbury in recent years affecting properties, transport links and agricultural land. The nature of the underlying geology means that groundwater flooding is not significant;
- Fifteen properties (September 2007) have been identified as being currently at risk from sewer flooding. Wessex Water are currently undergoing works to eliminate the majority of foul sewage flooding incidents by 2010;
- There are four reservoirs that are considered under the Reservoir Act 1975 (volume greater than 25000 m³). There are no potential development sites, identified within the WWDC Level 1 SFRA, located directly downstream of a reservoir. However, if future development is proposed downstream of these reservoirs a site specific FRA will be required to assess the potential flood risk;
- All of the main settlements (see Table 4-4) have potential development sites (as identified by WWDC) located within Flood Zone 1. Melksham and Westbury also have potential development sites that intersect with Climate Change Flood Zone 3b and 3a;
- The revised Environment Agency Flood Zone 2 and 3 extents (see Section 3.3) are unchanged from the flood zones presented within WWDC Level 1 SFRA. However it is considered best practice to use the GIS layers accompanying this report to ensure consistency throughout the Wiltshire Council administrative area.

Table 4-4: Flood zone classification for the potential development sites within the main urban areas within West Wiltshire

Settlement	Potential development sites intersect with Flood Zone 1	Potential development sites intersect with Climate Change Flood Zone 3b	Potential development sites intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Bradford on Avon	✓	✗	✗	✓

Settlement	Potential development sites intersect with Flood Zone 1	Potential development sites intersect with Climate Change Flood Zone 3b	Potential development sites intersect with Climate Change Flood Zone 3a	Other flood sources within urban area
Melksham	✓	✓	✓	✓
Trowbridge	✓	✗	✗	✓
Warminster	✓	✗	✗	✓
Westbury	✓	✓	✗	✓

4.3 The Location of Future Development

- 4.3.1 The broad-scale assessment of flood risk, provided in Section 4.2, indicates that within each district there are available sites for development located within Flood Zone 1. Where a site consists of land located in more than one flood zone the development should be sequentially located within the site boundary to ensure those developments that are vulnerable are located within the lowest risk flood zones.
- 4.3.2 Under certain circumstances other sustainability objectives considered by Wiltshire Council may result in sites located in Flood Zones 2, 3a and 3b being taken into account. In such cases, further work at the Level 2 SFRA stage may be required to satisfy the Exception Test.
- 4.3.3 Level 2 SFRA work is currently being undertaken for two specific sites within Salisbury (Churchfields Industrial Estate and Central Car Park / the Maltings). These sites are partially located within Flood Zones 2 and 3. The Level 2 SFRA work will provide detailed information on flood risk and flood risk management at the potential development sites.
- 4.3.4 Based on the information presented within the existing Level 1 SFRAs together with the Environment Agency Catchment Flood Management Plans (CFMPs) Existing areas in Chippenham, Salisbury and Malmesbury may require further information through additional hydraulic modelling to inform potential flood alleviation options, to mitigate against the anticipated effects of climate change.
- 4.3.5 To investigate feasible options to reduce flood risk these in urban areas a joint approach working with the Environment Agency should be adopted. In addition, within the settlements of Warminster and Britford SWMPs are likely to be required to manage the risk of surface water flooding.
- 4.3.6 It is noted that the Swindon Water Cycle Strategy is emerging and includes the 'west of Swindon growth area'. This growth area is undergoing a site selection process where from ten initial sites, three preferred sites have been identified. In some instances, these preferred sites lay within the administrative boundary of Wiltshire Council and it is thought that development can be fully accommodated within Flood zone 1. The Environment Agency has identified that a Level 2 SFRA may be required due to the size of the development (3000 houses) to consider other sources of flooding.

5 Flood Risk Management

5.1 Overview

- 5.1.1 This section provides an overview of flood risk management practices including commentary on flood defence infrastructure, flood warning and Sustainable Drainage Systems (SuDS).

5.2 Existing Flood Defences

- 5.2.1 Flooding may occur across areas of the study area with minimal effect to people, buildings, infrastructure or the economy, however, in some areas there may be a significant effect. Where required, flood defences are usually focused in and around the urban areas where for social, economic and sustainability reasons these are required to minimise disruption to individuals, businesses and the wider community.
- 5.2.2 Environment Agency Flood Maps do not account for the presence of flood defences when delineating the Flood Zone extent and therefore areas of land situated behind these defences are still attributed with a flood risk. The presence of flood defences does not remove the risk for the areas protected as failure through overtopping or breaching may occur, therefore, a residual flood risk remains.
- 5.2.3 Flood defences generally fall into one of two categories: 'formal' or 'defacto'. A 'formal' defence (termed 'raised defence (man-made)' in NFCDD) is a structure which has been specifically built to control floodwater. It is maintained by its owner (this is not necessarily the Environment Agency) so that it remains in the necessary condition to function.
- 5.2.4 A 'defacto' defence includes road and rail embankments and other linear infrastructure (buildings and boundary walls) which may act as water retaining structures or create enclosures to form flood storage areas in addition to their primary function. Other structures are identified on the Environment Agency database, but these have not necessarily been built to control floodwater and are not maintained for this purpose.
- 5.2.5 Mapping of the formal flood defences held within the NFCDD database has been provided within the existing Level 1 SFRAs. Integrated NFCDD man-made defence and structure GIS datasets have been produced as part of this high level executive summary covering the Wiltshire Council administrative area.

5.3 Flood Warning Procedures

- 5.3.1 The Environment Agency undertakes a considerable amount of work in terms of flood warning procedures. The Environment Agency operates a flood warning service in all areas at risk of flooding, which is available on their website⁴.
- 5.3.2 Within the study area there are a number of flood watch areas. Flood watch areas are hydrologically similar (or groups of catchments). Within each flood watch area are focussed areas, known as flood warning areas, where flooding is known to occur during larger flood events.

⁴ <http://www.environment-agency.gov.uk/homeandleisure/floods/31618.aspx>

- 5.3.3 The flood warnings are disseminated through a variety of mediums that include TV, radio, and Floodline Warnings Direct, which is a service direct to a phone/fax/pager/internet. Loudhailers are also used in certain circumstances. There is also an emergency Floodline number (0845 988 1188) and a quick dial number for individual rivers.
- 5.3.4 The Environment Agency aim to give a minimum of two hours warning prior to the onset of a flood event. However the rapid onset of some flood events, after a breach in flood defences or following a period of high intensity rainfall, means that sufficient warning cannot always be raised.
- 5.3.5 Flood warning areas have been mapped and presented within the existing Level 1 SFRA's. Integrated GIS datasets, showing both flood watch and flood warning areas within the Wiltshire Council administrative area have been provided as part of this high level executive summary.
- 5.3.6 Groundwater flood warnings are in place where the permeable nature of the underlying soil and geology presents a potential flood risk to local properties, such as Salisbury Plain. Groundwater flood warnings are issued on a parish basis, where it is the responsibility of the parish warden is for issuing flood warnings.

5.4 Sustainable Drainage of Development Sites

Overview

- 5.4.1 Sustainable Drainage Systems (SuDS) are the preferred method for managing the surface water run-off generated by developed sites. Both PPS1 (Delivering Sustainable Development) and PPS25 require that LPAs should promote their use for the management of runoff. SuDS seek to manage surface water as close to its source as possible, mimicking surface water flows arising from the site, prior to the proposed development. Typically this approach involves a move away from piped systems to softer engineering solutions inspired by natural drainage processes.
- 5.4.2 SuDS should be designed to take into account the surface run-off quantity, rates and also water quality ensuring their effective operation up to and including the 1 in 100 year design standard flood including an increase in peak rainfall of 30% to account from climate change.
- 5.4.3 Wherever possible, SuDS techniques should seek to contribute to each of the three goals identified below with the favoured system contributing significantly to each objective. Where possible SuDS techniques for a site should seek to:
- Reduce flood risk (to the site and neighbouring areas);
 - Reduce pollution; and,
 - Provide landscape and wildlife benefits.
- 5.4.4 These goals can be achieved by the SuDS management train, as outlined in 'The SuDS Manual' (CIRIA, 2007), where each component adds to the performance of the whole system:
- Prevention - good site design and upkeep to prevent runoff and pollution (e.g. limited paved areas, regular pavement sweeping);

- Source control - runoff control at/near to source (e.g. rainwater harvesting, green roofs, permeable pavements);
- Site control - water management from a multitude of catchments (e.g. route water from roofs, impermeable paved areas to one infiltration/holding site); and,
- Regional control - integrate runoff managed from a number of sites (e.g. into a detention pond).

5.4.5 In keeping with the guidance of PPS25, local authorities should encourage the application of SuDS techniques. This chapter presents a summary of the SuDS techniques currently available, enabling the local authorities to identify where SuDS techniques could be employed in development schemes.

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

5.4.7 Detailed design guidance can be found in the SuDS Manual C697, and associated Site Handbook for the Construction of SuDS, C698. These publications provide best practice guidance on the planning, design, construction, operation and maintenance of SuDS, to ensure effective implementation within developments.

SuDS Design

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

5.4.9 The design of SuDS measures should be undertaken as part of the drainage strategy and design for a development site. A ground investigation will be required to assess the suitability of using infiltration measures, with this information being used to assess the required volume of on-site storage. Hydrological analysis should be undertaken using industry-approved procedures, to ensure a robust design storage volume is obtained.

5.4.10 During the design process, liaison should take place with the Local Planning Authority and the Environment Agency in order to establish that the design methodology is satisfactory and to also agree on a permitted rate of discharge from the site.

5.4.11 A key consideration of SuDS design is the maintenance regime to ensure they operate effectively, which should be sufficiently detailed and agreed at the design stage. The maintenance regime should set out a framework with a clear identification of responsibility for the lifetime of the proposed development. Table 8-1 provides a summary of the different SuDS techniques.

Table 8-1: Summary of SuDS techniques and their suitability to meet the three aims for sustainability (see Section 9.2)

Management Train		Component	Description	Water Quantity	Water Quality	Amenity Biodiversity	
Regional	Source	Prevention	Green roofs	Layer of vegetation or gravel on roof areas providing absorption and storage.	●	●	●
			Rainwater harvesting	Capturing and reusing rainwater for domestic or irrigation uses.	●	○	○
			Permeable pavements	Infiltration through the surface into underlying layer.	●	●	○
		Filter drains	Drain filled with permeable material with a perforated pipe along the base.	●	●	×	
		Infiltration trenches	Similar to filter drains but allows infiltration through sides and base.	●	●	×	
		Soakaways	Underground structure used for store and infiltration.	●	●	×	
	Site	Bio-retention areas	Vegetated areas used for treating runoff prior to discharge into receiving water or infiltration	●	●	●	
		Swales	Grassed depressions, provides temporary storage, conveyance, treatment and possibly infiltration.	●	●	○	
		Sand filters	Provides treatment by filtering runoff through a filter media consisting of sand.	●	●	×	
		Basins	Dry depressions outside of storm periods, provides temporary attenuation, treatment and possibly infiltration.	●	●	○	
		Ponds	Designed to accommodate water at all times, provides attenuation, treatment and enhances site amenity value.	●	●	●	
		Wetland	Similar to ponds, but are designed to provide continuous flow through vegetation.	●	●	●	

Key: ● – highly suitable, ○ - suitable depending on design, × - not suitable

Where can SuDS be Utilised?

- 5.4.12 The underlying ground conditions of a development site will often determine the type of SuDS approach to be used at development sites. This will need to be determined through ground investigations carried out on-site; however an initial assessment of a site's suitability to the use of SuDS can be obtained from a review of the available soils/geological survey of the area.
- 5.4.13 The existing Level 1 SFRA's provide information on the type of SuDS suitable for the underlying soil and geology within each individual district, prior to the commencement of the single unitary authority.

SuDS Constraints

- 5.4.14 There are several constraints that may limit the application of SuDS. These will vary between locations and may include:
- Ground Contamination;
 - Ground Conditions;
 - Ground Use / Vulnerability;
 - Capacity of the receiving watercourse.

Ground Contamination

- 5.4.15 Ground contamination has the potential to contaminate groundwater and/or surface water resources if incorrectly managed. In some cases the nature of the ground contamination may be such that certain types of SuDS are not appropriate. Ground contamination should be determined by site investigation on a site by site basis.

Groundwater Use / Vulnerability

- 5.4.16 Groundwater resources can be vulnerable to contamination from both direct sources (e.g. into groundwater) or indirect sources (e.g. infiltration of discharges onto land). A review of the National Rivers Authority (now the Environment Agency) groundwater vulnerability map can be used to identify the groundwater vulnerability on and surrounding a potential development site.
- 5.4.17 The vulnerability of the groundwater is important when determining the suitability of SuDS. The Environment Agency should be consulted on proposals where it is proposed to discharge to groundwater.

Groundwater Source Protection Zones

- 5.4.18 The Environment Agency also defines groundwater Source Protection Zones (SPZ). SPZs are defined to protect areas of groundwater that are used for potable (drinking) supply, including public/private potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks.
- 5.4.19 Depending on the nature of the proposed development and the location of the development site with regards to the SPZs, restrictions may be placed on the types of SuDS appropriate to

certain areas. Consideration should be given to the SPZs when determining the suitability of SuDS for development sites. Further information is available on the Environment Agency website: www.environment-agency.gov.uk.

Planning Considerations for SuDS

- 5.4.20 The application of SuDS may require space on development sites to be set-aside. Early consideration of SuDS will assist in determining the space required and identify methods to spread the management of storm water throughout a site using the Management Train principle presented in the CIRIA report C697.
- 5.4.21 The design of SuDS measures should be undertaken as part of a drainage strategy proposed during the master planning of development sites. A ground investigation will be required to assess the suitability of using infiltration SuDS, with this information also being used to assess the required volume of on-site storage. Hydrological analysis should be undertaken using industry-approved procedures; to ensure a robust design storage volume is obtained. The consideration of utilising SuDS as part of a development will depend on many factors such as:
- The underlying geology and drift layers;
 - The depth of the groundwater table;
 - Site slopes;
 - run-off quality;
 - Site restrictions;
 - Maintenance requirements;
 - Economical viability; and,
 - Groundwater protection and ecological considerations.
- 5.4.22 The final drainage scheme and SuDS for a site should consider each of these elements in its design.
- 5.4.23 All relevant organisations should meet at an early stage of the drainage design process to agree on the most appropriate drainage system for the particular development. These organisations may include the Local Authority, the sewerage undertaker, Highway Agency, and the Environment Agency. Liaison with these organisations should focus on establishing a suitable design methodology, any restrictions and provision for the long-term maintenance of the feature.
- 5.4.24 The most convenient vehicle for agreeing long-term management responsibilities is through Section 106 of the Town and Country Planning Act. Under this, agreement for SuDS maintenance can be a requirement of the planning application, forcing the issue to be addressed.

5.5 Raising Flood Defence Standards

- 5.5.1 A design standard of 1 in 100 year annual probability is taken as the appropriate design standard for fluvial defences. The majority of the flood defences within the study area currently have a Standard of Protection (SoP) less than the 1 in 100 year annual probability. The SoP offered by flood defences will be reduced further by the anticipated effects of climate change with precautionary estimates indicating peak flows up to 20% greater than present.
- 5.5.2 The costs of raising these defences to the 1 in 100 year design standard will vary considerably. The Salisbury Level 1 SFRA provides indicative costs for raising fluvial flood defences by a linear metre, these costs range from £500 to £3,000.
- 5.5.3 Indicative capital costs for the provision of different types of flood defence have been provided below. Capital costs (CAPEX) for raising flood defences include the construction, preliminaries and site costs, enabling works and temporary works.
- 5.5.4 The CAPEX used has been based on unit cost rates obtained from the Environment Agency⁵. The following tables provide indicative costs for the provision of new flood defence walls (Table 5-1), new flood defence embankments (
- 5.5.5 Table 5-2), upgrading of existing embankments (Table 5-3) and inclusion of outfall structures (Table 5-4).
- 5.5.6 OPEX are the operational costs for a flood defence including maintenance and refurbishment depending on the proposed lifetime of the scheme. The following general assumptions have been made and can be applied to provide an indicative value for OPEX, these are:
- Annual costs of maintenance of the flood defence are approximately 0.5% of CAPEX; and
 - An allowance of 40% of the CAPEX should be made for refurbishment of the flood defence every 25 years.

Table 5-1: Indicative flood defence costs rates (per linear metre) – new walls (source: Environment Agency)

Type of Wall	Wall Height (m)	
	<1.2m	1.2m-2.1m
Masonry Wall	406	1,500
Retaining wall (Steel reinforced) Concrete	1,565	1,751
Wall with cutoff	916	2,652
Wall with piling	-	3,059

⁵ Information identified as being sourced from the Environment Agency in East Devon SFRA (Halcrow) Appendix L 'Indicative flood defence cost rates' and Parrett Tidal Flood Defence Technical Review (Black & Veatch).

Table 5-2: Indicative flood defence cost rates (per linear metre) – new embankment (source: Environment Agency)

Volume	Volume (m ³)		
	500-5,000	5,000-15,000	>15,000
Cost Range (£/m ³)	31-116	29-53	17-31
Average Cost (£/m ³)*	75	40	25
Average cost per linear metre (£/m)*	900	480	300

*An indicative volume of 12 m³ per metre run of defence has been used within the calculations.

Table 5-3: Upgrading flood defence indicative costs rates (per linear metre) (source: Environment Agency)

Type of Upgrade	£/m
Rebuild & Raise Hard Defences	4,800
Strengthen embankment with sheet pile	3,600
Additional capping to sheet pile	900

Table 5-4 Indicative costs of new and refurbished outfall (source Environment Agency)

Type of Outfall	£
New Small outfall (<400mm)	90,000
New Medium Outfall (400-900mm)	192,000
New Large Outfall (>900mm)	540,000
Refurbished Small outfall (<400mm)	45,000
Refurbished Medium Outfall (400-900mm)	96,000
Refurbished Large Outfall (>900mm)	270,000

5.5.7 The values provided by the Environment Agency within Table 5-3 and Table 5-4 have been increased by 20% to provide a conservative estimate of the increase in cost from original studies.

5.5.8 In addition to the capital costs, the Environment Agency maintains defences within the study area through a programme of repairs and upkeep of flood defence structures. This includes grass cutting, desilting, maintenance of drains, debris removal and scrub clearance.

6 Policy Recommendations

6.1 Overview

- 6.1.1 For the purpose of development control, detailed policies will need to be set out by Wiltshire Council to ensure that flood risk is taken account of appropriately for both allocated and non-allocated sites. This chapter provides a comprehensive summary of the Level 1 SFRA policy recommendations to ensure a consistent approach to flood risk throughout the Wiltshire Council administrative area.

6.2 Catchment Wide Strategies

- Wiltshire Council should adopt the climate change flood zones, (see accompanying GIS layers) including, where available, any additional flood risk areas identified in the historical flood map as the extent of 'critical drainage problem areas' to define flood risk areas for the purpose of article 10 of the Town and Country Planning (General Development Procedure) Order 1995 as amended by the Flood Directive 2007;
- A Planning Application falling in a 'critical drainage problem area' or on a site exceeding one hectare should not be considered for registration without a Flood Risk Assessment (FRA) (see Section 7). The FRA should be prepared in accordance with PPS25 and Council Development Control policies;
- It is not appropriate to use conditions to require the submission of a Flood Risk Assessment (FRA) or details to support a FRA which cannot be demonstrated in the FRA to be practicable and / or acceptable in terms of other planning considerations;
- A development should not increase flood risk on site or elsewhere, and where possible, opportunities should be taken to decrease overall flood risk;
- Where development is proposed in areas bordering onto areas defined as 'critical drainage problem areas' floor levels should be set above the 1 in 100 year fluvial or other flood level where the critical drainage problem area is identified due to other sources of flooding. For critical drainage problem areas the predicted maximum flood level for the life of the development should be calculated with an allowance for climate change, plus a minimum freeboard of 600mm;
- The development should be safe throughout its life, to achieve this dry pedestrian egress should be possible above the 1 in 100 year fluvial flood level and emergency vehicular access should be possible during times of extreme flood (an extreme flood event is an event with an annual probability of between 1% (1 in 100 year) and 0.1% (1 in 1000 year)). Should dry access not be possible, occupants should be able to egress the development to land outside the floodplain unaided. The evacuation route should not require people to enter into flood water which is considered a danger for some, which includes children, the elderly or infirmed as identified in FD2320⁶. An evacuation plan should be prepared and the advice from the Local Authorities emergency planning officer and the emergency services must be sought;

⁶ FD2320 report can be accessed at the 'Flood Risk for New Development' website - <http://www.hydras.co.uk>

- SuDS should be implemented to ensure that runoff from the site (post development) is either to greenfield runoff rates where the site is undeveloped at present or provide betterment, where possible, where the site is previously developed. This should include space set-aside within the confines of the site to allow its implementation. The use of SuDS techniques and attenuation should take into account the local geological and groundwater conditions. Should the surface water drainage system be designed to current standards for adoption, then; the surface water generated by a peak rainfall intensity, for all events up to that with an annual probability of 1%, in excess of the systems designed capacity shall be contained on site without causing a risk to property. The design peak rainfall intensity shall include the climate change allowances set out in Table B.2 of PPS25 appropriate to the design life of the development. ;
- Basements should not be used for habitable purposes. Where basements are permitted for commercial and ancillary use, it is necessary to ensure that the basement access points and any venting or other penetrations are situated 600mm above the 1 in 100 year fluvial level plus the climate change predicted maximum level for the life of the development;
- Development should be set-back from watercourses to allow appropriate access for routine maintenance and emergency clearance, if necessary. Any works or structures in, under, over or within 8 metres of the top of the bank of a main river are controlled under the terms of the Water Resources Act 1991 and the Land Drainage Byelaws. This requires a separate consent which is administered by the Environment Agency. Development should not propose culverting or the building over of watercourses;
- In areas protected to an appropriate standard by flood defences or down slope of water retaining structures (reservoirs) a detailed breach and overtopping assessment shall be carried out to inform the Sequential Test and to ensure that the potential risk to life can be safely managed throughout the lifetime of the development. Unless absolutely necessary, flood defences should not be used as an option to make development within higher flood risk areas permissible due to the risks of flood defence failure;
- Protect undeveloped floodplain from future development and where opportunities arise seek to increase the area of floodplain within urban areas, to restore natural river forms and floodplains (through managed reinstatement of floodplain where possible) and in so doing restore river corridors and floodplains as areas of biodiversity and improved amenity value;
- Opportunities should be sought to open culverted watercourses, where possible, to return them to a natural system. When opening up culverted watercourses consideration should be given to ensure flood risk is not exacerbated downstream;
- Routine monitoring of all watercourses should be undertaken to ensure they are clear of debris that could reduce flow conveyance and water quality;
- Development should not have a detrimental impact on the water environment through changes to water chemistry or resource and this should be ensured through the use of drainage systems which limit the occurrence of pollution to the water environment;
- Developments should look to incorporate water re-use and minimisation technology for example green roofs and water butts. This will aid developments in contributing to the

Code for Sustainable Homes and will help in adoption of source control SuDS as part of PPS25 requirements.

6.3 Area Specific Strategies

- In Chippenham, where deep and fast flood water flows can occur, opportunities to direct water away from areas of high social impact should be identified;
- In rural areas upstream of Malmesbury, Melksham and Chippenham opportunities should be sought to increase flood storage areas capacity, including an additional storage allowance for increases in flow accounting for climate change;
- Opportunities should be sought for strategic flood storage areas in close proximity to future development areas to be maintained by developer contribution for the lifetime of the development;
- In Bradford on Avon, where fluvial and surface water flooding can occur, opportunities to direct water away from areas of high social impact should be identified;
- In Warminster, opportunities should be sought to open culverted watercourses, where possible, to return them to a natural system. When opening up culverted watercourses consideration should be given to ensure flood risk is not exacerbated downstream;
- In the application of SuDS techniques it is recommended that priority is given to the use of surface water drainage techniques due to the generally permeable soils throughout Salisbury. Prior to implementing these techniques, each site should confirm that the use of infiltration drainage will not increase the risks of groundwater flooding.

7 Site Specific FRA Guidance

7.1 Overview

- 7.1.1 The existing Level 1 SFRA, together with this high level executive summary presents sufficient information to assist LPAs to apply the Sequential Test and identify where the Exception Test may be required. The broad scale assessment undertaken for a Level 1 SFRA provides sufficient detail to identify flood zones relevant to potential and existing allocations but is not of sufficient resolution to provide a detailed assessment within them.
- 7.1.2 A site specific Flood Risk Assessment (FRA) aims to refine the available information and minimise these risks through site design, layout and where required, mitigation. This chapter presents the recommendations for site specific FRAs prepared for submission with planning applications in the Wiltshire Council administrative area. Prior to committing expenditure or other resources on an FRA, consideration should be given to the ability of a site to pass the Sequential Test.

7.2 When is a FRA Required?

- 7.2.1 When informing developers of the requirements of a FRA for a development site, consideration should be given to the position of the development relative to flood sources, the vulnerability of the proposed development and its scale. The Environment Agency website provides standing advice on the requirement of FRAs for developers and LPAs⁷.
- 7.2.2 In the following situations a FRA should always be provided with a planning application:
- The development site is located in Flood Zone 2 or 3;
 - The site area of proposed development is greater than 1 ha and located in Flood Zone 1;
 - The development site is located in an area known to have critical flooding problems from any flood source;
 - The development is located within 20 m of any watercourse regardless of Flood Zone classification; and
 - Liaison with the LPA identifies the requirement for a FRA.

7.3 FRA Requirements

- 7.3.1 Annex E of PPS25 presents the minimum requirements for FRA. These include:
- Consideration of the risk of flooding arising from the development in addition to the risk of flooding to the development;

⁷ <http://www.environment-agency.gov.uk/research/planning/82584.aspx>

- Identify and quantify the vulnerability of the development to flooding from different sources and identify potential flood risk reduction measures;
- Assessment of the remaining 'residual' risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular development;
- The vulnerability of those that could occupy and use the development, taking account of the Sequential and Exception Tests and the vulnerability classification, including arrangements for safe access;
- Consideration of the ability of water to soak into the ground may change with development, along with how the proposed layout of development may affect drainage systems; and,
- Fully account for current climate change scenarios and their effect on flood zoning and risk.

7.3.2 The Practice Guide to PPS25 advocates a staged approach to site specific FRA. The findings from each stage inform the next stage iteratively throughout the development process. The following paragraphs describe the three levels of site specific FRAs.

Level 1 - Screening Study

7.3.3 A Level 1 Screening Study is intended to identify if a development site has any flood risk issues that warrant further investigation. This should be based on existing information such as that presented in the Level 1 SFRA. Therefore this type of study could be undertaken by a Land Drainage Engineer/Development Control Officer in response to the developer query or by a developer where the Level 1 SFRA is available. Using the information presented in the Level 1 SFRA and associated GIS layers a Land Drainage Engineer/Development Control Officer could advise a developer of any flooding issues affecting the site. This information can then be used by the developer as the basis to further their understanding of how the flood risks could potentially affect their development.

Level 2 - Scoping Study

7.3.4 A Level 2 Scoping Study is predominately a qualitative assessment designed to further understanding of how the flood sources affect the site and the options available for mitigation. The Level 2 FRA should be based on existing available information where this is available and use this information to further a developers understanding of the flood risk and how it affects their development. This type of assessment should also be used to inform master plans of the site raising a developer's awareness of the additional elements the proposed development may need to consider.

Level 3 – Detailed Study

7.3.5 Where the quality and/or quantity of information for any of the flood sources affecting a site is insufficient to enable a robust assessment of the flood risks, further investigation will be required. For example, it is generally considered inappropriate to base a FRA for a residential care home at risk of flooding from fluvial sources on Flood Zone maps alone. In such cases the results of hydraulic modelling are preferable to ensure details of flood flow velocity, onset of

flooding and depth of floodwater is fully understood and that the proposed development incorporated appropriate mitigation measures.

8 Recommendations

8.1 The Next Stage

Planning Policy

- 8.1.1 Based on the information presented in the existing Level 1 SFRA's and this high level executive summary document, including the accompanying GIS layers, Wiltshire Council have sufficient information to apply the Sequential Test. The Sequential Test should be undertaken based on the existing district administrative, due to the housing allocation structure within the draft RSS.
- 8.1.2 Where there are insufficient sites in Flood Zone 1 to accommodate the required growth, consideration should be given to the vulnerability classification of the development to ensure that it is located in an area of acceptable risk as defined in PPS25. In some cases this may require application of the Exception Test.
- 8.1.3 Where application of the Exception Test is required it will be necessary to undertake a Level 2 SFRA. As provided within the PPS25 Practice Guide the scope of the Level 2 SFRA consists of a more detailed assessment of the flood hazard to the development, which includes considering the following:
- Flood probability;
 - Flood depth;
 - Flood velocity; and,
 - Rate of onset of flooding.
- 8.1.4 This will allow informed decisions to be made regarding the safety of the development and whether the development is achievable and deliverable in terms of sustainability.
- 8.1.5 Where the Exception Test is required for a development, hydraulic modelling is normally required to define the above flood characteristics. In the absence of existing detailed hydraulic modelling, additional modelling work will be needed.

Further Work

- 8.1.6 Level 2 work is currently being undertaken for two specific sites within Salisbury, commissioned by SDC prior to the commencement of the unitary authority. The Environment Agency has also identified that the 'west of Swindon growth area' may require Level 2 work to consider other sources of flooding, due to the size of the development (3000 houses).
- 8.1.7 The Level 2 requirements for the rest of the Wiltshire Council administrative area will not be understood until the LPA has undertaken the Sequential Test within each of the district administrative boundaries.
- 8.1.8 However, to mitigate against the anticipated effects of climate change further information through additional hydraulic modelling may be required to inform potential flood alleviation options within existing urban areas of Chippenham, Salisbury and Malmesbury.

- 8.1.9 Issues with surface water have been identified in Warminster, Bradford on Avon and Britford. Depending on development aspirations, these locations may benefit from a surface water management plan to reduce flooding from this source in the future. In addition, areas identified for regeneration provide opportunities for holistic consideration of surface water management through such plans.
- 8.1.10 Chapter 6 provides policy recommendations for area specific strategies, which LPAs should seek to incorporate into their emerging LDF.

Level 1 SFRA Updates

- 8.1.11 SFRAs should be considered as 'live' documents where regular review and monitoring should be undertaken. The associated GIS layers can be readily updated and should be considered as the best available data for the purposes of the Level 1 SFRA. GIS layers should be updated as part of the annual monitoring process (see Section 3.4).