CAPITA SYMONDS

Woking (River Wey)
STRATEGIC FLOOD RISK ASSESSMENT

For WOKING BOROUGH COUNCIL

VOLUME 1:
DECISION SUPPORT DOCUMENT
FINAL

March 2009

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Woking Borough Strategic Flood Risk Assessment

Decision Support Document

Final / March 2009

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Preface

It is accepted that the technical content of the Woking Borough SFRA will need to be reviewed and amended in the future as new information becomes available. The policy basis for this version is PPS 25 (DCLG, Dec 2006) and the PPS 25 Practice Guide (CLG, June 2008).

Although there is no statutory consultation requirement at this stage the nature of the intended end use for the information makes it appropriate to obtain feedback relating to the report in order to contribute to the overall robustness and credibility of this work. This information will also be an aid when formulating the necessary next steps in engaging those parties who will be involved in the future.

It is the responsibility of the reader to be satisfied that they are using the most up to date information and that this has been included within the Woking Borough Council SFRA.

Notes:

This version of Volume 1 of the SFRA has been prepared in advance of the application of the Sequential and Exception tests and the preparation of policy on flood risk and land allocations by Woking Borough Council. It is recommended that the contents of this document are thoroughly reviewed following the preparation of policy and the application of the Sequential and Exception Tests in order that the contents of Volume 1 of the SFRA are compatible with the final plan outcomes.

Foreword

Woking Borough Council is required to prepare a Strategic Flood Risk Assessment (SFRA) to support their Local Development Framework (LDF). This SFRA has been prepared in response to the guidance in Planning Policy Statement 25 – *Development and Flood Risk* that states that a sequential risk based approach should be applied to decision making at all levels of the planning process. The principle stages being the Regional Level (South East England Plan), the Local Level (this assessment) and the site level (planning applications).

The SFRA creates a strategic framework for the consideration of flood risk when making planning decisions at Local Level within the Woking Borough Council area. It has been developed with reference to Planning Policy Statement 25 (PPS25), the PPS 25 Practice Guide (CLG, June 2008) and previously the Practice Guide Companion to PPS 25 "Living Draft" (DCLG, February 2007) and additional guidance provided by the Environment Agency.

The fundamental concepts that underpin the SFRA are outlined in PPS25. The guidance provided in PPS25 requires local authorities and those responsible for development decisions to demonstrate that they have applied a risk based, sequential approach in preparing development plans and consideration of flooding through the application of a sequential test. Failure to demonstrate that such a test has been undertaken at this level potentially leaves planning decisions and land allocations open to challenge during the planning process.

The underlying objective of the risk based sequential allocation of land is to reduce the exposure of new development to flooding and reduce the reliance on long-term maintenance of built flood defences. Within areas at risk from flooding, it is expected that development proposals will contribute to a reduction in the magnitude of the flood risk.

SFRAs are essential to enable a strategic and proactive approach to be applied to flood risk management. The assessment allows us to understand current flood risk on a wide-spatial scale and how this is likely to change in the future.

The main objectives of the Woking Borough SFRA are to provide flood information:

- As the evidence base for the application of the risk based sequential approach to support planning decisions, in line with PPS25;
- that is strategic as it covers a wide spatial area, considering both present and future risk;
- that supports sustainability appraisals of the local development framework; and
- that identifies what further investigations may be required in flood risk assessments for specific development proposals.

The SFRA is presented in a number of documents:

- VOLUME 1 – Decision Support Document (this document);
- VOLUME 2 – Technical Report; and,
- VOLUME 3 – Mapping.

The SFRA is a live document that is intended to be updated as new information and guidance becomes available. The outcomes and conclusions of the SFRA may not be valid in the event of future changes to legislation, policy of revised government guidance on flood risk, the data or the baseline flooding situation. Decisions also require the inclusive assessment of wider planning issues and the user should be aware that changes to decision making principles affecting other planning

issues can potentially affect the outcome of the risk based sequential test. The contents of this document are also dependant on the outcome of the Regional Flood Risk Appraisal. It is the responsibility of the user to ensure they are using the best available information.

Woking Borough Council
STRATEGIC FLOOD RISK ASSESSMENT - Structure

SFRA VOLUME 1 – DECISION SUPPORT

1. Introduction
2. Flooding in Woking Borough
3. How to Use the SFRA in Land Use Planning
4. How to Use the SFRA in Flood Warning and Emergency Planning
5. How to Use the SFRA in Development Control
6. SFRA Maintenance and Management

SFRA VOLUME 2 – TECHNICAL REPORT

1. Introduction and Catchment Summary
2. Flood Warning and Emergency Planning
3. Asset and Structure Data
4. Flooding from Rivers
5. Flooding from Land, Surface Water, Sewers and SUDS
6. Groundwater Flooding
7. Flooding from Artificial Sources
8. Flood Risk at Development Sites and Strategic Options

SFRA VOLUME 3 - MAPS

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Volume 3 – Maps (see separate volume)

1. INTRODUCTION TO THE SFRA

1.1. The information in this Strategic Flood Risk Assessment (SFRA) will be used to inform Woking Borough Council, Sustainability Appraisal, land allocations, and policies regarding flooding issues. The SFRA provides information required to apply the Sequential Approach and Sequential Test on the Local Development Document scale as defined by PPS25. In addition the SFRA will inform Flood Risk Assessments prepared in support of particular applications for development in accordance with the Local Development Framework (LDF).

1.2. The SFRA contains information that allows flood risk to inform the preparation of the LDF as it provides data that enables a risk based Sequential Test to be applied. PPS 25 advocates that the risk based Sequential Test is applied at all stages of planning. The applicable stages are identified as being:

- South East Plan (Regional Level – RSS) - A Regional Flood Risk Appraisal;
- Local Level (Local Development Framework) - A Strategic Flood Risk Assessment; and
- Site Level (Planning Application) - A Flood Risk Assessment

1.3. At the site level it will be necessary for the applicant to refer to the Testing performed by WBC in preparing the LDF and be satisfied that the site for which details were being prepared had been "Tested". It is not the responsibility of the applicant to perform the Test but he can be required to submit information to the local planning authority to enable them to perform the Test. The Sequential approach should be applied throughout all stages so that the vulnerability of the intended use is matched to the risk, e.g. higher vulnerability uses are sited in locations of lower probability of flooding. The Exception Test should only be applied after the application of the Sequential Test.

1.4. The underlying objective of the SFRA is to provide a platform for the consistent consideration of flood risk and accommodation of current practice and best available data for the duration of the plan. Inevitably this will require that consideration is given to the lifetime of development included within the plan (taken to be 100 years for residential development by the Environment Agency) therefore climate change effects described in PPS 25 should be incorporated into the SFRA.

1.5. In addition to its role within the LDF process the SFRA is likely to be accessed by a number of different functions within Woking Borough Council. This decision support document provides information on how to interpret the Woking Borough SFRA results to inform land use planning, flood warning and emergency planning and development control. The document also provides guidance for site-specific Flood Risk Assessment (FRA). The document requires the user to refer to technical information and flood maps contained in Volumes 2 and 3 of this SFRA. As stated it also informs those making decisions of the effects of climate change on flood risk.

1.6. The approach adopted for this SFRA has primarily been developed in recognition of the need to provide flood risk information to support appropriate land use allocation within Woking Borough and to allow the application of the Sequential and Exception Tests described in PPS25. The SFRA should also be used to inform Core Strategies, Area Action Plans (AAPs) and development control policies.

1.7. SFRAs can also be used to:

- set planning constraints within designated development areas and where relevant in the case of windfall planning applications; and

- identify the level of detail required for site-specific FRAs in particular locations and enable them to determine the acceptability of flood risk in relation to emergency planning (DCLG 2007).

1.8. This document is Volume 1: Decision Support, of the SFRA. This is the main SFRA document and should be read in conjunction with the Woking Borough SFRA Volume 2: Technical Report. This volume provides a summary of the background and methodology adopted for assessing strategic flood risk. It provides guidance for planners and developers, and supports the practical use of the maps contained in Volume 3.

1.9. Volume 2 is the technical report. It explains in detail the technical methodology adopted to assess the strategic flood risk issues in Woking Borough. Volume 3 contains maps developed for this study and should be used in conjunction with Volume 1 to determine areas at higher risk of flooding.

1.10. This document, Volume 1, has been broken into chapters, with the following structure designed to support Woking Borough in a range of activities:

Chapter 1: Introduction – this chapter;

Chapter 2: Flooding in Woking Borough– brief description of historic, current and future flood risk in the Borough;

Chapter 3: the SFRA in land use planning – this chapter explains how the SFRA should be used to support Woking Borough Council in their strategic land use planning, including an explanation of the Sequential Test, and Exception Test;

Chapter 4: How to use the SFRA in flood warning and emergency planning – this chapter advises on the responsibilities of Woking Borough with regard to emergency planning and flood risk, and outlines how the SFRA can be used to support these responsibilities;

Chapter 5: How to use the SFRA in development control – this chapter discusses the requirement for FRAs in certain development scenarios, and considers the role of the SFRA in identifying the need, and level of detail required;

Chapter 6: SFRA Maintenance and Management;

Chapter 7: **References; and,**

Chapter 8: Glossary and Notations.

1.11. In addition, APPENDIX A: HOW THE SFRA LINKS WITH OTHER PLANS AND POLICIES., provides a brief summary of the plans and policies which provided the context for the SFRA, and those that the SFRA will inform. APPENDIX B: HOW FLOOD RISK IS ASSESSED, defines flood risk and explains how various forms of flood risk are considered in the SFRA. It also considers the implications of climate change, and the uncertainties associated with establishing flood risk in Woking Borough.

2. FLOODING IN WOKING BOROUGH

2.1. The Woking SFRA covers an area of 63.41km2 and within this area the River Wey is the principle watercourse. It flows in a predominantly northeast direction from near Petersfield (North Wey) and Liphook (South Wey) to Weybridge. The total length of the main river is 92km, with 37km falling within the SFRA boundary.

2.2. The River Wey represents a major source of flood risk within the WBC area. Surface water flooding and flooding from smaller watercourses is also significant on a local scale. Current flood risk management measures are confined to localised flood bunds and bank protection, no formal flood defences exist within the SFRA study area.

2.3. The Study Area also contains the Basingstoke Canal, which is owned and managed by The Basingstoke Canal Authority, and used mainly by leisure boats. The Basingstoke Canal is potentially a source of flood risk.

2.4. Southern parts of the Woking area are also subject to flood risk from the Addlestone Bourne, a separate SFRA has been produced by Woking Borough Council in conjunction with Surrey Heath Council for the Addlestone and Hale Bourne catchments and should be referred to for flood risk information within this catchment. It is reasonable to use the guidance provided within the Woking (River Wey) SFRA in conjunction with the flood risk maps provided in the Hale and Addlestone Bourne SFRA however the H&AB SFRA dates from 2007 and as such the information contained within it may not be the best currently available.

Sources of Flooding

Fluvial (river) Flooding

2.5. Fluvial flooding from the River Wey and the Hoe Stream which both flow through the Woking SFRA study area is considered to be the main source of flooding in the SFRA. The SFRA includes a review of the Environment Agency Flood Zones and a detailed assessment of the risk of fluvial flooding from the River Wey and the Hoe Stream based on existing hydraulic models available from the Environment Agency. The detailed assessment of fluvial flood risk is described in Volume 2: Chapter 3 of this SFRA.

2.6. The Environment Agency Flood Zones for the study area (**Volume 3, Appendix B - EA Flood Zone Maps**) show extensive areas of land within Flood Zone 3, however much of this area has remained sparsely developed or undeveloped. There are however isolated pockets of moderate development intensities within Flood Zone 3. There are a number of transport links within the floodplain considered at high probability of flooding. The suitability of redevelopment within areas with a high probability of flooding would require careful consideration given the potentially high risk of flooding. A more detailed assessment of the risk in these areas is covered in more detail in this SFRA.

2.7. More detailed hydraulic modelling has been used to understand the magnitude and distribution of flood risk within the EA Flood Zones. This assessment has shown that there are small areas within the developed parts of the borough that are considered to be at high risk of flooding and this does include some key transport links. Predicted flood depths are shown to exceed 1m in parts of the study area. The assessment has shown that while the predicted extent of flooding may not be significantly increased as a result of the potential impacts of climate change, the predicted depth of flooding is expected to increase.

2.8. Following the detailed assessment of fluvial flood risk (Volume 2: Chapter 3) it can be concluded that:

- Generally existing development is at limited risk of flooding within the study area (particular exceptions are noted in the SFRA);

- The Flood Zones should be taken into consideration as part of the Woking Development Framework, and by Development Control, ensuring that vulnerable land uses (including residential and essential infrastructure) are directed to the lowest risk areas possible;
- Flood Zone 3 is currently largely undeveloped and occupied by rural land uses. It is unlikely that any significant proposed future development in these areas, except for water compatible or particular types of essential infrastructure development, would comply with the guidance within PPS25.
- Future development within Flood Zones 2 and 3 should take into consideration the potential to alter the Flood Zones via diversion, obstruction or increasing peak flow rates, thus increasing flood risk.

Surface Water and Sewer Flooding

2.9. A large percentage of the Study Area is currently undeveloped, therefore surface water runoff and drainage is relatively unchanged from the Greenfield condition in the more rural areas. There are areas within the study area which have experienced heavy urbanisation over the past century; the most intensive existing development being the urbanised centre of Woking and its associated suburbs, and Byfleet.

2.10. Surface water runoff from these developed areas is likely to result in flooding of some areas before the water can enter the river or drainage system and may also lead to increased water levels within the River Wey compared to the natural catchment river levels. Although this has not been quantified, it is generally accepted that a positive drainage system associated with development increases the peak flow rate from a development area and therefore in the receiving watercourses. Sustainable Drainage systems can reduce this impact

2.11. A broadscale assessment of the risk of flooding from surface water and sewers is presented in Volume 2: Chapter 4 of this SFRA based on recorded observations of flooding and a desk based assessment of the topography, soils and geology of the study area. The probability of surface water flooding in Woking is considered to be high and may be locally significant and management of surface water should be a key component of flood risk management policy in the LDF.

Groundwater Flooding

2.12. Much of Woking Borough is situated on top of London Clay, which due to its impervious nature would reduce the likelihood of groundwater flood. However localised groundwater flooding could occur in valley bottoms which have alluvial deposits. Any such groundwater flooding events would likely be of limited extent and localised to the valley bottoms. Volume 2: Chapter 5 of this SFRA includes more information on the risk of groundwater flooding and the management of the risk.

Flooding from Artificial Sources

2.13. There are two canals in the study area, the Basingstoke Canal and the Wey Navigation. The Basingstoke Canal is a 'contour' canal and therefore there is a risk of flooding caused by a breach in the canal embankment. The Basingstoke Canal has breached in banks in 1968, this was due to lack of maintenance and heavy rains. The residual risk of flooding from the Basingstoke Canal is an important source of flooding considered in this SFRA (Volume 2: Chapter 6) and a more detailed assessment of the risk will be required in site specific FRAs for development in areas highlighted in this SFRA as at risk from this source of flooding.

2.14. The risk of flooding from the Wey Navigation is not considered to be as great a risk as the risk from the Basingstoke Canal as the Wey Navigation largely follows the valley bottom and any breach would likely be confined within the flooding extents of the River Wey.

Historic flooding

2.15. The largest flood event on record for the River Wey catchment is September 1968, for which widespread and severe flooding was documented, however little reliable information on flood levels or flows are available for this event. The second largest event on record occurred during October and November 2000. For this event accurate information on levels and flows within the catchment is available, and was utilised in the calibration of the Wey produced for the Wey Flood Mapping Study commissioned by the EA. During this event flooding is known to have occurred within the study area including the urban areas of Woking and Byfleet.

2.16. On the 20th July 2007 Woking and the surrounding areas experienced heavy downpours, with several weeks worth of rain falling within a matter of hours. This resulted in some severe flooding in the area.

2.17. The majority of the flooding was caused by surface water runoff, with the drains unable to cope with the excess water on the roads. The amount of surface water runoff flowing into the drains was so much that Surrey's deputy member for transport even stated that "No drainage system in the world would have coped with that."

2.18. The River Bourne was also reported to have burst its banks early on the 20th July 2007 causing heavy pockets of flooding in the area around Chobham (outside of the Woking Council boundary). It appears however not to have affected the borough of Woking.

Probability of flooding

2.19. The probability of flooding is described in this SFRA using the 'return period' terminology. A flood event that is described as a 100 year return period flood event is an event that is likely to occur, on average, once every 100 years. This could also be described as having an Annual Exceedance Probability (AEP) of 1%. This is sometimes known as the 'annual probability' of flooding and means that an event of that magnitude has a 1% (or 1 in 100) chance of occurring in any given year.

2.20. This SFRA discusses three different probability flood events summarised below in Table 1 Flood Events Assessed in this SFRA.

Table 1 Flood Events Assessed in this SFRA

Flood event (AEP)	Flood event (return period)	Flood type	Risk assessed
5% AEP	20 year return period	Fluvial (river)	Used in a detailed assessment of the predicted depths and extents in river flooding events and to define Functional Floodplain.
1% AEP	100 year return period	Fluvial (river)	Used in a detailed assessment of the predicted depths and extents in river flooding events.
1% AEP with Climate Change	100 year return period plus a 20% increase to represent the possible impacts of climate	Fluvial (river)	Used in a detailed assessment of the predicted depths and extents in river flooding events.

	change.		
0.1% AEP	1000 year return period	Fluvial (river)	Used in a detailed assessment of the predicted depths and extents in river flooding events.

2.21. The fluvial (river) flood zones are derived using the events shown in Table 1 Flood Events Assessed in this SFRA. Table 2 Flood Zones Defined in PPS25 provides a definition of the Flood Zones which are defined in PPS 25 and are used in this SFRA.

Table 2 Flood Zones Defined in PPS25

Flood Zone	Definition
Flood Zone 1. Low probability	Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (< 0.1%)
Flood Zone 2. Medium probability	Land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% to 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% to 0.1%) in any year.
Flood Zone 3a. High probability	Land assessed as having a 1 in 100 or greater annual probability of river flooding (> 1%) or a 1 in 200 or greater annual probability of flooding from the sea (> 0.5%) in any year.
Flood Zone 3b. Functional floodplain	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 Environment Agency.

2.22. The National Flood Zone dataset provided by the Environment Agency is prepared for a scenario that ignores the presence of flood defences where they exist. There are no formal flood defences within the Woking study area and therefore there is no need to consider defended and undefended scenarios separately.

2.23. A detailed assessment of the risk of fluvial (river) flooding in Woking has been undertaken for the four events shown in Table 1 Flood Events Assessed in this SFRA . This provides more detailed information than is shown in the Environment Agency Flood Zones. The refinement of the EA Flood Zones is one of the key objectives of a SFRA as required by PPS 25. This includes an extreme flood event with an annual exceedence probability of 0.1% (1 in 1000 year return period) event. Additionally in this SFRA the risk of flooding from the Basingstoke Canal has been considered including an assessment of areas liable to flood in the event of embankment failure on the canal.

3. How to Use the SFRA in Land Use Planning

Introduction

3.1. Guidance on development and flood risk is given in PPS25 and the Practice Guide. PPS 25 requires that flood risk be considered through the application of a Sequential Test. The process of how to obtain the information needed to perform the Sequential Test is described in this chapter.

3.2. PPS25 advocates a sequential risk based approach when preparing an assessment. The policies in PPS25 require that all stages of the development planning process should take account of both the nature and spatial distribution of flood risk and the degree of vulnerability of different types of development. This should be achieved in the South East Plan, the Local Development Framework and in planning applications.

3.3. It is not the intention for guidance provided in this document to supersede that contained in PPS25 or other plans or policies. The information and procedures are included as an interpretation of national policy for the use in the SFRA. This SFRA should be read and used in conjunction with PPS 25 and the Practice Guide (June 2008).

3.4. The Environment Agency's 'Strategy for Flood Risk Management 2003 - 2008' (Environment Agency 2003), describes flood risk as a combination of two components, the:

> *"**chance (or probability)** of a particular flood event; and,*
>
> ***impact (or consequence)** that the event would cause if it occurred."*

3.5. PPS 25 captures this intent by requesting that flood risk is avoided, reduced and managed by taking full account in decisions on plans and application of:

- present and future flood risk, involving both the statistical probability of a flood occurring and the scale of its potential consequences, whether inland or on the coast; and
- The wider implications of flood risk of development located outside of flood risk areas.
- The concept of flood risk is described in further detail in Appendix B: How Flood Risk is Assessed.

3.6. The PPS 25 Practice Guide develops the 'avoid – reduce – manage' approach advocated in PPS 25 into a flood risk management hierarchy of 'assess – avoid – substitute – control – mitigate'. This hierarchy is summarised in the flow chart below (from PPS 25 Practice Guide, CLG, June 2008).

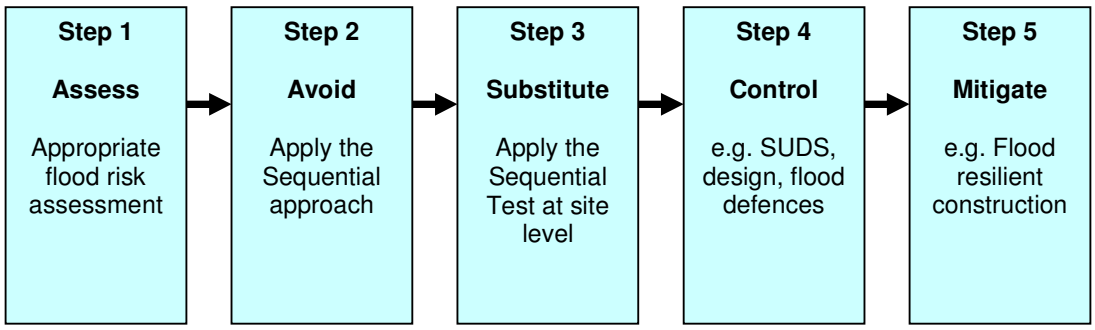


Figure 1 The Avoid-Risk-Manage Approach

3.7. The evidence in the SFRA is intended to inform the formulation of the vision, policies and broad search areas during the production of the Core Strategy to an appropriate level of detail so that the Core Strategy is robust with respect to flood risk. Flood risk is one of many issues which will have to be considered by Woking Borough Council in the Sustainability Appraisal process and the SFRA provides the information that is required to ensure that the decision making process within the LDF takes full account of flood risk issues in the borough.

3.8. The SFRA provides Woking Borough Council with the information to assess their allocations of new development sites and apply a risk based Sequential Test. The SFRA also provides the necessary information for planners to make strategic decisions that identify the amount and type of development that may be appropriate, requirements for the management of run off, and identification of strategic responses (options) to manage flood risk.

3.9. The results of the SFRA can be used to:

- Prepare appropriate policies for the management of flood risk within Woking Borough area; and,
- Inform the Sustainability Appraisal so that flood risk is taken into account when considering options and the preparation of strategic land use policies.

Sequential Test

3.10. It is recognised that flood risk information must be considered alongside other spatial planning issues. Allocations are thus “Tested” on the basis of their flood risk attributes and the outcome used to inform decisions that include other spatial planning issues. Chapter 4 of the PPS 25 Practice Guide provides guidance on the application of the Sequential approach and the Sequential Test.

3.11. The Sequential Test is applied at all stages of planning. The SFRA provides the flood risk data to enable the application of the risk based Sequential Test in the process of identifying land that is suitable for development in the Local Development Framework. It also provides information to inform Flood Risk Assessments at particular sites and contributes further data to inform future revisions to the South East Plan (Regional Flood Risk Appraisal). Specifically the SFRA contains information on flood risk that enables Woking Borough Council to demonstrate that they have tested the reasonably available alternatives using a risk based search sequence.

3.12. To perform the Sequential Test Woking Borough Council first need to be aware of what sites are reasonably available alternatives in their council area. It is necessary to clearly define “reasonably available” and be able to provide evidence that there are not locations outside of those considered with a lower probability of flooding that could be considered to be “reasonably available”. The PPS 25 Practice Guide defines the area that the Sequential Test should be applied to at this level of planning as the whole LPA area.

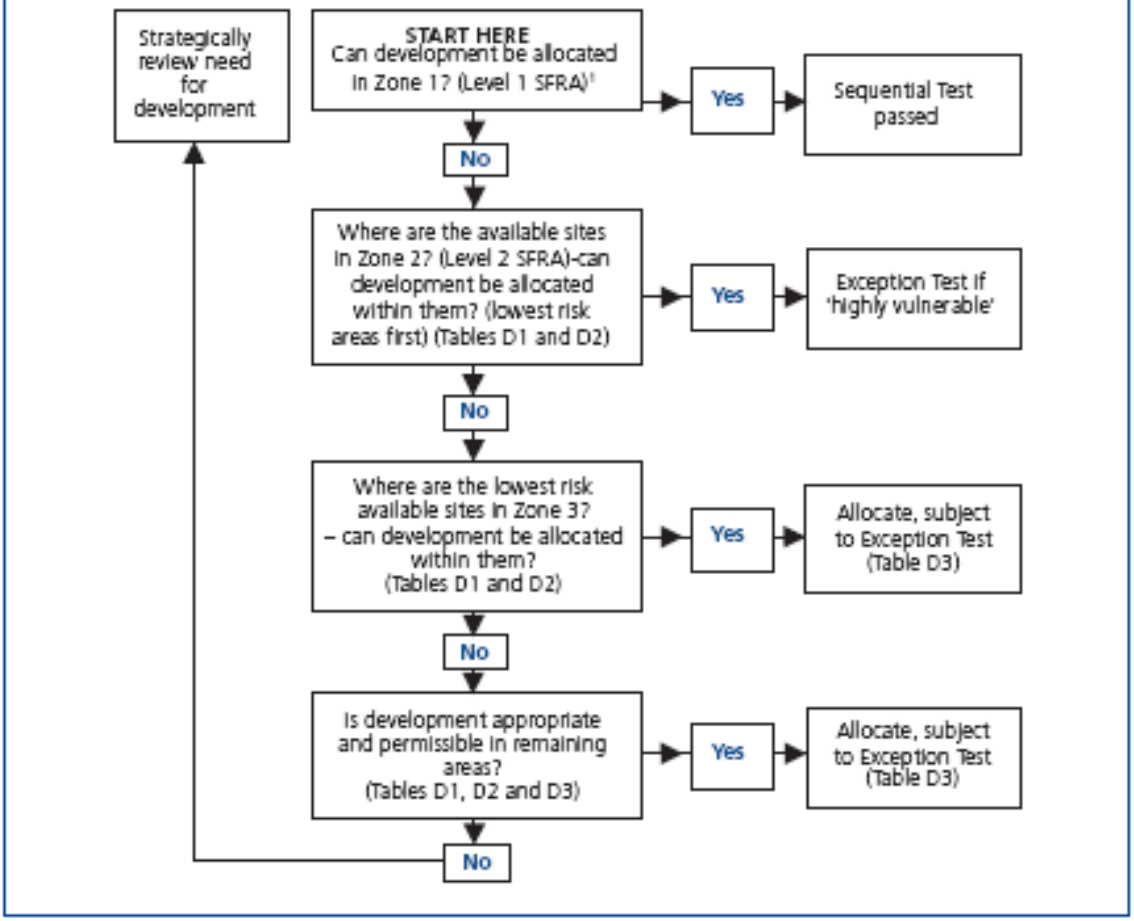
3.13. Evidence of the application of the Sequential Test by Woking Borough Council should be provided through the Sustainability Appraisal process. When applying the Test it will be important for Woking Borough Council to demonstrate:

- That a transparent process has been formulated and followed;
- That this process has sought to steer new development to areas with the lowest probability of flooding (according to table D.1 of PPS 25); and
- That full consideration has been given to reasonably available alternatives on land with a lower probability of flooding.

3.14. Figure 4.1 of the PPS 25 Practice Guide (reproduced below as Figure 2 Application of the Sequential Test provides a flow chart for use by local authorities in the application of the Sequential Test. It is a tool to help the decision-maker locate a proposed development in

lower flood risk categories. Below this flow chart are some additional notes (Table 3 Guidance on the use of the SFRA in the Application of the Sequential Test) which direct the user to the particular sections of technical information or mapping within this SFRA which should be used in each stage of the process.

Figure 4.1 Application of the Sequential Test at the Local level for LDD preparation



Note

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

Figure 2 Application of the Sequential Test

Extract from the PPS25 Practice Guide (Figure 4.1)

3.15. The flood risk information required to address the four stages in the application of the Sequential Test noted above is provided in the flood maps in Volume 3 of this SFRA. Specific guidance for Woking Borough Council on the use of these flood maps in the application of the Sequential Test is provided below in Table 3 Guidance on the use of the SFRA in the Application of the Sequential Test.

Table 3 Guidance on the use of the SFRA in the Application of the Sequential Test

Stage in Sequential Test	**Guidance**	**Associated figures in** Woking Borough Council **SFRA (Volume 3)**
1. Can development be allocated in Zone 1?	Woking Borough Council should use Flood Zone maps to identify areas of borough within Zone 1 and consider whether proposed developments can be allocated in Zone 1 land. Within Zone 1, areas at risk from other sources of flooding should be avoided where possible	Volume 3, Appendix B - EA Flood Zone Maps Volume 3, Appendix E - Other Sources of Flooding Volume 3, Appendix F - Flood Risk from the Basingstoke Canal
2. Where are the available sites in Zone 2? Can development be allocated within them?	Woking Borough Council should use Flood Zone maps to identify areas of borough within Zone 2 and consider whether proposed developments can be allocated in these areas	Volume 3, Appendix B - EA Flood Zone Maps Volume 3, Appendix E - Other Sources of Flooding Volume 3, Appendix F - Flood Risk from the Basingstoke Canal
3. Where are the lowest risk available sites in Zone 3? Can development be allocated within them?	Woking Borough Council should use more detailed information within this SFRA to understand the distribution of risk within Flood Zone 3. Detailed maps of the areas at risk of fluvial flooding are provided and areas of greatest risk within this zone are identified on maps showing predicted flood depths.	Volume 3, Appendix B - EA Flood Zone Maps Volume 3, Appendix C - Detailed Maps of River Flooding Volume 3, Appendix D - Flood Depth Mapping Volume 3, Appendix E - Other Sources of Flooding Volume 3, Appendix F - Flood Risk from the Basingstoke Canal
4. Is development appropriate and permissible in remaining areas?	In considering the appropriateness of development in remaining areas, Woking Borough Council should consider the vulnerability of the proposed development and Tables D2 and D3 of PPS 25. Information on the flood hazard in river flooding events and from canal breach embankments is also provided in this SFRA.	Volume 3, Appendix C - Detailed Maps of River Flooding Volume 3, Appendix D - Flood Depth Mapping Volume 3, Appendix E - Other Sources of Flooding Volume 3, Appendix F - Flood Risk from the Basingstoke Canal

3.16. As shown in Figure 2 Application of the Sequential Test and Table 3 Guidance on the use of the SFRA in the Application of the Sequential Test the EA Flood Zones are the starting point in the application of the Sequential Test. Information relating to non-fluvial sources of flooding is often less quantitative than for fluvial (river) flooding but these sources must

also be taken into account when considering the lowest risk areas available for development. Volume 2: Chapters 5, 6 and 7 provide information on non-fluvial sources of flooding including a broadscale assessment of areas which may be at risk and where further information is required.

3.17. It should be noted that the process illustrated in Figure 2 Application of the Sequential Test, does not take into account the potential impacts of climate change on the level of flood risk. It is recommended that Woking Borough Council consider the potential impacts of climate change when applying the third and fourth stages of the Sequential Test process described above. The potential impacts of climate change on the risk of fluvial flooding in Woking Borough are shown in **Volume 3, Appendix C - Detailed Maps of River Flooding** of this SFRA. The potential impacts of climate change on other sources of flood risk in Woking Borough Council are discussed in the Volume 2: Technical Report and should be referred to when considering the areas of lowest risk within Flood Zone 3.

3.18. The protocols adopted for the Sequential Test should ideally be agreed with the Environment Agency. It is important that the decision maker engages key stakeholders early in the decision making process. It is also important to consider uncertainty of information when making land use planning decisions.

3.19. In the allocation of development sites in the LDF Woking have to consider flood risk information alongside other spatial planning issues such as transport, housing, economic growth, natural resources (see Figure 3 Consideration of Other Spatial Planning Issues).

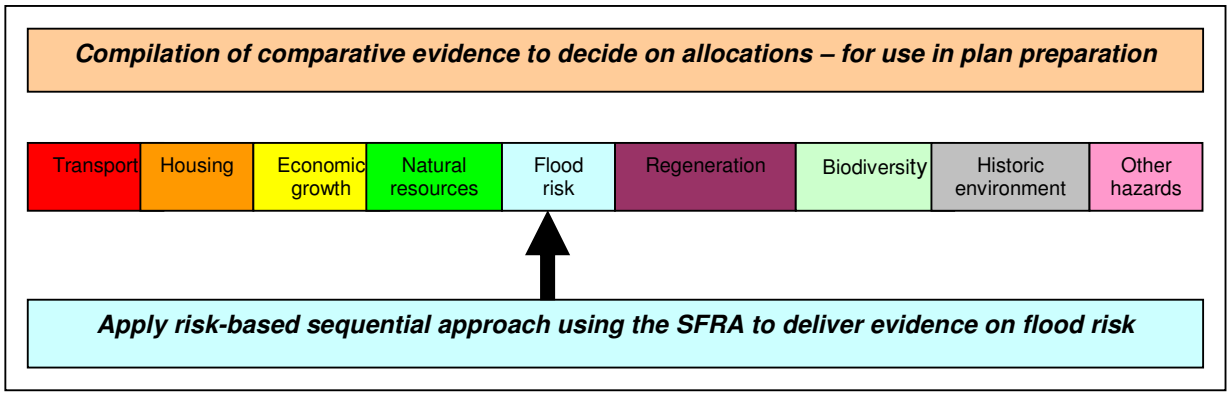


Figure 3 Consideration of Other Spatial Planning Issues

3.21. It is recommended that Woking Borough Council formulate a bespoke flow chart that:

- Adopts the same conceptual logic as shown in Figure 3 Consideration of Other Spatial Planning Issues ;

- Clearly sets out the information used to inform the "Yes/No" decisions shown in Figure 3 Consideration of Other Spatial Planning Issues, and where this information can be found;

- Identifies the process used to select "reasonably available alternatives"; and

- Records how information on other material planning issues has been considered in the decision making process.

3.22. The PPS 25 Practice Guide reinforces the fact that it is important that Woking Borough Council apply the Sequential Test in a clearly documented and transparent manner. Table 5 Example Table for Recording the Sequential Test Process at the end of this chapter provides a template for Woking Borough Council to consider when undertaking the Sequential Test. This table can be used to record the information used in the decision

making process for each allocated area/site following the methodology outlined in the flow chart, Figure 2 Application of the Sequential Test.

3.23. Chapter 4 of the PPS 25 Practice Guide provides guidance on the application of the Sequential Test for the specific circumstances of non-allocated development, windfall sites, single properties and change of use applications.

Exception Test

3.24. If, following the application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding, the Exception Test can be applied in accordance with Table D3 and paragraphs D9 to D14 of PPS25. Figure 2 Application of the Sequential Test, highlights the stages in the Sequential Test at which the Exception Test may need to be applied. The Test provides a method of managing flood risk while still allowing necessary development to occur. It may not always be appropriate to apply the Exception Test.

3.25. Figure 4 Application of the Exception Test is a reproduction of Figure 4.2 in the PPS 25 Practice Guide which illustrates the process that should be followed by Woking Borough Council in the application of the Exception Test.

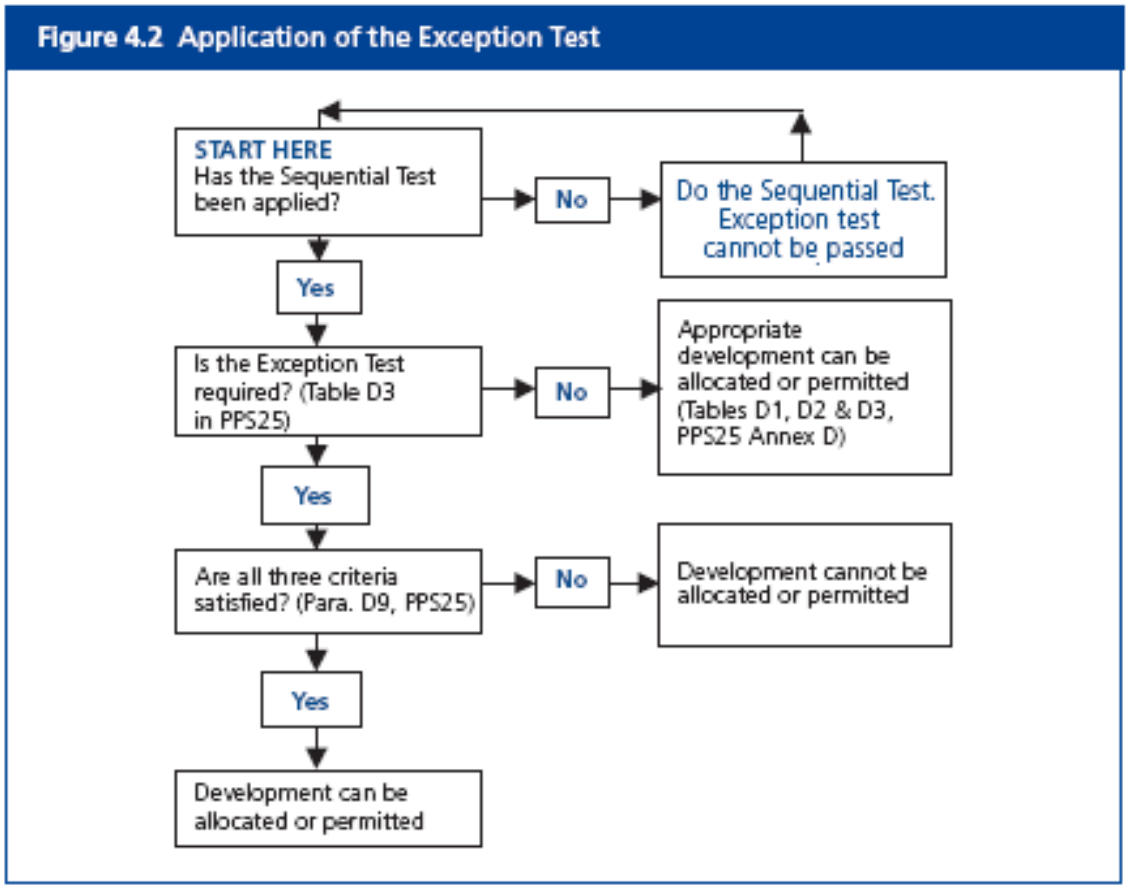


Figure 4 Application of the Exception Test

Reproduced from Figure 4.21, PP2 25 Practice Guide (CLG, June 2008).

3.26. Where it is appropriate to apply the Exception Test, all of the following three elements must be passed:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk;
- the development should be on developable previously-developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously-developed land; and
- a FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.27. The three criteria of the Exception Test referred to in the process in Figure 4 Application of the Exception Test are listed above. The PPS 25 Practice Guide provides additional guidance in Chapter 4 on the application of this test. The first stage of the test reflects the wider sustainability benefits of the development which should be tested against the aims and objectives of the Sustainability Appraisal and other LDD policy. Woking Borough Council may wish to develop a sustainability checklist for use in assessing this criterion of the Exception Test. The second criterion of the Exception Test relates to the previous use of the site and further guidance on this is provided in PPS 3. The third part of the Exception Test relates to the "safety" of the development and Chapter 4 of the PPS 25 Practice Guide provides detail on 'What is safe?' and 'Access and egress'. Information referenced in Table 4 Guidance for WBC on the use of the Exception Test can be used to assess the safety of particular locations since it gives greater detail on the risk of flooding and the associated magnitude of the flood hazard. Consideration should be given to the safe access and egress arrangements that can be implemented so that during flood events the appropriate level of safety can be maintained.

Table 4 Guidance for WBC on the use of the Exception Test

Exception Test part c): safe development		
Source of flood risk	**Guidance**	**Associated figure in Woking SFRA (Volume 3)**
1. Fluvial flooding	There are areas at risk of fluvial (river) flooding in Woking Borough Council. Information is provided within the SFRA indicating the predicted flood depth in these areas at risk. The potential area at risk of fluvial flooding is expected to increase as a result of climate change.	Volume 3, Appendix C - Detailed Maps of River Flooding Volume 3, Appendix D - Flood Depth Mapping
2. Other sources of flooding	The risk of flooding from groundwater, surface water and artificial sources of flooding (including the Basingstoke Canal) have been considered and are mapped and discussed in this SFRA. Areas of relatively high risk have been identified and guidance provided on where more detailed investigation is required.	Volume 3, Appendix E - Other Sources of Flooding Volume 3, Appendix F - Flood Risk from the Basingstoke Canal

3.28. It is important that Woking Borough Council retain a record of all their assumptions and decisions with regard to both the Sequential and Exception Tests, in order to demonstrate that they have performed the process. Once the Tests are completed, and Woking Borough Council is satisfied with the outcome, it is then possible to continue with the development process.

3.29. Flood events, more than many other emergencies, can affect a wide number of homes and the time to recover from a flood emergency can be prolonged. Accordingly it should be remembered that the level of "safety" will vary depending on the vulnerability of the community affected. More vulnerable residents will potentially be more severely affected

by the consequences of flooding and levels of safety should be commensurate with the risk.

Potential Development in Woking Borough

3.30. Future development in Woking Borough is spread throughout the study area. These areas correspond with the emerging Core Strategy. Development in these areas is planned to be of mixed uses and includes new jobs and new houses. The Woking Borough preferred option areas (January 2006) shows these areas and the site allocations within them.

3.31. The majority of the potential development areas in Woking Borough are found within Flood Zone 1 and have a low risk of fluvial (river) flooding. Application of the Sequential Test must consider all sources of flooding (not only river flooding) when directing development towards areas of lowest flood risk. New developments within this zone may still require a site specific Flood Risk Assessment. Table D1 in PPS 25 indicates that all sites in Flood Zone 1 which are greater than one hectare require a FRA. The FRA should consider all sources of flooding and ensure that runoff from the development is managed in such a way to prevent an increase in flood risk on the site or to third parties.

3.32. Some of the potential development sites in Woking are expected to be in Flood Zones 2 and 3 and have a medium or high risk of flooding. All sites in Flood Zones 2 and 3 will require a site specific FRA. The application of the Sequential Test at these sites must demonstrate that there are no reasonably alternative sites within areas at lower risk of flooding. Following application of the Sequential Test and the demonstration that there are no reasonably available alternative sites in areas at lower risk of flooding, some sites in these zones may require the application of the Exception Test, depending on the vulnerability of the proposed development to flooding (see PPS 25, Table D3) to demonstrate that the sites are safe and do not exacerbate the flooding situation.

3.33. All sites that are identified by the SFRA maps (or other data sources) as potentially at risk of flooding (from any source) will require a detailed assessment of flood risk at the planning stage (in the form of an FRA). For some sites a detailed investigation of flood risk will be required at the allocation stage in order to ensure the allocation is appropriate. In these cases WBC may produce the FRA for a site or an area, however in most cases the responsibility to provide an FRA and undertake a detailed assessment of flood risk will fall to the developer,

3.34. It should be noted that if, following the application of the Sequential Test, it is identified as being necessary to locate development in Zone 3 it follows that:

- A commitment must be made to maintain flood warning and emergency response capacity so that the duty could be performed for the lifetime of the development (this might require developer contributions to ensure that there is future capacity in circumstances where the risks are increasing due to climate change effects);

- A commitment must be made to seek to identify strategic measures that can contribute to a long term reduction in the flood consequences and identification of an adaptation strategy that over the long term improves the general resilience of the affected communities. This adaptation strategy will evaluate the resilience of critical civil infrastructure (eg. identified as being a “single point of failure”) and identify strategic measures that will reduce the vulnerability of the existing community to flood emergencies during the strategic, tactical and post event phases of a flood event;

- Generic measures should be identified which improve the resilience to all forms of flooding, in particular surface water and drainage flooding caused by high intensity local rainfall; and

- The design and layout of the development should aim to reduce the flood risk on site and to surrounding properties.

3.35. Surface Water Management Plans (SWMPs) when prepared by Woking Borough Council can be used to reduce the impacts of flooding through new development. As indicated in the PPS 25 Practice Guide (Chapter 5) the aim of the SWMPs will be to provide cost-beneficial solutions for the areas at greatest risk of surface water flooding and should be used by planners in the preparation of the LDF Core Strategy documents.

Table 5 Example Table for Recording the Sequential Test Process

Sites Identified for Potential Future Development	EA Flood Zone	Risk of fluvial (river) flooding	Risk of surface water and sewer flooding	Risk of ground water flooding	Risk of flooding from artificial sources	Additional comments
ID and Location of site	*Which Flood Zone is the site in?*	*Do the more detailed maps show the site to be at risk from fluvial (river) flooding?*	*Is the site in an area known to be at risk of surface water or sewer flooding?*	*Is groundwater flooding expected to be an issue at the site?*	*Is flooding from artificial sources expected to be an issue at the site?* *Is the site at risk of flooding from a breach in the embankments of the Basingstoke Canal?*	*Is there any other flood risk related information relevant to this site?* *Does this site pass the Sequential Test?* *Does this site need a site specific Flood Risk Assessment?* *Following application of the Sequential Test, will the Exception Test need to be applied to this site?*
	See **Volume 2: Chapter 3** for more information on EA Flood Zones See **Volume 3: Appendix B** for EA Flood Zone Maps	See **Volume 2: Chapter 3** for more information on fluvial (river) flooding See **Volume 3: Appendix C** for more detailed maps of river flooding showing the predicted extent of flooding for the 1 in 20, 1 in 100 and 1 in 1000 year return period flood events and for the 1 in 100 year return period flood event with an allowance for the potential impacts of climate change. See **Volume 3: Appendix D** for flood depth mapping showing the predicted depth of flooding for the 1 in 100 year return period flood event. The maps in **Volume 3: Appendix C** and **Volume 3: Appendix D** are based on more detailed flood modelling than used in the EA Flood Zones.	See **Volume 2: Chapter 4** for more information on surface water and sewer flooding. See **Volume 3: Appendix E** for mapping showing the observed records of sewer flooding and surface water flooding.	See **Volume 2: Chapter 5** for more information on groundwater flooding.	See **Volume 2: Chapter 6** for more information on flooding from artificial sources. See **Volume 3: Appendix F** for mapping showing areas at potential risk of flooding from a breach in the embankments of the Basingstoke Canal	Refer to PPS 25, Practice Guide to PPS 25 and **Volume 1: Chapter 3** of this SFRA for further information

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4. HOW TO USE THE SFRA IN FLOOD WARNING AND EMERGENCY PLANNING

4.1. PPS25 recognises that flooding is a natural process that plays an important role in shaping the natural environment. However, flooding also threatens life and causes substantial damage to property. Although flooding cannot be wholly prevented, its impacts can be avoided and reduced through good planning and management. A necessary component of flood defence is flood warning, backed up by civil protection measures. In this context, the Environment Agency is the authority responsible for issuing forewarning of possible river flooding events to the public, local authorities and emergency services. The Met office provide warnings of extreme rainfall events which may lead to flooding.

4.2. Structures and procedures for civil protection drawn up under the Civil Contingencies Act came into force in November 2004. The Act formalises the duties on Category 1 responders to emergencies by requiring risk assessment and contingency planning to deal with emergencies, and the provision of advice and information to the public about actual or likely emergencies.

4.3. Under the Act, risk assessment and planning is arranged through Local and Regional Resilience Forums. The Forums, which are led by the Regional Resilience Teams in the Government Offices of the Regions, seek to draw in all those bodies, which may be exposed to risk or be required to respond to events, including flooding. This includes production of an emergency flood management plan, which may then be incorporated into a local emergency plan or a major incident plan as judged appropriate. The Teams also assist local authorities and emergency services in responding to and recovering from events.

4.4. The Woking Borough Council Draft Flood Plan (2008) aims to give a detailed structure to be implemented along with the Woking Borough Emergency Plan. The Council aim to assist those residents of the Borough that are at risk of flooding from principally the River Wey and Hoe Stream but also any other flooding that could occur throughout the Borough.

4.5. The Boroughs Flood plan is designed to:

- Outline the flood threat to Woking;
- Give details on the properties at risk and roads that are prone to flooding.
- Outline the alerting procedure.
- Give guidance on the monitoring of the rivers.
- Give guidance on the delivery of sandbags to threatened properties.
- Be used as a guide for the response to flooding caused by flash flooding or flooding caused by rivers or canals.

4.6. The Civil Contingencies Act 2004 also places a legal duty on category one responders (which includes Local Authorities) to produce a community risk register. Community risk registers are a compilation of risk assessments for hazards, including flood risk.

4.7. The outputs of the SFRA will support Woking Borough Council in the maintenance of the Community Risk Register and provide data of a higher resolution than shown on Environment Agency mapping so that the magnitude of risks can be evaluated with greater precision in Woking Borough. This will help to facilitate joined-up local planning, based on consistent planning assumptions and provide data that can be used to prepare strategic responses to reduce the consequences of flood emergencies and hence reduce the risks to all.

4.8. Woking Borough Council are currently participating in the production of a new Multi-Agency Flood Plan. The intention is that this will be formally adopted in April 2009.

4.9. As stated the SFRA provides information on the spatial distribution of flood hazard. This information should be used to feed upwards to strategic land use planning (the South East Plan and the Regional Flood Risk Appraisal), and down to individual site development control decisions. Inappropriate development in flood risk areas can pose a significant risk to life, especially to the young, elderly and infirm. Flood risk maps are provided in Volume 3 of this SFRA. It is essential that those new developments which occur within flood risk areas are safe, and that new developments are designed and constructed such that the health, safety and welfare of people is appropriately managed. This is of particular reference to developments which proceed following the application of the Exception Test.

4.10. In response to this SFRA, it is recommended that a procedure is put in place so that the Civil Protection Unit at Woking Borough Council receive notification of significant developments approved or planned to take place in the borough so that they can be assessed and additional emergency planning preparations or alterations to existing borough plans be made as necessary. The District Emergency Planning Liaison Officer will identify whether the risk presented in the SFRA is so significant (because of planned development) that additional steps need to be taken to identify alternative evacuation centres or additional emergency stores.

4.11. Consideration of health and safety issues should also be a fundamental issue during the design and construction of new developments. The outputs of this SFRA will support Woking Borough Council in understanding the level of flood risk management requirements at each proposed development. As noted the safety levels considered should be proportionate to the vulnerability of the community affected by the flood risk.

4.12. The spatial distribution of flood hazard should also inform the production of emergency flood management plans. Emergency flood management plans should minimise risks to life and property, through, for example, ensuring that evacuation procedures are adequate to the kinds of risks that a major flooding event may create. Developers and consultants preparing site specific emergency plans for new developments should consult with Woking Borough Council Emergency Planning team during the preparation of such plans.

4.13. Woking Borough Council has a legal duty to prepare and update emergency plans for major and local civil emergencies, including flooding. As part of the requirements the Council has a duty to:

- assist other relevant services and agencies, including the emergency services and the Environment Agency, with regards to alerting or warning the public if local flooding is either imminent or likely.
- assist the emergency services with the evacuation of residents from areas that are likely to be, or have already been flooded.
- identify and staff public reception centres for evacuees to offer information, refreshments and if necessary shelter over-night.
- assist the Fire Brigade in dealing with floodwater and mitigating damage, by providing flood control measures such as filled sandbags.
- assist the emergency services to control access to the scene by undertaking road closures or erecting road barriers etc.

4.14. The findings of the SFRA can be used to support these legal requirements. Mapping provided in Volume 3 will support Woking Borough Council in identifying evacuation area and reception centre locations in areas of low flood risk. The mapping can also be used to identify critical infrastructure in Woking Borough which lies within Flood Zones 2 and 3.

The SFRA can also help to identify implications for the future resourcing of emergency planning, for example the implications of climate change and flood risk.

4.15. The information in the SFRA if made available to those attending flood emergencies would potentially reduce the magnitude of the risks that personnel might be exposed to. Importantly it enables those attending flood emergencies to prepare in advance and reduce the chance of unforeseen exposure to high hazard magnitudes during a flood emergency.

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5. HOW TO USE THE SFRA IN DEVELOPMENT CONTROL

5.1. SFRAs set the context within which any planning application should be considered, by establishing:

- the category of Flood Zone within which the proposed site is located;
- the flood risk constraints in accordance with guidance in PPS25; and,
- the basis of the policies of Woking Borough Council regarding proposed development in each Flood Zone.

5.2. Local Development Documents (LDDs), should be referred to in considering the suitability of a site for development. LDDs can be used to guide appropriate development to the most suitable areas by considering specific local issues and concerns, including flood risk, in allocating suitable land use types across the local authority area. The SFRA should be used to provide high level flood risk information for decisions on land use planning. This can be done on an "as required" basis, matching the needs of phased submission of applications.

5.3. It is the responsibility of developers to carefully consider the flood risks at a site as early as possible. Developers should be referred to the SFRA at the start of any pre-application consultation with Woking Borough Council. For those proposing development, the primary responsibility is to safeguard their land and other property against flooding and to manage drainage of their land to prevent adverse impacts on neighbouring land. It is the responsibility of developers to ensure that the future occupiers of the site are not placed in danger from flood hazards and that they remain safe throughout the lifetime of the development.

5.4. Consideration of flood risk is required by PPS25 for all new developments unless the site area is under 1hectare in total **and** the site is located in Flood Zone 1 (low risk). The SFRA provides information on other sources of flooding including sewer, surface water, groundwater and canal flooding which may not be available to the EA – it is recommended that WBC also require developers to provide an assessment of flood risk where the site falls within an area identified on the SFRA maps as at risk from other sources of flooding.

5.5. Change of Use Applications should be considered on a case by case basis. If the proposed change of use results in an increase in the vulnerability of the site (with reference to Table D2 of PPS25) **and** the site is within Flood Zones 2 or 3 then it is recommended that WBC should require the developer to provide an assessment of flood risk. For example a change of use within FZ3 from a sports pavilion to a camping barn/youth hostel would change the vulnerability from "Water Compatible" to "More Vulnerable" and it would be necessary to consider whether the occupants of the building would be safe in the event of a flood. Equally a change from a commercial building to residential would change the vulnerability from "Less Vulnerable" to "More Vulnerable" and as such would be considered inappropriate within Flood Zone 3 unless the Exception Test is passed.

5.6. A developer is not required to apply the Sequential Test if a proposed development is located on a site which has been allocated for that type of development in the LDD that applied the Sequential Test during the allocation process and was supported by a SFRA. However, the developer should still apply the sequential approach to any flood risk within the site itself and demonstrate compliance with PPS25 when determining the location of appropriate land uses within the site. The aim of the sequential approach is to minimise flood risk by considering the probability of flooding in conjunction with the vulnerability of receptors.

5.7. Where developers promote development outside of the allocated areas identified in the LDDs they are responsible for demonstrating compliance with PPS25 notably obtaining confirmation from Woking Borough Council that the proposed application site passes the Sequential Test. The PPS 25 Practice Guide reinforces the fact that in this situation it is the responsibility of the developer to collate the evidence required for the LPA's planning officer to carry out the Sequential Test. Chapter 4 of the Practice Guide lists the information that may be required in this case. This is likely to include evidence:

- on the flood risk on the site;
- on the availability of 'reasonably available' sites in areas of lower flood risk;
- on the vulnerability classification of the development;
- of the wider sustainability benefits of the site (if the Exception Test will need to be applied); and
- that the development is safe. This might require the developer to collect and submit information to Woking Borough Council as evidence to be used in performing the Sequential Test and if appropriate the Exception Test.

5.8. Where it is necessary for the developer to provide evidence in relation to the Sequential Test it will be necessary to define the "area of search", this is the area within which WBC would reasonably consider an alternative site to the one proposed for the development to be suitable in wider planning terms. In many cases the area of search will be defined as the WBC area, however there will be cases where appropriate justification can be provided to limit the area.

5.9. When considering alternative sites in the context of the Sequential Test it is important that this is done within the context of WBC's housing land supply and requirement and within the context of any wider sustainability and spatial planning policies and documents.

5.10. In areas where flood risk has been identified as an issue, developers should liaise with Woking Borough Council and the Environment Agency to agree on who should be consulted in pre-application discussions. Pre-application discussions between Woking Borough Council, the Environment Agency and other relevant stakeholders should be used to scope out the availability of other sites which may meet the requirements of the application and what evidence will be required to show that other sites have been considered. The scope of any site specific FRA should also be agreed with Woking Borough Council and with the Environment Agency and will be informed by the outputs from this SFRA.. It should be noted that the Environment Agency cannot agree whether or not the Sequential Test has been passed, this is the role of WBC. However, where appropriate the EA may agree the correct methodology has been used in undertaking the test.

5.11. The level of information in FRAs should be proportionate to the degree of flood risk and the scale, nature and location of the proposed development. The SFRA provides information on flood hazards which should be considered in the production of site-specific FRAs. The SFRA allows WBC to identify the level of detail required in site specific FRAs and to advise developers accordingly.

5.12. The information within the SFRA should also be used to inform the development of planning constraints within development areas designated in the LDDs, the use of the SFRA to inform spatial plans and policies is described in Chapter 3 of this document. In terms of Development Control however the information within the SFRA may be used to identify constraints to development on windfall planning applications that have not been considered through the formal LDD process.

5.13. The WBC Development Control team should review any flood risk information submitted with an application, then refer to the more detailed maps in Volume 3 of this SFRA in order

to establish whether there is a high-moderate or low flood risk to the site. For example, in those areas of fluvial flood risk **Volume 3: Appendices C and D** should be referred to for more detailed information on the magnitude and distribution of risk. **Volume 3: Appendices E and F** provide information on other (non-fluvial) sources of flooding. All the information on flooding provided in the SFRA maps (Volume 3) can also be accessed via WBCs in house GIS system.

5.14. Where a site falls within an area shown to be at risk of flooding on the SFRA maps (from any source) the developer should be asked to provide detailed information on flood risk in the form of a Flood Risk Assessment. The Environment Agency can provide technical advice in relation to the suitability of the FRA.

5.15. The Environment Agency will generally only comment in relation to fluvial flood risk and may not be aware of the potential for flooding from other sources. WBC and this SFRA are the main source of information on "other sources of flooding" and in particular, surface water flooding, flooding from small watercourses and drains that the EA do not have powers over, and the Basingstoke Canal. WBC must review the full suite of maps within the SFRA in relation to each application received and where a site is located in an area of flood risk (from any source) the developer should be asked to provide detailed information on flooding in the form of a FRA.

5.16. Information from the EA Historic Flood Map is included in the Flood Zone 2 outline the EA provide. Therefore a review of the Flood Zone Maps in Volume 3 will also establish whether the EA have a historic record of river flooding. On occasions it may also be helpful to refer to the EA historic flood map independently. Where a site is identified to be at risk from any source of flooding (including historic river flooding) the developer should be asked to provide detailed information on flooding in an FRA. The Environment Agency can provide technical advice in relation to the suitability of the FRA.

Guidance for site-specific flood risk assessments

5.17. Although this SFRA has been undertaken for Woking Borough, it does not negate the need for site specific Flood Risk Assessments (FRA) to be undertaken at the planning application stage. Instead, this SFRA provides advice on the scope of the additional information required within a site specific FRA.

A Guide for Developers

5.18. The Environment Agency Guide for Developers (November 2006) provides a tool for developers to refer to during each development stage. The guide gives advice on how a development can be designed and implemented to provide benefits for people and the environment.

5.19. At the Pre-Planning Application stage, the Environment Agency encourages developers to make enquiries on the Agency website that allows for a considered response. This stage of enquiries allows issues to be addressed such as; a lack of information in the application, if there is any more information available to help the application, and whether the application is likely to attract an objection from the EA. Pre-Planning Application Enquiries save the developer time and money, and make sure the development is better for the environment (Section 1.4, Developers Guide, November 2006).

5.20. In addition to PPS 25, the Guide for Developers provides advice on "Managing the risk of flooding" by ensuring the site land use and layout is appropriate to risk of flooding. This section of the guide also reiterates the government regulations set out by PPS 25 by stating the need for developers to "avoid causing flooding elsewhere".

5.21. The Guide for Developers details the permissions needed for any Flood Risk Management measures proposed. Any development under the following conditions will additionally require permission under the Land Drainage Act 1991 and the Water Resources Act 1991,

and the Environment Agency must also be contacted as local byelaws which also apply will vary. Within Woking permission is required for:

- development in, over, under or within 8m of a main river or formal defence.
- Any depositing of material or building not covered by planning permission within an area liable to flood (as defined by the "Thames Water Authority Land Drainage Byelaws 1981 Area Liable to Flood");
- Any works likely to obstruct flow (such as a weir, dam, culvert, etc) on any watercourse.

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5.22. The FRA will be required to demonstrate that flood risk to the development can be managed now and in the future, and that the development will not increase the risk of flooding elsewhere and that the proposals are compliant with the SFRA. The requirement for site-specific FRAs is detailed in PPS25 and further information is provided in Chapter 3 of the PPS 25 Practice Guide. Planning applications for development proposals of one hectare or greater in Flood Zone 1 and all proposals for new development located in Flood Zones 2 and 3 require a FRA.

5.23. The principles and key requirements of a FRA are provided in PPS25 Appendix E. The scope of a FRA should include:

- a description of the development and the planning context:
  - what is the development proposed and where will it be located?
  - what is the proposed developments Vulnerability Classification (see Table D.2 of PPS25)?
  - Is the proposed site consistent with Local Planning Policy, and has the Sequential Test or Exception Test been applied in the selection of the proposed site for the development type proposed?
- definition of flood hazard:
  - what sources of flooding could affect the proposed development site?
  - for each source, describe the pathway and receptor of the flooding. Refer to historic records where available.
  - What are the existing surface water drainage arrangements for the proposed development site?
- probability of flooding:
  - which flood zone is the proposed development site within?
  - what does the Woking SFRA show of relevance to the proposed development site?
  - what is the extent of flooding, including depth and velocities, on the proposed development site?
  - what are the existing rates and volumes of run-off generated by the proposed development?
- impacts of climate change on flood risk:
  - how is the flood risk at the proposed development site likely to be affected by climate change?
- detailed description of development proposals:
  - details of the development layout, referring to relevant drawings:
  - where appropriate, demonstrate how land uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding.

- If the development includes construction of any sub-surface structures (including basements or foundations) the FRA should investigate local groundwater levels and the potential for the construction to exacerbate groundwater flooding for neighbouring properties with basements.

- flood risk management measures including the application of Sustainable Urban Drainage Systems (SUDS):
  - how will the site be protected from flooding, including the potential impacts of climate change, over the development's lifetime?
  - how will the developer maintain flood defence walls and other flood risk management infrastructure? The riparian owner is required to survey, renew and maintain the flood defences.
  - how will the surface water management strategy relate to guidance in Surface Water Management Plans (SWMPs)?

- impacts of the development off site:
  - how will the proposed development ensure it does not increase flood risk elsewhere, both in terms of flood protection measures on site and run-off from the completed development?

- an assessment of residual risk:
  - what forms of flood risk management are proposed for the site, for example, flood warning and evacuation?
  - what flood related risks will remain after implementing flood risk management measures?
  - A breach analysis may be required for developments close to a watercourse. The parameters of the breach analysis should be agreed with the Environment Agency.
  - how, and by whom, will these risks be managed over the lifetime of the development?

5.24. Before commencement of a detailed site-specific FRA, a broad scale assessment of flood risk should be taken by the developer to ascertain the level of risk to their site. This should utilise the Local Authority's SFRA, including Flood Zones, detailed flood risk mapping and breach mapping where available, and records of non-fluvial flood risk. In addition, if the development site is adjacent to an impounded water body or a formal raised flood defence and no breach mapping is available, the developer may need to carry out their own assessment of residual risk (criteria for breach analysis on impounded water bodies should be agreed with the relevant owner while the Environment Agency can agree the criteria for breach analysis on raised defences).

5.25. Once the level of risk has been ascertained and the developer has passed the Sequential Test and the Exception Test where necessary, a detailed flood risk assessment should be undertaken to address sequential site layout and any necessary mitigation measures necessary for the development to be acceptable.

Development proposed within the Functional Floodplain

5.26. Within Flood Zone 3b (functional floodplain) – defined as the 5% AEP. Due to the nature of the functional floodplain as land where floodwater regularly flows or is stored, very few development proposals are considered to be appropriate within this area. The following criteria apply where development may be acceptable:

- **Highly Vulnerable Development** - development proposals involving a change of use from a lower to higher vulnerability classification would not be permitted in accordance with Table D.3. of PPS25. Small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments

would not be acceptable due to the loss of floodplain storage and interruption of flood flow routes, as well as the severe risk to life and property within the functional floodplain;

- **More Vulnerable Development** - development proposals involving a change of use from a lower to higher vulnerability classification would not be permitted in accordance with Table D.3. of PPS25. Small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments would not be acceptable due to the loss of floodplain storage and interruption of flood flow routes, as well as the severe risk to life and property within the functional floodplain;
- **Less Vulnerable Development** - development proposals involving a change of use from a lower vulnerability classification would not be permitted in accordance with Table D.3. of PPS25. Small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments would not be acceptable due to the loss of floodplain storage and interruption of flood flow routes, as well as the severe risk to life and property posed by the functional floodplain;
- **Water-Compatible Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. Any essential ancillary sleeping or residential accommodation should be subject to a flood-warning and evacuation plan, and should identify appropriate access and egress routes with reference to Table 13.1 from FD2320, "Flood Risk Assessment Guidance for New Development", up to a 1 in 100 year plus climate change flood event;
- **Essential Infrastructure** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. In accordance with part (c) of the Exception Test, opportunities should be sought to reduce flood-risk through redevelopment, for example, redesigning the layout of development to improve flood flow conveyance, reducing footprint to increase flood storage, re-locating development in the lowest-risk area of the development site, etc. Additionally, the FRA should address how the proposed development will remain operational during a flood, up to and including a 1 in 100 year plus climate change flood event.

Flood Zone 3a

5.27. Within Flood Zone 3a - Although most development types may be appropriate (subject to the Sequential and Exception Test being passed) within this area, the high risk of flooding means that stringent criteria are required for new developments to be acceptable.

- **Highly Vulnerable Development** - development proposals involving a change of use from a lower vulnerability classification would not be permitted in accordance with Table D.3. of PPS25. Small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments are unlikely to be acceptable due to the intensification of a Highly Vulnerable development;
- **More Vulnerable Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments and new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint

should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. Any new development should be subject to a flood-warning and evacuation plan, and should identify appropriate access and egress routes with reference to Table 13.1 from FD2320, "Flood Risk Assessment Guidance for New Development", up to a 1 in 100 year plus climate change flood event. In accordance with part (c) of the Exception Test, opportunities should be sought to reduce flood-risk through redevelopment, for example, redesigning the layout of development to improve flood flow conveyance, reducing footprint to increase flood storage, re-locating development in the lowest-risk area of the development site, reducing the number of residential units on site, etc.;

- **Less Vulnerable Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments and new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level;
- **Water-Compatible Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. Any essential ancillary sleeping or residential accommodation should be subject to a flood-warning and evacuation plan, and should identify appropriate access and egress routes with reference to Table 13.1 from FD2320, "Flood Risk Assessment Guidance for New Development", up to a 1 in 100 year plus climate change flood event;
- **Essential Infrastructure** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. In accordance with part (c) of the Exception Test, opportunities should be sought to reduce flood-risk through redevelopment, for example, redesigning the layout of development to improve flood flow conveyance, reducing footprint to increase flood storage, re-locating development in the lowest-risk area of the development site, etc.

Flood Zone 2

5.28. Within Flood Zone 2 - generally, there is a medium probability of flood risk. However, it is accepted that parts of Flood Zone 2 will become part of the 1 in 100 year floodplain when climate change is taken into account. Accordingly, the following design criteria should be considered to mitigate the impacts of climate change:

- **Highly Vulnerable Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. Any new development should be subject to a flood-warning and evacuation plan, and should identify appropriate access and egress routes with reference to Table 13.1 from FD2320, "Flood Risk Assessment Guidance for New Development", up to a 1 in 100 year plus climate change flood event. In accordance with part (c) of the Exception Test, opportunities should be sought to reduce flood-risk through redevelopment, for

example, redesigning the layout of development to improve flood flow conveyance, reducing footprint to increase flood storage, re-locating development in the lowest-risk area of the development site, reducing the number of residential units on site, etc.;

- **More Vulnerable Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments and new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. Any new development should be subject to a flood-warning and evacuation plan, and should identify appropriate access and egress routes with reference to Table 13.1 from FD2320, "Flood Risk Assessment Guidance for New Development", up to a 1 in 100 year plus climate change flood event;
- **Less Vulnerable Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions of existing developments and new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level;
- **Water-Compatible Development** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level. Any essential ancillary sleeping or residential accommodation should be subject to a flood-warning and evacuation plan, and should identify appropriate access and egress routes with reference to Table 13.1 from FD2320, "Flood Risk Assessment Guidance for New Development", up to a 1 in 100 year plus climate change flood event;
- **Essential Infrastructure** - small scale extensions of existing developments should be designed in accordance with the Environment Agency's Flood Risk Standing Advice. Large scale extensions or new developments should be designed so as not to impede flood flow routes or result in a net loss of floodplain storage. Accordingly, any increase in built footprint should be compensated for on a level-for-level, volume-for-volume basis, up to and including the 1 in 100 plus climate change flood level.

Flood Zone 1

5.29. Within Flood Zone 1 - sites within Flood Zone 1 are considered to be at a low risk of fluvial flooding. However, all new developments on sites greater than 1Ha require a Flood Risk Assessment to ensure that other sources of have been investigated and that surface water is managed effectively. Redevelopments of existing sites should seek to improve surface water drainage and reduce run-off rates and volumes as far as possible, preferably back to Greenfield rates and volumes. Specifically, FRAs need to:

- Assess the existing surface water runoff rates and volumes for the site over a range of return periods, namely the 1 in 1yr, 1 in 30yr and 1 in 100yr storms and whether any flooding issues exist as a result of the existing surface water system;
- Design a surface water drainage system for the proposed development following the SUDS management train and assess the surface water runoff rates and volumes for the 1 in 1yr, 1 in 30yr and 1 in 100yr storms including an allowance for climate change, ensuring that the proposed runoff rates and volumes do not exceed the existing;

- Assess any flooding that may occur from the proposed surface water system up to a 1 in 100 yr storm with allowance for climate change and ensure that the site is designed to safely retain this flooding (low-level flooding of kerbed areas, parking areas, roads, etc. may be acceptable).

5.30. Once a planning application, together with an appropriate FRA, is submitted by the developer, it should be assessed to ensure that the applicant has considered flood risk from all sources and demonstrated how flood risk will be managed taking climate change into account.

Consultation with the Environment Agency

5.31. Due to the large number and variety of planning applications received by Woking Borough Council, and the need to consult with the Environment Agency on many of these applications, it is becoming increasingly difficult to identify when, and how, Woking Borough Council should consult with the Environment Agency on receipt of a planning application. To ease this process, the Agency has developed a consultation matrix (Table 6 Environment Agency Consultation Matrix), which identifies when the Environment Agency should be consulted, and what level of information needs to accompany the FRA if one is required. The Woking SFRA can support this process, by identifying the location of the development site within a particular flood zone and the likely vulnerability of the Site.

5.32. The Environment Agency Consultation Matrix (Table 6 Environment Agency Consultation Matrix) is part of the Environment Agency's Flood Risk Standard Advice V2.0 (FRSA V2.0), which is provided to LPAs for more straightforward planning applications. The FRSA also allows LPAs to identify those higher risk development situations where consultation with the Agency is essential. This information is available on the Environment Agency website at http://www.environment-agency.gov.uk/research/planning

5.33. The EA have indicated that FRSA is likely to be revised and reissued in 2008. It is unlikely that this will be significantly different from what is currently being used.

Table 6 Environment Agency Consultation Matrix

Development category	Development (including boundary walls etc.) within 20 metres of the top of a bank of a Main River	Includes culverting or control of flow of any river or stream	Within Flood Zone 3	Within Flood Zone 2	Within Flood Zone 1
Non-residential extensions with a footprint of less than 250m^2 and householder development and alterations	Consult EA on flood defence consent requirements.	Consult EA with FRA showing design details of any culvert or flow control structure proposed	No consultation. See "standard Agency comment" for details of small scale **FRA**	No consultation. See "standard Agency comment" for details of small scale **FRA**	No EA consultation required
Change of use from 'water compatible' to 'less vulnerable' development	Only consult EA if site also falls within Flood Zone 3. FRA required	No EA consultation required	Consult EA with FRA	No EA consultation required	No EA consultation required
Change of use resulting in 'highly vulnerable' or 'more vulnerable' development	Only consult EA if site also falls with Flood Zone 3 or 2. FRA required	No EA consultation required	Consult EA with FRA	Statutory standing advice may apply *WBC should obtain more information from the EA FRSA document available online.*	No EA consultation required
Operational development less than 1 hectare	Consult EA on flood defence consent requirements	Consult EA with FRA showing design details of any culvert or flow control structure proposed	Highly Vulnerable – EA likely to object but consult EA with FRA Other Vulnerabilities – consult EA with FRA and Sequential Test evidence and where required confirm Exception Test has been applied	Statutory standing advice may apply. *WBC should obtain more information from the EA FRSA document available online.*	No consultation required – see surface water management good practice advice – see standard comment.
Operational development of 1 hectare or greater	Consult EA on flood defence consent requirements	Consult EA with FRA showing design details of any culvert or flow control structure proposed	Highly Vulnerable – EA likely to object but consult EA with FRA Other vulnerabilities – consult EA with FRA and Sequential Test evidence and where required confirm Exception Test has been applied	Highly Vulnerable – consult EA with FRA and Sequential Test evidence and where required confirm Exception Test has been applied Other Vulnerabilities – consult EA with FRA and Sequential Test evidence	Consult EA with FRA

Note: This table, and further supporting information, is available at http://www.environment-agency.gov.uk/research/planning/82584.aspx

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Management of flooding

Sustainable Urban Drainage Systems

5.34. As development of the landscape may lead to an increase in the area of impermeable surfaces, the volume and rate of surface water flows leaving a site can be increased, which if uncontrolled may lead to an increase in the risk of flooding to third parties. To reduce the risk of flooding, PPS25 states that:

> *"Surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account".* (Paragraph F6, PPS 25)

5.35. It is a requirement of PPS25 that the control of surface water is considered on all new development sites. Consideration of surface water runoff is a requirement of all Flood Risk Assessments and the FRA will normally propose an outline surface water management strategy for the site. Where an application is for a large site or is significant in some other way then the EA may require a more detailed Surface Water Management Strategy to be provided either as part of the FRA or as a stand alone document. The EA will normally advise developers where this is required.

5.36. The Environment Agency, in line with this statement require demonstration of the way in which the proposed development will reduce surface water flow rates to at least greenfield rates where the site is currently undeveloped. On previously developed sites rates close to greenfield or between greenfield and the previously developed rate may be acceptable if it can be demonstrated that no further reduction in rate is practicable. The primary aim on all sites should be to achieve greenfield rates or lower for rainfall events up to the 1 in 100 year event plus climate change.

5.37. To achieve this proposed development should, wherever practicable, incorporate Sustainable Drainage Systems (SUDS) into their surface water drainage design. SUDS are a collective term which refers to surface water drainage systems developed in line with the ideals of sustainable development. Both PPS 1 and PPS 25 request that regional planning bodies and local authorities promote the use of Sustainable Drainage Systems (SUDS) for the management of run-off within any development.

5.38. These SUDS fall into three broad groups based on their primary function:

- Reduce the quantity of runoff from the site (source control techniques);
- Slow the velocity of runoff to allow settlement, filtering and infiltration (permeable conveyance systems); and
- Provide passive treatment to collect surface water before discharge into groundwater or to a watercourse (end of pipe systems).

5.39. There are a whole range of approaches to sustainable surface water drainage management. The Environment Agency look for the application of the "SUDS Hierarchy" in new development proposals, this hierarchy, starting with the "best" methods is summarised below:

- **Source control measures including rainwater recycling and drainage;**
- **Infiltration devices to allow water to soak into the ground, that can include individual soakaways and communal facilities;**

- **Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns;**
- **Filter drains and porous pavements to allow rainwater and run-off to infiltrate into permeable material below ground and provide storage if needed; and**
- **Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding.**

5.40. Although many SUDS techniques can provide all three functions, the advantages and disadvantages of different surface water management techniques should be considered for each development site. When doing this, consideration should be given to the particular setting and especially the ground conditions at the site. Some of the benefits that may be offered by SUDS include:

i. protection and enhancement of water quality and biodiversity;
ii. maintenance or restoration of natural flow regimes in streams;
iii. protection of people and property from flooding, now and in the future;
iv. protection of watercourses from pollution caused by accidental spillages and misconnections; and
v. they can allow natural groundwater recharge where this is considered appropriate.

5.41. Appropriately designed, constructed and maintained SUDS are more sustainable than conventional drainage methods, as they mitigate against many of the adverse effects of urban stormwater runoff on the environment. SUDS can be designed in a way that is sympathetic to their environmental setting and the needs of the community. It is important however to recognise that not all SUDS are appropriate for all sites – for example soakaways are only effective where the ground conditions are permeable and are not generally suitable on sites with ground contamination. A site specific investigation is often required to verify the applicability of particular SUDS techniques. In the Woking area the ground conditions are generally very impermeable as the area is mainly underlain by the London Clay. Infiltration techniques are unlikely to be feasible in areas underlain by London Clay and should not be proposed unless specific evidence of suitable soakage rates, based on on-site testing, is provided.

5.42. Developers should consult WBC, the Environment Agency, and sewerage undertakers at the earliest stage of the development process to establish the best surface water drainage solution for a particular site. The Environment Agency advises that widespread adoption of sustainable drainage system techniques would see a long-term improvement in the quality of rivers and the reduction in flood risk.

5.43. Relevant documents, which should be consulted for further information on SUDS include:

- **CIRIA C697 (The SUDS Manual)**
- **CIRIA C523 (SUDS - Best Practice manual)**
- **CIRIA C582 (Source control using constructed pervious surfaces)**
- **CIRIA C609 (SUDS – hydraulic, structural and water quality advice)**
- **CIRIA C625 (Model agreements for SUDS)**
- **CIRIA C635 (Designing for drainage exceedence in urban drainage – good practice)**

- **CIRIA C644 (RP714 Building Greener – guidance in urban drainage – good practice)**
- **National SUDS Working Group (NSWG), 2004, Interim Code of Practice for Sustainable Drainage Systems.**
- **CIRIA X108 (Drainage of development sites – a guide)**
- **HR Wallingford Report SR666 (Use of SUDS in high density developments)**
- **UKWIR Report 05/WW/03/6 (Performance and Whole Life Cost of Best Management Practices and Sustainable Urban Drainage Systems)**
- **Sewers for Adoption 6th Edition**
- **Environment Agency Thames Region – DRAFT Sustainable Drainage Systems, A Practical Guide, October 2006.**

5.44. A desk-based broad-scale assessment of the topography, geology and soil conditions in the Woking study area has been undertaken for this SFRA. This assessment has concluded that the most suitable SUDS for the Woking Borough area are likely to be Non-Infiltration based SUDS and Green Roofs. Further information on this assessment and the use of SUDS techniques in Woking is provided in Volume 2, Chapter 6 this SFRA.

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6. SFRA MAINTENANCE AND MANAGEMENT

Introduction

6.1. This chapter provides an introduction to the maintenance and management procedures that are required to ensure the Woking Borough SFRA remains up-to-date and continues to make use of the best available information. Implementing a maintenance and management procedure for the SFRA will assist Woking Borough Council to regularly review the technical data available and to commission technical updates where necessary. The need for revisions should also be reviewed if there are material changes to primary legislation, policy or national guidance.

6.2. Throughout this chapter, several key actions are recommended for Woking Borough Council in the implementation of a maintenance and management structure for the SFRA. These actions are highlighted in blue bold text.

Data Collection

6.3. The key datasets used in the Woking SFRA were supplied by:

- **The Environment Agency**
- **Woking Borough Council**
- **Thames Water**
- **British Waterways**

6.4. Table 7 Summary of Key Datasets used in the Woking SFRA details the key data sets received from various organisations in order to develop the Woking SFRA. The SFRA is a living document and as such the contents of this table should be updated when the SFRA is revised and new data is incorporated. A record should be kept so that it is possible to attribute the data used to inform flood risk at any moment in time throughout the plan period.

Table 7 Summary of Key Datasets used in the Woking SFRA

DATA	*DESCRIPTION*	*DATE PROVIDED*	*OWNER / AUTHOR*
River Wey Flood Mapping Study, Main Report Volume 1	*Study undertaken by Atkins for the Environment Agency. This report included all mapping and appendices in .pdf format.*	*15 June 2006*	*Environment Agency*
Hydraulic Models	*iSIS Hydraulic models of the Upper Wey, Middle Wey, Lower Wey and Hoe Stream that were constructed for the River Wey Flood Mapping Study . The EA have provided detailed modelled flood extents and output data in addition to the models*	*15 June 2006*	*Environment Agency*
Inflow Hydrographs	*Hydrographs for all 4 hydraulic models for 5yr, 20yr,50yr,100yr, 100yr+20%*	*15 June 2006*	*Environment*

DATA	DESCRIPTION	DATE PROVIDED	OWNER / AUTHOR
	events		*Agency*
IFSAR Digital Terrain Model	*DTM for Wey and Hoe Stream study area, created by Atkins as part of the River Wey Flood Mapping Study. Generated from IFSAR and improved with photogrametry where available*	*28 July 2006*	*Atkins*
Model sub-catchment boundaries	*GIS Layer of model sub-catchments as used by Atkins in generation of hydraulic model inflows for River Wey Flood Mapping Study*	*04 August 2006*	*Atkins*
River Defence & Asset information	*NFCDD GIS database information within study Area*	*23 June 2006*	*Environment Agency*
WBC Development proposal	*GIS Layers showing:* *-Primary Employment sites* *-PFI housing sites* *-Town Centre Boundaries* *-Safeguarded sites* *-Retail regions* *-Infill villages* *-Housing potential sites* *-Gypsy sites*	*21 June 2006*	*WBC*
Watercourses (EA Main River)	*Watercourse layer - line data only 1:10000 scale (within the Woking study area)*	*20 June 2006*	*Environment Agency*
Historical flood records/data	*Information of incidences of previous flood events within Woking*	*14 June 2006*	*WBC*
Mapping	*1:10,000 mapping of Woking Borough*	*24 June 2006*	*WBC*
WBC Core Strategy	*Development Plan Document, Preferred Option, Woking Local Development Framework, January 2006.*	*14 June 2006*	*WBC*
Wey Flood Risk Management Strategy, Scoping Document. June 2006	*Environment Agency study that is a Strategic Environmental Assessment scoping and preliminary appraisal of flood mitigation options*	*July 2006*	*Environment Agency*
Information on the Basingstoke Canal	*Received from Tony Beecher at the Basingstoke Canal Authority, covering risk of breach and emergency procedures*	*August 2006*	*Basingstoke Canal Authority*

DATA	DESCRIPTION	DATE PROVIDED	OWNER / AUTHOR
Wey / Mole CFMP (summary)	*Summary of Wey / Mole CFMP*	*September 2006*	*Environment Agency*
Hoe Valley Project	*Flood extents and levels generated by the Hoe Valley Project*	*November 2006*	*WBC/BTP-Hyder*
Historic Flood Outlines	*The EA have provided flood outlines for all recorded flooded events including an extent showing the areas affected by the 2007 Floods*	*27 November 2007*	*Environment Agency*
Thames Water Sewer Flooding Records	*Records of historical sewer flooding – subdivided by Postcode.*	*17 December 2007*	*Thames water*
Environment Agency Flood Zones Data set	*Maps of Flood Zones provided by the EA in September 2008. These maps are frequently updated and Las made aware of the updates.*	*September 2008*	*Environment Agency*
Postcode extents within SFRA Boundary	*Required postcodes located within the SFRA boundary to locate where Thames Water sewer flooding has occurred*	*8 January 2007*	*WBC*

6.5. It is recommended that during future iterations of the SFRA, the data providing organisations noted in are contacted to ensure that the most up-to-date records are included in the SFRA.

6.6. The use and processing of the above datasets in the assessment of flood risk and in the production of maps (Volume 3) is described in detail in Volume 2 of this SFRA.

Data Ownership

6.7. The datasets obtained for use in the SFRA have come from a number of sources under licence agreement. These datasets can not be passed to external sources without permission from the owner. Those requiring the data should ensure that they possess the appropriate copyrights and access. **Woking Borough Council should be aware of the IPR they possess so that they only issue data that is contractually appropriate. Datasets produced during the SFRA are owned by Woking Borough Council and can be passed to external parties at their discretion.** The ownership and licensing details of the key datasets used in this SFRA are summarised in Table 8 Ownership and Licensing of Key Datasets used in the Woking SFRA.

Table 8 Ownership and Licensing of Key Datasets used in the Woking SFRA

List of Key Data Sets	Ownership	Licence Required	Contact

Floodplain topography – LiDAR, and topographic survey	Environment Agency	Yes	Environment Agency -Twerton
Flood Warning Areas	Environment Agency	Yes	Flood Mapping & Data Environment Agency
Historic flood information	Environment Agency	Yes	Flood Mapping & Data Environment Agency
River Wey model (including hydrological and hydraulic analysis and study report)	Environment Agency	Yes	Flood Mapping and Data, Environment Agency
OS Mapping	Ordnance Survey	Yes	WBC
SFRA reports and Maps	Woking Borough Council	No	WBC
Woking Emergency Plan and Flood Plan	Woking Borough Council	No	WBC
Details of artificial watercourses	British Waterways	No	British Waterways
Sewer Flooding	Thames Water	Confidential	Thames Water

6.8. It is recommended that information on all sources of flooding continues to be collected and that where appropriate more resources are invested in determining the source and pathways of flooding. When more detailed or updated hydraulic modelling becomes available from the EA or other sources this information should be incorporated into the SFRA. More detailed information may also be collected for FRAs carried out by developers and land owners at the local site scale. Information from site level FRAs will be submitted to the councils and the Environment Agency as part of the development control process and this information should be used to inform the SFRA in the future.

SFRA data management system

6.9. The data management strategy developed for the SFRA is designed to account for likelihood that external parties will seek to make use of the information within the SFRA in preparing flood risk assessments and assessing sites. The SFRA is also a “live” document, and as such it is necessary to ensure at regular intervals in the future that the information within it remains valid.

6.10. The final deliverables of the SFRA are delivered in two forms:

- Hardcopies of the SFRA reports – the SFRA contents are divided into several volumes and chapters to allow easier update during future iterations.

- Electronic datasets including:

  - Raw GIS data - SFRA flood outlines and additional GIS data layers used to produce the SFRA maps and figures. Some of these were obtained under licence from the Environment Agency. All data is provided in a format compatible with Woking Borough Council's existing corporate GIS infrastructure.
  - Electronic document management system - PDF versions of all maps and reports produced during the SFRA

6.11. To ensure that the SFRA remains 'live' it is important to nominate a Management Group with responsibility for monitoring, managing and maintaining the SFRA, as shown in Figure 5 Conceptual SFRA Management Process. It is recommended that the monitoring of the SFRA is linked to the Borough's LDF Annual Monitoring report.

6.12. By following this process of information dissemination and review, the management team can ensure a consistent and up to date supply of strategic flood risk information to all levels of planning process.

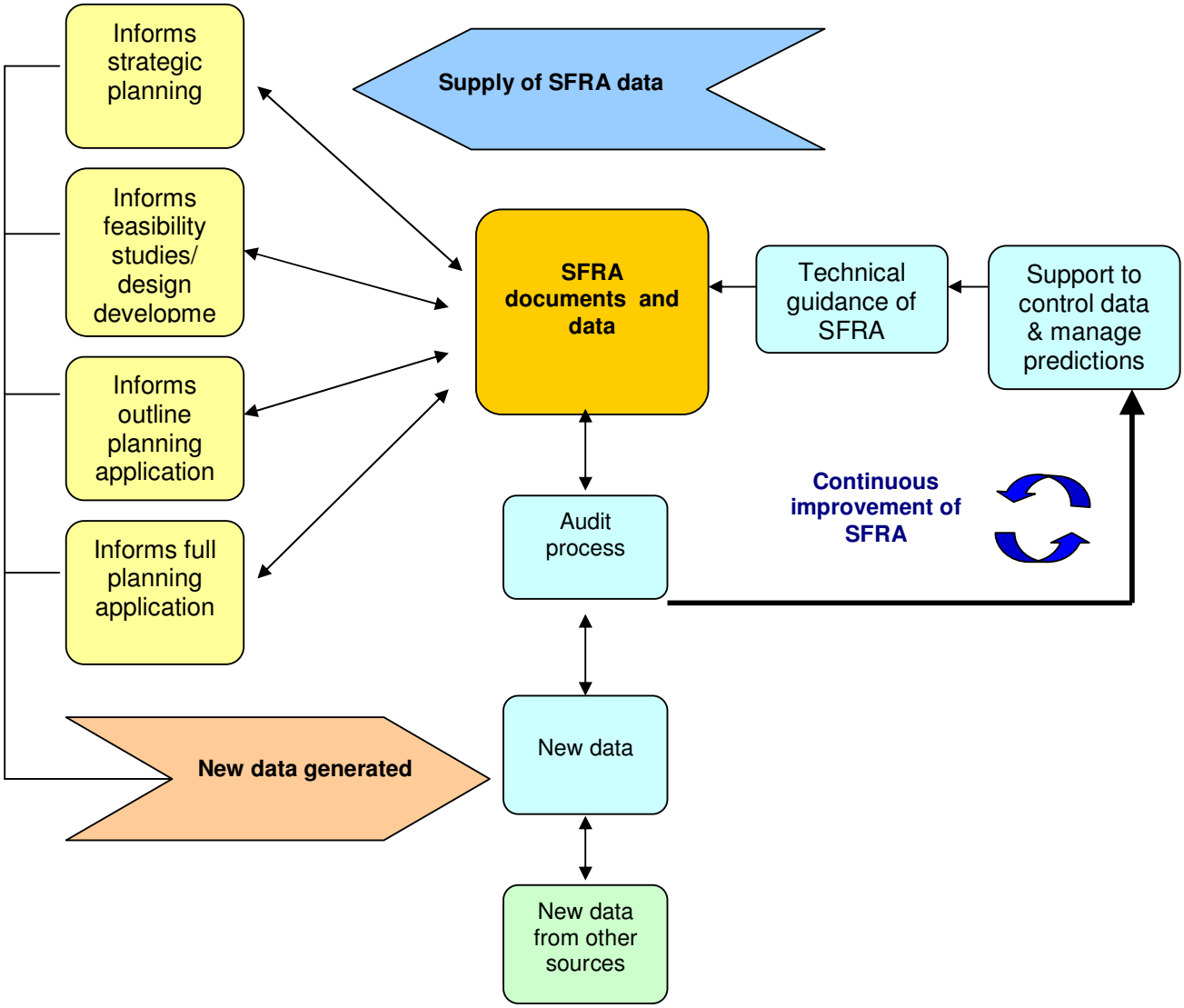

Figure 5 Conceptual SFRA Management Process

Monitoring the SFRA

6.13. It is in the interest of Woking Borough Council that the SFRA remains current and up-to-date. To help facilitate this, it would be useful for Woking Borough Council to liaise with Thames Region of the Environment Agency to discuss the need for an update and if necessary organise an annual meeting to review the SFRA. Prior to this meeting it is recommended that the following maintenance checks be undertaken:

- **Review the currency of datasets used in the SFRA.**
- **Consider whether a formal review of the SFRA is necessary.**

6.14. Whilst all datasets should be checked for updates and key organisations contacted, Table 9 Regularly Updated Datasets contains a list of datasets that are likely to be updated regularly.

Table 9 Regularly Updated Datasets

Dataset	Owner	Comment
Flood Zones	Environment Agency	Updated quarterly
Catchment Flood Management Plans	Environment Agency	Updated every five years
National Flood and Coastal Defence Database (NFCDD)	Environment Agency	Ongoing updates
System Asset Management Plans	Environment Agency	Unknown
Historic flood incidents	Environment Agency, Water companies, Fire Brigade, Highways Depots	Unknown

Incorporating new datasets

6.15. The following tasks should be undertaken when including new datasets in the Woking SFRA:

- **Identify new dataset.**
- **Save new dataset/information.**
- **Record new information in log so that next update can review this information.**

Updating SFRA reports and figures

6.16. Volume 2 provides a record of all of the technical analyses used to develop the Woking SFRA. In recognition that the SFRA will be updated in the future, the report has been structured in chapters according to the sources of flooding investigated. By structuring the report in this way, it is possible to undertake further analyses on a particular source of flooding and only have to supersede the relevant chapter, whilst keeping the remaining chapters unaffected.

6.17. In keeping with this principle, the following tasks should be undertaken when updating SFRA reports and figures:

- **Undertake further analyses as required after SFRA review**
- **Document all new technical analyses by rewriting and replacing relevant Volume 2 chapter/s.**
- **Amend and replace relevant SFRA Maps in Volume 3.**
- **Review and if required, amend Chapter 1 of Volume 1.**
- **Reissue to departments within Woking Borough Council and other stakeholders.**

7. REFERENCES

Communities and Local Government (2006) 'Planning Policy Statement 25' (PPS25)

Communities and Local Government (2008) 'PPS 25 Practice Guide'

Environment Agency (2000) ' Lessons learnt - Autumn 2000 floods' November 2000

Environment Agency (2003) 'Strategy for Flood Risk Management 2003 - 2008'

Environment Agency/Defra (2005) 'Flood Risk Assessment Guidance For New Development' Phase 2 Framework and Guidance for Assessing and Managing Flood Risk for New Developments - Full Documentation and Tools, R&D Technical Report TR2320/TR2, October 2005

Defra (October 2006) 'FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts.'

CIRIA 624 (2004) 'Development and Flood Risk – Guidance for the Construction Industry'

South East Plan (2006): South East England Regional Assembly

Draft Flood Plan (2008) Woking Borough Council

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8. GLOSSARY AND NOTATION

Actual Risk	The risk from flooding based on best available information and representing the influence of flood defences and the distribution of risk within the Flood Zones.
Atkins	*Atkins Consulting Engineers* sometimes referred to as *Atkins Global*. The consultants commissioned to carry out the River Wey Flood Mapping Study.
BHS	British Hydrological Society
Cu.m (cumecs)	Cubic metres of water per second
DCLG	Department for Communities and Local Government (previously ODPM)
DEFRA	Department for Environment, Food and Rural Affairs
DTM	Digital Terrain Model created using LiDAR, IfSAR or Photogrammetry data.
EA	Environment Agency
FEH	The Flood Estimation Handbook (1999) gives guidance on rainfall and river flood frequency estimation in the UK and is the main method used for the calculation of peak flood flows. The Handbook is accompanied by the FEH CD-ROM containing catchment descriptors and gauging station details for catchments throughout the UK.
Flood Zones	This refers to the Flood Zones in accordance with Table D1 of PPS 25 derived for this Woking SFRA and do not refer to the Environment Agency's Flood Zones.
Flood Zones (EA)	This refers to the Environment Agency's Flood Zones.
Formal Raised Defences	Formal defences are typically raised embankments or structures which are specifically designed and maintained for the purpose of flood defence. Informal defences are all other structures which were not designed specifically for the purpose of flood defence, but may afford some protection against flooding e.g. walls or railway embankments located next to watercourses

FSR	Flood Studies Report (1975) the predecessor method of flood peak estimation in the UK largely superseded by the Flood Estimation Handbook.
GIS	Geographical Information System
IFSAR (NEXTmap)	Interferometric Synthetic Aperture - An aircraft-mounted sensor designed to measure surface elevation, which is used to produce topographic imagery. Sold under the name NEXTmap.
iSIS	iSIS Flow is a one-dimensional fully hydrodynamic simulator for modelling flows and levels in open channels and estuaries; it incorporates both unsteady and steady flow solvers.
JFLOW	JFLOW is a 2-D flood routing program developed by JBA, which is able to calculate time travel across flood cells and simulate inundation extent based on an underlying Digital Elevation Model
Km^2	Square kilometres
LiDAR	Light Detection and Ranging survey method used to collect data for construction of a ground model.
M	Metres
m/sec	Metres per second
mAOD	Metres Above Ordnance Datum
Main River	As Defined by the Environment Agency *main rivers* are usually larger streams and rivers, but also include smaller watercourses of strategic drainage importance. A main river is defined as a watercourse shown as such on a main river map, and can include any structure or appliance for controlling or regulating the flow of water in, into or out of the main river. The Agency's powers to carry out flood defence works apply to main rivers only. Main rivers are designated by the Department for Environment, Food & Rural Affairs in England.
Mm	Millimetres
NEXTMAP	Digital terrain elevation and radar image data
ODPM	Office of the Deputy Prime Minister (now DCLG)

Ordinary Watercourse	As Defined by the Environment Agency an *ordinary watercourse* is every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than public sewer) and passage through which water flows which does not form part of a main river. On ordinary watercourses, the local authority and, where relevant, Internal Drainage Boards have similar permissive powers as the Agency has on main rivers.
PPG 25	Policy Planning Guidance Note 25: Development and Flood Risk - Guidance explaining how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and loss of life. Superseded in December 2006 by PPS 25.
PPS 11	PPS11 Regional Spatial Strategies. This Statement replaces Planning Policy Guidance note 11 - Regional Planning and sets out the procedural policy on the nature of Regional Spatial Strategies (RSS) and focuses on procedural policy, on what 'should' happen in preparing revisions to them and explains how this relates to the Act and associated regulations.
PPS 12	PPS12 Local Development Frameworks. This statement replaces Planning Policy Guidance note 12 - Development Plans and sets out the Government's policy on the preparation of local development documents which will comprise the local development framework.
PPS 25	Planning Policy Statement 25. Development and Flood Risk Guidance replaced PPG 25 in December 2006 and outlines how flood risk should be considered at all stages of the development process.
Precautionary Principle	*"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation*". The precautionary principle was stated in the Rio Declaration in 1992. Its application in dealing with the hazard of flooding acknowledges the uncertainty inherent in flood estimation.
QMED	The median flood flow calculated in the FEH method and used to estimate flood peaks by the statistical method in the WINFAP package. This is the flood that can be said to occur with a return period of two years (50% annual probability).
Residual Risk	The risk remaining after applying the sequential approach and taking mitigation actions (e.g. the risk of defences being overtopped).

Return Period	The average time until the next occurrence of a defined event.
Section 105	Environment Agency Floodplain Modelling produced in accordance with Section 105 of the Water Resources Act 1991.
Sequential risk-based assessment	Priority in allocating or permitting sites for development, in descending order to the flood zones set out in Table D1 of PPS 25, including the sub divisions in Zone 3. Those responsible for land development plans or deciding applications for development would be expected to demonstrate that there are no reasonable options available in a lower- risk category.
SFRA	Strategic Flood Risk Assessment
Study Area	Refers to the area of Woking Borough falling within the River Wey catchment .
WBC	Woking Borough Council
WINFAP-FEH	WINFAP is the software package associated with the Flood Estimation Handbook and FEH flood peak dataset used to calculate flood flow peaks by the FEH statistical method.
1D	1 Dimensional
2D	2 Dimensional
1 in 20 year return period flood event	The flood event that is predicted to occur with an annual probability of 5.0% (there is a 1 in 20 (5%) chance each year this event will be witnessed).
1 in 100 year return period flood event	The flood event that is predicted to occur with an annual probability of 1.0% (there is a 1 in 100 (1%) chance each year this event will be witnessed)
1 in 1000 year return period flood event	The flood event that is predicted to occur with an annual probability of 0.1% (there is a 1 in 1000 (0.1%) chance each year this event will be witnessed)

APPENDIX A: HOW THE SFRA LINKS WITH OTHER PLANS AND POLICIES.

National Planning Policy on Flood Risk

A1. Guidance on development and flood risk is given in PPS25. This statement requires that flood risk be considered through the application of a Sequential Test. SFRAs enable LPAs, in this instance Woking Borough Council, to allocate areas for development in accordance with the Sequential Test, and as appropriate the Exception Test, as described in PPS25. Following application of the Sequential Test, if it is still necessary to allocate potential development sites higher probability Flood Zones, SFRAs should be refined to provide information necessary for application of the Exception Test (PPS25).

A2. PPS25 outlines how flood risk should be considered at all stages of the planning development process. It gives guidance on how flood risk can be managed and reduced through the land use planning process. PPS25 acts on a precautionary basis and takes into account climate change.

A3. PPS25 uses the planning process to promote a risk-based approach to ensure new development is not exposed unnecessarily to flooding by considering flood risk at every stage. New developments should reduce flood risk where possible and maintain floodplains as natural areas that continue to function effectively. Therefore, floodplains should be protected from inappropriate development. The guidance also places emphasis on the adoption of the precautionary principle and the benefits that should be derived from developer contributions.

A4. Planning policies and decisions should consider flood risk and its management on a whole-catchment basis and not be restricted to floodplains. PPS25 states that regional and local planning bodies should prepare and implement strategies that help deliver sustainable development by:

- appraising risk;
- managing risk; and,
- reducing risk.

A5. SFRAs fall into the first category of 'Appraising risk' so that the risk can be appropriately managed or reduced.

A6. Flood risk can be assessed to various degrees of detail, which should be proportionate to the nature and complexity of the flood risk within the administrative boundary. To ensure that an appropriate level is included, guidance in the PPS 25 Practice Guide (CLG 2008) recommends two levels of detail:

- Level 1 (initial assessment) - should be carried out for all of the administrative area, as it is necessary for the LPA to understand comparatively flood hazard across its administrative area, in order to consider flooding on a risk basis.
- Level 2 (more detailed) - where the result of the Level 1 assessment indicates that there is an issue of flood risk, then it is necessary to undertake a more detailed assessment of flood risk to collect further information on the spatial distribution of flood hazard.

A7. This SFRA for the Woking Borough Council is a combination of a Level 1 and a Level 2 assessment. Level 1 assessment has been undertaken at a broad scale across the study area which identifies areas of flood risk. Further detail (Level 2) has been provided for these areas identified as having a high risk of flooding.

A8. The role of the SFRA in the hierarchical planning structure in England is summarised in Table A.1 below. Figure A.1 illustrates how the SFRA may fit into the conceptual land use planning framework.

Table A.1 Hierarchy of flood risk appraisal

Flood Risk Management Tool	Applicable to	Prepared by
Regional Flood Risk Appraisal	Regional Spatial Strategy	Regional Planning Body
Strategic Flood Risk Assessment	Local Development Framework	Local Planning Authority
Flood Risk Assessment	Specific sites	Developer/land owner

Additional National Planning Policy Guidance / Statements

A9. When completing the sequential test in line with PPS25 Woking Borough Council should be aware of the full gamut of National PPS and Planning Policy Guidance (PPG). The following PPS and PPG documents summarised briefly here are likely to be of particular importance to Woking Borough Council when preparing their LDF:

- PPS1: Delivering Sustainable Development: sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system;
- Planning and Climate Change – Supplement to PPS1: sets out how planning, in providing for the new homes, jobs and infrastructure needed by communities, should help shape places with lower carbon emissions and resilient to the climate change now accepted as inevitable;
- PPS3: Housing: underpins the delivery of the Government's strategic housing policy objectives and the government's goal to ensure that everyone has the opportunity to live in a decent home, which they can afford in a community where they want to live;
- PPS6: Planning for Town Centres: sets out the Government's policy on planning for the future of town centres;
- PPS11: Regional Spatial Strategies: sets out the procedural policy on the nature of Regional Spatial Strategies (RSSs) and focuses on what should happen in preparing revisions to them and explains how this relates to the Act and associated regulations;
- PPS12: Local Development Frameworks: sets out the Government's policy on the preparation of local development documents which will comprise the local development framework;
- PPG2: Green Belts: outlines the history and extent of Green Belts and explains their purposes. It describes how Green Belts are designated and their land safeguarded.

Green Belt land-use objectives are outlined and the presumption against inappropriate development is set out;

- PPG15: Planning and the Historic Environment: provides a full statement of Government policies for the identification and protection of historic buildings, conservation areas, and other elements of the historic environment. It explains the role played by the planning system in their protection; and,
- PPG16: Archaeology and Planning: sets out the Secretary of State's policy on archaeological remains on land, and how they should be preserved or recorded both in an urban setting and in the countryside.

Regional Spatial Strategy

A10. The Regional Spatial Strategy (RSS) covering Woking Borough is the South East Plan (2006), prepared by the South East Regional Assembly. This plan is currently not adopted and is a strategic framework developed to manage growth in the South East. The Planning Frameworks of individual boroughs must be in general agreement with the South East Plan.

A11. The South East Plan recognises that there is likely to be an increased risk of flooding in the future, related to a predicted rise in sea levels and increased winter storminess. The South East Plan states that a precautionary approach must be taken to the risks created by global warming and the potential for flooding. Policies relating to Flood Risk are detailed below:

POLICY NRM3:
SUSTAINABLE FLOOD RISK MANAGEMENT
The sequential approach to development in flood risk areas set out in PPG25 (to be superseded by PPS25) will be followed. Inappropriate development should not be allocated or permitted in zones 2 and 3 of the floodplain (Map NRM2) or areas with a history of groundwater flooding, or where it would increase flood risk elsewhere, unless there is over-riding need and absence of suitable alternatives.

Where development is proposed for parts of zones 2 and 3, local authorities (in the case of plan allocations) and developers (in the case of specific proposals) with advice from the Environment Agency should undertake a strategic Flood Risk Assessment (SFRA) to provide a comprehensive understanding of the flood risk and options for managing that risk in a cost effective manner. This should have regard to climate change and identify appropriate types of development and suitable mitigation and adaptation measures in scheme design and layout.

Existing flood defences will be protected from development. Where development is permitted in appropriately defended floodplains it must be designed to be resilient to flooding (to minimise potential damage) and to allow for the future maintenance, realignment or management of the defences to be undertaken.

In the preparation of Local Development documents and considering planning applications, local authorities in conjunction with the Environment Agency should also:

i Take account of River Basin Management Plans, Catchment Flood Management Plans and Shoreline Management Plans in developing Local Development Documents and other strategies. Where locationally specific flood risk and land management options such as flood storage, managed realignment and set back from coastal defences are identified, land should be safeguarded for these purposes and appropriate land management practices should be encouraged

ii Require incorporation and management of Sustainable Drainage Systems (SuDS), other water retention and flood storage measures to minimise direct surface run–off, unless there are practical or environmental reasons for not doing so

iii Take account of increased sewage effluent flows on fluvial flood risk.

Regional Flood Risk Appraisals

A12. Regional Planning Bodies (RPBs) are required to prepare Regional Flood Risk Appraisals (RFRAs) and in doing so, consider flood risk when preparing their Regional Spatial Strategies (RSSs).

A13. The South East Regional Assembly prepared a Regional Flood Risk Appraisal (RFRA) in November 2006. This RFRA was prepared in consultation with the Environment Agency prior to the release of PPS 25. The RFRA sought to identify those areas where the presence of Flood Zones 2 and 3 coincided with relatively high levels of additional growth.

A14. In the 'London Fringe Area' the assessment has indicated that areas of the Lower Thames Valley and Mole and Wey Valleys are particularly at risk of flooding. The RFRA notes that further investment in defences and mitigation may be necessary as well as more detailed SFRAs. The Environment Agency were able to assist in this assessment by providing flood risk data to inform the strategic planning process and by feeding back on flood risk in relation to larger residential commitments.

A15. In response to this assessment, the following three actions were noted for this area:

- Housing potential studies were discussed with the EA. The majority of large residential commitments are located outside the Flood Zones. Otherwise justification is provided.
- A number of SFRAs are being undertaken at the local level to support LDFs and their findings may have strategic implications for future land supply.
- The flood risk on development sites within the built up area, especially in the Lower Thames Valley, will be assessed and where possible mitigated through the development control process but may act as a constraint on future housing potential.

A16. The findings of this RFRA should be taken into account by Woking Borough Council in the LDF process. No specific guidance is provided in the RFRA for Woking Borough Council on the undertaking of a SFRA. It is expected that the findings of this SFRA and the subsequent use by Woking Borough Council in the application of the Sequential Test will be used to inform future revisions of the RFRA.

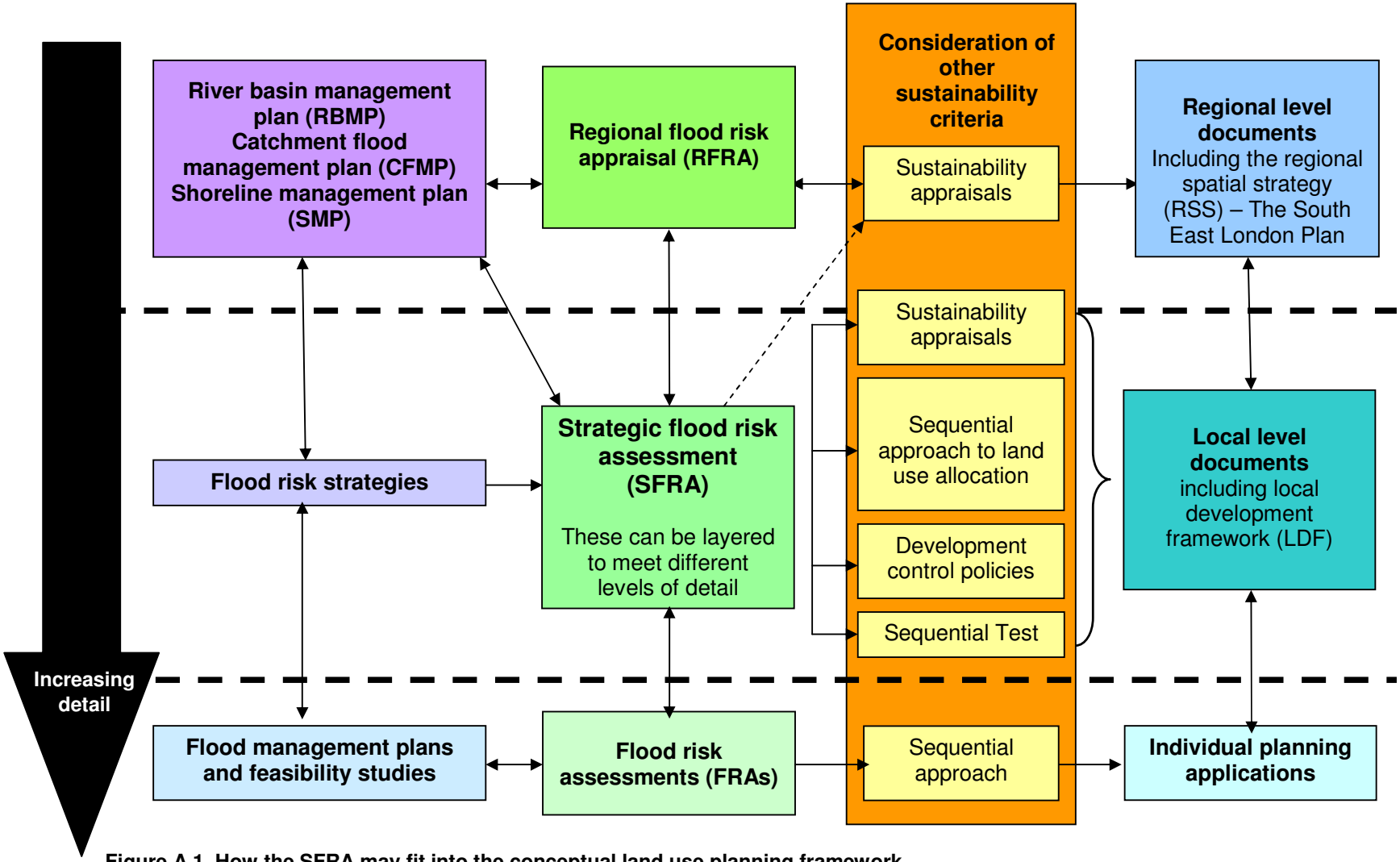

Figure A 1 How the SFRA may fit into the conceptual land use planning framework

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APPENDIX B: HOW FLOOD RISK IS ASSESSED

Introduction

B1. This appendix defines flood risk and its sources. It then goes on to consider the four stage approach to the assessment of flood risk that has been undertaken in line with PPS25. It then considers the impact of climate change on flood risk, before going on to consider uncertainty. It concludes with a brief discussion of currency of information.

Defining flood risk

B2. The Environment Agency's 'Strategy for Flood Risk Management 2003 - 2008' (Environment Agency 2003), describes flood risk as a combination of two components, the:

- *"**chance (or probability)** of a particular flood event; and,*
- ***impact (or consequence)** that the event would cause if it occurred."*

B3. By considering both the definition of risk and the "source-pathway-receptor" model, it is beneficial to assess risk in terms of the components shown in Figure B.1.

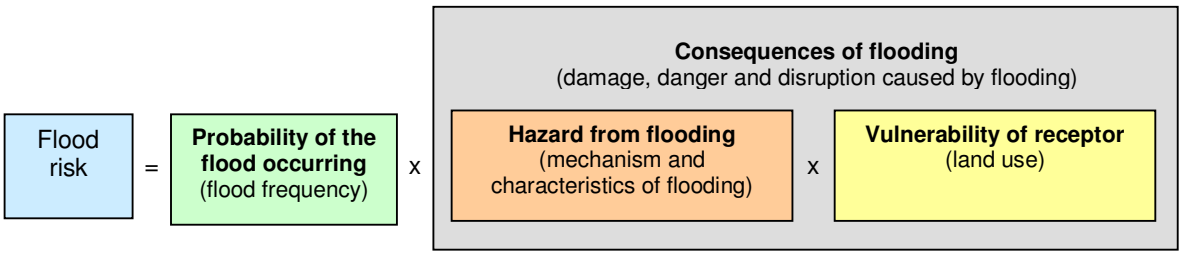

Figure B 1 - The Risk Equation

B4. The probability of flooding can be defined using data and statistical analysis. The hazard from flooding can be evaluated by considering the depth of floodwater, the velocity of flow, the speed of onset of flooding and the rate of rise of floodwater. The vulnerability of flooding can be assessed through analysis of the land use, property or people that would be affected by flooding.

B5. It can be seen from the risk equation Figure B.1 above that by reducing the hazard or vulnerability of flooding, it is possible to reduce the risk. It follows that, development proposals within the Woking Borough area should be developed and assessed using a risk-based search sequence avoiding risk where possible and managing it elsewhere.

B6. There is inherent uncertainty in estimation of flood probability due to the need to simplify variability in rainfall, storm types, soil types, land cover and antecedent conditions into one design event. By separating flood risk into its three components, it is possible to gauge risk even if the exact probability of an event is uncertain. In this way a precautionary principle can be applied, as flood risk will be higher for floods with significant hazards and consequences, even when the probability of occurrence is uncertain.

B7. This information can then be used to inform the Sequential Test. By including consideration of climate change the procedure is precautionary, in accordance with PPS25.

B8. The SFRA provides high level information for decisions on land use planning within the Woking Borough area. The strategic approach defined in this document will require that information supporting all planning applications in the study area make reference to the SFRA and clearly demonstrate adoption of a risk-based sequential approach.

Sources of flood risk

B9. Flooding can come from rivers, the sea, directly from rainfall, groundwater, highway and sewer drainage systems, and from artificial sources such as canals. The impact of flooding will depend upon its source and the land-use. Further information on flooding from the six sources is contained within Annex C PPS25 and the PPS25 Practice Guide.

B10. The Autumn 2000 Flood Report produced by the Environment Agency reported that 42 per cent of flooding reported nationally arose from sources other than river flooding (Environment Agency 2000).

B11. The Flood Zones based on the Environment Agency Flood Map account only for river flooding and flooding from the sea.

B12. In accordance with PPS25 the SFRA has refined the information on the Environment Agency Flood Map to account for other forms of flooding as well. Information on groundwater, surface water, sewers and artificial sources has been collated. This information should be used when preparing appropriate policies for flood risk management and land use allocation.

Types of flood risk

B13. The SFRA provides a range of information so that the hazard of flooding, not just the probability of flooding, can be examined. In keeping with PPS25, there are four types of flood risk to be considered.

1. Flood Zones

B14. As defined in Table D1 of PPS25, Flood Zones show areas at risk of river and sea flooding, ignoring the presence of flood defences. It is important to recognise that because the Flood Zones ignore the presence of flood defences, they do not describe an actual level of flood risk. Thus, large areas of development behind flood defences can be shown as at risk.

B15. PPS25 also defines the functional floodplain as the area where water has to flow or be stored at times of flood, and that SFRAs should identify this by the land liable to flood during a flood with a 5 per cent annual exceedance probability (AEP). The Practice Companion Guide to PPS25 clarifies that this should be with flood defences in place.

B16. PPS25 requires that all sources of flooding be examined. Flood Zones are a good starting point for this assessment as they show areas at risk of flooding from rivers and the sea, which cause the most damage across England and Wales. However other sources and types of flooding must be examined, even if a proposed development lies within a low probability Flood Zone. Thus the actual and residual risks must be examined as well.

2. Detailed information on the magnitude and distribution of risk

B17. This stage of the assessment provides more detailed information on flooding, when the impact of existing flood defences (if present) is considered, assuming that they operate as they are supposed to. The risk of river flooding is assessment and more detailed flood hazard information is usually provided the 1% AEP flood event.

B18. The risk of flooding from other sources (land, groundwater, sewers and artificial sources) can be assessed using a range of analyses. However, for the level of assessment required in an SFRA, these sources are usually assessed via a review of historic flood incidents records and a qualitative analysis of catchment characteristics.

3. Residual risk (extreme flood events)

B19. There is a need to be aware of the residual risk generated by an extreme flood event which is more severe than that for flood risk management measures have been implemented. Accordingly, this risk assessment usually considers the flooding associated with an extreme event (such as a 0.1 % AEP) or flooding that may result from climate change.

4. Residual risk (breach and/or failure)

B20. This involves the assessment of breach or failure of flood defences or other features, which may act as a defence. Such scenarios may include the structural failure of a canal or reservoir embankment, collapse of a flood defence wall, or blockage of a culvert. . Whilst the probability of a breach or failure is generally low, the consequences of an event are often very high. Following the precautionary principle, such high hazards should be considered when making land use planning decisions.

B21. Breach and failure hazards are site specific and should be assessed in individual flood risk assessments. The Woking Borough SFRA has considered the breach hazard from the Basingstoke Canal (**Volume 3, Appendix F - Flood Risk from the Basingstoke Canal**). This assessment presents an indication of the likely breach hazard in the Borough. For individual site specific FRAs, other breach locations and conditions may have to be assessed.

Climate change

B22. Projections of future climate change indicate that more frequent short-duration, high intensity rainfall and more frequent periods of long duration rainfall could be expected. Winters are expected to become wetter with summers and autumn becoming drier than at present. Global sea level rise is also expected to continue. These kinds of changes will have implications for all forms of flooding.

B23. Changes in the extent of inundation as a result of climate change are likely to be negligible in well-defined floodplains but may be dramatic in low-lying and flat areas. It is expected that climate change will lead to a reduction in the standard of protection provided by defences constructed in the past. Changes in the depth of flooding may reduce the return period of a given flood and as a result the flood zone classification within which certain areas fall.

B24. The Environment Agency Flood Map and Flood Zones do not take account of climate change. PPS25 requires that the spatial planning process should consider the implication of changes in our climate.

B25. The Woking Borough SFRA contains information on flood probability areas in the future based on a time horizon representing 100 years (2107) into the future. Refer to Volume 2, Chapter 5 of this SFRA for further information about the climate change projections used in this assessment.

B26. In the UK the implications of climate change are assessed by the UK Climate Impacts Programme and latest government guidance on allowance for the impacts of climate change on flooding is provided in Defra guidance issued in October 2006 and reproduced in PPS 25 Annex B. Further research and updates are expected in the future.

B27. It is imperative that allowances for climate change are based on the latest predictions and up to date guidance. PPS25 states:

B28. "The most up-to-date guidance on climate change and flooding from the Environment Agency, Defra, Communities and Local Government and the UKCIP should be considered in the preparation of…Strategic Flood Risk Assessments…"

B29. The user must ensure that the most recent climate change guidance is considered over an appropriate time horizon when using the SFRA to inform decision making.

Uncertainty

B30. Flood risk can be assessed using a number of techniques and also to various degrees of detail. It is important to be confident that the methods used for estimation of flood risk produce results that are sufficiently certain for land use planning decisions to be based upon.

B31. Uncertainty in flood estimation arises from the:

- Complexity of the flooding;
- Quality of the input data; and
- The uncertainty of climate change.

B32. When using the SFRA to inform land use planning the following questions must be answered:

- Is the assessment suitable for the type of flooding and the scenarios being considered (fit for purpose)?
- Is the study appropriate for the level of detail required for the proposed land use (vulnerability)?
- Are the limitations of the method clearly understood and reported?
- Are the studies appropriately verified?
- Are the key assumptions identified and stated?
- Is the key input data justified and appropriate for the level of assessment (fit for purpose)?
- Have sensitivity analyses been carried out?
- Have all relevant uncertainties (such as climate change) been identified and appropriately addressed?

B33. Where there is high certainty in flood estimation there may be no need for further analyses. Conversely low certainty requires more detailed assessment.

B34. The potential impacts of climate change are an important aspect of uncertainty relevant to flood risk estimation. Government guidance suggests that the impacts of climate change can be managed by either monitoring change in risk and adapting in the future as the need arises (Managed Adaptive Approach) or acting now to manage the eventuality (Precautionary Approach).

B35. Adopting a "Managed Adaptive Approach" to land use planning is not advised. Future adaptation to the impacts of climate change may not be technically feasible in the long-term or practical in intervening periods and the requirement to review and take action can be managed more effectively through individual planning applications rather than by Woking

Borough Council within the LDF process. Climate change information within the SFRA has been based therefore on a precautionary approach.

Currency of information

B36. It is imperative to ensure that the latest information is used when assessing flood risk. The source and quality of the flood risk information and in particular how up to date it is should be checked before using any information. Management protocols are included in Volume 1, Chapter 6 of the Woking Borough SFRA.