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Management R&D Programme

Land use planning – Assessing the quality and influence of Strategic Flood Risk Assessments (SFRAs)

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Glossary

AAP	Area Action Plans
AMR	Annual Monitoring Report
BC	Borough Council
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
DC	District Council
DCLG	Department for Communities and Local Government
DPD	Development Plan Documents
EiP	Examination in Public
FRA	Flood Risk Assessment
FZ	Flood Zone
GIS	Geographical Information System
IDB	Internal Drainage Board
LDD	Local Development Document
LDF	Local Development Framework
LGA	Local Government Association
LiDAR	Light Detection and Ranging
LP/UDP	Local Plan / Unitary Development Plan
LPA	Local Planning Authority
NFCDD	National Flood & Coastal Defence Database
PPG25	Planning Policy Guidance 25 - Development and Flood Risk
PPS25	Planning Policy Statement 25 - Development and Flood Risk
RFRA	Regional Flood Risk Assessment
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SEA	Sustainable Environmental Appraisal
SMP	Shoreline Management Plan
SFRA	Strategic Flood Risk Assessment
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SWMP	Surface Water Management Plan
UKCIP	United Kingdom Climate Impacts Programme
WCS	Water Cycle Strategy

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1. Introduction

1.1 Background

As part of the Making Space for Water Strategy, a new planning policy statement PPS25 on development and flood risk was published in December 2006. This, along with other changes to the planning system sought to provide clearer and more robust guidance to ensure that current and future flood risk is taken into account at all levels of the planning system. One key outcome was a greater reliance on the development of appropriate flood risk assessments, in particular Strategic Flood Risk Assessments (SFRAs), and a revised Sequential Test. The policy also introduced a new Exception Test which was designed to help direct development away from flood risk areas and match land allocations to appropriate uses through the use of vulnerability classifications. A Practice Guide was also published to provide practical guidance for planners when interpreting the application of the main document and this guidance promotes a clear flood risk management hierarchy to “Assess, Avoid, Substitute, Control and Mitigate” flood risk at all levels and at all stages of the planning system.

Overall the purpose of an SFRA is to consider flood risk strategically at a local planning authority (LPA) level, and to help ensure planning decisions minimise flood risk to and from new development and people remain safe. It is intended to inform the preparation of Local Development Documents (LDDs) and forms part of the evidence base for the Sustainability Appraisal (SA). Ultimately SFRAs should consider all types of flooding, provide information of the extent and potential impact of flood risk areas where further developments are likely to impact on flood risk, and an inventory of current flood risk management policies. An SFRA will allow the LPA to undertake a risk based sequential assessment as part of the development of the Local Development Framework, and subsequently assess the flood risks for individual development applications. The SFRA should also be designed to facilitate preparation of appropriate policies for the management of flood risk within the LDDs.

Although many local authorities have either completed or are undertaking an SFRA, there was, prior to this study, no previous assessment of the quality, consistency of approach and relevance of prepared SFRAs across planning authorities. There have also been concerns that some SFRAs are being prepared on the basis of existing land allocations in local development documents and that the sequential test is not being applied correctly.

Outside the specific role of the SFRA to appraise, manage and reduce flood risk related to development, PPS25 sets out important “efficiency” issues linked to the sourcing and assembly of data, models and information that enable a strategic approach to be taken to flood and surface water management at the local level. This information can be useful not only for SFRAs, but also for flood risk assessment and mapping for Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs), Floods Directive, Surface Water Management Plans (SWMPs), and emergency planning.

It is therefore important to establish whether SFRA are helping to deliver the key planning objectives of PPS25 in terms of a partnership approach: with LPAs working efficiently with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective; and ensuring spatial planning supports flood risk management policies and plans, and emergency planning.

1.2 Aims and objectives of study

To address these concerns, Entec UK and JBA Consulting were commissioned by Defra in spring 2008 to undertake a study to evaluate the current position regarding the preparation of SFRA. The key objectives of the study were to:

- understand the current application of SFRA outputs in the planning and development process, the benefits accrued and the barriers in place;
- promote better and repeat use of available flood risk data, with due regard to uncertainties due to climate change, model accuracy and resolution;
- assess whether pluvial and/or surface water flood issues are being adequately considered in SFRA and hence, whether they provide useful information to make effective decisions on the suitability of new development;
- identify whether SFRA have been effective in engaging a variety of stakeholders and hence contribute to the delivery of truly integrated flood risk management planning and operations;
- assess the execution of the strategic assessment of flood risks, the use of that information in spatial planning decisions and the efficacy of the Sequential Test;
- explore how the integration of flood risk management objectives and spatial planning policies are fundamentally linked to the quality of the appropriate flood risk assessment;
- provide an evidence base on how SFRA have evolved and improved since the introduction of PPS25;
- assess the degree to which SFRA have been used and influenced Sustainability Appraisals and ultimately the delivery of flood risk management objectives;
- explore the successes and limitations of the Sequential Test in a planning environment and its correlation with the spatial scale at which it is applied;
- provide best practice examples of how SFRA deliver the objectives stated above, with an assessment of the costs and benefits achieved.

The remainder of the report summarises the work undertaken in this study to investigate these objectives and ultimately produce a final set of recommendations which can help improve the future development of SFRA and their subsequent use by local authority planners, developers and other stakeholders.

These aims have been investigated through three key project stages (see below);

Stage 1 - Establish a broad evidence base on the quality and effectiveness of SFRA produced for Local Development Framework (LDF). This has been designed to provide a “snapshot” of the current position regarding preparation of SFRA – specification, quality control, partnership working, who are completing them, quality and coverage, barriers to producing an effective SFRA, costs, impact on land allocations and links to/influence on other plans, policies and strategies.

Stage 2 - Using a sample of thirty five studies, assess in detail the quality and influence of SFRA. This task considers both the shortcomings in current assessments but also the benefits of a “good” SFRA, both in terms of its influence on planning decisions and policies but also the value SFRA have had in influencing the planning process and other relevant flood risk or drainage management activity.

Stage 3 - Assess the implications for the PPS25 Companion Practice Guide, and make recommendations on ‘good practice’ about how to inform that guide on preparation of future generations of SFRA. The study will also make recommendations to address the barriers which have prevented the development of effective SFRA and the efficient use of common data, models and information with other relevant flood risk or drainage management activity.

The remainder of this report reports the key findings of the study using the following structure.

Section 2 Role of SFRA studies within the planning system

This section summarise the key policy developments which have shaped the development and use of SFRA documents within the UK planning system. This includes the background to PPS25 (Sequential and Exception Tests); Regional Flood Risk Assessment (RFRA); Strategic Flood Risk Assessments (SFRA) and Local development Frameworks (LDFs). This provides the baseline for evaluating the technical content and influence of SFRA studies in the remainder of the report.

Section 3 National summary of SFRA completions

This section provides a short analysis of SFRA completions and status for the 353 local authorities (at March 2009) within England. This provides the context for the more detailed research undertaken in the remainder of the report.

Section 4 Initial review of SFRA quality and influence

This section describes the development of an internet based questionnaire designed to gain the opinions of local authority planners responsible for developing and/or using SFRA documents. The section provides subsequent analysis of 164 responses to the web survey.

Section 5 Detailed review of SFRA quality and influence

This section outlines the development of a more detailed questionnaire designed at assessing the overall quality of SFRAs and their influence upon the determination of land allocations and effective application for PPS25 sequential and exception testing. The discussion also highlights the process for selecting 35 SFRAs which have been investigated in detail in the remainder of the study.

Section 6 Assessing the quality of SFRA documents

This section summarises the key features of the SFRA documents reviewed and highlights good practice which should be included in future updates of SFRA studies.

Section 7 Assessing the influence of SFRA documents

This section considers the influence of the SFRA documents upon the development control process. This includes assess their influence upon spatial planning decisions and the overall effectiveness of the PPS25 sequential test.

Section 8 Assessing the long term contribution of SFRA documents

This section considers the long term influence of the SFRA documents to the wider planning process. This includes consideration of the wider use of SFRA documents within sustainability appraisals; the sharing of information between organisations and the use of SFRA within the wider LDF process.

Section 9 Study findings

Summary of the findings of study based upon the evidence presented in Sections 3 – 8 of the report.

Section 10 Recommendations

The final section of the report highlights key recommendations for future actions by government, local authorities and other key stakeholders in the future development, update and use of SFRA information. This includes reinforcement and sign posting of existing guidance (such as the existing PPS25 Practice Guide) and development of new recommendations to improve areas of current weakness. These recommendations are principally aimed at spatial planners and development control officers working in local government and the Environment Agency.

2. Role of SFRA studies within the planning system

2.1 Introduction

The content and focus of SFRA documents have changed over the last decade to accommodate the changing requirements and expectations of UK planning policy and flood risk management needs. To understand the role and influence of strategic flood risk assessments, it is necessary to outline the key policies and framework which have influenced their development. This is essential to provide the baseline for the assessment of the technical content (see Section 6) but also the influence (see Section 7 and 8) of SFRA studies upon the wider planning system.

The remainder of this section considers the following topics.

- Management of flood risks within the UK planning system - Identification of the different tiers of the UK planning system and the key flood risks management tool which operate within this system;
- PPS25 and management of flood risks for new development - Overview of the government policy including summary of the PPS25 exception and sequential tests;
- Flood risk management at the regional planning level - Discussion of the higher level Regional Spatial Strategies (RSSs) and Regional Flood Risk Appraisals (RFRAs) and the links to SFRA studies;
- Flood risk management and Local Development Framework (LDF) - Discussion of the role of SFRA within the LDF process and implementation of the PPS25 sequential and exception test approaches;
- Characteristics of an effective SFRA – Summary of the key requirements and features of a Level 1 and Level 2 SFRA study

2.2 Management of flood risk within the UK planning system

The management of flood risk for new and existing development within the UK planning system is sub-divided into five main stages, namely, Assess; Avoidance; Substitution; Control and Mitigation (see Table 2.1 overleaf). This tiered and strategic approach is designed to facilitate the management of flood risk management at all levels of the planning system and underpin the key flood management objectives of Defra Making Space for Water Strategy and PPS25 Planning Policy (DCLG, 2006).

Table 2.1 Management of flood risk within the planning system

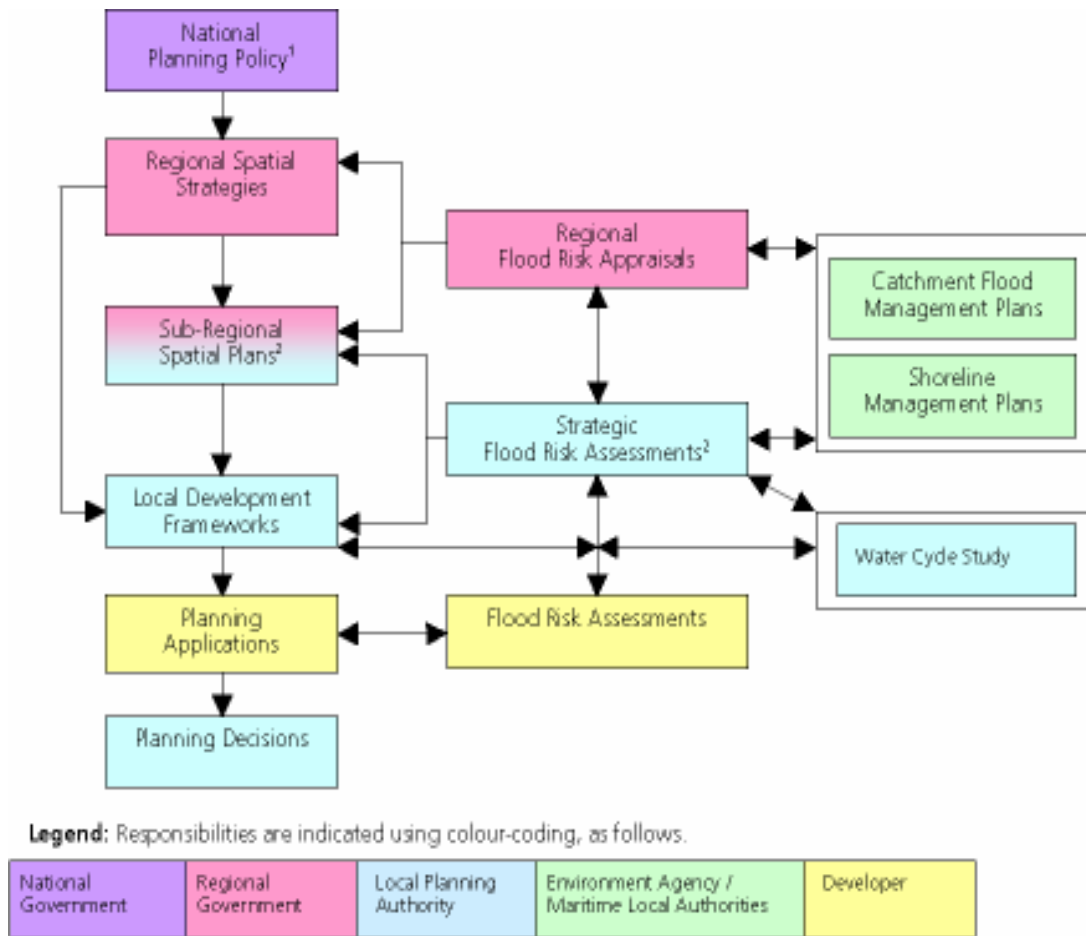
Flood Risk Management Stage	What it means	How the planning system deals with it	Who is responsible
Assess	Undertake studies to collect data at the appropriate scale and level of detail to understand what the flood risk is.	Regional Flood Risk Appraisals (RFRA), Strategic Flood Risk Assessments (SFRA), Flood Risk Assessments (FRAs) and application of the sequential approach.	Planning bodies and developers.
Avoidance/ Prevention	Allocate developments to areas of least flood risk and apportion development types vulnerable to the impact of flooding to areas of least risk.	Use the outputs of an SFRA to support the implementation of the PPS25 Sequential approach (including the Sequential Test and Exception Test where relevant) to locate development in appropriate locations.	Planning bodies and developers.
Substitution	Substitute less vulnerable development types for those incompatible with the degree of flood risk.	At the plan level, the Sustainability Appraisal should show how flood risk has been weighted against other sustainability criteria.	Planning bodies and developers.
Control	Implement flood risk management measures to reduce the impact of new development on flood frequency and use appropriate design.	Use River Basin Management Plans (RBMPs), Catchment Flood Management Plans (CFMPs), Shoreline Management Plans (SMPs), Surface Water Management Plans (SWMPs), Flood Risk Management Strategies, appraisal, design and implementation of flood defences.	Planning bodies, Environment Agency and other flood and coastal defence operating authorities, developers and sewerage undertakers. Developers are responsible for design of new developments.
Mitigation	Implement measures to mitigate residual risks.	Flood risk assessments. Incorporating flood resistance and resilience measures. Emergency Planning Documents. Implementation of flood warning and evacuation procedures.	Planning bodies, emergency planners, developers, the Environment Agency, other flood and coastal defence operating authorities and sewerage undertakers.

Source: Reproduced and adapted from DCLG 2006

As shown in Table 2.1, all forms of flooding and their impact on the natural and built environment are material planning considerations and should therefore be considered at all stages of the planning process to avoid unsuitable development flood risk areas. This research has investigated the degree to which SFRA documents fulfil this overall goal, and where necessary, provide further guidance and recommendations for improvement.

Table 2.1 also highlights the role that different stakeholders must take to ensure the effective delivery of key studies (including Strategic Flood Risk Assessments) and the subsequent use of this information within the planning process. An overview of the key linkages between tiers of the planning system, related studies and stakeholders are reproduced below in Plate 2.1 (reproduced from DCLG, 2006).

Plate 2.1 Links between tiers of the planning system, stakeholders and flood risk management documents



Source: Reproduced from DCLG 2007

Plate 2.1 highlights the importance of managing and limiting flood risk at each stage of the spatial planning process. The outcome should be a strategic approach to flood risk management at all levels which enables a sequential and proportional approach to assessment of the suitability of new developments.

The remainder of this section considers the key components of this hierarchy and provides the setting for the subsequent assessment of the ability of SFRA studies to provide adequate information for the assessment of development suitability.

2.4 PPS25 overview and relationship to SFRA studies

As highlighted earlier in this report, the primary role (to-date) of SFRA studies has been to provide adequate technical information to support the earlier PPG25 and current PPS25 policies designed to assist the management of development within flood risk areas (DCLG, 2006). The remainder of this section sets out the key features (including details of the sequential and exception tests) of the current PSS25 policy. This is designed to provide a reference for later sections of the report which highlight the successes and limitations of previous SFRA studies in implementing the requirements of PPS25.

In summary, the Planning Policy Statement 25 (PPS25) sets out Government policy on development and flood risk. Its primary aim is to ensure that flood risk is taken into account at all stages (RFRA and SFRA) in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

To aid the assessment of suitability, PPS25 incorporates two tests, namely the “Sequential Test” and “Exception Test”. The key features of these tests are outlined below.

PPS25 Sequential Test

The PPS25 Sequential Test is designed to be applied at all stages of planning and its primary aim is to steer (where possible) new development to areas at the lowest probability of flooding (Zone 1). Although this is the optimum development scenario, the lack of suitable development sites in Zone 1 and wider development pressures will in some cases require decision makers to consider the appropriateness of some developments in the higher flood probability areas (Zone 2 and 3).

In most situations, the evaluation of the appropriate use of potential sites will be considered as part of the preparation and review of Regional Spatial Strategies (RSSs) and Local Development Documents (LDDs). The two tiers of the planning system are discussed in detail later in this section.

PPS25 recommends that during this process, existing and proposed development sites should be reviewed in order that (where possible) existing vulnerable uses located in medium and high flood zones are considered for reallocation to less vulnerable flood risk areas. This is intended to help realise opportunities arising through redevelopment and ultimately help improve the sustainability of communities.

To aid the implementation of the Sequential Test, PPS25 Annex D outlines a series of profiles of appropriate development uses for each of the main Environment Agency flood risk zones. These profiles are reproduced below in Appendix A.

PPS25 Exception Test

As shown in Appendix A, the development of some uses and some flood risk vulnerability classifications require the application of the PPS25 Exception Test. For the Exception Test to be passed:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared.
- 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.

PPS25 also highlights that the Exception Test should be applied by decision-makers only after the Sequential Test has been applied and in the circumstances when 'more vulnerable' development and 'essential infrastructure' cannot be located in Zones 1 or 2 and 'highly vulnerable' development cannot be located in Zone 1. As a consequence, it should not be used to justify 'highly vulnerable' development in Flood Zone 3a, or 'less vulnerable'; 'more vulnerable'; and 'highly vulnerable' development in Flood Zone 3b.

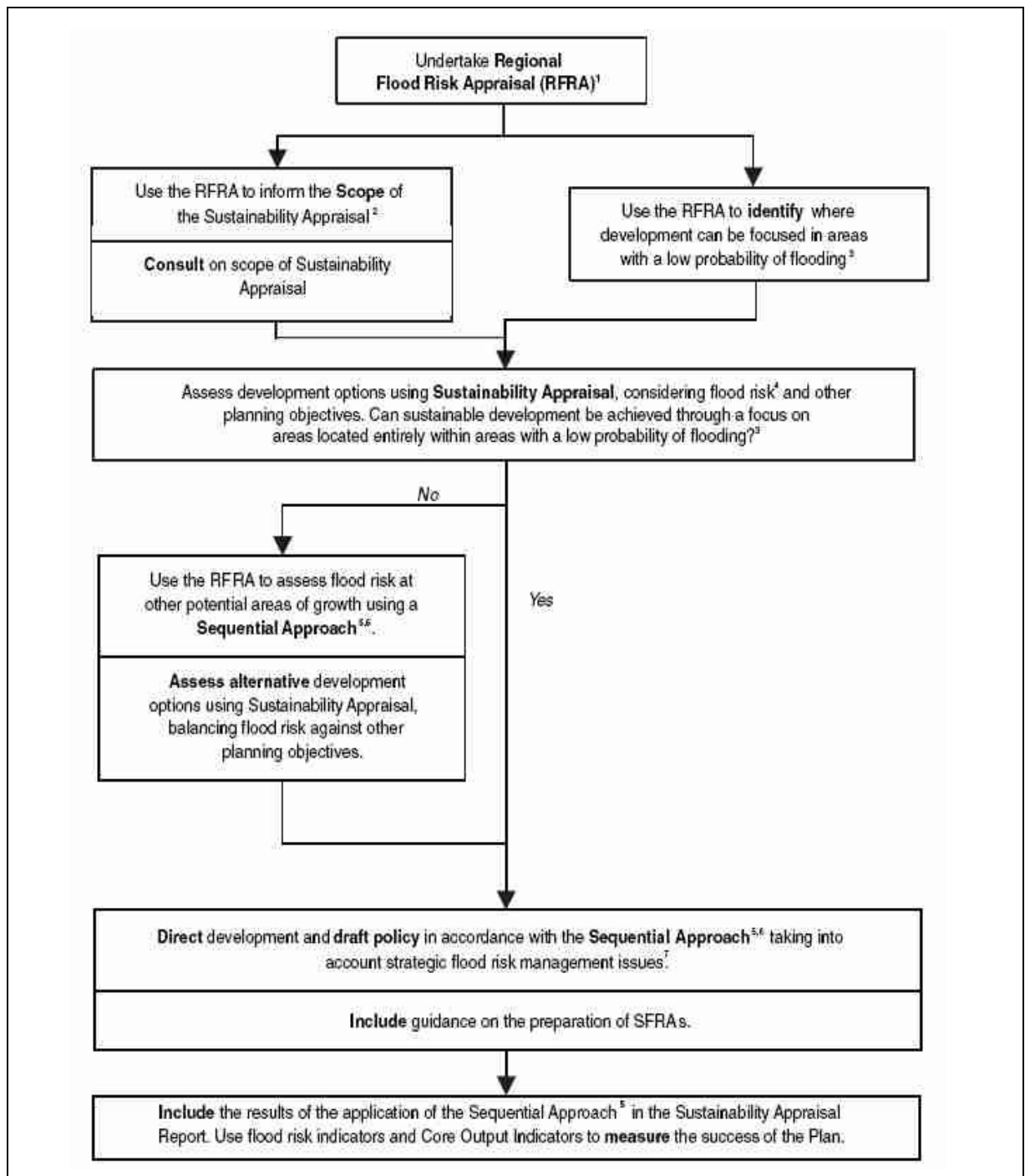
The following sections consider the operation of PPS25 within the different tiers of the planning system. The first of these covers the development of Regional Flood Risk Assessments (RFRAs) as part of the development of Regional Spatial Strategies (RSSs) by Regional Planning Boards (RPBs). The section also highlights the links that RFRA studies should have with subsequent and more detailed Strategic Flood Risk Assessments (SFRAs).

2.3 Regional Spatial Strategies and Regional Flood Risk Assessments (RSSs and RFRAs)

The role of a Regional Spatial Strategy (RSS) is to provide strategic planning policies for a region. To ensure that these strategic policies are sustainable, it is essential that a Regional Flood Risk Assessment (RFRA) is undertaken to evaluate the current and long term flood risk issues within a region. This study has a key role in the sustainability appraisal of the RSS.

As shown in Plate 2.2, a key requirement of the PPS25 is that regional planning bodies (RPBs) undertake Regional Flood Risk Appraisals (RFRAs) to provide the evidence to support regional scale policies. This appraisal includes the adoption of a sequential approach (following PPS25 principles) to direct strategically significant growth areas towards locations with the lowest probability of flooding. This approach will act as the first high level filter of suitability which will help limit the subsequent work undertaken by individual local authorities.

Plate 2.2 Assessing flood risk in Regional Spatial Strategies (RSSs)



Notes

- 1 Guidance on undertaking a RFRA can be found in chapter 3.
2. Guidance on developing the scope of SA can be found in ODPM (2005) Sustainability Appraisal of Regional Spatial Strategies (RSS) and Local Development Documents (LDD). Guidance on suitable flood risk indicators can be found in Flood Risk Assessment Guidance for New Development FD2320, D2.1.
- 3 Flood Zone 1 for fluvial and tidal flooding and with a low risk of flooding from other sources.
- 4 Including an assessment of the potential effect of proposed development on surface water run-off.
- 5 Including the likelihood of the Exception Test being passed, where appropriate.
- 6 Including, in broad terms, consideration of the variability of flood risk within a Flood Zone from existing SFRAs.

The use of this strategic screening approach enables RPBs to demonstrate that a PPS25 style sequential approach to managing flood risk has been followed and

thereby provide adequate evidence to support Examination in Public (EiP) of the RSS. This process should also consider the impact of climate change upon the sustainability of existing and planned flood defences.

The RFRA should also consider the impacts of proposed large scale development at the strategic scale and identify whether there are opportunities to be gained to reduce flood risk. This could include strategic level options such as major storage areas; realignment of defences and/or long term land use changes.

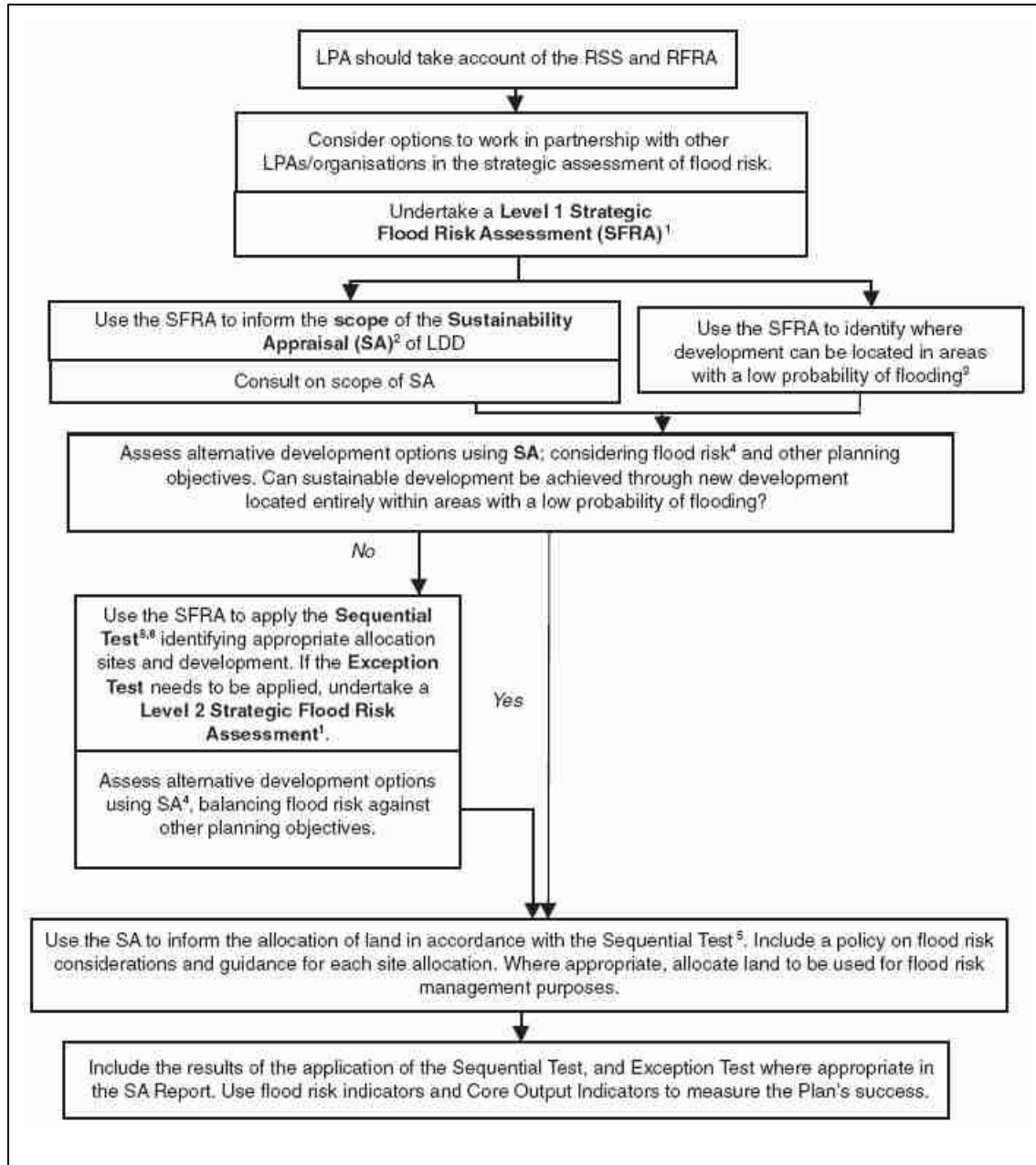
An important feature of RFRA is that they are strategic studies and therefore not directly affected by local perceptions of risk and/or historical allocations. The strategic nature of these studies can also help prioritise and signpost where more intensive SFRA need to be carried out, and what policies will apply. In some locations, RFRA have also been developed into high level 1 SFRA, which for some authorities have deemed sufficient for use in their LDDs. This means that a good RFRA may ultimately more effective than a localised SFRA in guiding growth to low risk areas.

In conclusion, an effective RSS should identify clear policies which will help limit the vulnerability of development in flood risk areas by establishing locational criteria to guide broad development allocations. The development of these criteria will help aid LPA implement the Sequential Test effectively and ultimately avoid inappropriate development within a LPA Local Development Core Strategy. The important relationships between a RSS and the SFRA produced for a Local Development Framework is discussed below.

2.4 SFRA and the Local Development Framework and Local Development Documents (LDF AND LDDs)

The production of an SFRA within a local authority's Local Development Framework (LDF) is the key mechanism for influencing planning policies and approaches to flood risk. The development of this document should provide the necessary information to ensure that site allocations are determined using the PPS25 Sequential Approach and that clear guidance on how flood risk issues should be addressed at sites allocated within flood risk areas. The key processes involved are shown in Plate 2.3.

Plate 2.3 Assessing flood risk in Local Development Documents (LDDs)



Notes

- 1 Guidance on undertaking a SFRA can be found in chapter 3.
- 2 Guidance on developing the scope of SA can be found in ODPM (2005) Sustainability Appraisal of Regional Spatial Strategies (RSS) and Local Development Documents (LDD). Guidance on suitable flood risk indicators can be found in Flood Risk Assessment Guidance for New Development FD2320, D2.1.
- 3 Flood Zone 1 for fluvial and tidal flooding and with a low risk of flooding from other sources.
- 4 Including an assessment of the potential effect of proposed development on surface water run-off.
- 5 Including consideration of the variability of flood risk within a Zone.
- 6 Including in broad terms, consideration of the variability of flood risk within a flood zone from existing SFRA's.

As shown in Plate 2.3, one of key roles of an SFRA is to provide baseline information regarding flood risk for inclusion in the Sustainability Appraisal (SA) of LDDs

produced for the scoping and evaluation stages. As a consequence, a SFRA should be produced at early stage of the LDF development process to ensure that flood risk issues are considered in the wider sustainability appraisal process. This important issue is considered later in this report.

PPS25 requires that LPAs prepare Strategic Flood Risk Assessments (SFRAs) to an appropriate level of detail to allow the PPS25 Sequential Test to be applied in the site allocation process. This is an essential part of the pre-production/evidence gathering stage of the plan preparation process.

A key component of this process is that a LPA should demonstrate through evidence that it has considered a range of options in conjunction with the flood risk information from the SFRA and applied the PPS25 Sequential Test, and where necessary the Exception Test, in the site allocation process. This can be undertaken directly or, ideally, as part of a sustainability appraisal. Where other sustainability criteria outweigh flood risk issues, the decision making process should be transparent with reasoned justifications for any decision to allocate land in areas at high risk in the SA report. The process should take account of any location criteria included in guidance prepared by the RPB.

The current PPS25 policy also stresses that the Sequential Test should be applied to site allocations for development at an early stage of the plan-making process. This includes within the development of LDDs, and Supplementary Planning Documents (i.e. site development briefs) and thereby minimise the need to apply it to individual planning applications.

PPS25 also states that where the Exception Test has been applied in allocations, Area Action Plans (AAPs) or criteria-based policies, the local planning authority should include policies in its LDDs to ensure that the developer's FRA satisfy point (iii) of the Exception Test rules. The Environment Agency and other appropriate operating authorities such as Internal Drainage Boards should be consulted on the drafting of any policy intended to apply the Exception Test at a local level.

As a footnote to this section, it should be noted that previous research (FRMRC, 2007) has also highlighted the importance of the planning system and notably the sustainability appraisal process to achieve effective regional and local flood risk management goals. These conclusions of this study have been considered in this report and are ultimately reflected in a number of the final recommendations provided in Section 10.

2.5 What should a Strategic Flood Risk Assessment contain?

As highlighted in Section 2.4, a Strategic Flood Risk Assessment is central to implementation of the PPS25 policy at a local level. It should therefore be designed to provide sufficient data and information on all types of flood risk and therefore enable a local authority to apply the Sequential Test when determining land use allocations and, where necessary, the Exception Test.

In addition, an effective SFRA should allow LPAs to:

- fully understand flood risk from all sources within its area and also the risks to and from surrounding areas in the same catchment;
- inform the Sustainability Appraisal so that flood risk is fully taken account of when considering options and in the preparation of LPA land use policies;
- prepare appropriate policies for the management of flood risk within LDDs;
- identify the level of detail required for site-specific FRAs in particular locations; and;
- determine the acceptability of flood risk in relation to emergency planning capability and resilience of the proposed community or installation.

As noted above, the SFRA should also be completed at an early stage of the LDF process to provide adequate information to inform the development of options for the allocation of land for development. For housing, this should be done through the development of a Strategic Housing Land Availability Assessment. However, the timing of PPS25 and the changes to the planning system have meant that most SFRA's have been conducted at a later stage of the process than is desirable.

Subsequent sections of this report will investigate the scope and timing of SFRA's which have been created to-date and considers the ability of the documents to provide adequate information to address these issues.

It is also important to note that a staged approach to the development of SFRA's should be adopted as outlined in PPS25 (annex E paragraph E6). This approach is specifically designed to enable all local authorities to undertake an initial broad level assessment of flood and development issues. This is commonly referred to as a Level 1 SFRA. In many situations, the production of a Level 1 SFRA will be sufficient for the application of the sequential test for areas which have limited flooding issues and/or where development pressures are low, or even from the Regional Flood Risk Assessment.

However where a Level 1 SFRA shows that land outside flood risk areas cannot accommodate the necessary development and the Exception Test needs to be applied, then the scope of the SFRA should be widened. This more detailed SFRA is referred to as a Level 2 SFRA. The features of Level 1 and Level 2 SFRA's are outlined in the remainder of this section.

Level 1 SFRA - Scope and Approach

The evidence collated in this study has shown that majority of all local authorities in England have undertaken, as a minimum, a Level 1 SFRA as part of the evidence base preparation for their Local Development Framework. Further details are presented in Section 3 of this report. The key aims of these studies are to provide a strategic overview of flood risks and provide sufficient information to enable current (or in many cases future) application of the PPS25 Sequential Test and if necessary the PPS25 Exception Test

The sources of information typically assessed in a Level 1 SFRA are:

- Environment Agency National Flood Zone maps of main river and tidal flood extents;
- Environment Agency preliminary maps of surface water flood risks;
- Outputs of the Regional Flood Risk Assessment including notably the high level assessment of sequential risks across the region
- CFMP and SMPs, and their underlying risk data
- Basic review of national Environment Agency studies such as National Flood Risk Assessment (NaFRA) and the National Flood and Coastal Defence Database (NFCDD);
- Information from Environment Agency area staff regarding the availability of detailed modelling and flood mapping studies; records of recent/historic flood events and evidence of critical drainage areas;
- Information from other flood risk consultees, including IDBs, water company/sewerage undertakers, highways authorities, local authorities (in their role as statutory drainage (operating) authority), navigation authorities, reservoir operators and informed local sources. Examples include records of sewer flooding from relevant water companies
- Datasets which can provide indications of groundwater and surface water flooding potential. Examples include geological, land use and soil maps, and
- Historical records of flood events from local newspapers, local resident groups (resilience forums) and community groups.

Due to the variety of information needed to be assessed, it is essential that the LPA (and/or appointed consultants) make contact at an early stage with key stakeholders, such as the Environment Agency, IDBs, sewerage undertakers and where relevant local resilience forum. This will help ensure that access to required datasets is secured and that the views of key stakeholders can be fully integrated into the development and subsequent application of the SFRA process. The importance of these issues is discussed later in Section 6.

Through analysis and interpretation of these information sources, a variety of outputs are typically produced within a Level 1 SFRA. Examples include:

- plans showing the local authority boundary, main rivers, ordinary watercourses and flood zones and in many cases previously allocated development sites (or sites to be considered in the future);
- a broad assessment of the implications of climate change for flood risk at allocated development sites over an appropriate time period, if this has not been factored into the plans above¹;
- definition and mapping of the functional floodplain in locations where this is required;
- areas at risk from other sources of flooding such as surface water and groundwater flooding
- flood risk management measures, including location and standard of infrastructure and the coverage of flood warning systems;

¹ Guidance on appropriate timescales over which to assess climate change impacts may be provided within the RFRA. For a Level 1 assessment, it is suggested that the minimum requirement would be a qualitative appraisal, by a flood risk management professional, of whether site allocations could potentially be affected by climate change impacts, as defined within Annex B of PPS25.

- locations where additional development may increase flood risk elsewhere through the impact on existing sources of flooding, or by the generation of increased surface water run-off (a Surface Water Management Plan may be needed);
- guidance on the preparation of FRAs for allocated development sites; and
- guidance on the likely applicability of sustainable drainage systems (SUDS) techniques for managing surface water run-off at key development sites.

It is also important that the outputs of a Level 1 SFRA are designed to enable the assessment of the suitability of individual development sites but also provide an adequate basis to assess environmental objectives relating to flooding, as required in the Sustainability Appraisal (see Plate 2.3). The Environment Agency as a statutory consultee for the preparation of LDDs will ultimately consider the quality of the SFRA to achieve these aims before providing final approval of the SFRA document.

Level 2 SFRA - Scope and Approach

The purpose of a Level 2 SFRA is to provide more detailed information for medium or high flood risk areas where there is likely to be development pressure and where there are no other suitable alternative areas for development after applying the Sequential Test.

It is expected that a Level 2 SFRA study should consider the detailed nature of the flood hazard, taking account of the presence of flood risk management measures such as flood defences. This assessment should provide additional information on the location, standard, condition and maintenance profile of existing flood defences.

The Level 2 SFRA should build on a Level 1 SFRA and produce more detailed outputs, including:

- modelling and mapping of flood probability, flood depth, flood velocity and rate of onset of flooding for key flood risk areas;
- evaluation and mapping of the “residual risks” for people living behind flood defences
- maps showing the distribution of flood risk across all flood zones from all sources of flooding taking climate change into account;
- an appraisal of the current condition of flood defences and of likely future flood management policy with regard to its maintenance and upgrade;
- an appraisal of the probability and consequences of overtopping or failure of flood risk management infrastructure, including an appropriate allowance for climate change;
- guidance on appropriate policies for sites which satisfy parts a) and b) of the Exception Test, and requirements to consider at the planning application stage to pass part c) of the Exception Test;
- guidance on the preparation of FRAs for sites of varying risk across the flood zones, including information about the use of SUDS techniques;
- identification of the location of critical drainage areas and identification of the need for Surface Water Management Plans; and

- recommendations to inform policy, development control and technical issues.

A key consideration of a Level 2 SFRA is the undertaking of detailed breach/ overtopping modelling to evaluate the “residual risks” posed to people living behind flood defences. Further information on these approaches is outlined in outputs of the Defra R&D project, FD2320 and FD2321 (Defra, 2005 and 2006). Examples of good practice in the creation and use of these outputs are provided in Section 6.

The creation of the Level 2 SFRA outputs should also be sufficiently detailed to enable application of the sequential approach to site allocations and if necessary ensure that development in such areas satisfies the requirements of the Exception Test.

In addition, the SFRA should aim to provide clear guidance on appropriate risk management measures for adoption on potential sites within Flood Zones 2 and 3, which are protected from flooding by existing defences. This should be designed to help limit the need for additional breach and overtopping modelling within future individual flood risk assessment

The success of existing Level 1 and Level 2 SFRAs to provide the necessary information to enable effective implementation of PPS25 is discussed later in Sections 6 - 8 of this report.

3. National summary of SFRA completions

The first task conducted within the project was to review the availability and currency of SFRA documents produced for the 353 local authorities across England. It should be noted that this high level review concentrates on the availability of SFRA documents produced for local development frameworks. This review was primarily undertaken by review of individual local authority websites and information gained from consultants who had developed SFRA studies. The key findings of this review are outlined below.

How many SFRA documents have been completed and are they PPS25 compliant?

- The review has shown that 302 (86%) of the local authorities in England had completed, as a minimum, a Level 1 SFRA by March 2009. Of this total, 257 (73%) of the SFRAs had been created since the introduction of PPS25 in late 2006, with the remaining 45 (13%) SFRAs produced for either PPG25 or the draft PPS25. As a consequence, these SFRAs are likely to need updating in the future. Many of the authorities with older PPG25 SFRAs are located in East Anglia (including Cambridgeshire and Lincolnshire).
- It also known that a further 46 (13%) councils are currently developing an SFRA, with many due for completion in Spring/Summer 2009. The completion of these studies will increase the number of SFRAs produced since the introduction of the PPS25 policy to around 300.
- It is understood that SFRAs for the remaining 4 (1%) council areas are likely to be progressed in the next financial year. This follows recent local authority boundary changes which have occurred in April 2009.

Who has produced the SFRAs?

- The review has also shown that a majority (88%) of the completed SFRAs have been produced by external consultants, with 12 major UK environmental/engineering companies undertaking a majority of the studies. The review has identified 40 SFRAs which have been produced by in-house planning/engineering teams. It is understood that a number of these authorities are considering an update of these documents following the outcome of the Pitt Review and the development of new unitary authorities (notably in Cornwall and Northumberland) in April 2009.

Are SFRA's available to help the management of flood risk within the Government's Growth Areas and Growth Points?

- A majority (34 of the 49) of the local authorities which cover the Government key **growth areas** (Ashford, M11 Corridor, South Midlands and Thames Gateway) have finalised or are progressing a PPS25 SFRA. This total comprises:
 - 23 authorities covered by PPS25 SFRA's - Ashford, Aylesbury Vale, Barking and Dagenham, Bedford, Bexley, Braintree, Broxbourne, Dartford, Daventry, East Hertfordshire, Enfield, Gravesham, Hackney, Haringey, Havering, Lewisham, Mid Bedfordshire, Milton Keynes, North Hertfordshire, Peterborough, South Bedfordshire, Uttlesford and Waltham Forest;
 - 5 authorities covered by a draft PPS25 SFRA completed in 2006 - Basildon, Castle Point, Rochford, Southend-on-Sea and Thurrock (South Essex SFRA);
 - 6 authorities currently developing a PPS25 SFRA. These authorities are: Epping Forest, Harlow, Luton, South Northamptonshire, Stevenage and Swale.
- The remaining 15 authorities have an older PPG25 SFRA (Corby, East Cambridgeshire, East Northamptonshire, Fenland, Greenwich, Huntingdonshire, Kettering, Medway, Newham, Northampton, Redbridge, South Cambridgeshire, Tower Hamlets and Wellingborough). The evidence collected in this study has indicated that many of these studies will be updated to meet the requirements of PPS25 and thereby provide adequate information to make effective future development decisions.
- At the time of writing this report, 88 (83%) of the 106 local authorities covering the Government's Round 1 and 2 **growth points**² have produced a PPS25 SFRA.
- A further 13 (13%) of these 106 authorities are currently developing a PPS25 SFRA. These authorities are: Basingstoke and Deane, Birmingham, Derby, Kerrier, Malvern Hills, Newark and Sherwood, North Kesteven, North Somerset, South Kesteven, West Lindsey, Wirral, Worcester and Wychavon.
- Three of the remaining growth points (Carrick, Craven and Eastleigh) are covered by older PPG25 SFRA's, while the status of SFRA's for the two remaining growth points (Blyth Valley and Wansbeck) will be reassessed after the creation of the new Northumberland Unitary Authority in April 2009.

² Further information available at <http://www.communities.gov.uk/housing/housingsupply/newgrowthpoints>

4 Initial review of SFRA quality and influence

4.1 Designing the SFRA web questionnaire

To provide additional information regarding the status and influence of SFRAs, an internet based questionnaire was developed and implemented in Stage One of this study. This survey was designed specifically for completion by local authority planners responsible for developing and/or using SFRA documents. The introduction page of the survey hosted at www.sfraqs.jbaweb.co.uk is shown below in Plate 4.1.

Plate 4.1 Defra SFRA Review – Internet survey of local authorities

The screenshot shows a web browser window with the following content:

- Page Title:** DEFRA - Strategic Flood Risk Assessment in Planning Questionnaire.
- Address Bar:** http://www.sfraqs.jbaweb.co.uk/
- Page Header:** SFRA Questionnaire
- Logos:** defra (Department for Environment Food and Rural Affairs), Environment Agency, Communities and Local Government, Entec, jba CONSULTING.
- Main Content:**
 - QUESTIONNAIRE INFORMATION:** Questionnaire and website development by Entec UK and JBA Consulting
 - ASSESSING THE QUALITY AND INFLUENCE OF STRATEGIC FLOOD RISK ASSESSMENTS IN THE PLANNING PROCESS**
 - Site Guide:**
 - Introduction** - background to the questionnaire.
 - Registration** - use this page to register to complete the questionnaire online.
 - Online Questionnaire** - begin or resume the online Questionnaire.
 - Questions Preview** - view the list of potential questions before you begin the Questionnaire.
 - If you are already registered, you may **login** using the form to the right of this page.
 - Contact:**
 - Address for email correspondence is: thurn@entecuk.co.uk
 - The address for postal correspondence is:
 - Neil Thurston
 - Principal Consultant
 - Entec UK
 - Canon Court North
 - Abbey Lawn Business Park
 - Abbey Foregate
 - Shrewsbury
 - Shropshire
 - SY2 5DE
 - Note:** The questionnaire is in three sections. Section A is to be completed by all respondents. Please follow the instructions within the questionnaire to determine whether you need to complete Section B or Section C.
- Right Side Panel:**
 - A user name must be setup before completing the online questionnaire. **To register, please click here.**
 - Please note: registration is only for the purpose of saving and retrieving your responses should you be unable to complete the questionnaire in one session.
 - If you have already registered, please enter your username and password to **continue**
 - User Name:
 - Password:
 -
 - Questionnaire and website development by JBA Consulting.

The key aim of the questionnaire was to facilitate an improved understanding of the coverage of SFRAs within England, their scope, methods of consultation and integration with complementary plans and strategies. The questionnaire was designed to identify relatively standard information (i.e. date of completion of the SFRA, cost of the SFRA etc) but also to enable local authority planners to provide more detailed information regarding the development and use of their SFRA document. The questionnaire was also intended to help identify the extent to which local planning authorities reflect the findings of the SFRA within their Sustainability Appraisals (SA) of Development Plan Documents, (DPDs). Selected questions from the survey are outlined below:

- Was the SFRA developed "in-house" or through consultants?
- Was your SFRA document written to conform to PPG25, draft PPS25 and PPS25, and PPS25 plus practice guide?
- Did the EA take an active involvement in the process by providing data and advice?
- Did the SFRA use existing flood risk information or did it generate new data?
- Was a detailed flood risk model developed as part of the SFRA?
- Was flooding from all sources taken into account, particularly surface water and ground water flooding?
- Was the SFRA subject to consultation?
- Has supplementary policy guidance or documents (SPD/SPG) been prepared to implement the recommendations of the SFRA?
- Does your Sustainability Appraisal (if published) make reference to the SFRA in its consideration of options?
- Has the SFRA been used to shape flood risk criteria based policies in Local Development Documents and allocate land for development?
- Has the final SFRA document been used to inform PPS25 sequential testing of development sites?
- Has the final SFRA document been used to inform PPS25 exception testing of development sites?
- Are developers using the SFRA to influence the scale and nature of their site specific FRAs?
- Has the SFRA changed the previously identified land allocations across the area significantly?
- Do you believe your existing SFRA provides sufficient information on current and future flood risks to enable effective decisions on sustainable development having regard to identified climate change impacts?
- Did you involve other functions within the council, namely emergency planning and drainage engineers in the preparation of the SFRA?
- Is it your intention to regularly update the SFRA?
- Has the SFRA led to a better working relationship with the Environment Agency?

A full list of the survey questions is provided in Appendix B.

4.2 Conducting the web consultation survey

At the commencement of the survey, an introduction letter and accompanying email was sent to the head of each of local authority planning department in England. Both of these communications highlighted the objectives of the study and outlined the anticipated time (30-45 minutes) required to complete the online survey.

Through these approaches, 79 responses were received in the first three weeks of the project and were logged automatically in a database system. These approaches were followed up by a follow-up phone call to each of the planning/development control team who had not responded to the initial survey

request. This process was time consuming but was actively pursued to produce a final total of **164 responses** to the survey (see list of respondent local authorities is provided in Appendix C). This information forms the basis of the analysis presented in Section 4.3 and the selection of SFRA studies for detailed assessment in Stage Two of the project.

4.3 Analysis of web consultation responses

The key issues identified from analysing these responses are summarised below:

- **A majority of the respondents stated that they were currently in the process of developing their Local Development Framework core strategies and sustainability appraisals.** Only a small number of respondents stated that they had completed their LDD Core Strategy (12 councils) or sustainability appraisals (25 councils).
- **A majority of the SFRAs undertaken were commissioned by individual (85 respondents – 52%) councils or small groups (one to four) of councils (37 respondents – 23%).** The remaining councils delivered their SFRAs as part of larger consortiums. The largest of these being the East London SFRA which covered eleven London authorities.
- **The SFRAs for 130 of the 164 survey respondents were developed by external consultants.** A smaller number of studies were created by a combined consultant / in-house team (14 studies) or an in-house (13 studies) team. The remaining seven respondents did not provide an answer for this question.
- **A majority of the respondents stated that their SFRA had either been completed or substantially updated in 2007 or 2008 (136 studies in total – 83%).** Only 12 councils who responded stated that their SFRA had been created prior to PPS25. These councils were: Gateshead Council; Hambleton DC; Kirklees Metropolitan council; Leicester City Council; London Borough of Bexley; Salford City Council; Scarborough Borough Council; Sedgefield Borough Council; Sheffield City Council; South Tyneside Council; Spelthorne Borough Council and Wakefield MDC.
- **The survey highlighted that cost (ranging from £5,000 - £40,000 per council) and timescales for the completion of an SFRA were extremely variable.** This variability related primarily to the number of local authorities involved in the SFRA; the geographical size of the area covered; the complexity of flood mechanisms involved; and the amount of additional flood risk modelling required to assess detailed levels of risks. This last point is particularly important for Level 2 SFRA studies. Most SFRAs are competitively tendered through council select lists or taken from consultants on EA frameworks. Subsequent issue of the practice guide together with assistance from the Environment Agency has helped to improve quality and standardise costs.

- **Around 60% of the councils surveyed stated that no new data had been created during the development of the SFRA.** This reflects the dominant use of existing Environment Agency fluvial/tidal model results in Level 1 SFRA. Around 40% of the studies had developed new data/model results. This was typically breach/overtopping modelling and/or creation of residual risk / risk to life maps within Level 2 SFRA studies.
- **144 of the councils surveyed (92%) stated that the Environment Agency had actively assisted the development of the SFRA.** This was mainly through the provision of fluvial/coastal flood risk models and/or technical advice during the project. Supplementary comments by a range of councils indicated the importance of the Environment Agency's support in the development of the SFRA.
- **133 (81%) of the respondents believed that their SFRA had considered the risks of flooding from all sources (including fluvial, coastal, surface water and groundwater).** Although the planners interviewed have this positive view, our review of individual SFRA has shown that the consideration of other flooding sources was more limited and far from consistent. This was also the view of the EA. This issue is considered later in the report.
- **A majority of the survey respondents indicated that other functions (notably drainage and emergency planners) had been involved in the development of the SFRA.** However the comments recorded in the survey indicated that the level of involvement and consultation was variable.
- **140 (89%) of the councils surveyed said they intended to regularly update the SFRA.** However few respondents provided specific details on how or when updates would be undertaken.
- **122 (74%) of the survey respondents stated that the completed SFRA provided sufficient information to enable the effective assessment of planning and development control in their areas.** However, 35 councils said they were less confident in the outcomes of their SFRA.
- **A majority (80%) of the respondents said that the development of the SFRA had improved working relationships with the Environment Agency.** This important observation was supported by a range of comments provided by survey respondents.
- **61% of the respondents surveyed had used their SFRA to inform PPS25 sequential testing.** However, further analysis of the responses to this question revealed that many of the councils had undertaken a broad preliminary sequential assessment of allocations, only a few had undertaken detailed sequential and exception testing for the purposes of PPS25. This was mainly due to current status/progress on the development of their core strategy.

- **Only 12 (8%) of the respondents stated that the SFRA had led to final alterations in previously defined land allocations.** These authorities were: Bradford Council; Charnwood Borough Council; Coventry City Council; Eastbourne Borough Council; King's Lynn and West Norfolk Borough Council; London Borough of Bexley; Nottingham City Council; Spelthorne Borough Council; Stafford Borough Council; Suffolk Coastal District Council; Watford Borough Council and City of York Council.

A majority of the other authorities stated that it was too early to confirm the influence of the SFRA land allocations within their Local Development Framework. This was principally due to the relatively recent completion of many SFRA studies.

- **Only 7 (4%) of the respondents said that supplementary planning documents guidance (SPD) had been created following publication of the SFRA.** These authorities were: Castle Point Borough Council; Copeland Borough Council; Hull City Council; Newcastle City Council; Newcastle-under-Lyme Borough Council; Royal Borough of Kensington and Chelsea and Southwark Council. The main reason provided was that sufficient guidance was provided in the existing PPS25 policy and accompanying practice guide. A few authorities stated that some form of additional planning guidance would be produced in the future but this would probably be included in broader Sustainable Design and Construction SPDs and/or development control policies in DPDs.

Many of these issues are discussed in detail in of the remainder of this report.

5 Detailed review of SFRA quality and influence

The second phase of the project has concentrated on assessing the overall quality of SFRAs (in terms of data used, flood issues addressed and outputs produced) and its influence upon the determination of land allocations and effective application for PPS25 sequential and exception testing. This phase of work has also considered the benefits which documents have achieved or are achieving; identified examples of good practice and identified areas for improvement.

5.1 Developing the detailed review questions

To assess the issues mentioned above, a number of detailed review questions were developed by the project team in consultation with the project board. These questions were grouped into the three primary categories of: (a) Creating an effective SFRA; (b) Practical use of a SFRA for spatial planning and development control purposes; and (c) Assessing the long-term contribution of SFRAs to flood risk management. The final consultation questions are provided in Appendix D.

5.2 Selecting the SFRAs to be reviewed

Analysis of the web survey results highlighted a total of 71 respondents who were willing to assist the more detailed review of SFRAs conducted in the project. This initial shortlist was subsequently reduced to 35 SFRAs using a number of secondary criteria. These were:

- Studies covering different flooding sources– fluvial, tidal, surface water and/or groundwater
- Studies covering different geographical settings - Urban versus rural settings
- Studies produced by different consultants
- A number of studies within each of the Environment Agency regions

The final list of studies investigated in Stage 2 of the study is shown in Table 5.1.

For each of these SFRA studies, the project team undertook a review of the technical SFRA documents produced and conducted phone interviews with a planner at each of the local authorities. The key outcomes of the technical review and phone interviews were logged using an Excel template which is reproduced in Appendix D.

The project team also conducted eight interviews with Environment Agency officers responsible for input and review of SFRA studies. The officers interviewed were based in the following Environment Agency area offices: Anglian Eastern (Ipswich); Midlands Lower Trent (Nottingham); North East - Dales (York) North East - Ridings (Leeds); North West - Central (Preston); Southern - Sussex (Worthing); Thames - South East (Camberly) and Thames - North East (Hatfield).

The information collated in the technical review of the SFRA document and the related interviews were assessed globally to identify: (a) innovative features of existing SFRA studies; (b) illustrations of their active use within spatial planning and development control processes and (c) gauge their overall influence in the local development framework planning process.

These outcomes of this work is summarised in Sections 6, 7 and 8 of this report.

Table 5.1 Stage Two - SFRA studies reviewed

SFRA	Consultancy	Completed	Number of LAs	Lowland	Upland	Fluvial	Coastal	Urban	Rural	PPG	Draft	PPS	Level 2
Adur	Capita Symonds	Sep-07	2						*			*	*
Arun	Capita Symonds	Mar-07	1	*			*		*			*	*
Brent(Islington)	Jacobs	Dec-07	6		*	*		*				*	*
Bury MBC (Sub-regional)	Scott Wilson	2008	10		*	*		*				*	*
Calderdale, Wakefield and Kirklees	JBA	May-08	3		*	*		*				*	*
Charnwood	Entec	2008	1		*	*		*				*	
Chiltern	Jacobs	Jun-08	1	*		*			*			*	*
Dacorum	Halcrow	Aug-07	4		*	*		*				*	*
Darlington	JBA	Feb-07	5		*		*	*			*		
Eastbourne	Scott Wilson	Mar-08	2	*		*	*		*			*	
Havering Council	JBA/Entec	Nov-07	1	*		*		*				*	*
Herefordshire	Brian Faulkner - Waterconsultant												
Horsham	Scott Wilson	Jun-07	1		*	*			*		*		
Ipswich Borough Council	Internal	2008	1	*			*	*				*	
Isle of Wight	Entec	Mar-08	1		*		*					*	
Kingston upon Hull	Halcrow	Nov-07	1	*			*	*				*	
Lancaster	Jacobs	Sep-07	1		*	*		*				*	*
Leeds	Internal	Oct-07	1		*	*		*				*	
London Borough of Hillingdon	Scott Wilson		1	*		*		*				*	
Mid Bedfordshire	WSP	Sep-07	1		*	*		*				*	*
Mid Essex	Scott Wilson	Oct-07	4		*	*		*				*	*
North & North East Lincs	Rye	2006	2	*			*		*	*			
North Cornwall DC	Internal	Jun-07	1			*	*		*			*	
Nottingham	Black & Veatch	2008	5		*	*		*				*	
Preston	Scott Wilson	Dec-07	3	*		*		*				*	
Reigate, Banstead & Crawley	Jacobs	Dec-07	3		*	*		*				*	
Richmond	JBA/Entec	2008	2										
Sheffield	Jacobs	2007	1		*	*		*				*	
South Essex	Scott Wilson	Nov-06	5	*		*			*		*		
Stafford	Halcrow	Jan-08	4		*		*		*			*	
Suffolk Coastal and Waveney	Scott Wilson	Feb-08	2	*		*			*			*	
Tewkesbury/ Gloucester City/ Gloucester County/ Stroud/ Cotswolds/ Cheltenham and Forest of Dean	Halcrow	Ongoing	7	*		*		*	*		*	*	
Wandsworth Borough Council	Scott Wilson	2008	4			*		*			*		*
Wyre Forest	Royal Haskoning	Jan-08	1		*	*			*			*	
York	Internal	Sep-07	1	*		*		*				*	*

6. Assessing the quality of SFRA documents

Using the questions outlined in Section 5, the project team reviewed the technical content of each of the selected SFRA reports (see Table 5.1). The desk based review has been supplemented by detailed interviews with planning practitioners working in local authorities and the Environment Agency. The information gleaned from the desk based reviews and interview responses generally confirm the dynamic nature of SFRA learning amongst practitioners. It also shows a general and progressive improvement in the quality of SFRA documents over recent years and particularly following the publication of PPS25 and the Practice Guide.

Information gathered has been summarised under logical headings below, and examples of good practice highlighted which should be adopted in future updates/production of SFRA studies. In addition, information on how practitioners can improve their SFRA is provided and areas where further work is necessary have been identified. Key study findings have been carried forward into Section 9 of this report and specific recommendations are included in Section 10.

Many of the key findings and recommendations identified for SFRA also have direct relevance to related studies such as Surface Water Management Plans (SWMPs) and Water Cycle Strategies.

6.1 Effective use of available datasets

All of the SFRA reviewed have used the Environment Agency fluvial/tidal flood risk models and maps as the primary data source for their SFRA maps. This should always be the starting point of any sequential examination of the flood risks. In a majority of cases, this base information was supplemented with more detailed numerical modelling, data and information provided by the Environment Agency in respect of local and specific flood defence strategies, schemes and projects. In some cases, as with the Adur and Worthing SFRA, the Agency's Catchment Flood Management Plans (CFMPs) modelling outputs were also used to assess relative flood risks.

In the North East, fluvial depth grids from the CFMPs have been used to infill the flood zone map with flood risk data. This is a rich dataset that provides depth grids for a range of defence standards and a range of flood events. It can also deliver climate change impacts as an extent and also as a vertical sensitivity. The data sets also provide a means of looking at the modification of flood risk provided for by defences, and through a multi layered presentation of flood risk data can support the planners through the sequential and exception tests. This data set has demonstrated the power of good consistent flood data which can be easily mapped and understood.

For some of the SFRA reviewed, additional sensitivity checks were conducted to ensure that the Environment Agency flood map was actually representative of localised flooding conditions. These sensitivity checks have principally focused on sensitivities of topography definition within urban areas.

The importance of topographic changes was also highlighted through the work undertaken to develop the Ipswich SFRA. In this study, detailed LiDAR ground level data provided by the Environment Agency was used in the preparation of the flood zone outputs. However, during the course of the development of the SFRA study, subsequent land raising occurred across three active development areas. These changes required subsequent manual adjustment of the final flood risk maps to account for these differences. This example highlights the need for regular reviews of potential terrain changes and the potential impact that these changes may have upon flood risk and flood storage capacity.

The review also highlighted a number of SFRA which were affected by subsequent changes in the Environment Agency's flood zone map after finalisation of the SFRA document. This issue was identified in the review of the Leeds SFRA. In this study, changes in the Environment Agency Flood Zone map meant that the boundaries shown on the SFRA were no longer consistent and could lead to additional work in agreeing the future suitability of particular development sites.

This example highlights the need for effective systems to be in place to ensure that updates of the Environment Agency flood zone map are communicated effectively to and within local authorities. Practitioners should regularly check with the Environment Agency and obtain the latest flood zone map updates. The issue of data sharing is discussed later in Section 8.

However, it must be accepted that all SFRA produced are only a snapshot of flood risk, which will always be developed further as more detail becomes available. The SFRA should therefore be considered as independent of the Flood Zone Map, and all subsequent maps should provide more detail or graduation of the risk data for use in subsequent stages of the Sequential Test.

Most SFRA make reference to modelling accuracy, uncertainties and varying degrees of confidence in the data being used. As an example, the Greater Manchester SFRA included a register for all data received. This included an assessment of the relevance and accuracy of each dataset in order to derive a final confidence level for its contribution to the SFRA. This process was also undertaken for the Horsham SFRA. This form of assessment is largely subjective and based on both planning and flood risk experience. Confidence ranking in High, Medium and Low was carried out and produced in tabular form along with maps showing flood zones coloured to show data confidence.

A further example of good practice was the Central Lancashire SFRA which highlighted the importance of registering and assessing the accuracy and relevance of the data sources used (see Plate 6.1). This was particularly important given the variety of data sources used in the production of the flood risk maps and the need to assess confidence levels for the final SFRA outputs.

Plate 6.1 Central Lancashire SFRA – Assessment of data accuracy and relevance

		RELEVANCE		
		1 - VERY RELEVANT	2 - PARTLY RELEVANT	3 - NOT RELEVANT
ACCURACY	1 - EXCELLENT	VERY GOOD	GOOD	GOOD
	2 - GOOD	GOOD	GOOD	FAIR
	3 - FAIR	GOOD	FAIR	FAIR
	4 - POOR	FAIR	FAIR	POOR
	5 - VERY POOR	FAIR	POOR	VERY POOR

Information regarding the relative confidence and source of the data accompanies the electronic versions of the data. In developing SFRA, practitioners should undertake a proportionate assessment of data accuracy, relevance and confidence.

The interviews conducted in this study have shown that few SFRA data and maps have been routinely uploaded to benefit the Environment Agency National flood risk management data holdings, principally due to concerns of data quality and fitness for purpose. Whereas, instances of SFRA data being loaded onto local area management systems were identified and this issue of “collect once and use many times” should be looked at further and widely adopted by practitioners wherever possible.

The majority of the SFRA reviewed have concentrated on providing detailed information (text and maps) covering fluvial and tidal flood risks. This relates to the focus of many authorities upon these risks (especially in coastal locations), and the availability and use of the Environment Agency fluvial and coastal flood risk maps. An improved process is required for acquiring Environment Agency flood risk map data (including new surface water risk layers), and using this information to assist practitioners to update their future SFRA documents.

All of the SFRA reviewed highlighted that other stakeholders had been approached to share data, models and information. These have been principally the Environment Agency and water companies however; some SFRA production teams had also approached the Highways Agency, British Waterways and internal drainage boards. A significant issue found with the vast majority of SFRA was the lack of appropriately detailed data and information from water companies. Detailed sewer capacity and flooding records, other than those contained on the DG5 Public Register were rarely provided, and this is an area requiring increased focus from all SFRA practitioners.

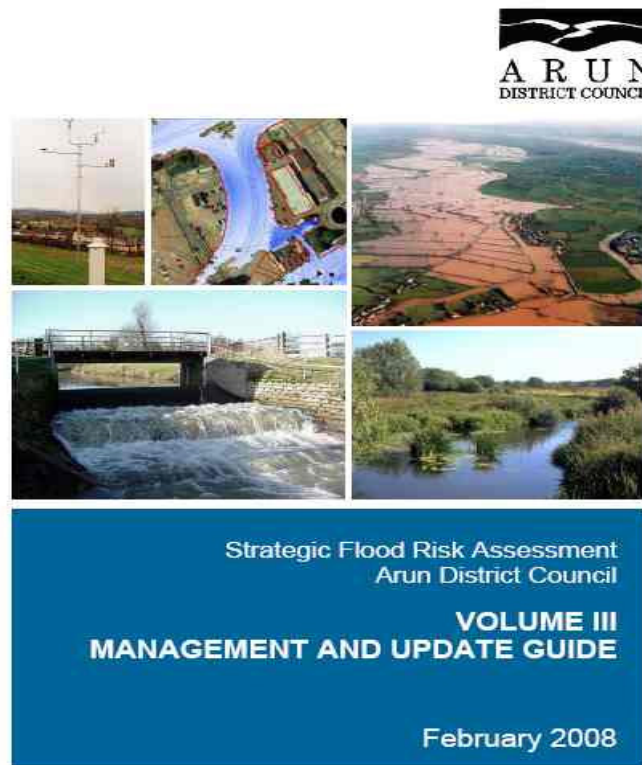
The interviews conducted with Local Authority and Environment Agency practitioners also highlighted a number of SFRA studies which had been more difficult to deliver due to the lack of communication and interaction between individual local authority departments. These observations highlight the need for greater communication of the benefits of SFRA studies across a wide range of local authority departments.

Most of the SFRA reviewed have created a digital data register which is referenced in the technical SFRA document. A good example of this process is the data register produced for the York SFRA, where all sources of information are reviewed and presented using main river catchments for ease of identification and use³.

Good examples of the use and communication of data registers are the Arun SFRA and Adur & Worthing SFRA studies. In these studies, a detailed register of data was produced and a specific volume of the SFRA written to cover data management systems and protocols (see Plate 6.2). The key aim of this volume was to improve the management of existing and new data sets and aid the future updates of the SFRA.

Other studies, such as the Charnwood SFRA recommended that a single officer was identified within the council to be responsible for managing information about flood risk and to improve communication between departments. However, the structured communication of information and data was a weakness of some SFRA studies and should be given greater focus in future SFRA, Water Cycle Studies Water Cycle Strategies and Surface Water Management Plans.

Plate 6.2 Arun SFRA - Management and Update Guide



3 York SFRA Appendix 1 – Sources of Information

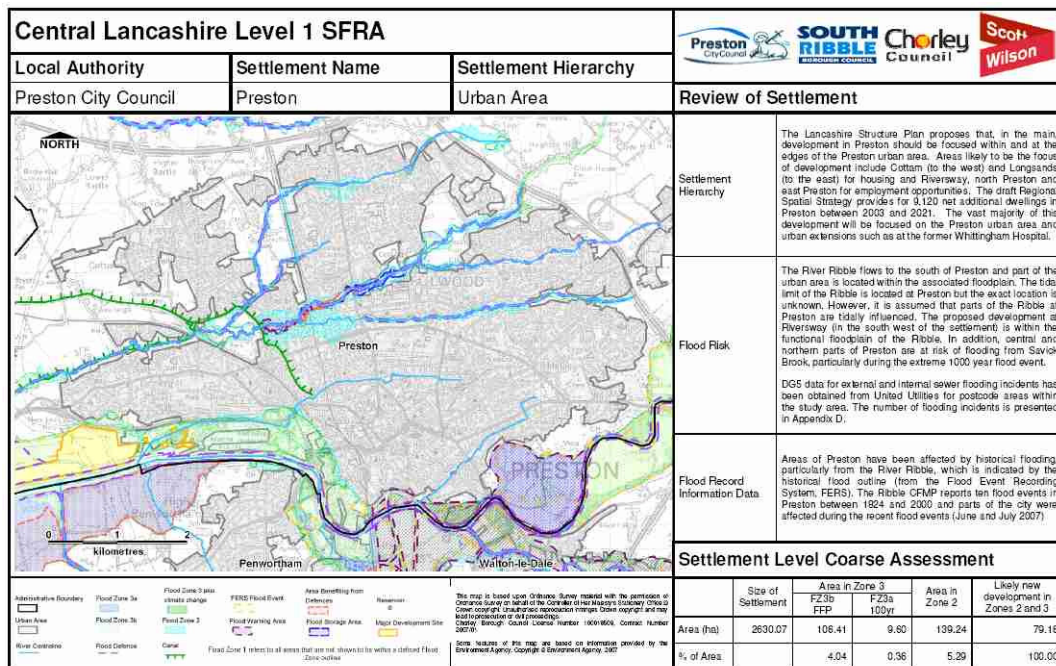
6.2 Summary of flood risks and mechanisms

Each of the SFRA's reviewed included a general description of the flooding mechanisms and risks within the text of the technical report, with some SFRA's providing broad scale maps showing the key risks within the areas assessed. In most of the studies assessed, the emphasis of the reporting was on fluvial flood risk, and where applicable, tidal flooding, with typically less focus on surface water, pluvial, groundwater and sewer flooding issues. This typically reflected the lack of data and information for these flooding mechanisms.

In addition to a general commentary of flood risks, SFRA's have used different techniques to present flood risk information and the vulnerability of settlements, development areas and individual sites. Examples of good practice for reference and use by practitioners are presented in the remainder of this section.

The Central Lancashire SFRA provides an overview of flood risk throughout the study area through the provision of overview maps and incorporates a settlement level assessment relating to urban areas, potential major development sites and rural settlements⁴. An example of the report produced for this SFRA is shown in Plate 6.3.

Plate 6.3 Central Lancashire Level 1 SFRA – Settlement level risk assessment



An alternative presentation format produced for the PUSH (Partnership for South Hampshire) SFRA⁵ is shown below in Plate 6.4.

⁴ Central Lancashire SFRA - Settlement Level Coarse Assessment Map B3 & Table B1 Settlements Flooding Summary

⁵ Partnership for South Hampshire (PUSH) - <http://push.atkinsgeospatial.com>


Plate 6.4 Partnership for South Hampshire (PUSH) SFRA – Regional assessment of risk

PUSH Strategic Flood Risk Assessment

PUSH Sub-Region Climate Change (2115) Stage 2 Statistics

Summary of Impact on Statistics
 Sea level rise could result in expansion of Flood Zones 2 and 3 into the existing urban area, reducing the existing urban area classified as Flood Zone 1 by 2.7%. Assuming a uniform distribution of dwellings within the existing developed area, the change in Flood Zone areas would result in an increase in the total number of existing dwellings in Flood Zones 2 and 3 by 18%. Assuming no control on future development and the same uniform distribution of the proposed housing within the existing urban area, the total number of additional dwellings that could be located within Flood Zones 2 and 3 could increase by 19%. Expansion of the flood zones due to sea level rise would reduce the 'Greenfield Land in Flood Zone 1 (Outside Areas of Environmental Designation)' as a percentage of the PUSH sub-region by only 0.1%, due to the lack of Greenfield Land in the areas affected by sea level rise. The PUSH allocation to greenfield would take up 3.3% of this reduced Greenfield Land in Flood Zone 1. The area required for re-allocation of PUSH urban dwellings from Flood Zone 3 would take up 1% of the reduced Greenfield Land in Flood Zone 1. The area required for relocation of existing urban dwellings in Flood Zone 3 would take up 8.1% of the reduced Greenfield Land in Flood Zone 1.

Impact on Key Conclusions
 The impact of climate change to 2115 does not alter the following key conclusions of the baseline analysis:
 • The PUSH housing target of 80,000 dwellings is feasible, in terms of flood risk.
 • Consideration should be given to revising the PUSH Housing Distribution to allow provision for additional dwellings in the Greenfield Estimate, with an associated reduction in the Urban Capacity Estimate.
 • Flood risk will continue to be a significant issue in the region, with the number of existing dwellings in Flood Zones 2 and 3 increasing by 2115.
 • Where existing flood management/mitigation measures currently protecting development in Flood Zones 2 and 3 are unsustainable, the large amount of Greenfield Land in Flood Zone 1 should provide opportunities to manage strategic relocation of this development, subject to other planning constraints and considerations.



Reference - 504525R/71.DG/044_PUSH
June 2007

Notes
 This analysis is based on sea level rise predictions and increased river flow due to climate change to 2115.
 It should be noted that in the absence of a suitable dataset, in order to account for the effects of increased river flow in non-tidal areas, Flood Zone 2 (1 in 100 year fluvial flood extent) in 2115 has been represented using the present day Flood Zone 2 (1 in 1000 year fluvial flood extent). There is no equivalent for fluvial Flood Zone 2 in 2115.
 This further work has been informed by the guidance on recommended allowances for climate change published by Defra in October 2006 and summarised in Annex 6 of PPS25.

1 Effect of Climate Change Outlines on Analysis of PUSH Urban Capacity Estimate

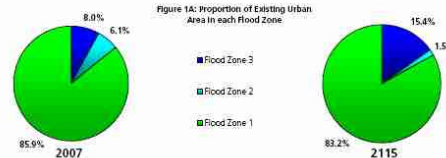


Table 1A: Distribution of Existing and Future Urban Dwellings within Flood Zones prior to application of the Sequential Test for both 2007 and 2115 conditions

	2007	2115	% Change
Flood Zone 1			
Existing dwellings at 2007	367,165	356,275	-3%
Future Additional by 2026	46,500	45,034	-3%
Flood Zone 2			
Existing dwellings at 2007	25,165	5,679	-77%
Future Additional by 2026	3,319	787	-76%
Flood Zone 3			
Existing dwellings at 2007	33,919	64,294	90%
Future Additional by 2026	4,333	8,329	92%

2 Effect of Climate Change Outlines on Greenfield Land in Flood Zone 1

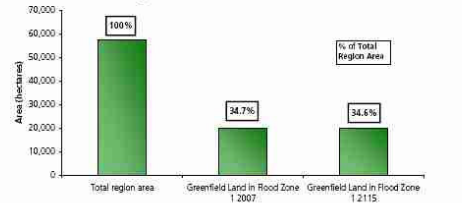



Table 2A: Greenfield Land in Flood Zone 1 and Requirements

	2007		2115	
	Area (ha)	% of Greenfield Land in FZ 1	Area (ha)	% of Greenfield Land in FZ 1
Greenfield Land in Flood Zone 1 (Outside Areas of Environmental Designation)	10,986	-	10,883	-
Greenfield Allocation	646	3.2%	No change	3.3%
Area required for re-allocation of PUSH urban dwellings from Flood Zone 3	108	0.5%	208	1.0%
Area required for relocation of existing urban dwellings in Flood Zone 3	848	4.2%	1,607	8.1%

Flood risk is difficult to describe in specific terms that are meaningful when considering whether a development will be safe and the residual risks can be agreed as being acceptable. Flood extent or even flood depth do not adequately describe whether all the various facets of flood risk can be managed. Other factors, particular to the area being considered need to be assessed, such as whether the evacuation or containment of the proposed population will be practicable when set in the context of the existing emergency plan. Risk to people indicators need to extend beyond combinations of velocity and depth. The Wakefield SFRA incorporates flood risk consideration of the Central Wakefield Area Action Plan Special Policy Areas and recommends acceptability or otherwise of proposed land uses. These flood risk indicators were designed to assist the Sequential and Exception Tests⁶. Flood risk balance sheets should be developed by practitioners in future SFRA and an example of the format used in the Wakefield SFRA is shown below in Plate 6.5.

⁶ Wakefield SFRA – Figure 1.1 and Table 5.1

Plate 6.5 Wakefield SFRA – Use of flood risk indicators for selected sites

		Flood risk indicators adopted as measure of Acceptability within Exception Test <i>(-ve indicates flood risk will be required to be managed or maybe considered unacceptable when viewed with all the other flood risk indicators)</i>									
		A	B	C	D	E	F	G	Recommendation (Summary response to FRI's/ in SFRA)		
		Development is within existing flood risk area	Residual risk measures are easily applied and within a norm	Egress and access. Impact on emergency planning provision and whether development would be safe	Change in the number of people at risk as result of development	Change in number of properties at risk in 1% and 0.1% event before and after. Assumes mitigation measures put in place	Scale and nature of flood risks.	Impact of mitigation measure on other areas d/s and adjacent	Counter to strategic approach, flood risk unacceptable, Exception Test would be difficult to pass. Not recommended. Sequentially not preferred, but limited land uses maybe possible Sequentially not preferred but a range of land uses could be put forward after careful consideration and FRA Acceptable with some detailed consideration of flood risk issues Acceptable subject to FRA		
Policy area	Proposed land use	CW 25 (i)	Residential	-	-	--	--	-	-	=	
		The Waterfront Core Area	Commercial	-	-	--	-	+	-	+	
CW 25 (ii)	South of Wakefield Lock	Residential	-	-	-	-	+	+ / -	+		
		Commercial	-	+ / -	+	=	+	+	+		
CW 25 (iii)	Evans Halshaw Site / Fall Ings	Residential	--	--	--	--	-	--	=		

Indicator						
A	B	C	D	E	F	G
+= no risk - = risk area within resilient communities -- = vulnerable community, which would struggle to recover – reverse upward trend	++= None required += Measures could reduce risk to existing development - = standard, no major alteration to layout and form -- = flood resistance is dominant in design	+ = no special provisions, safe - = needs to be managed, should be safe, must be proven in FRA -- = special provision, natural response will not be obvious. Safety not guaranteed, and may not convince LPA/EA	+= reduction - = increase	+ = reduction (preferable outcome in PPS25) - = increase	++ = Benign, and understood -- = difficult to warn, unpredictable, may result in operational failure of defences from multiple sources	+= reduction = neutral impact - = inc in flood risk elsewhere (Exception test requires no impact)

The London Boroughs of Wandsworth, Merton, Sutton and Croydon SFRA also provides helpful specific site reference tables incorporating flood zone, flood depth and flood hazard maps for each individual site under consideration; along with a description of the proposed use and flood risk issues to be aware of and addressed at later stages of the planning and flood risk assessment process⁷.

⁷ Wandsworth, Merton, Sutton and Croydon SFRA – see Table A4, Appen A Sutton SFRA

6.3 Stakeholder engagement and involvement

Stakeholder engagement information provided below is in the context of the quality of SFRA documents reviewed, and not in respect of the influence of SFRA on LDFs, spatial planning and development control.

When developing SFRA, practitioners should clarify the key aims and objectives for stakeholder engagement early on in the process and these should relate specifically to the SFRA production and not spatial planning outcomes or local flood risk management issues etc. Once these have been determined, they will help to focus efforts on engaging with appropriate partner organisations and/or community groups. The SFRA provides technical evidence on flood risk to inform the local authority Core Strategy and support the LDF process, and it should be communicated as an important part of the broad evidence base provided for land use planning purposes. Care should be taken not to confuse the reasons for engagement during the development of the SFRA and falsely raise the expectations of stakeholders; allowing them to believe they are contributing to the consideration of spatial planning outcomes and/or development options at this stage, and as part of the flood risk assessment. The opportunity for engagement on these planning and flood management issues will generally be provided by the Local Authority following the completion of the SFRA and as part of the Issues and Options Stages of the Core Strategy development. This is discussed later in Section 7.

The focus of early engagement for the development of SFRA documents should be primarily with those organisations and/or communities that can add value to the evidence base. This helps to improve the quality of data collected (e.g. modelling/theoretical, physical, past flood event, essential infrastructure, emergency and resilience etc.), on which the strategic assessment of flood risk is based. Stakeholder engagement in the later stages of development of the SFRA document will help to “ground truth” draft flood risk assessment outputs and any key assumptions made, unearth any remaining data held that may be useful, raise awareness of flood risk mechanisms and issues, and seek wide support for the SFRA as a valuable evidence based technical document.

The interviews and reviews of final SFRA reports have shown that all SFRA studies have been developed with the active engagement of the Environment Agency. However, more variable levels of engagement from water companies, internal drainage boards, the Highways Agency, elected Council members and other Council departments, and flooded communities was found. Consultation with most stakeholders (other than the Environment Agency) was only undertaken as part of the data gathering process to inform early stages of the SFRA and that the level of engagement did vary between different SFRA studies.

The experience of many of the local authority planners interviewed was that water companies had been reluctant to provide inputs into SFRA studies, other than the provision of flooding history data from the public DG5 register. It is hoped that the recommendations of the Pitt Review and the future development of surface water management plans will help increase the active involvement of water companies in future SFRA studies.

An example of an SFRA with good stakeholder engagement is the work undertaken for the Central Lancashire SFRA. In this study, individual parish councils in the study area were consulted to ensure that the Level 1 SFRA was robust. Each Parish Council was provided with the draft Executive Summary, a map showing flood data in their parish and a pro-forma giving them the opportunity to comment. The results of this consultation had a direct influence on the final document produced and this approach should be encouraged in future SFRAs.

Our review has also shown that residents groups and resilience forums have not been actively involved in the majority of the SFRAs reviewed. This lack of engagement has probably led to the absence of important local knowledge of flood occurrence in some areas and should be encouraged in future SFRA studies, especially those with active Flood Resilience Forums.

Comments received from various Environment Agency staff also highlighted the importance of early and direct communication between the Environment Agency and local authorities. This was illustrated in the Environment Agency Southern - Hampshire Area where early contact helped to develop good relationships with a majority of the local authorities working in the area. This ultimately contributed to successful and co-operative SFRAs.

Some Environment Agency practitioners also expressed concern that in a number of local authorities planning staff found it difficult to engage with other internal council teams about flood risk issues, such as Development Control and Emergency Planning. This highlights the need for development of good internal as well as external relationship building, to support the development of SFRAs and other related studies.

Relationship building can cover a number of aspects including:

- Engagement with those in possession of known data sets, in particular the water companies;
- Engagement with those with more informal knowledge of local flooding problems such as flooded communities;
- Engagement on surface water or local flooding. This has occurred later on in the development of SFRAs, particularly following the Pitt Review. There seems to be some expectation from the Environment Agency, with their strategic overview role on inland flooding, that local authorities should via the SFRA, start to understand and plan a response to local flood risk issues. These may be outside the remit of the planning evidence base that the SFRA is used for in allocating land for development and clarification is needed;
- Strengthening of the understanding and knowledge base of flood risk issues across all functions in the local authority;
- Engagement beyond the planning officers, to use the SFRA as a means of raising the issue of flood risk management at a community level, extending the Environment Agency's FRM plans and strategies; and
- Consultation on the influence flood risk had in the development of the LDF

The review has confirmed that most local authorities consider that a SFRA is a technical document contributing to the evidence base for the development of the core strategy. As a consequence, most of the authorities reviewed, stated that the final SFRA document should be used for future public consultation, undertaken for the subsequent phases of the LDF process. An example of this was the Hull SFRA which incorporated a key stakeholder workshop as part of the development of the SFRA. The results of this consultation were incorporated into the final SFRA document.

6.4 Defining the SFRA flood zones

Flood Zones published by the Environment Agency are a first point of reference for the assessment of flood risk. These maps are constructed from a range of model outputs, from broad scale modelling for the National fluvial and tidal flood risk maps and outlines for local areas from detailed mapping or scheme studies. In some studies, additional hydrodynamic modelling prepared for previous flood defence strategies, schemes and projects, has been made available. The improved resolution of this modelling has tended to replace broad scale modelling results or applied these models for the different outcomes for the SFRA. This includes examination of climate change drivers or extreme flooding events.

For detailed Level 2 SFRA, detailed hydraulic inundation modelling (e.g. TUFLOW 2D or ISIS/TuFLOW or MIKE21), using a digital elevation model (DEM) based on LiDAR data were used to determine in detail, the degree of hazard (extent, depth and speed of floodwater) and residual risk, due to either breaching or overtopping of defences. The importance of these modelling approaches is discussed later in Section 6.8.

Flood risk zones have generally been defined in accordance with PPS25, ignoring the presence of defences. However, in some SFRA, Flood Zones 3a and 3b have been broken down in a number of different ways to reflect the variation and gradation of flood risk across the zones. This is particularly true for large and highly vulnerable areas and/or areas with complex flood mechanisms. Examples of some of these different approaches are provided below for Hull, Sheffield and York.

In the Hull SFRA, Zone 3a has been sub-divided into three categories to reflect different potential flood mechanisms and hazards. These categories are:

- *Flood Zone 3a (i): Low hazard zone (with appropriate defences and not unacceptable flood risk). Areas protected to the appropriate standard of protection where the consequence of the defences failing is unlikely to be life-threatening.*
- *Flood Zone 3a (ii): Medium hazard zone (with appropriate defences and not unacceptable flood risk). Areas protected to the appropriate standard of protection where the consequence of the defences failing is unlikely to be life-threatening but damages to properties may be significant.*
- *Flood Zone 3a (iii): High hazard zone (without appropriate defences or unacceptable flood risk). If a breach was to occur, these are areas where there would be a threat of loss of life.*

- *Flood Zone 3b: Areas of Functional Floodplain are present adjacent to Holderness Drain in the Bransholme area. These are areas where water has to flow or be stored in times of flood.*

With regard to the York SFRA, three sub-zones of Flood Zone 3a are identified. These are:

- *Zone 3a(i): areas at high risk of flooding which are currently defended to the appropriate minimum standard as defined by PPS25 (1 in 100-year (1%) protection).*
- *Zone 3a(ii): areas at high risk of flooding which are currently defended to the appropriate minimum standard for existing development as defined by Defra (50-year (2%) protection), but are not defended to the appropriate minimum standard for new development as defined by PPS25 (1 in 100-year (1%) protection).*
- *Zone 3a(iii): areas at high risk of flooding which are not currently defended to the appropriate minimum standard as defined by Defra (50-year (2%) protection).*
- *Zone 3b areas, functional floodplains are defined in PPS25 as “..land where water has to flow or be stored in times of flood”. Specifically, this land would flood with annual probability of 1 in 25 (4%) or greater in any year, or is designed to flood in an extreme 1 in 100 (1%) year flood,*
- *All areas in Zone 3 are considered as Zone 3b (Functional Floodplain) unless shown to be in Zone 3a (High Probability) by this SFRA or a site specific FRA.*

The presence and standard of existing defences has in these examples, been used to derive coarse "new" flood zones. Whilst flood defences will impact on the probability and consequences of residual flood risk in these areas, it is important to remember that flood defences provide only one method of mitigation (there are many other methods), and mitigation forms the lowest tier in the flood risk management hierarchy. Suitable gradation of the flood hazard across Flood Zones 3a and 3b, taking into account all sources of flooding, in terms of depth, velocity and speed of onset etc. is currently not widely being considered. Consequently the integrated and iterative nature of the Avoid, Substitute, Control and Mitigate hierarchy at all stages in the planning system, and the thought processes behind this approach, are not clearly communicated in some SFRAs. Practitioners need to address this issue in future SFRAs.

With regard to the Sheffield SFRA:

Areas subject to flooding in the 1% probability of occurring in any one year (1 in 100) design event have been delineated as Zone 3a High Probability. Areas that are ‘previously developed’ have been defined as Zone 3a(i). Within the context of the SFRA ‘previously developed’ areas, delineated as Zone 3a(i) for planning purposes, relate to sites within which there are existing buildings that are considered to be impermeable to floodwaters. It is important to recognise that the land surrounding these buildings are critical flow paths and/or flood storage areas, and must be retained. Specific planning responses have been developed for both Zone 3b and Zone 3a(i).

As highlighted in a number of case studies reviewed, exceptional circumstances exist where there are very large and highly vulnerable areas of Flood Zone 3 covering the greater part of a local authority administrative area. Examples include East London and the City of Hull. For these situations where there is little or no Flood Zone 1 or 2, the graduation of flood probability to land can provide a useful pragmatic aid to adopting a risk based sequential approach for individual local authorities. However, different approaches to Flood Zone 3 delineation will conflict with the consistent identification of Flood Zones 3a and 3b, and the value and use of the Sequential and Exception Tests as currently defined by PPS25. It may also increase confusion for developers and the Environment Agency when dealing with different local authorities. This issue is addressed later in Section 10.

For the reasons stated above, local authorities should not use subdivisions of flood zones 3a and 3b within their primary sequential testing. A staged approach should be followed that starts with the primary flood zoning system outlined in PPS25 and the Practice Guide. Further guidance is needed to assist local authorities allocate land for development in accordance with the Assess, Avoid and Substitute elements of the flood risk management hierarchy, having regard to flood risks identified in the SFRA. It is recognised that more detailed risk assessment will be required for some high risk areas so that residual risks such as overtopping or breach are included in the next iteration of the sequential approach. This guidance should clarify how the sequential Test should be applied in relation to the more detailed SFRA outputs.

The important lesson found from the review is that a single flood zone or sub zone cannot support the application of the Sequential Test and Exception Test. It is the examination of multiple layers of flood risk data that should be used in delivery of a sequential approach. This issue is addressed further in Section 7.

6.5 Defining the functional floodplain

In the majority of SFRAs reviewed, the functional floodplain has been defined for fluvial and tidal sources as either the 4% or 5% annual flood probability outlines, with urban areas being excluded. The difference between these outlines is typically very small, and where an available outline can be used the SFRA can help simplify and set the approach. However, the definition in PPS25 allows for flexibility to make allowance for local circumstances and the fact that functional floodplain should not be defined on rigid probability parameters. Evidence of some of the key thought processes behind identifying existing, reinstating and potential future functional floodplain and green infrastructure (i.e. single or multiple use conveyance routes, flood storage areas), is not easily communicated, and this is an area that needs further attention to maximise the potential for integrated flood management infrastructure investment and provision. Importantly, the SFRA has a key role in the safeguarding of land for future flood management purposes, and it appears from the review that this critical step is not universally understood. These issues should be addressed by practitioners in future SFRAs.

For example, the Lancaster District SFRA recognises that land surrounding buildings can form important flow paths and storage areas for flood water and these should be protected. For this reason, a sub-delineation within Flood Zone 3b has

been provided, making reference to developed and undeveloped areas. Understanding the functionality of the floodplain is more important and where an existing development prevents the full benefits of the floodplain to be delivered downstream, then its reinstatement or regeneration should not presume a continuation of the current land use through the limited messages of redefined flood zone. The Sequential and Exception Test should be applied as provided in PPS25.

The reviews conducted have also some SFRA which have made the presumption that all floodplain was functional, unless proven otherwise. Although this is a useful starting point in any review, it is too open for effective use in development control matters. It is therefore important that each local authority establish a coherent methodology for the consideration of functional floodplains as per the requirements of PPS25, and that Flood Zone 3b should be checked thoroughly to confirm its suitability for use.

For a number of the SFRA reviewed (e.g. Central Lancashire), the reports acknowledge that data to define the 4% or 5% annual flood probability outlines is not currently available. As a consequence, the 1% annual flood probability outline (Flood Zone 3a) has been used as a proxy until such time as more detailed information is available, either from the Environment Agency or from site specific FRAs.

In some SFRA, modelling information to determine the functional floodplain has been used where available, and then manually adjusted using professional judgement to produce a more realistic outline, so avoiding the use of proxy data. This approach was undertaken in the Greater Manchester SFRA with the agreement of the Environment Agency.

The interviews with Environment Agency officers also expressed concern over the interpretation and definition of the functional flood plain used for development purposes and the fact that an established dataset for the functional floodplain is not available as a data set across all areas of the Environment Agency. The creation of this consistent dataset was considered to be an important requirement for improving future planning and development decisions. However, in the North East Region the Environment Agency are making clear that the Flood Zone 3b line is a planning line that is the responsibility of the LPA to define, and will be adhered to by the Environment Agency in any planning consultations.

It is also important to note that the definition or mapping of the functional floodplain taking account of all sources of flooding was not undertaken in most SFRA studies. This clearly limits the ability of the planning process (through PPS25) to appropriate safeguards upon land subjected to flooding. This limitation will also be a key barrier to the implementation of the Pitt Review and surface water management plans. There are still significant challenges in clearly establishing current and future surface water, pluvial and groundwater functional flow and storage areas for relatively frequent return period events; and then combining these areas with traditional tidal and fluvial functional floodplain areas to reflect all sources of flooding. However, a realistic approach will be needed in surface water management studies, and to ensure that a planning designation can be achieved for

land uses which could double as flood storage areas within the urban environment. Issues relating to other sources of flooding are detailed below.

6.6 Assessing other sources of flooding

Each of the SFRA studies reviewed have considered other sources of flooding (i.e. surface water, pluvial, groundwater, sewers and canals etc.) to some degree. However, the discussion of these flood mechanisms tends to be brief in comparison to the discussion of fluvial and, where applicable, tidal flooding risks. These flood risks are usually expressed by showing historical flooding records only and this limitation is an important issue which should be addressed by practitioners in SFRA updates and future Surface Water Management Plans.

The interviews conducted in the study have shown that the ability and extent of engagement of local authority drainage staff and use of their local knowledge and experience can be an important positive factor, and improve the detail and quality of the assessment of local sources of flood risk. For example, this was illustrated in the final SFRAs produced internally by Ipswich and York councils.

The main reasons given in SFRA documents for the limited assessment of surface water, pluvial, groundwater and sewer flooding are: lack of available mapping/data; the risk of flooding from other sources is relatively low and/or other sources of flooding should be considered in detailed flood risk assessments. Although these phrases are fairly common in the text of Level 1 SFRA documents, a number of studies have explored innovative ways of assessing the extent and importance of these flood risk issues. Some examples of good practice are provided in the remainder of this section.

In some studies, such as the Eastbourne and Wealden SFRA, sewer flooding incidents have been considered by dot mapping of previous flood incidents and/or presentation of broad scale DG5 water company data, see Plate 6.6.

Plate 6.6 Eastbourne and Wealdon SFRA – Previous sewer flooding incidents



Sewer flooding has generally been assessed using historical records and data from the Water Company DG5 database detailing the total number of flood incidents that have affected both internal and external properties. However, it should be noted that DG5 data only covers a limited period of time and should be considered a snapshot of flooding. Flooding from land drainage, highway drainage, rivers/watercourses and private sewers are not recorded in the DG5 dataset. In addition, the DG5 dataset is only provided on a five-digit postcode area, which can be large and make it difficult to determine where sewer flooding problems may have occurred in the past.

In the case of the Greater Manchester Sub-regional SFRA, detailed sewer flood models originally developed for the Salford IUD pilot were used to undertake a detailed assessment of the risks posed. However, this is not a common feature of the SFRA reviews with most water companies not releasing digital data regarding flood risks from the public sewer network, due to data protection/sensitivity concerns. It is hoped that this situation will improve with the implementation of the recommendations of the Pitt Review.

A minor number of recent SFRA reviews have considered the risks of surface water flooding in more detail. An example of good practice for this issue is the mapping produced for the PUSH (Partnership for Urban South Hampshire) SFRA study. In this study covering ten local authorities, datasets covering slope, geology and urbanisation were evaluated to assess the likelihood of surface water run-off and overland flow. Examples of the outputs of this study are shown in Plate 6.7 and 6.8.

Plate 6.7 PUSH SFRA - Impact of land use, geology and slope on surface water flow

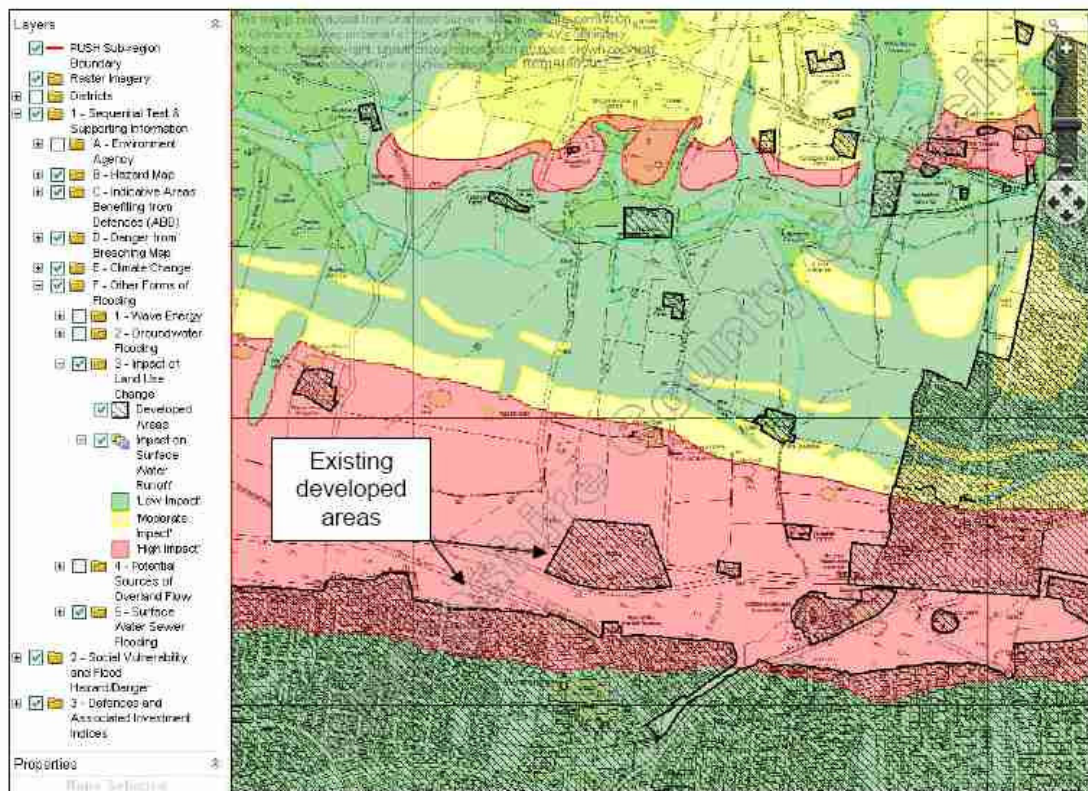
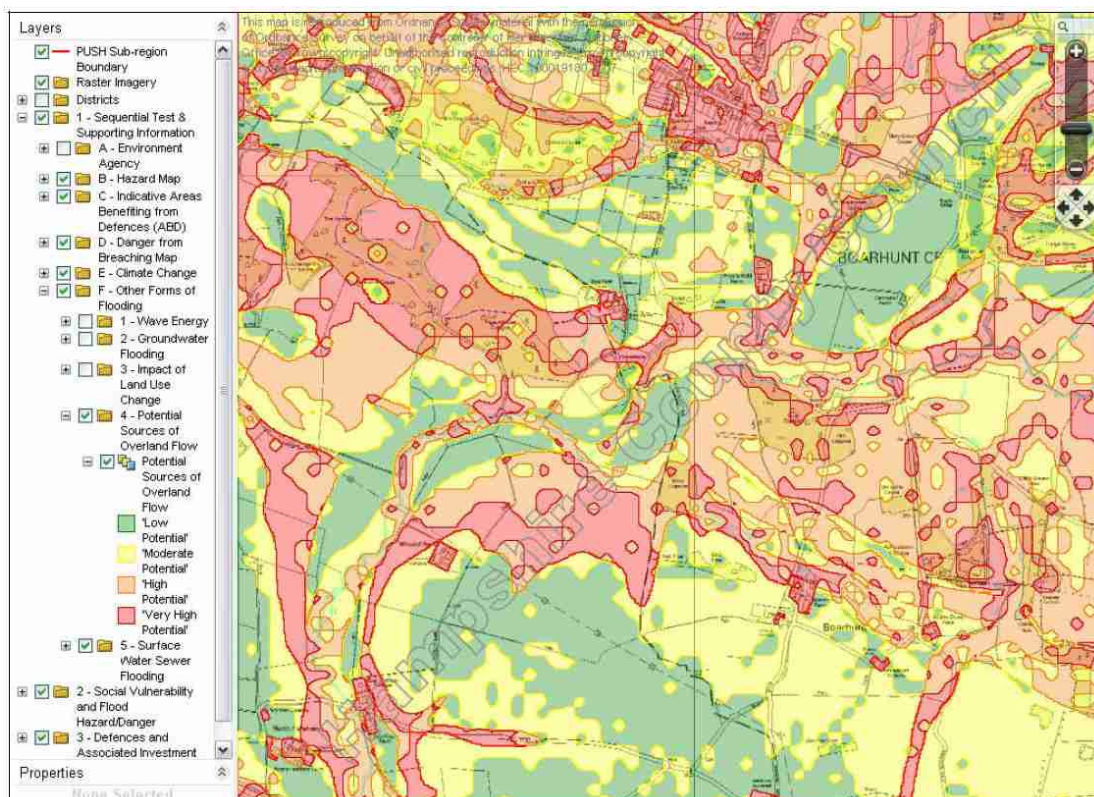


Plate 6.8 PUSH SFRA - overland flow potential map

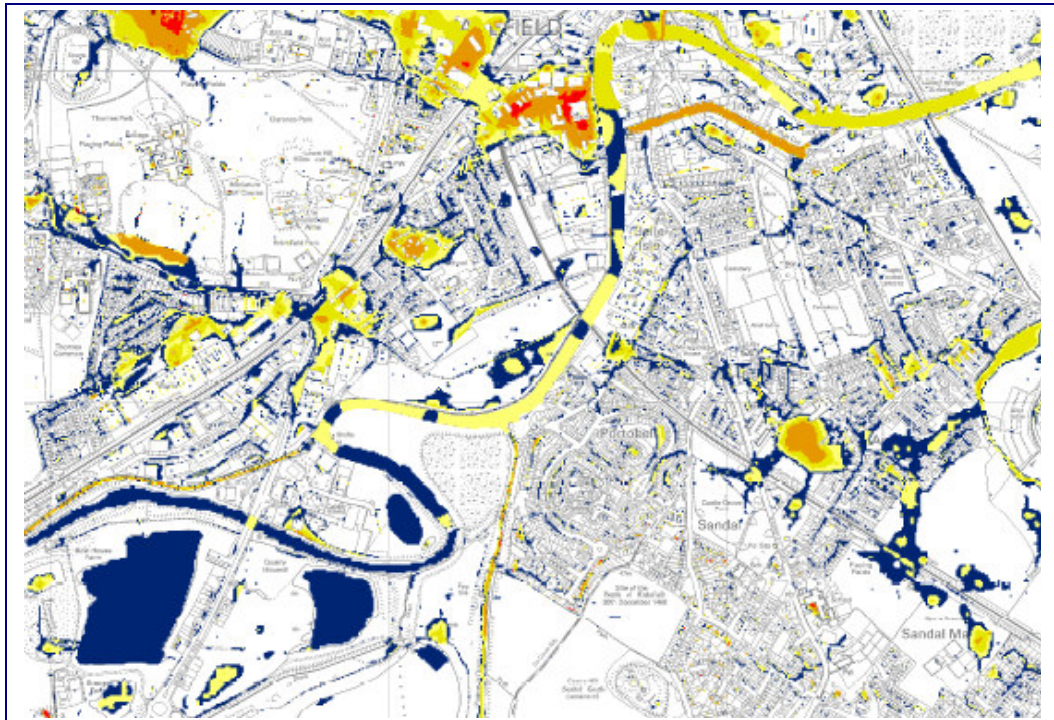


More recent SFRA's and some updates have been able to utilise the National surface water maps licensed to the Environment Agency from JBA Consulting.

These maps give a good overview of the topographically susceptible areas, and in Level 2 SFRA the rainfall routing techniques can be used at a greater resolution.

This information was used in the recent Wakefield City Centre AAP Level 2 SFRA, which included assessment of various sources of flood risk, from fluvial overtopping and breach, local surface water and flooding from upstream tributaries exceeding the capacity of their culverts. An example of the surface water flooding map is shown in Plate 6.9.

Plate 6.9 Surface water flooding - areas of significant ponding during a 100 year rainfall event



The reviews conducted in this study have shown that the assessment of groundwater flooding is relatively weak within most SFRA. This is particularly surprising for SFRA which have been developed in areas dominated by major chalk and sandstone aquifers in southern and eastern areas of England; but it possibly reflects the current lack of data and information, and the lack of clarity of organisational responsibility for this flooding source. The text below illustrates the extent of groundwater flood risk for one recent SFRA.

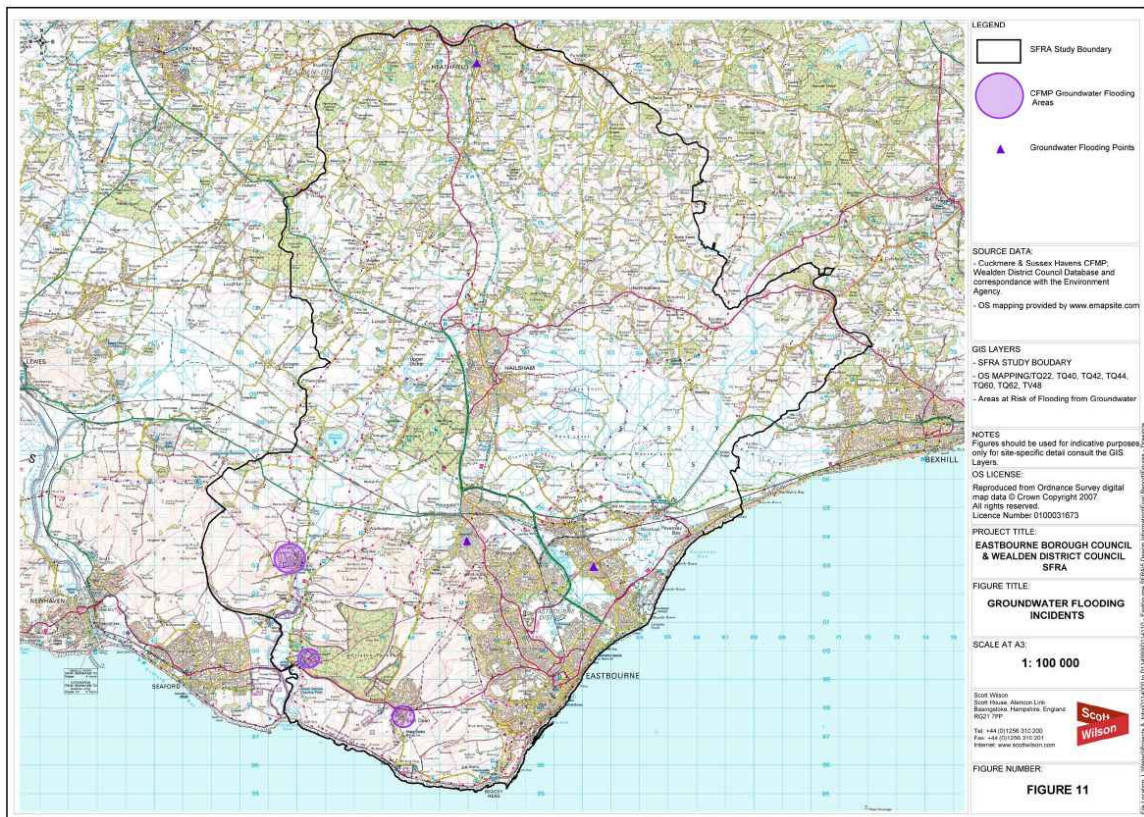
There is a risk of groundwater flooding in the XXXX region. Groundwater flooding usually occurs following a prolonged period of low intensity rainfall and although there are no records of significant groundwater flooding in the region, it is still a possibility. The future risk from this source is more uncertain than surface water as the climate change predictions indicate that although sea levels will rise, thus possibly raising groundwater levels, overall summer rainfall will decrease, therefore having a long-term effect of lowering the groundwater levels. However, long periods of wet weather, such as those experienced in the autumn and winter of 2000/01 are predicted to increase:

these are the type of weather patterns that can cause groundwater flooding to occur.

There is limited information on groundwater flooding in the XXXX area. However, the draft XXXXX CFMP outlines that some of the soils in the lower lying areas of XXXX (in particular areas of the XXXX catchment) are characterised by seasonally wet clays. Therefore, these could be susceptible to groundwater flooding following prolonged rainfall as described above. In addition, dry valleys that are potentially susceptible to groundwater flooding should be assessed. Due to a lack in available data, these are currently difficult to assess but should be considered in future reviews of this SFRA.

In some SFRAs, the likely risks and consequences of groundwater flooding are considered by using the Environment Agency groundwater vulnerability and/or basic BGS geology maps. The Adur & Worthing SFRA contains historic records and other information on groundwater flooding and where this is the case, there is generally a greater focus placed on this source. The Stafford SFRA for example, makes reference to the use of monitored groundwater levels from borehole records held by the Environment Agency on its WISKI database. Some studies have considered groundwater issues in more detail though text discussion and dot mapping of groundwater flooding events. This is illustrated for the Eastbourne and Wealden SFRA in Plate 6.10.

Plate 6.10 Eastbourne and Wealden SFRA – Previous groundwater flooding incidents



In terms of future SFRA studies, it is important to acknowledge that future (post Pitt Review) Environment Agency mapping programmes will provide better data sources

relating to other sources of flooding. It has been noted in SFRA in coal mining areas that the Coal Authority are intending to produce a risk map of where mine rebound may impact in 2009. All these outputs will take time to develop but they should provide better inputs for future SFRA and related studies such as Water Cycle Strategies and Studies, and Surface Water Management Plans.

6.7 Assessing the implications of climate change

Impact of climate change upon floodplain extents, flows and flood depths

Climate change is generally being taken into account in SFRA mapping and guidance to planners and development control officers, but the approaches and techniques vary considerably. Each of the SFRA reviewed have considered the broad impact of climate change as per the requirements of PPS25 and expressed the impact in a number of different ways in the text of the reports.

The interviews conducted with LPA planners also indicated that most authorities believe that their SFRA consider climate change effectively. In many cases, this is reflected in maps showing the standard 20% increase in fluvial flows to accommodate climate change. This is in accordance with the information contained in current PPS25 planning policy, Annex B.

In a number of SFRA, where no further modelling has been produced, the current 0.1% Environment Agency Flood Zone 2 outline has been used as a surrogate for the future 1% Flood Zone 3 outline. Examples of this approach include the Sheffield and Greater Manchester SFRA. In respect of the Adur & Worthing SFRA, future flood extents for 2056 and 2106 taking into account current defences were mapped. The Lancaster SFRA has for tidal reaches, added the prescribed PPS25 climate change allowances to the 0.5% tide table levels and produced a flood outline using topographic data.

Some studies have undertaken additional modelling to map flood zones incorporating climate change. Where additional modelling has been carried out, typically for Level 2 SFRA, this has enabled the PPS25 climate change allowance to be incorporated numerically and outputs reflect the potential impacts. Examples of future climate change risk maps are reproduced below in Plates 6.11 and 6.12.

Plate 6.11 Suffolk and Waveney SFRA – Flood depth map for 1 in 200 year flood event occurring in 2107 with expected climate change

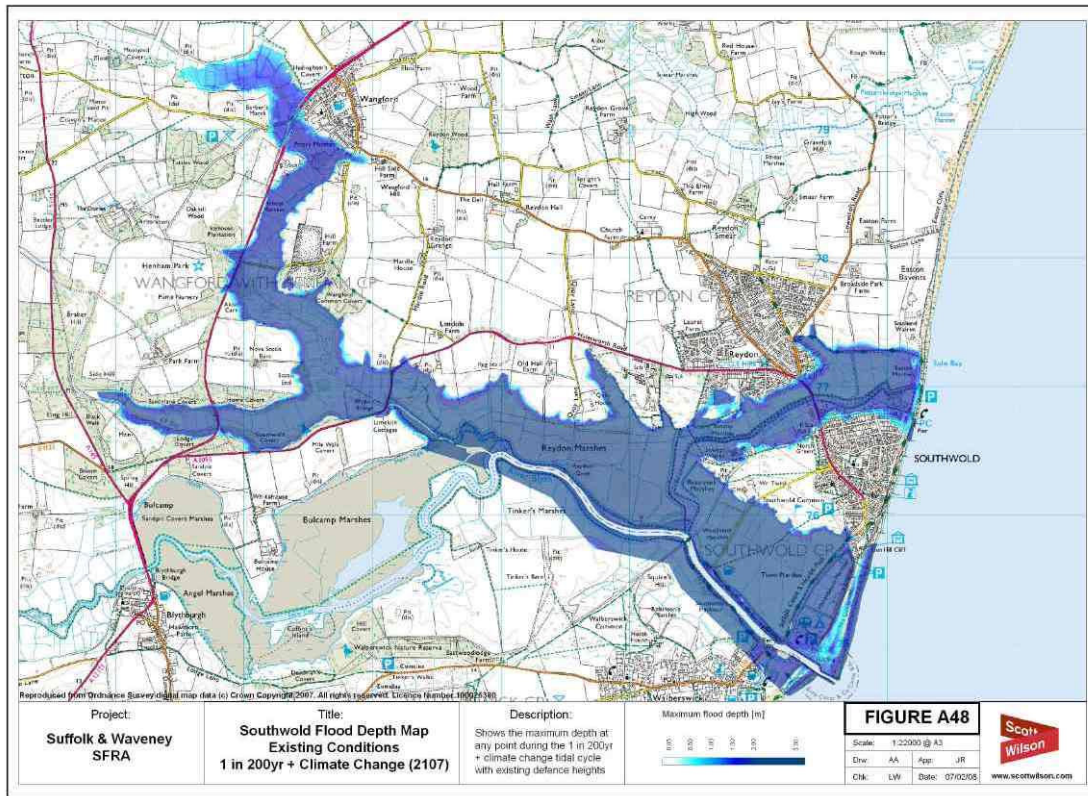
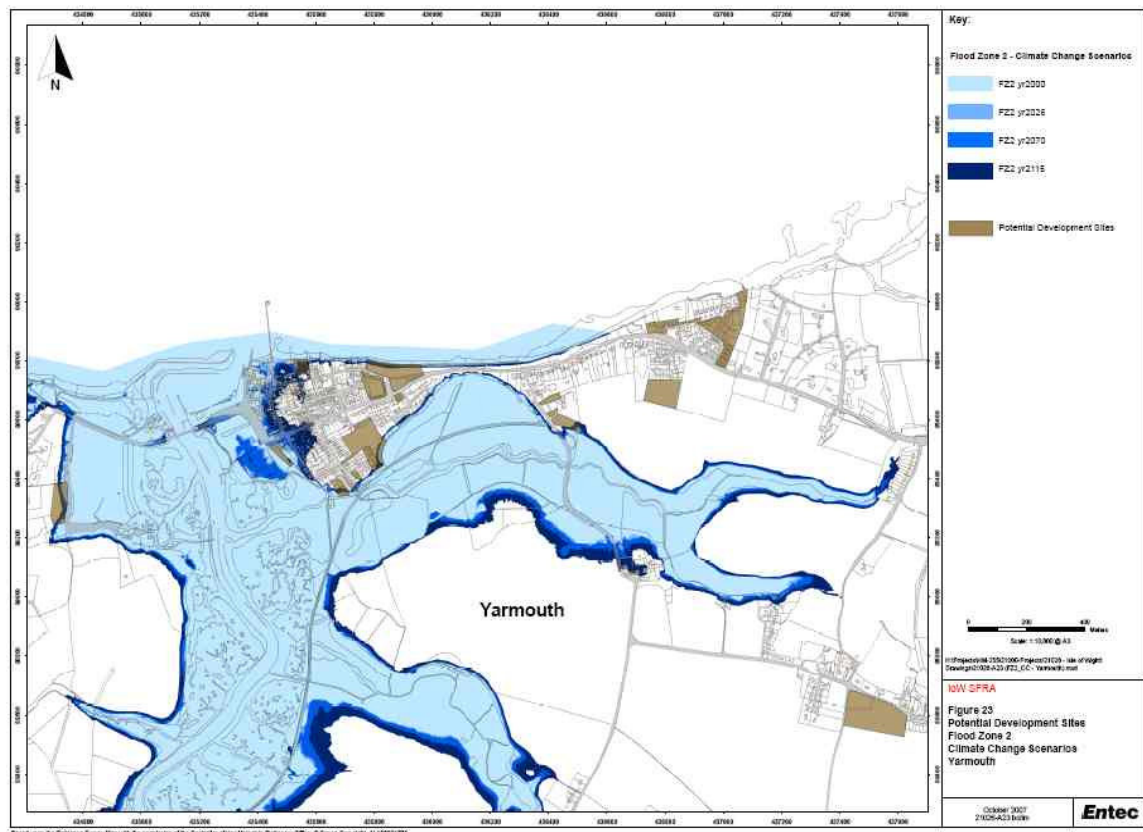


Plate 6.12 Isle of Wight SFRA – Flood depths for different climate change scenarios, 2000, 2026, 2070, 2115



Although the production of these products have helped assess the long term sustainability of future development sites, discussions with Environment Agency staff have highlighted concern over the lack of consistency of the time horizons / scenarios used to model climate change issues.

A number of Environment Agency officers also highlighted that consideration of climate change was restricted to fluvial sources of flooding and not other sources of flood such as groundwater and pluvial flooding. One officer also highlighted an example of where specific climate change scenarios (in terms of time steps) had been selected to suit the design life of a particular development.

To improve this situation, practitioners require further guidance regarding standard time horizons/climate change scenarios which should be used in future studies. It is important that any future advice is based upon the latest 2009 UKCIP climate change scenarios.

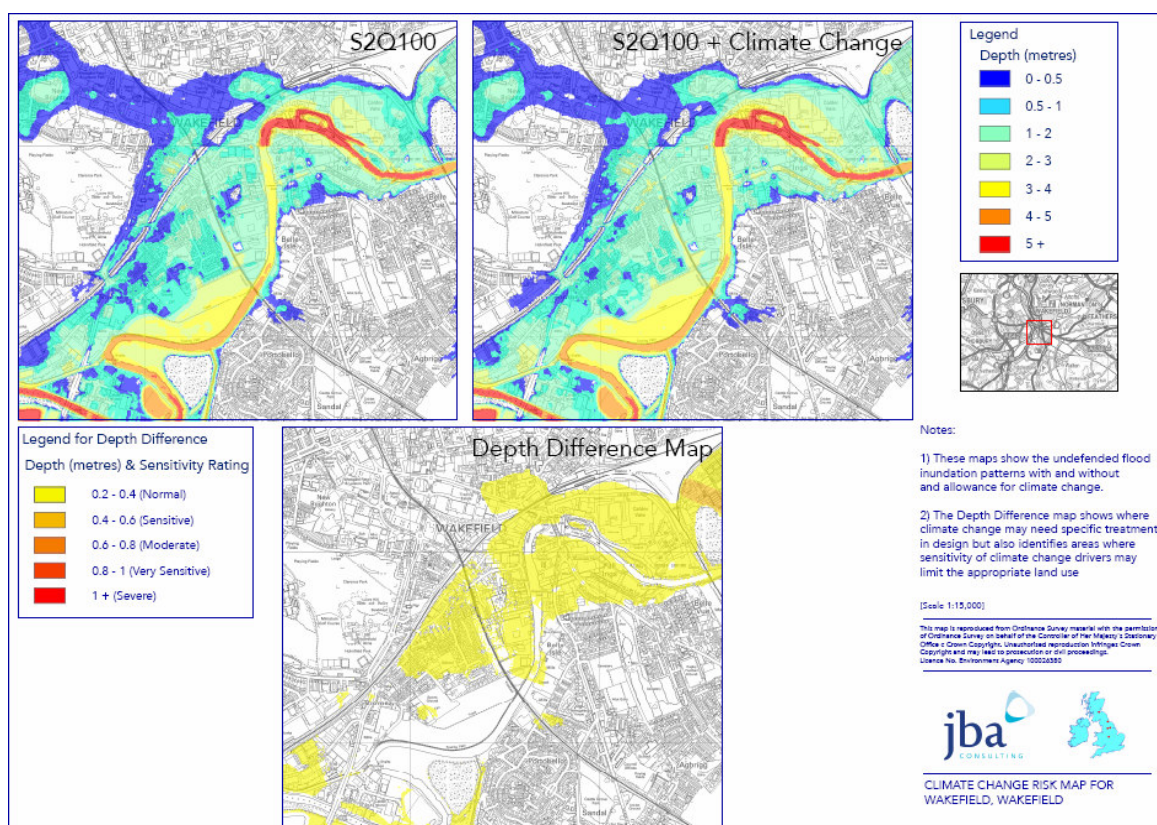
Assessing the vertical sensitivity of climate change

The vertical sensitivity of climate change is not considered in most of the Level 1 SFRA's reviewed in the study. The focus of most Level 1 SFRA's is placed on assessing lateral changes in flood extent due to climate change. However, most recent SFRA's make reference to the guidance provided in the PPS25 Practice Guide and highlighted the need to evaluate potential increased flood depths due to climate change in site specific flood risk assessments. This includes consideration of adjusted floor levels, requirements for clear access & escape routes, drainage systems and other mitigation measures.

Concern was expressed by some Environment Agency staff that clarity and a consistent approach is still required regarding land allocations and developments proposed within flood risk areas, impacted upon once climate change allowances have been added to the extents of flood zones shown on the Environment Agency Flood map. Guidance was requested on how best to consider flood zones incorporating climate change and the vulnerability of development in these areas, bearing in mind future flood risk.

Some SFRA's also provide details of the impact of climate change upon river flows. An example of this is the Charnwood SFRA, where a table is provided showing the sensitivity of key rivers to a +20% increase in flows in terms of vertical dimension and elevation. However, the review undertaken in this study has shown that the detailed consideration of vertical sensitivities due to climate change is normally undertaken in more detailed Level 2 SFRA's. Two recent Regional Flood Risk Assessments, undertaken using risk data available in the North East Region of the Environment Agency, have mapped climate change sensitivity as a scale of depth change on the floodplain. This has also been undertaken in the Level 2 SFRA for Wakefield, as shown in Plate 6.13.

Plate 6.13 Wakefield SFRA – Climate change depth difference and sensitivity mapping



6.8 Residual risks and risks to life assessment

The importance of “Residual risk” is generally recognised in the text of most Level 1 SFRA and is normally covered through basic discussion of the consequences (depth, velocity and hazard) which would result from the overtopping and breach of defences in key locations. It is reinforced by the use of undefended flood zone maps.

Most Level 1 SFRA recognise that further modelling is required to address these issues and this is reflected in the absence of detailed flood depth, velocity and hazard maps for most of these studies. Some Level 1 SFRA have considered the needs for residual risk in greater detail with respect of the preparation of guidance for flood risk assessments and planning applications. However, this issue is generally covered as a minor element of most Level 1 SFRA studies.

Detailed modelling of flood depths and velocities and subsequent assessment of residual risk and risks to life are more commonly in Level 2 SFRA studies. Previously, breach or overtopping assessments were required in areas where a planning decision may not be likely, and SFRA were generally unfocused and expensive as a result. With the Level 1 SFRA scoping out where a detailed assessment is required, more detailed effort is now possible in critical areas only. Discussions with Environment Agency staff have highlighted that a majority of these

studies have been undertaken in tidal flood risk areas to address the concerns of the implications of a breach in existing engineered defences.

The review of the SFRA's conducted in this study, has shown a number of different approaches to assess residual risk and risk to life issues. In most Level 2 SFRA studies (examples include Dacorum and Sheffield); detailed 2D hydraulic analysis of breach failure and/or overtopping scenarios is undertaken. In the Thames Gateway, South Essex SFRA, flood inundation animations for each breach modelled were provided to illustrate the zones of rapid inundation. The primary aim of this modelling is to evaluate the flow direction, velocity and depth which will result from the breach or overtopping of an existing flood defence. The anticipated depth and speed/velocity of the flow as it passes overland, is typically considered at 'critical' locations within the existing defence system; defined on the basis of land use vulnerability and/or defences potentially susceptible to failure. The hazard posed by flooding has then generally been determined using the relationships defined in the Defra research report FD2321 (Defra, 2006).

In some of the SFRA's reviewed, areas affected by breach and/or overtopping of defences are still being referred to as "rapid inundation zones", as opposed to PPS25 Flood Zone 3 affected by residual risks that need to be taken account of when determining appropriate development. As a consequence, the policy implications and thought processes relating to these two expressions need to be better communicated to practitioners and then taken into account in future SFRA's. This issue is linked to that identified in Section 6.4 concerning the gradation of all flood risks in Flood Zones 3a and 3b.

Good practice examples of outputs of selected breach scenarios are shown below in Plates 6.14 - 6.16.

Plate 6.14 Dacorum SFRA – Flood depth map for sample breach location

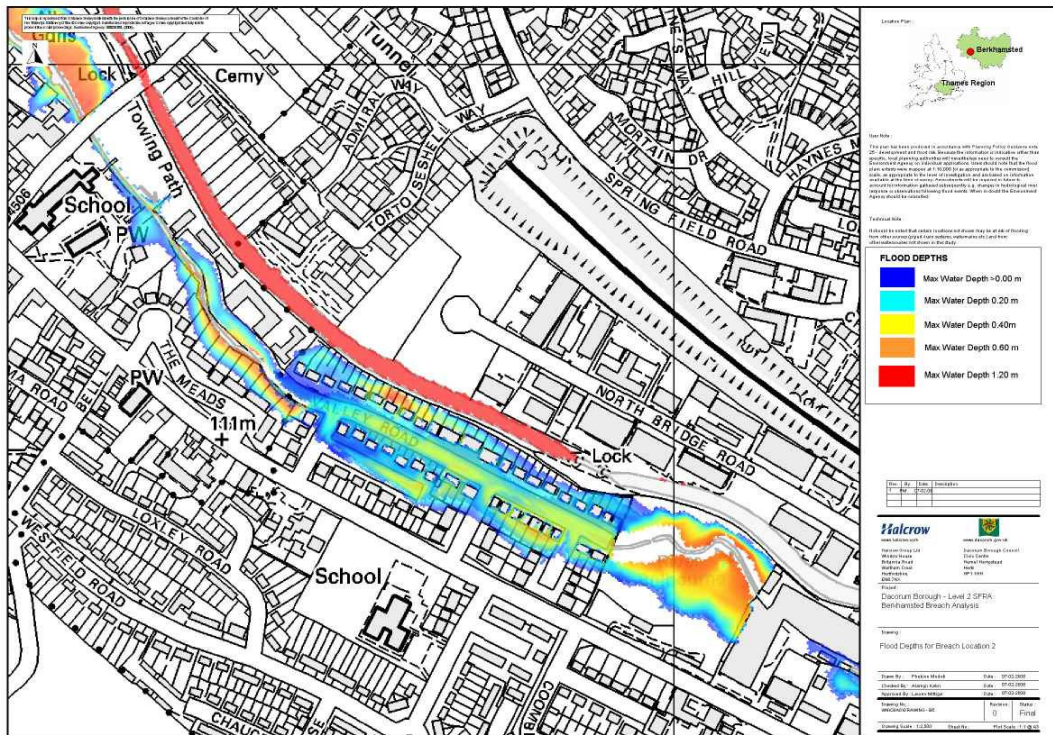


Plate 6.15 Dacorum SFRA – Flood velocity map for sample breach location

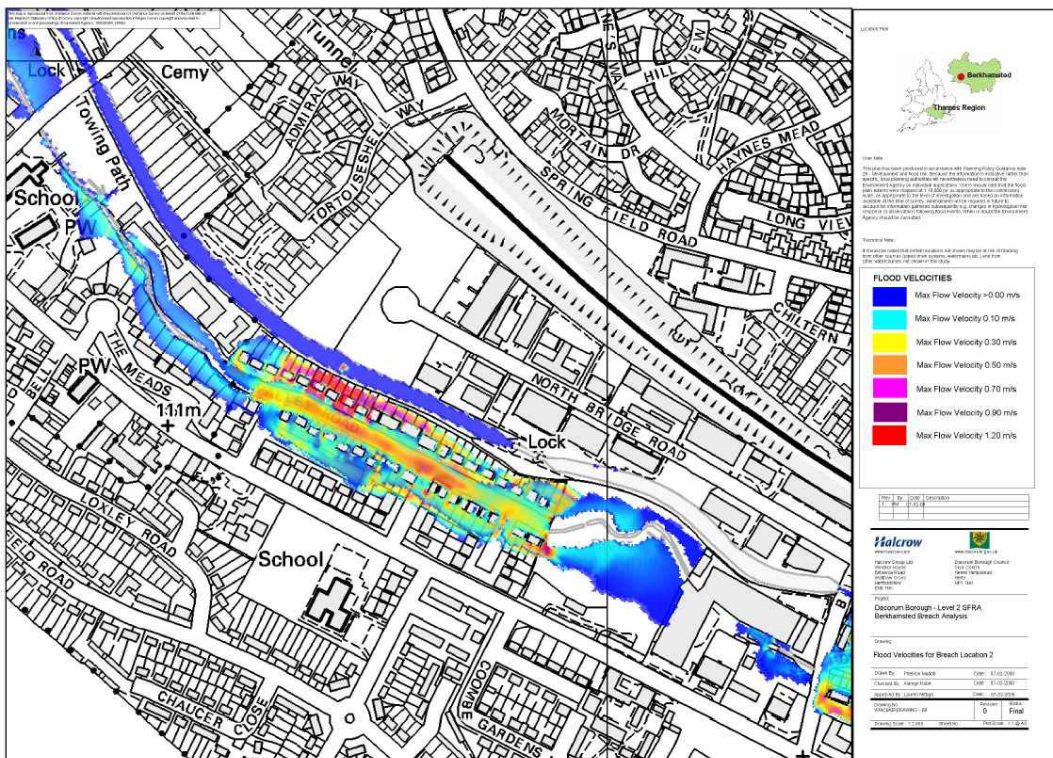
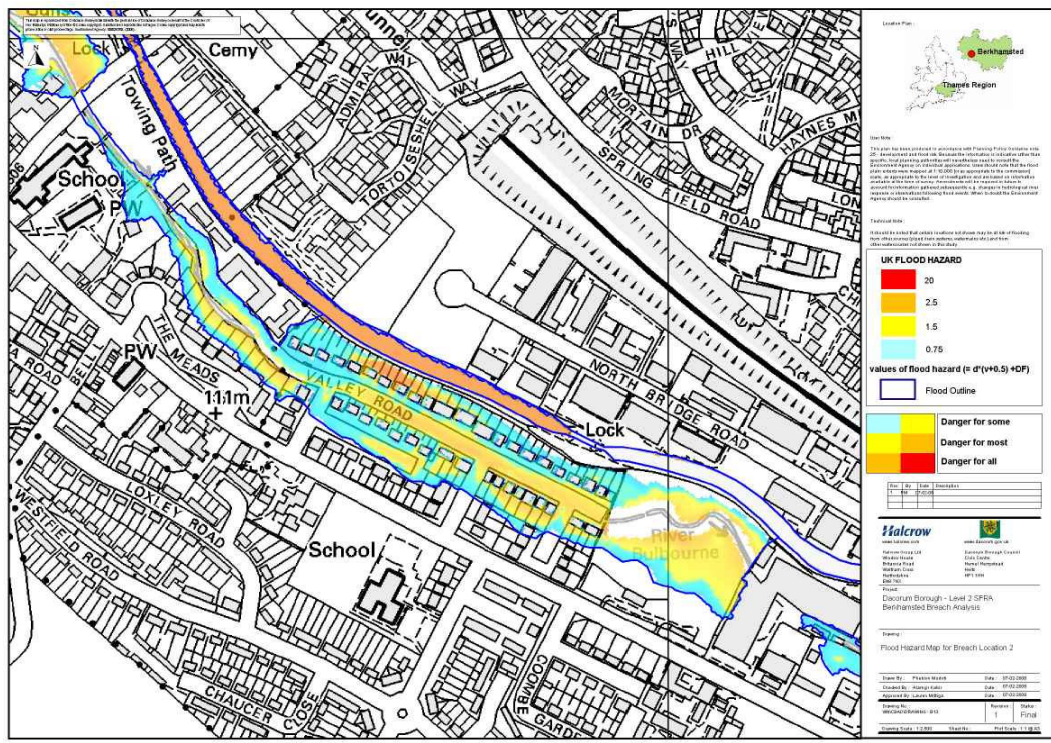


Plate 6.16 Dacorum SFRA – Flood hazard map for sample breach location



This type of modelling has also been produced for defence overtopping scenarios. Examples produced for the North Cornwall SFRA are shown in Plates 6.17 - 6.18.

Plate 6.17 North Cornwall SFRA flood depth map – 1:100 year fluvial event

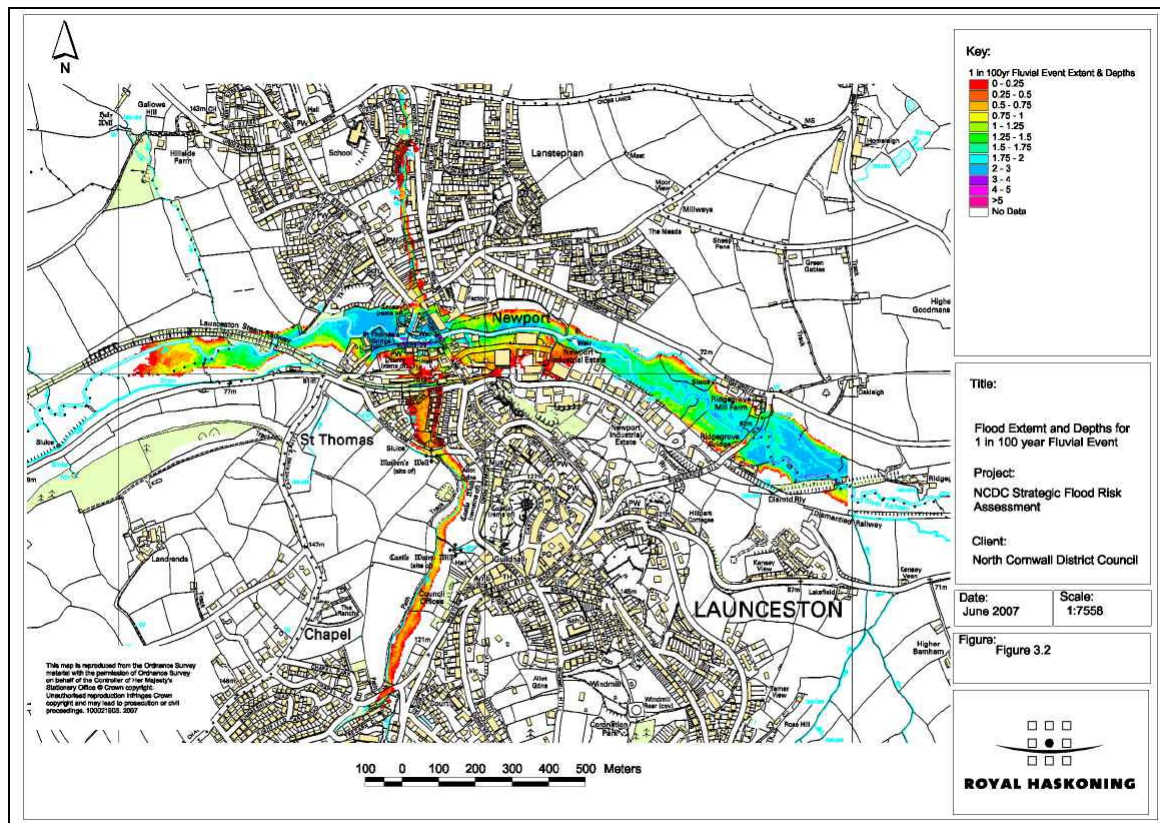
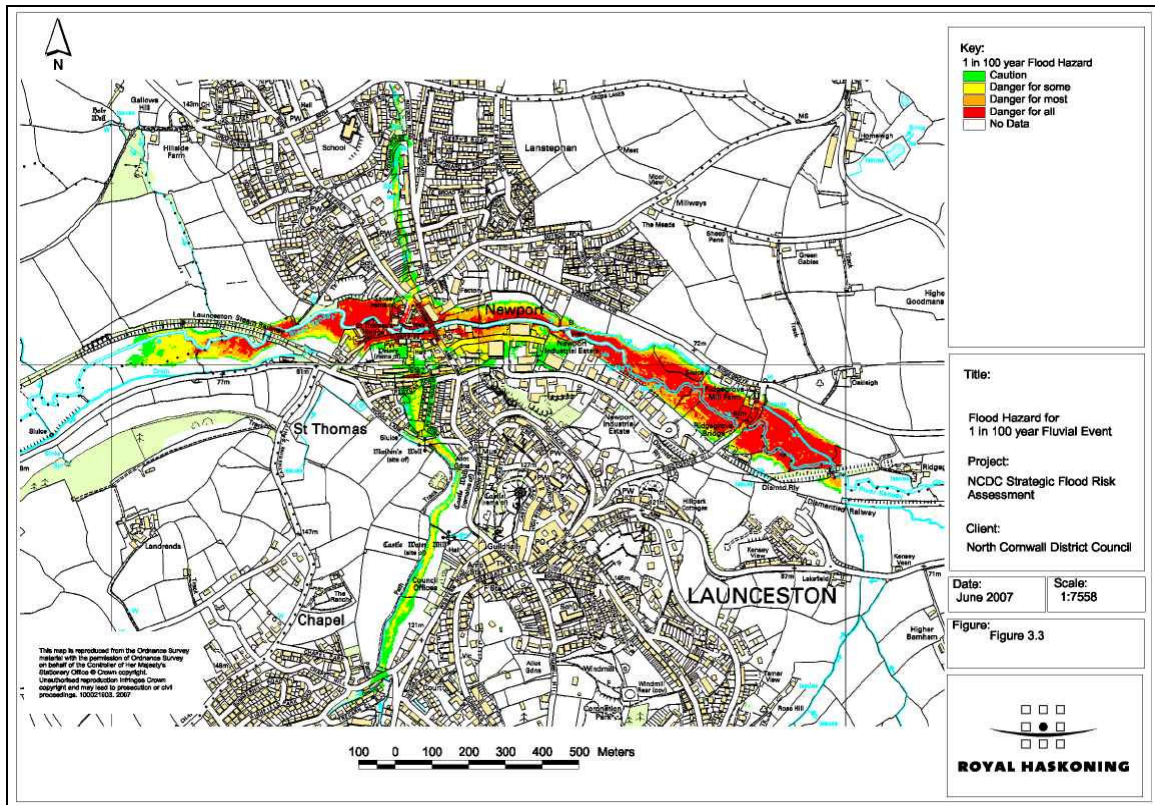


Plate 6.17 North Cornwall SFRA flood hazard map – 1:100 year fluvial event



Although this approach is very helpful in illustrating the potential velocity, depth and hazard for a modelled breach, it is important to remember that these outputs represent the outcomes of only one specific breach/overlapping scenario.

The interviews with Environment Agency officers also highlighted an example of a local authority, which had commissioned a Level 2 SFRA but requested that only the most favourable model runs were presented in the final risk assessment. This situation required additional work by the Environment Agency to ensure that the true level of risk was presented in the final SFRA study. Although this appears to be an isolated example, it has demonstrated the need for greater communication of the role of an effective Level 2 SFRA to local planners. This includes ensuring that planners fully understand the role of the SFRA / PPS25 sequential test to avoid inappropriate development and not to be seen as a process which can be manipulated to help justify existing but “unsafe” allocation sites.

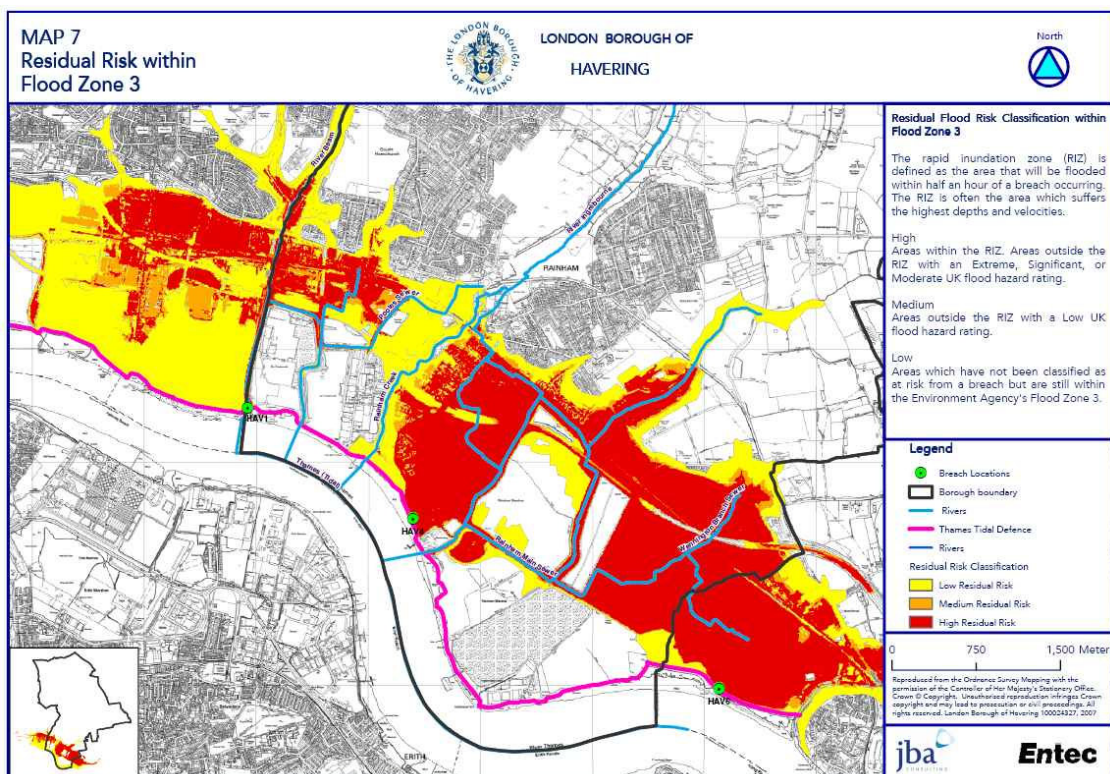
An alternative approach to the assessment of residual risk and risks to life was undertaken for the City of York SFRA. In this SFRA, the relationships documented in the previous Defra research projects FD2320 and FD2321 (Defra, 2005 and 2006) were used as the basis for determining flood risks. Within the study, detailed flood levels and topographic data (where available) were used to evaluate the depth and velocity of flooding for a 1 in 100-year (1%) event. This data layer was then reclassified using the definitions outlined below, to derive the final risk maps for the City of York.

High Risk – land within 500m of existing flood defences and at least 600mm below the 1 in 100-year (1%) predicted flood level, posing a threat to human life, or land which lies beyond 500m from the existing flood defences and which is more than 1000mm below the predicted 1 in 100-year (1%) flood level.

Medium Risk - Land in Zone 3, which is within 500m of the existing flood defences and which is less than 600mm below the 1 in 100-year (1%) predicted flood level; in the event of a breach, flood depth and flow velocities would be comparatively low. In addition, land within Zone 3, which lies beyond 500m from the existing flood defences and which is less than 1000mm below the predicted 1 in 100-year (1%) flood level, where flooding would not pose a threat to human life, i.e. the higher ground, unlikely to be in the rapid inundation zone.

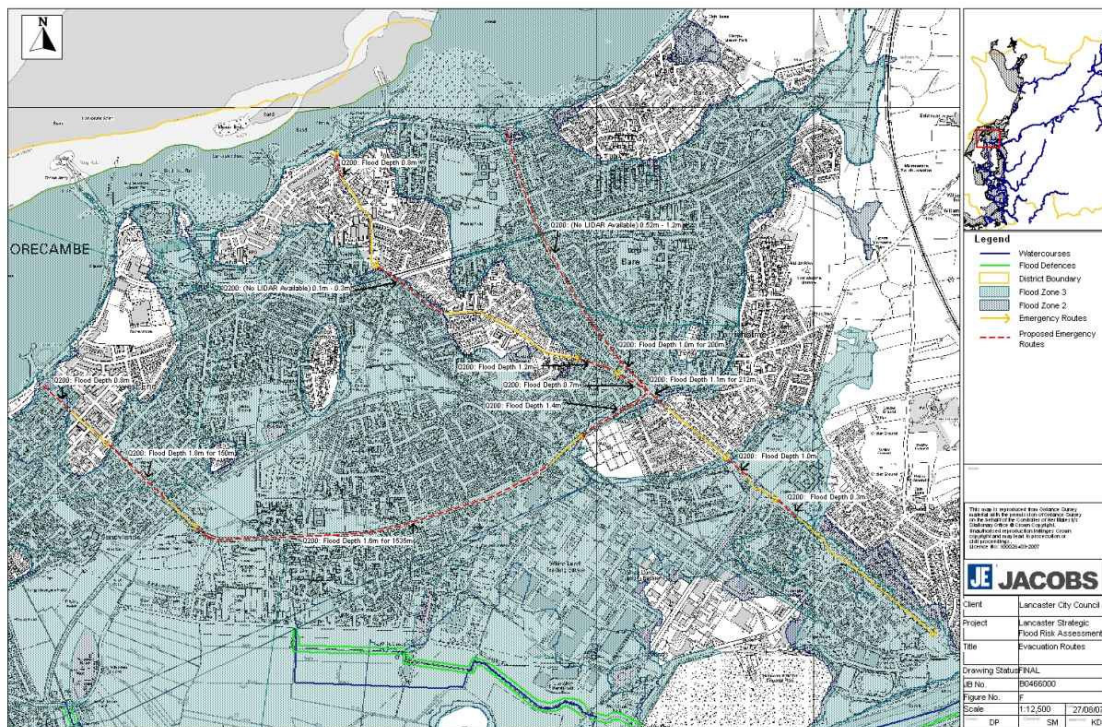
A similar approach was also adopted for the Havering SFRA conducted in East London. The main purpose of this type of mapping is to make it clear what is expected in a detailed FRA, and whether a breach assessment is necessary. The final output map produced is shown below in Plate 6.19.

Plate 6.19 Havering SFRA – Residual risk map



A number of SFRA have also considered risks to life directly by producing maps highlighting the most effective emergency evacuation routes to use in the event of a major flood. A good practice example for the Lancaster SFRA is shown below in Plate 6.20.

Plate 6.20 Lancaster SFRA – Evacuation routes for major flooding



This is a very good example of providing emergency planning outputs via the SFRA process, and should be considered by practitioners for inclusion in future SFRA. These outputs clearly have a dual function in not only helping to improve future flood risk management but also providing additional information (in terms of safe access routes) which can aid the effective evaluation of development suitability. The assessments of residual risks and risk to life are critical elements of the evidence base to inform the risk based sequential approach, the Sequential Test, and determining safe development as required by Part C of the Exception Test.

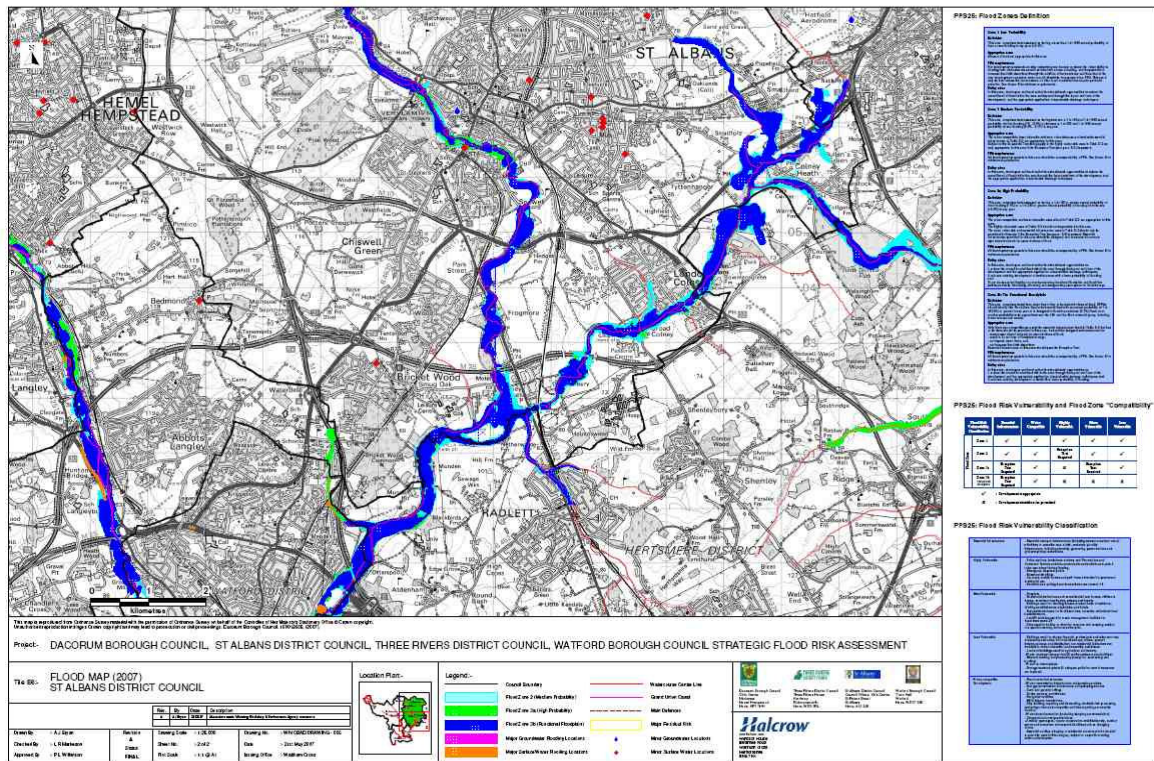
6.9 Producing effective and accessible SFRA outputs

As shown in the earlier sections, the map outputs produced for SFRA reports vary in terms of content and detail as well as the type of maps produced. Maps vary in scale within, and across SFRA. Some maps don't have scales stated and some are not to scale. Those that are to scale include scales of 1:150,000, 1:100,000, 1:50,000, 1:25,000, 1:12,500 and 1:10,000. Generally, scales are chosen to allow the study area to be shown on one A3 or A4 page. Where study area wide information is presented, then scales are generally small and where specific development locations or settlements are of interest, then scales tend to be larger.

One of the main limitations of most Level 1 SFRA map outputs is the relatively coarse scale of mapping used. This is typified by the production of a series of flood risks at a relatively small scale (1:200,000 or greater). These maps are generally difficult to interpret and although these scales are appropriate for index maps, more effective map outputs have been produced at scales of 1:30,000 or less. Good examples of map outputs also include multiple sources of flooding, details of datasets used, PPS25 vulnerability categories and annotations highlighting key risk

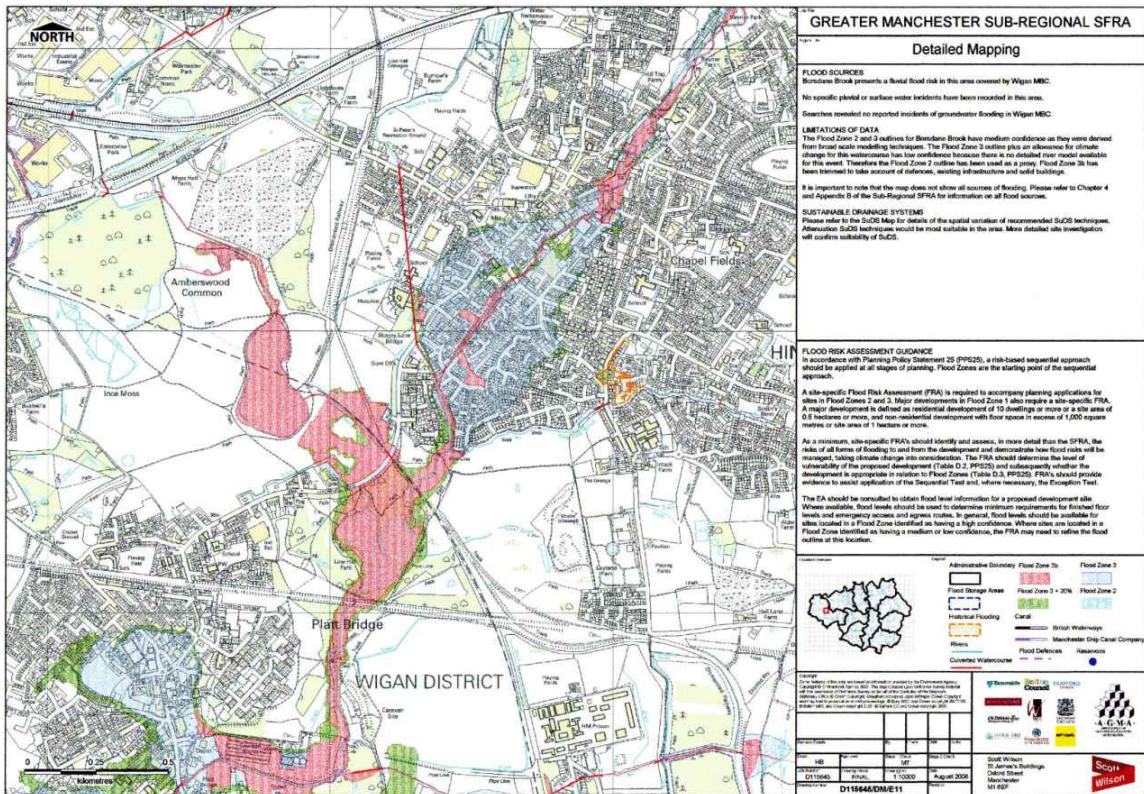
areas. Good practice examples of map outputs integrating these elements are shown below in Plates 6.21 to 6.23.

Plate 6.21 Dacorum SFRA – Example of flood zone mapping



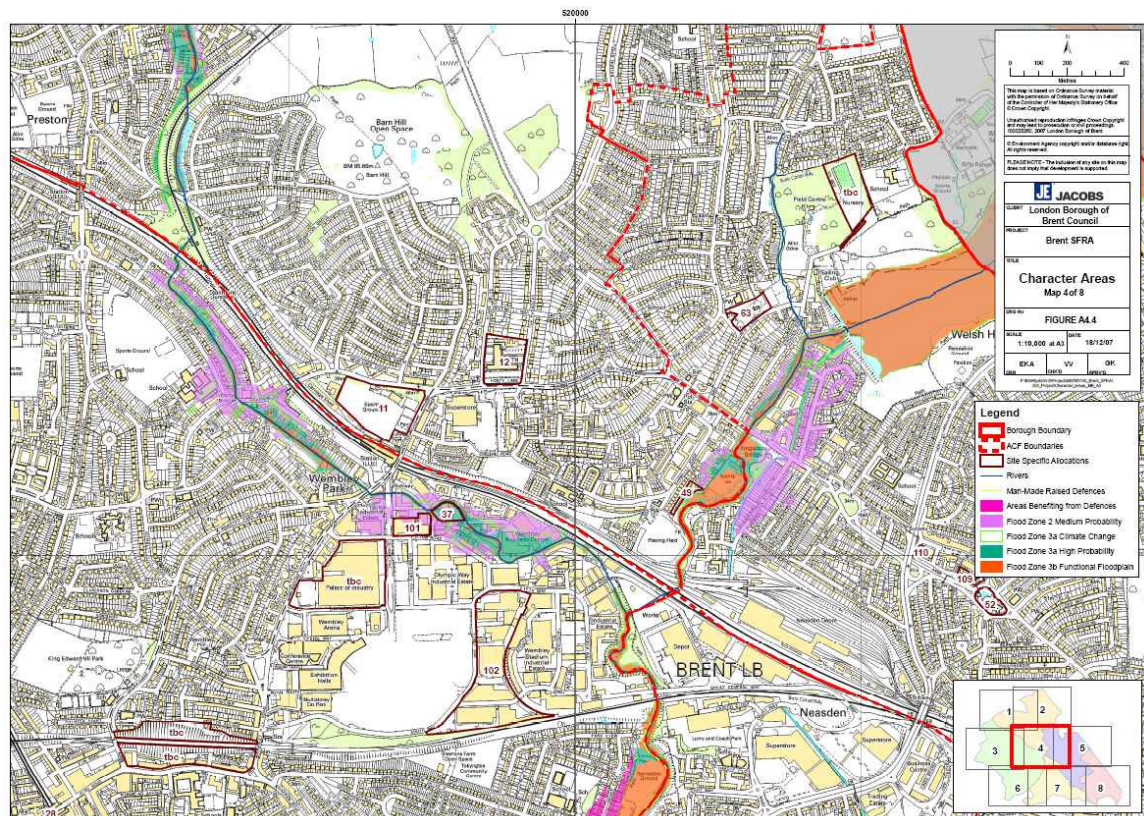
Note: Series of three 1:25,000 maps at A1 scale covering Dacorum which show flood zones, major groundwater and surface water flooding, area of residual risk and PPS25 development / vulnerability information

Plate 6.22 Greater Manchester SFRA - Example of flood zone mapping



Note: Series of detailed flood risk maps showing key flood zones, areas historical flooding, details of flood sources, details of datasets used (including limitations) and flood assessment guidance

Plate 6.23 London Borough of Brent SFRA - Example of flood zone mapping



Note: Series of eight 1:10,000 maps at A3 scale cover Brent which show flood zones (with/without climate) and key development zones

Although the final mapping of many SFRA reports is variable in content and quality, it is important to note that SFRA map outputs/layers are now almost universally produced in a digital GIS format. However, access to and/or use of these layers is typically only available for the planning and development control teams within the local authority concerned.

The review also highlighted that some local authorities have yet to resolve technical limitations of their internet sites (including hosting of static PDF files), and the outputs of SFRA's can only be obtained on CD when requested.

In other cases, local authorities have not placed digital copies of documents and maps on the internet due to a concern that the strategic information may be taken out of context by individual householders and cause unnecessary concern to members of the public. In these instances the outputs are generally available to those who request them, but only following a discussion/meeting with a local authority planning officer.

7. Assessing the influence of SFRA upon spatial planning and development control

The following section considers how the outputs of SFRA studies have been used to influence the spatial planning and development control decision making process. This discussion adopts a number of key themes, namely: (a) SFRA and effective spatial planning; (b) Effective decision making and the PPS25 sequential test; (c) Key barriers and limitations; and (d) Improving knowledge and understanding. The discussion is structured using the questions outlined in Section 5 and provides the setting for the recommendations provided in Section 9.

7.1 SFRA and effective spatial planning

Influencing the development of Local Development Frameworks (LDFs)

All of the local authorities contacted have stated that their SFRA will be used to influence the development of their primary LDF core strategy. However the degree of this influence will depend crucially on the timing and content of the Level 1 SFRA study and potentially in terms of key development sites the timing and availability of Level 2 SFRA outputs (i.e. depth and hazard map outputs). These issues are discussed in detail below.

Horsham was one of the first local authorities in the country to complete its core LDF strategy. However, this strategy was completed prior to the introduction of the PPS25 policy and triggered the requirement of a SFRA study by the authority. The undertaking of the study has subsequently led to amendments to a number of previously allocated sites within the established core strategy. This example highlights the importance of undertaking an SFRA study at an earlier stage of the LDF development cycle.

The importance of timing can also be illustrated in the authorities involved in the Greater Manchester Sub Region SFRA. At the time of writing this report, Bury, Bolton and Trafford had all produced their preferred options report, while other local authorities (including Wigan) were still developing their issues and options stages of their core strategy production. These differences in LDF progress will influence the use of the SFRA within individual areas of the Greater Manchester sub-region.

The reviews undertaken in this study have shown that existing preliminary sequential testing has been undertaken for sites included in existing LP/UDP policies or draft allocation sites, with few authorities currently progressed as far as undertaking formal sequential testing of development sites for their final Local Development Framework.

Although this is the case for most authorities, the reviews have shown that the existing SFRA have helped to refine / remove potentially unsuitable sites from the initial allocation process. Some example comments include:

The SFRA will influence the core strategy and is demonstrated by removal of some sites from the recent Housing Land Availability Assessment (HLAA) Study on flood risk grounds (Dacorum Council)

The SFRA will probably sound the “death knell” for some previously allocated sites (Eastbourne Council)

Planners at Hull, Preston and Sheffield council also stated their SFRAs would be an important evidence document which would influence their core strategy and the final land allocations included in the Local Development Document.

It should also be noted that some local authorities and Environment Agency officers were concerned about the absence of Regional Flood Risk Appraisals (RFRAs) in some regions. This is typically because RFRA studies are generally only undertaken once the RSS has been considered to be sound. This anomaly could mean that the RSS may include areas for development which are not appropriate for major growth because of the risk of flooding.

A number of Environment Agency staff also expressed concern that some planners are not sufficiently engaged in the use and future update of their SFRAs. This was reflected in a number of comments which stated that some local authorities relied too heavily on the Environment Agency or their consultants for information. This was highlighted by some local authorities asking the Environment Agency for information which was actually contained in the Council’s own SFRA. These experiences highlight the need for increased communication of the wider benefits and purposes of existing SFRA studies. This issue is addressed fully in Section 8.

Influence of flood issues within LDF Sustainability Appraisals

All of the planners interviewed acknowledged that flood considerations are or would be included in the LDF sustainability appraisal process. However the interviews also highlighted concern of the difficulty of developing a balanced Sustainability Appraisal (SA) / LDF, which gives equal weight to flood risk issues alongside a list of other planning considerations, while at the same time using the outputs of the SFRA to undertake a truly transparent application of the PPS25 sequential approach. These two objectives can sometimes be divergent and have led to some examples of tension between individual local authorities and the Environment Agency.

Although these concerns exist, some of the LA planners interviewed have highlighted that flood risk is an issue which has been given due consideration in the SA process. As an example, Eastbourne Borough Council stated that flood risk was considered a primary consideration in the SA process and the core strategy will be framed around whether development control is acceptable on flood risk grounds. Adur & Worthing also acknowledged that the flood risk will have a high priority and that they may need to consider some formal weighting of flood risk against other sustainable development objectives.

The interviews conducted in this study also revealed that flood risk issues are typically not given additional weight in the SA process. This was typically to ensure that all issues were given equal consideration and therefore objective. Although this is the current position, the DCLG Sustainability Appraisal Guide does state that weighting and scoring can be assigned to individual issues in order to clarify the decision-making process (DCLG, 2005, p127). Clarification on the potential use of weights within the SA process would be helpful in future versions of the PPS25 practice guide.

The comments received in both Stage 1 and 2 of this study have also shown that local authorities would also like more guidance on integrating the flood risk sequential testing process with other key development factors as part of developing the core strategy, and then how best to test the Core Strategy objectives (inclusive of flood risk) against the SA objectives.

7.2 Effective decision making and the PPS25 sequential test

Most of the interviews conducted in this study have shown that the outputs of SFRA studies are being actively used to support a range of spatial planning and development control processes. This was particularly evident for local authorities which had experienced recent flooding and/or for which risks are likely to increase due to climate change. Examples include Eastbourne and Wealden, Hull, Suffolk and Waveney and York SFRAs.

Many local authorities indicated that the SFRA had helped to deal with complex planning issues by providing evidence to assist with the sequential approach and indicate where development can be promoted safely in areas at low flood risk.

The production of flood risk profiles (including a statement of relative flood risks, risk maps and planning guidance) for individual or groups of sites was considered to be a particularly valuable source of primary information. Examples of these forms of outputs for the London Boroughs of Brent and Havering are shown in Plates 7.1 to 7.2.

Plate 7.1 Havering SFRA – Sample development and flood risk profile

A.2.9 SSA11: Beam Park				
Type: London Riverside	OS NGR: TQ 505 829	Area: 11.6 ha	Brown/Greenfield: Brownfield	
Proposed use: Mixed use (residential and ancillary education, community, leisure, recreation and retail)				
Flood risk vulnerability classification (PPS25 Table D2): More vulnerable, less vulnerable				
% of site in each Flood Zone:	Flood Zone 3b: 2%	Flood Zone 3a: 93%	Flood Zone 2: 1%	Flood Zone 1: 4%
Exception test required? Yes, for more vulnerable land uses				
Flood Zone Map: <p>© Crown copyright 2007. All rights reserved. Licence number 100024327.</p>				
Fluvial flood risk : <p>© Crown copyright 2007. All rights reserved. Licence number 100024327.</p>				
Tidal flood risk: The area is within the tidal Flood Zone 3a.				

Other sources of flood risk: Low

Flood defences:

- Defended against high levels in the River Beam caused by tide-locking by the Beam Washlands. Approximate standard of protection: 4% annual probability (1 in 25 year event).
- Defended against extreme tide levels in the River Thames. Approximate standard of protection: 0.1% AEP (1 in 1000 year event)

Residual risk:

Fluvial – High - residual risk at annual probabilities >4%, or if the Beam Washlands fails to operate as designed.

Tidal – High – Most of the site is at high residual risk from failure of the Beam Sluice under the 0.5% annual probability scenario and above (see Map 7),

Time to inundation: < 0.5 hours. Part of the site is within the Rapid Inundation Zone.

Depths: 0 - 1.1m (see Maps B1-B4 and below)

Maximum water level: 2.71 mAOD

UK flood hazard index: 0 - 1.9 (Low to Significant) (see Maps B5-B8)



Effect of climate change: Increased river flows and increased frequency and duration of tide locking of the River Beam are likely to increase fluvial flood risk and tidal residual risk in the future.

Requirements for a Flood Risk Assessment:

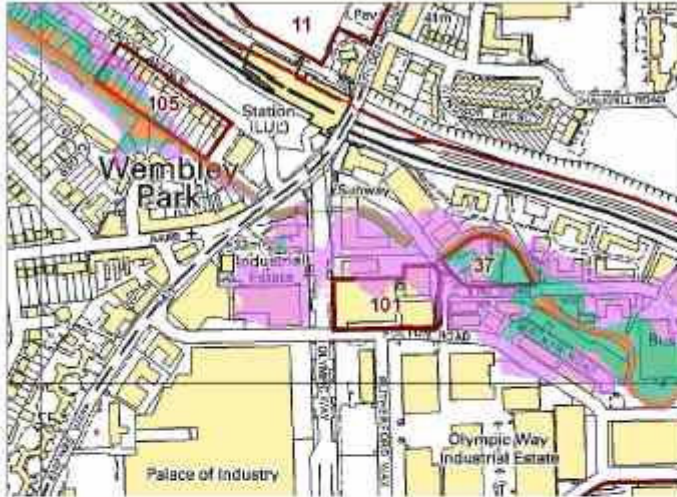
The developer should carry out an FRA suitable for a site in Flood Zone 3a as described in Section 10.4 of the main report. Particular issues to consider at this site include:

- River levels from fluvial flooding in the River Beam
 - Use the Beam and Ingrebourne Marshes West model to examine actual and residual water levels from extreme events in the River Beam.
 - Consider the effect of climate change over the next 100 years on river flows and tide-locking and the effectiveness of the Beam Washlands.
- Leave a buffer of 8m or covering Flood Zone 3b (whichever is greater) along the River Beam.
- Aim to improve river form and habitat.
- Tidal flooding – assess the residual risk from a breach at the Beam Sluice, now and in 100 years.

Plate 7.2 Brent SFRA – Sample development and flood risk profile



SSA 101 – Shubette House



Key:	Site Specific Allocation	Medium Probability Zone 2	High Probability Zone 3a	Climate Change Zone 3a	Functional Floodplain Zone 3b

Site Information

Proposed Land Use:	Mixed use development including residential, hotel, office, workspace and leisure and food and drink.
PPS25 Vulnerability Classification:	Mixed uses vary from Less Vulnerable (i.e., Offices) to More Vulnerable (i.e., Residential)
Sequential Test:	Site appears to be suitable for intended use.
Area of Site (Ha):	n.Bg

Overview of Flood Risks

- Majority of the Site appears to be in Low and Medium Probability Zones.
- Source of Flooding - Wealdstone Brook
- Some areas in the margins to the north may lie in Zone 3a.

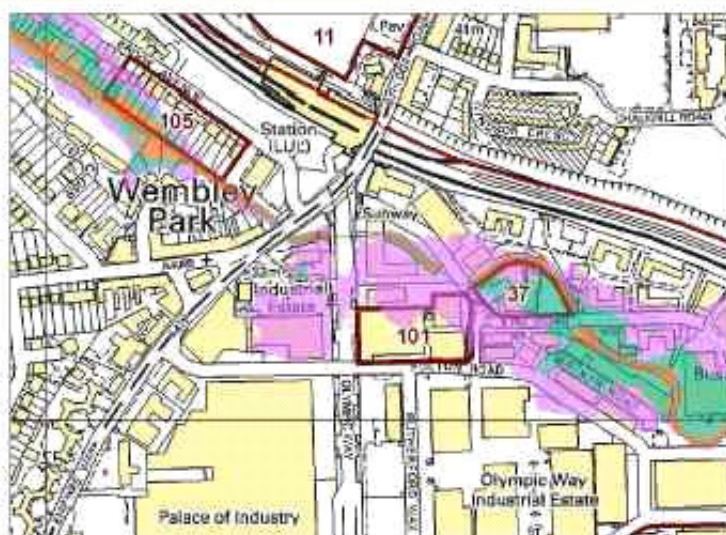
Planning Issues






- The Site appears suitable for intended use.
- A buffer zone between top of the bank and the development should be allowed. The Environment Agency would normally require an 8m wide strip.
- Encroachment into functional flood plain should not be allowed.

Flood Risk Assessment Requirements

- Developers should submit a site specific flood risk assessment which includes following:
- Flood Risk should be minimised at the design stage ensuring that the proposed layout and form does not include any buildings or structures within identified high risk areas.
 - Threshold floor levels should be above predicted 1 in 100 year flood levels plus an allowance for climate change.
 - SUDS should be required to limit runoff to that of undeveloped and natural land.
 - Overland flow paths should not be obstructed by buildings.
 - Flood storage should not be displaced nor runoff increased.
 - Safe dry access and egress should be provided.

SSA 101 – Shubette House



Key:					
	Site Specific Allocation	Medium Probability Zone 1	High Probability Zone 3a	Climate Change Zone 3c	Functional Floodplain Zone 3b

Site Information

<i>Proposed Land Use:</i>	Mixed use development including residential, hotel, office, workspace and leisure and food and drink.
<i>PPS25 Vulnerability Classification:</i>	Mixed uses vary from Less Vulnerable (i.e., Offices) to More Vulnerable (i.e., Residential)
<i>Sequential Test:</i>	Site appears to be suitable for intended use.
<i>Area of Site (Ha):</i>	0.89

Overview of Flood Risks

- Majority of the Site appears to be in Low and Medium Probability Zones.
- Source of Flooding – Wealdstone Brook
- Some areas in the margins to the north may lie in Zone 3a.

Planning Issues

- The Site appears suitable for intended use.
- A buffer zone between top of the bank and the development should be allowed. The Environment Agency would normally require an 8m wide strip.
- Encroachment into functional flood plain should not be allowed.

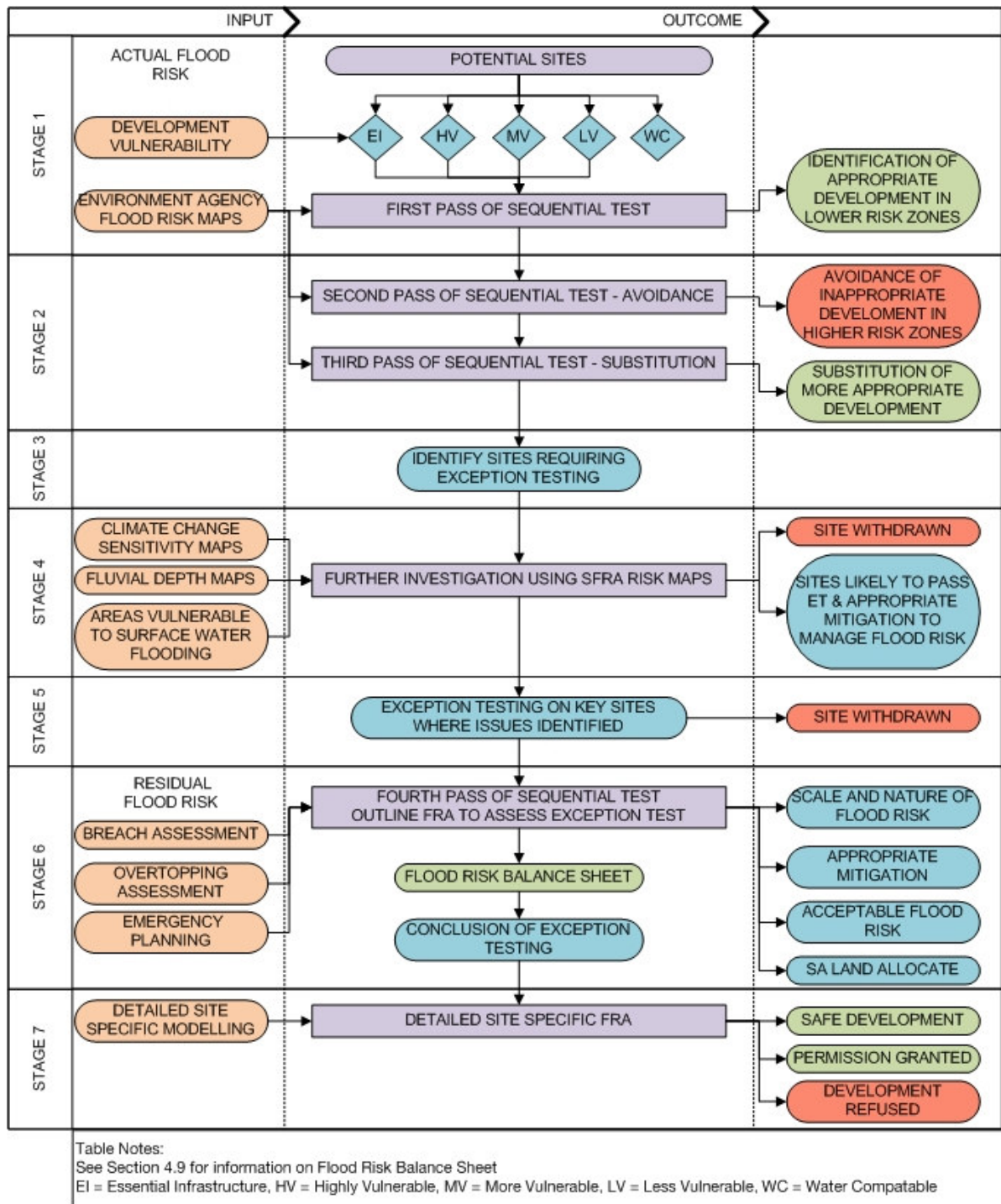
Flood Risk Assessment Requirements

Developers should submit a site specific flood risk assessment which includes following:

- Flood Risk should be minimised at the design stage ensuring that the proposed layout and form does not include any buildings or structures within identified high risk areas.
- Threshold floor levels should be above predicted 2 in 100 year flood levels plus an allowance for climate change.
- SUDS should be required to limit runoff to that of undeveloped and natural land.
- Overland flow paths should not be obstructed by buildings.
- Flood storage should not be displaced nor runoff increased.
- Safe dry access and egress should be provided.

In addition to the development of planning focused risk assessment profiles, a number of SFRAs have also included specific guidance to supplement the PPS25 Practice Guide and provide planners with a structured route for implementation of the PPS25 sequential and exception tests. An example from the Calder Valley SFRA is shown in Plate 7.3.

Plate 7.3 Calder Valley SFRA – Hierarchical guide to help planners



The interview with a York City planner indicated that the SFRA has definitely helped in creating improved planning decisions and their planners placed considerable importance on the evidence base in the development of the LDF Core Strategy. In addition, the council indicated that the SFRA document had been invaluable when used as a constraint document to help indicate where development should not be placed. Hull also indicated that the SFRA was very useful in this respect and whilst it has not produced its Allocations DPD yet, housing bids have been sought from

developers and some of these have been ruled out due to their location to the identified functional floodplain.

In other situations, some councils (such as Hounslow and Isle of Wight) have followed their SFRA to the letter when undertaking PPS25 sequential testing. This resulted in the deletion of some allocations, alterations to the vulnerability classifications for development on some, and helped guide developers to avoid flood risk. Many rural authorities are able to complete a basic level 1 SFRA and elect to delete sites from flood risk areas.

The London Borough of Brent has also acknowledged that the development of a common language in their SFRA (including terminology and map outputs), had helped to improve communication with the Environment Agency. This was principally by enabling the development control staff to provide a more consistent approach including standard wording for required planning conditions.

However this view was not expressed by some Environment Agency practitioners who stated that for some SFRAs it had been difficult to glean specific information because of the reporting style and content etc. An outline SFRA template was therefore suggested for future SFRA updates to enable users to quickly identify and access specific sections to provide specific information, for specific users and uses.

Charnwood Council also highlighted that development control teams in particular, tend to “dive” straight in to the SFRA maps for reference, in preference to reading the text in the document. As a consequence, the quality of the mapping outputs and guidance provided on the maps were particularly important to this individual council.

Although these are positive examples, a number of Environment Agency planning officers still expressed concern that some local authorities were simply wanting to “tick the box” when it came to undertaking an SFRA study, and that the Sequential Test was not being applied as originally intended. It was also noted that these authorities tended to have inadequate documentation to demonstrate that sites had been assessed using a risk based precautionary approach as required by PPS25.

These observations suggest that greater clarity is required on the ability of the Environment Agency to seek evidence of the Sequential Test process being carried out in an open and transparent way as part of its new overview role; as opposed to simply seeking confirmation that it has been done. This remit could include clarifying a number of aspects including the area of search and the degree of transparency etc; and then communicating these important issues to practitioners with advice as needed.

Most of the SFRAs reviewed also provide guidance to developers on undertaking flood risk assessments, design standards and use of SuDs etc. in support of information contained in PPS25 and the Practice Guide. Some of the SFRAs reviewed also included additional guidance for developers and for communities on flood warnings and evacuation.

Although this type of information is present in many SFRA studies, many of the planners interviewed stated that the use of studies by developers and/or members

of communities were generally limited. With all SFRA, clear aims and objectives for communicating with stakeholders need to be established early in the process. This evidence suggests that additional efforts need to be made to communicate the benefits of SFRA outputs, particularly to the house building industry and to private sector planners. Further thought is required on how better to communicate with these stakeholders following the production of the SFRA and then guidance should be provided to practitioners. This issue is discussed later in Section 7.4.

7.3 Key barriers and limitations

The interviews conducted in this study have also identified a number of current barriers which limit the full use of SFRA information within the spatial planning system, especially with respect to the implementation of the PPS25 Sequential and Exception Tests. These barriers include inadequate surface water, groundwater and sewer flooding risk information, inappropriate use of SFRA outputs and the influence of other development pressures. These issues are discussed in detail in the remainder of this section.

Limited consideration of other sources of flooding

As shown in Section 5, the functional floodplain is defined for fluvial and tidal flood risk but more limited for flooding from other sources (i.e. surface water, pluvial, sewer, groundwater, canals etc.). Links to the need for current and future green infrastructure and over ground flood flow routes were also a limited consideration of many studies. The absence of “other sources” information means that the relative importance and weighting of these mechanisms in respect of other constraints/opportunities also tends to be poorly considered in many examples of delivering the risk based sequential approach.

The reviews conducted highlighted no specific examples of surface water, sewer and groundwater flooding being clearly identified and evaluated within the spatial planning process. Many LDFs are in their early stages (Issues and Options), and the need to influence these and subsequent stages is becoming increasingly urgent so as not to miss the window of opportunity.

Practitioners therefore require further information and advice on how to seek/identify and map integrated functional floodplain for all sources and for this to be recognised as a sustainability requirement by LAs in LDFs, along with green and integrated infrastructure. Further thought and consideration is also needed regarding magnitude of flood events for other sources, modelling and mapping integrated functional floodplain and green infrastructure. Consistent advice on these issues should be provided to practitioners.

Similarly, the consideration of integrated management of surface water, sewers and groundwater flooding, including long-term infrastructure investment by key stakeholders is not covered in most SFRA. There is still much work to do in helping Councils, the Environment Agency, water companies and IDBs etc. to join together and seek integrated solutions to flood risk and infrastructure investment issues. SFRA generally lack the appropriate consideration of strategic thinking for

combined infrastructure solutions. Sharing of data and information is very important and in addition to the SFRA, water cycle strategies have a key role to play.

A number of councils indicated that their SFRA would influence their own flood and drainage investment plans and it is suspected that this may not generally be the case for other stakeholders. An example of good practice in this area is the recent work undertaken by Hull City Council. Extensive flooding during the summer of 2007, much of which was due to surface water, sewers and groundwater, is a major feature of the SFRA. This has driven the need for Yorkshire Water, Hull City Council and the Environment Agency to work together on a long-term infrastructure and investment strategy overseen by a formal “Integrated Strategic Flood management Partnership”. This form of partnership working is clearly a key feature of emerging surface water management plans (SWMPs) and should be encouraged as a model for stakeholders to follow for the future management of local flood risk issues

Inappropriate use of SFRA outputs

A number of authorities (including Preston City Council) have highlighted the tendency for some consultants and developers to misinterpret the results of the SFRA to avoid the need for a site specific FRA. This was particularly true when considering future climate change impacts upon the extent of currently defined flood zones. In addition, Hull City Council stated that whilst planners and developers are reasonably familiar with the SFRA, this was not the case for housing professionals. The Agency has also highlighted that at least one Authority had commissioned breach modelling and then used it selectively because the results were detrimental to some of its preferred allocation sites.

The reviews have also indicated that there are different interpretations of how and which primary data sources (i.e. SFRA map/documents or the latest Environment Agency Flood Zone map), should be used by local authority planners to determine the suitability of individual development sites. These issues were highlighted by a number of authorities including Charnwood, Dacorum, Darlington and Leeds. As a consequence, there is a need for greater clarification on the use of the SFRA flood maps, especially when used in conjunction with the Environment Agency’s Standing Advice covering flood risks.

A number of authorities contacted also commented on specific data and advice gaps in their own SFRA. This ultimately made it difficult to effectively implement the Sequential Test for currently identified development sites. These authorities acknowledged that further information (in terms of detailed flood risk assessments), would be required at later stages of the planning process to make final development decisions.

The interview conducted with Sheffield City Council indicated that there is still some confusion regarding SFRA, on who should do what and by when; and they have produced internal guidance to help deliver a consistent approach, particularly in respect of implementing the Sequential Test.

Flood risk and other development pressures

A number of people interviewed (notably planners in the Environment Agency) stated that they would welcome greater clarification of the standing of SFRA information and the PPS25 sequential testing, in relation to wider planning and sustainable development objectives.

This was clearly communicated by one Environment Agency respondent who stated that *“it would be useful to be certain which economic, social or environmental issues should ‘trump’ others”*.

This issue was illustrated by an example of whether the redevelopment of a recently vacated employment use in Flood Zone 3 to create jobs and boost the local economy, was a sufficient reason to overcome the concerns that the site was at serious risk of flooding. This example highlights the not uncommon conflict between flood risk management concerns and opposing drivers for development due to social and economic needs. This conflict has been reflected in confusion in the implementation of the PPS25 Sequential and Exception Tests. The interviews conducted in this study suggest that further clarification and guidance is needed in relation to this issue.

Assessing windfall sites

Comments received from Environment Agency staff also highlighted that application of the PPS25 Sequential Test to windfall sites is generally less successful. It was suggested that more guidance should be provided for land owners with regard to windfall sites and the Sequential Test; since small developers tend not to have alternative sites from which they can select one which is less likely to flood. Indeed most of the appeals against the Sequential Test are for schemes of up to two homes rather than larger developments. It is becoming important that the SFRA defines how the Sequential Test should operate in these instances, providing guidance on how large the area of search is for example.

7.4 Improving knowledge and understanding

Additional training and support

The interviews conducted in this study have shown that most SFRA studies consisted of the delivery of a technical report and in most cases a formal end of project meeting to present the key results of the study. The interviews highlighted that only a small number of authorities had funded additional training sessions and meetings, to help internal understanding and external communication of the outputs of the SFRA process.

An example of good practice was the Dacorum SFRA. In this study, Environment Agency staff and consultants provided face-to-face seminars to help communicate

the results of the SFRA. This was considered a very valuable way of enhancing knowledge and understanding of the results of the study and appropriate methods for using the SFRA information to support sequential based testing.

An additional example of good practice was the Selby SFRA. In this study, the external consultants appointed for the study ran a half day interactive workshop with exercises for participants to ensure they fully appreciated the content and the implications of the SFRA. This approach was also considered very beneficial for planners working in the council

Producing supplemental advice and guidance

The degree to which the development of an SFRA has led to the development of further guidance has depended largely on the stage of plan preparation within the Authority and the risk of flooding within the area. As shown in Plate 7.1 and 7.2, outputs produced from SFRA are being actively used to support broad sequential testing of the suitability of sites, and being used to inform the development of policies in the Core Strategy and specific Area Action Plans.

Some LAs interviewed have also considered developing their own version of Standing Advice to assist their planners and development control officers as part of the Level 2 SFRA. This initiative needs to be considered carefully by the Environment Agency as to the potential synergies /impacts in respect of their National Standing Advice and then practitioners advised accordingly.

Hull Council has worked with the Environment Agency to develop a local matrix, similar in substance to the National Standing Advice. This matrix identifies the sites and circumstances where the Council needs to make decisions about the appropriateness of development; as well as when it needs to refer the proposal to the Environment Agency. This has given planners more responsibility for the interface between land use development and flood risk management within their area

Only a handful of the councils interviewed (including London Borough of Brent and Isle of Wight Council), stated that they would create a flood related Supplementary Planning Document (SPD) following the creation of a SFRA study. Castle Point Council are currently developing supplementary planning guidance (SPG) on flood risk assessment but need further advice from the outputs of the water cycle study, particularly with respect to surface water. Sheffield Council indicated that it was unlikely that separate SPG is needed as all the relevant information is contained within their SFRA.

However, a number of respondents (including Darlington) stated that they would produce a wider SPD covering sustainability design issues. The review also showed that Hull is in the process of producing a Sustainable Development SPG which incorporates flood risk. The view of Hull City Council is that their approach is more efficient and effective at getting the flood risk issues integrated into planning decisions than having a separate flood risk SPG, because of the integrated nature of sustainable development.

In terms of advice for climate change, a majority of the SFRAAs have also provided guidance for the consideration of climate change in detailed flood risk assessments. This information was largely based on PPS25. Other councils (including Ipswich and Hull) have included specific policies on recommended minimum floor levels and safe access etc. Section 6 of this report identified the inconsistent approach to climate change considerations in SFRAAs as an issue that needs future action.

Interviews conducted with Environment Agency staff also highlighted specific concerns about the approaches which some local authorities are taking to proposed basement conversions and highly vulnerable developments located in high risk areas. This was particularly evident in London, where there have been increases in the number of planning permissions which have been granted for basement conversion, against a sustained objection from the Environment Agency. Unfortunately due to the individual nature of these developments, they are not being reported in the existing High Level Target 5 monitoring process. Specific guidance and advice on this important issue was requested by Environment Agency practitioners to enable consistent use of SFRAAs to help determine the suitability of development sites.

Many of the messages highlighted in this section indicate that there is a need to continue raising awareness and communicating key messages and outputs of SFRAAs within the planning community; related recommendations are provided in Section 10.

8 Assessing the long term contribution of SFRA documents

From the interviews conducted in the study, the project team have also considered the long term role of SFRA studies in helping to (a) delivery of long term benefits and cost savings; (b) improve links between organisations; (c) providing a robust and accessible repository of flood risk information; (d) enabling data sharing and (e) improving the monitoring of flood risk for new development. The topics are considered in the remainder of the following section and contribute to the development of the study recommendations outlined in Section 9.

8.1 Delivery of long term benefits and cost savings

The majority of councils interviewed in the study indicated that the development of the SFRA had led to the introduction of a hierarchical approach to risk assessment which had added value and ultimately reduced costs.

Some examples of the benefits stated by the planners are given below:

- Helped support effective site selection
- Increase the understanding and awareness of flood risk by planners and developers
- Helped confirm the acceptability of development types
- Acted as a driver for developing spatial options
- Helped enhance communication and dialogue with the Environment Agency (most authorities reviewed)
- Was essential to allow elected members to understand the reasoning behind why flood risk is such an important issue, and support officer recommendations
- Helped develop relationships with other stakeholders
- Helped improve the consistency of advice provided to professional bodies and members of the public
- Helped improve the assessment of potential mitigation strategies (i.e. flood proofing and resilience)
- Helped improve the understanding of the potential risks of flooding under future climate change pressures

A majority of these benefits were expressed by planners who had experienced major flooding in recent years and/or were concerned about the likely impact of climate change upon future flood risks. For councils with a limited history of flooding or perceptions that flooding was a low priority issue, the comments regarding the benefits of developing an SFRA were more muted. This included comments regarding the expense of producing a SFRA document; the limited value which the exercise had provided and the limited influence which the documents would have upon the overall core strategy development.

A number of positive comments regarding the value of the SFRA process are provided below.

Sheffield City Council stated that the SFRA was a valuable exercise, providing a much better understanding of flood risk issues and had helped strengthen relationships with the Environment Agency. It was also noted that the SFRA now provide a good evidence base for decision making and will reduce flood risk and inappropriate development.

Hull City Council stated that the SFRA had reduced costs to developers because they did not have to go through similar and duplicate evidence gathering and thought processes as they just use the guidance in the SFRA. In addition, staff time had been reduced when considering planning applications as they all used a common set of criteria for acceptable and unacceptable development and hence do not duplicate effort. This would ultimately lead to efficiency savings but these could not be easily quantified.

8.2 Enhancing stakeholder engagement and relationships

In addition to the internal benefits delivered by SFRA studies, the also interviews conducted also highlighted the important role of the studies in helping develop and/or improve stakeholder relationships and engagement.

Almost all of the Local Authority and Environment Agency practitioners interviewed stated that relationships between key stakeholders had improved as a result of the creation of the SFRA. This improvement was particularly evident in the relationships between Local Authorities, the Environment Agency and selected Water Companies.

For example, York Council felt that the SFRA process had enhanced their relationship with the Environment Agency going generally from ad-hoc liaison arrangements mainly about individual planning applications to more structured contact about wider strategic planning and flood risk issues. This view was supported by a number of other comments collated during the interviews.

As an example of good practice, Sheffield Council and Sedgemoor Council have also produced a signed protocol with the Environment Agency to ensure close and timely working together on future SFRA updates. One Environment Agency officer also called for a National protocol to be produced between the Environment Agency and the LGA which would support the development of future SFRA studies.

Some of the local authority planners interviewed stated that whilst the production of PPS25 and the SFRA process had helped in this respect, recent flood experience (especially Summer 2007) had contributed significantly to changing Councillors and Chief Executives views and subsequent actions relating to flood risk management. For example, Hull City Council's SFRA has been seen by the Cabinet, Environment & Transport and Scrutiny Committees and its contents (including policy recommendations) are now fully adopted by the Council. This level of support enables the SFRA to provide considerable influence in many areas of decision

making within the City Council. Adur Council communicated their SFRA to Members via a Members Bulletin.

A further good example of active consultation was Chiltern SFRA. In this study, workshops were held between technical officers of Chiltern DC, South Bucks DC and the Environment Agency; a questionnaire was sent to all town and parish councils for information on flooding events and there was also further consultation with Bucks CC highways, Thames Water and The Environment Agency.

The interviews have also indicated that most SFRA have not generally been subjected to a wider consultation process at the end of the study. This is because most councils believe that wider community/stakeholder based consultation is best undertaken when the full LDF evidence base has been developed rather than undertaken for a specific issue such as flooding.

Although relationship was a key positive message noted in the interviews, many of the local authorities stated that they believed there was still a need for a sustained effort to communicating core SFRA messages to other stakeholders such as developers and private sector planners. This included raising awareness of the outputs of SFRA studies and effective communication of the levels of risk within different geographical areas.

8.3 Accessibility and currency of flood risk information

Accessibility of SFRA information

Most of the SFRA reviewed are publicly accessible via local authority websites. However this was not universal and a limited number of authorities are still only able or willing to provide hardcopy (at cost) SFRA documents.

Where information is on the internet, experience of accessing these sites has shown that the organisation of outputs is highly variable, with some of the documents easy to find and use and others located in obscure areas of local authority websites. One of the main criticisms of SFRA data provided on most of the council's website is that reports and maps are provided as a series of individual downloadable links with limited description of the content of the files. This common structure greatly increases the time needed to access specific information (especially map outputs). Improved management and access to these files is an area which should enable improved access to the outputs generated from individual SFRA studies.

A good example of a structured collection of SFRA documents is the dedicated website established for the South Essex SFRA (<http://floodrisk.tgessex.co.uk>). This site provides background information to the development of the SFRA, structured planning guidance for use of the sequential test and links to key report/figure outputs.

A number of councils including Adur & Worthing indicated that whilst their SFRA were live, they had not placed the documents and maps on the web due to concerns that the information might be used out of context by members of the public. They also felt that as strategic documents, the SFRA needed to be explained and not simply taken at face value.

This issue was also important for Lancaster Council who has placed the main SFRA document on the web but not the accompanying detailed maps. This was primarily due to the detailed scale of mapping used and desire to ensure that the risks to specific areas were communicated correctly to potential developers and existing residents.

In contrast, interviews with a number of Local Authority and Environment Agency staff have highlighted that making SFRA outputs publicly available has been critical to improving their effective use. This has been particularly important for prospective developers who can now access information for many areas and thereby understand the risk implications of a potential at land purchase and site consideration stage.

Update and currency of the SFRA information

Most of the respondents interviewed stated that they would review, update and reissue the SFRA on a regular basis rather than amending the existing one. However update periods varied enormously, with one council stating that they had a living SFRA which would be reviewed in 6-10 years, while other councils specified an annual review of the information to ensure the suitability of the information for development purposes.

However, only a limited number of councils reviewed (including Adur and Worthing; Arun; Sheffield City Council & Lancaster District SFRA) made clear statements on the steps which would trigger an update of the review. The most common reasons given were: updates of baseline data; changes in the Environment Agency data models and/or unforeseen amendments to the current PPS25 process. However, most of the councils reviewed appreciate the need to be more specific about criteria and issues that will trigger a review of the SFRA.

It is also worth noting that one council (Adur & Worthing) have agreed to hold an annual meeting with the Environment Agency to discuss new datasets, models or development changes which would justify a major update of the SFRA outputs. Others have already approached the Agency for data and support in updating the SFRA. In addition, some councils have retained their consultants to undertake a review of the SFRA at the end of the first year.

A number of Environment Agency staff interviewed were also concerned that local authorities would not update their SFRA, especially in terms of any possible changes in the Environment Agency's flood risk maps. It is therefore important that the need for regular update of a SFRA is communicated directly to local authority planning departments. This will help ensure that inappropriate development does not occur in the future.

8.4 Data creation and sharing

The interviews undertaken in the study have highlighted that there is no systematic approach to data sharing / use of the results of the mapping and modelling undertaken within the SFRA with the Environment Agency regional or national mapping functions. This was highlighted by a number of the councils interviewed and is surprising given the benefits of data generated in the course of developing the SFRA studies. This is particularly true for new depth, flow and velocity datasets generated for Level 2 SFRA studies. Examples were shown earlier in Section 6.

There are examples of good practice, such as the dovetailing of the Hull and East Riding SFRAs, and occasions where the Agency and the LPA have jointly commissioned modelling to inform flood risk within a particular area but in general data sharing could be improved. Similarly Bury BC (Greater Manchester Sub regional SFRA) has held recent discussions with the Environment Agency regarding a commitment to use SFRA mapping outputs to update their future data sets.

As outlined in Section 6, some individual SFRAs (i.e. the Adur & Worthing SFRA) have produced specific data management system and management protocols to help manage existing and new datasets used in the SFRA; triggers for future update of the SFRA; and methods used to manage the SFRA process so that it remains current and suitable for informing land use planning decisions into the future. However, the further acquisition and supply of data and information is not always clear and further guidance was requested by a number of planners interviewed

In some regions, SFRA data received by the Environment Agency has been loaded onto a central database system. This was confirmed by comments received from two councils (Mid-Bedfordshire and the London Borough of Brent) who stated that some of the data collected during the SFRA had been provided to the Agency. However there will be a time delay whilst the data is checked and adopted by the EA and then loaded onto "What's in my backyard".

A number of Environment Agency staff interviewed also stated that consultants had been unwilling to provide data freely into the public domain and this has restricted the amount of data received by the Agency.

The reviews conducted also highlighted that none of the SFRAs documents included specific recommendations for the capture or recording the impacts of future flood events. This was an interesting observation and contrasted with the views of many of the local authority planners interviewed who accepted the need to improve the recording the impact upon people/assets during future flood events. However many planners felt this was a duty which the Environment Agency should perform rather than local authorities.

The lack of a consistent approach for capturing and/or sharing data is clearly a limitation of the current SFRA process and is an issue which should be addressed for future SFRA and related flood management studies.

8.5 Enhanced monitoring of flood risk issues

Councils are required to monitor the number of developments undertaken in areas of flood risk in their Annual Monitoring Review (AMR) statement. A number of respondents referred to this as well as the requirements of Defra High Level Target 5 to monitor planning applications granted in flood risk areas despite a sustained objection from the EA.

However the use of SFRA to support the assessment of local indicators is more limited. This was highlighted by our interview with the planning officer for the Environment Agency Thames Region, who reported that only one Local Authority in its area had used a flood risk indicator in its Local Area Agreement. Examples of authorities who have progressed further with the use of SFRA data for monitoring purposes are outlined below.

Planners at Darlington and Hull councils stated that the production of the SFRA helped to improve the production/consideration of this indicator based information. The planner at Hull also commented that it was in discussion with the Environment Agency regarding specific indicators resulting from the SFRA. Discussion with planners at Isle of Wight council also highlighted SFRA relied on the use of indicators in its final presentation through colour coded and ranked sites. This approach had helped to improve the usefulness of the final SFRA report.

Many of the other authorities contacted stated that the outputs of their SFRA should help in the generation of future monitoring data but had not taken this further at this stage. The regional appraisals will start introducing indicators over time and the whole life cycle of planning and whether risk is avoided or minimised can be measured.

9. Study findings

Using the information collated from the SFRA document reviews and subsequent interviews, **23 key findings** for the study were identified. The findings were based around 50 key issues and actions originally identified from the review exercises. The identification of these findings also forms the basis for recommendations provided in Section 10.

Development of the SFRA document

- Many of the local authority planners interviewed stated that the production of their SFRA study had been beneficial in improving the overall understanding of flood risk issues but also providing a centralised repository for detailed flood risk information for a particular area. A number of the interviewees also stated that the availability of SFRA would help avoid future duplication in data collection and analysis and thereby contribute to more efficient use of limited flood management resources.
- The production of many SFRA has helped to contribute to closer working relationships between many local authorities, the Environment Agency and in some cases Water Companies. A number of those interviewed stated that closer working relationships would help improve discussions regarding potential development sites and in some cases encourage data sharing between organisations.
- The reviews conducted have also highlighted the benefits of creating detailed data registers for SFRA studies, which clearly record the source, accuracy and confidence of datasets used. The development of these registers is also likely to aid the development of future SFRA updates and potentially the development of future SWMP and WCS studies.
- Although fluvial and tidal flood risks have been adequately assessed in most SFRA, the assessment of surface water and groundwater issues within many Level 1 SFRA studies has been relatively weak. This should be an area of focus for future SFRA updates and more detailed Level 2 studies. However this review has not established whether this would yield any benefits in spatial planning outcomes.
- A number of the Environment Agency staff interviewed raised concerns regarding the different approaches which have been used in some SFRA studies to sub-divide Flood Zones 3a and 3b. At present, this issue is only partially addressed in the PPS25 Practice Guide and has led to different interpretations of risk and application of the PPS25 Sequential Test across individual local authorities.
- The technical review of SFRA documents has shown that different approaches have been taken to evaluate the impacts of climate change upon future flood risk. In many cases, the approach has been a simple evaluation of sea level and flow estimates contained in Annex B of the

PPS25 planning policy. In others, climate change factors have been integrated into 1D/2D flood risk models to produce future flood risk outlines. However, different SFRA studies have tended to use different time horizons for climate change scenarios and this limits direct comparison between individual SFRA studies.

- Consideration and assessment of residual risk and risk to life issues in SFRA studies, including safe access and egress, vary and result in an inconsistent approach to determining safe and appropriate development. In some studies, Rapid Inundation Zones have been defined and used to identify areas where breach assessments may be required in detailed planning applications. Although this has value in Level 1 SFRAs, it is recommended that Velocity and depth indicators (typically produced for Level 2 SFRAs) should be used in preference to describe these risks. Also hazard assessments should apply to a wider area than the development allocations, so that the community impacts of flood inundation can be fully explored and also to demonstrate how the flood risk issues relating to proposed development would be managed through emergency planning and the work of the emergency services.
- The evidence presented in this report has shown that detailed map outputs (at 1:20,000 scale or better) have been particularly helpful in communicating the flood risks issues to different stakeholders. However, some Level 1 SFRAs have used coarse map scales and this has restricted the usefulness of the information presented.

Assessing the influence of SFRAs upon the spatial planning and development control process

- The reviews and interviews carried out in this project have highlighted the importance of undertaking SFRAs at an early stage of the LDF planning cycle and thereby providing adequate flood risk information for subsequent phases of the LDF process. A number of examples have shown that this early engagement has helped remove inappropriate sites from being allocated or ensured the consideration and adoption of effective flood management measures for individual development sites.
- The linking of FRM and spatial planning objectives to achieve integrated/combined strategic solutions to flood risk and land use issue is only being conducted in some SFRA studies and full potential is a long way from being realised. The reviews have also indicated that the information from only some SFRAs is feeding directly into the strategy and investment plans of the Environment Agency and other organisations.
- Although the production of SFRAs has helped to produce more consistent information to evaluate the suitability of new development, some practitioners remain confused about how the flood risk Sequential Test process should be integrated with development of the core strategy and how best to test the core strategy objectives (inclusive of flood risk) against Sustainability Appraisal objectives.

In particular, they need further information on (i) how the sequential approach/test should be integrated into the LDF core strategy; (ii) how wide and at what scale should the sequential search be undertaken; (iii) the various roles and responsibilities of the local authority, Environment Agency and Developers; (iv) how sustainable objectives for land allocations should be developed; and (v) the weight that is afforded to flood risk in the Sustainability Appraisal.

- The evidence collected in this report indicates that additional information needs to be provided in many SFRAs to aid the determination of safe or acceptable development. The PPS25 practice guide sets out the main considerations for safe development and SFRAs should apply this to local circumstances, and in doing so, consider the effectiveness and capability of structural and non structural flood risk management measures. Flood risk balance sheets should also be introduced to record how all the different attributes of flood risk are to be managed.
- Some local authority officers have highlighted variations in approaches to using existing and future (with climate change) floodplain areas and flow routes. There have been few examples of positive safeguarding of floodplain for flood management but rather a focus on getting Flood Zone 3b correct in urban areas. In addition, where functional floodplain has been determined, this primarily relates to fluvial and/or tidal sources. Surface water, pluvial, groundwater, sewers and canals are identified as functional floodplain in a limited number of studies, however wide scale adoption of this approach is limited by uncertainty of how to apply these non probabilistic mapping. The absence of flood risk information for “all sources” is therefore a limiting factor upon the wider PPS25 sequential risk based approach and sequential/exception test processes.
- To-date there has been limited use of detailed sewer and surface water datasets within SFRAs, with many practitioners leaving these considerations to the non-strategic site specific FRA stage. As a consequence, many practitioners remain confused about the detail of data collection and modelling which is required to effectively assess these issues. This lack of clarity may also be a factor which has limited the release of data sources from some water companies.
- The interviews conducted in the study have indicated that access to web based SFRA information (in most areas) has helped to increase the awareness of developers of the flood risks issues. The availability of this information should also help subsequent discussions between developers, the local authority, the Environment Agency regarding the suitability of some future development sites.

However, individual local authority planners have indicated the need for development of targeted guidance notes for developers. These notes would ideally set out the requirements for private and commercial developers

regarding the correct procedure(s) to adopt for the development of flood risk assessment in support of new development applications.

- With respect to SFRA, the use of CFMP information is relatively limited and few SFRA include CFMP policy units and policy considerations. CFMP policy options for relevant units are not often communicated and thereby the broader context for flood risk management for the area in question is not considered. Many planners and other practitioners are also unsure of the role and influence of CFMPs and associated mapping, policy outcomes and how the SFRA is a key document in the delivery of local FRM. It should be noted however that completion of all English CFMPs was only achieved in December 2008 and it is understandable that awareness of CFMPs and incorporation of their information is at an early stage at the time that LPAs were interviewed for this project.
- The timescale for production of RFRA has impacted on the ability for these studies to inform SFRA. Completion of SFRA ahead of RFRA has meant that the cascading approach to assessment (RFRA informing SFRA) has not been delivered as intended within PPS25. Whilst most English Regions now have a RFRA in place, most of the SFRA reviewed had little or no consideration of the RFRA findings. RFRA have the potential to influence and improve the standard of SFRA by signposting what issues are critical, where more comprehensive SFRA will be needed, where they should include adjoining authorities, need for SWMPs and introduction of monitoring indicators to be worked up in the SFRA.

Long term contribution of SFRA studies

- A majority of the local authorities in England have made the outputs of their SFRA study available via their website to stakeholders and the general public. However identifying and accessing SFRA documents on some individual websites can be difficult and improvement in data management would help improve the engagement and awareness of other key stakeholders, such as developers.
- Although the Environment Agency has been involved in many SFRA studies, the involvement of other stakeholders and production of stakeholder communication plans has been limited. This has not achieved an inclusive stakeholder engagement approach and the wider sharing of data and information in many studies. Clarity is essential as to whether this is engagement for the purposes of collating relevant data or a planning led consultation exercise on whether appropriate weight has been given to flood risk issues in the allocation of sites etc. These are two very different purposes and the review highlighted confusion on this point.
- The management of metadata, data, information and systems within SFRA is variable. In particular, there is no consistent and systematic approach to sharing mapping and modelling information undertaken as part of the SFRA, and then incorporating this into the Environment Agency updates of national flood risk datasets. Local authority planners and the Environment

Agency have highlighted that the sharing and subsequent use of digital outputs (including climate change and more detailed velocity and probability maps) from most SFRA studies has been limited. In addition, a number of local authority planners were unsure of the primary data source(s) which should be used to determine the suitability of individual planning applications. This was particularly true in locations where the Environment Agency's Flood Map had been altered since the creation of the SFRA.

- The evidence from the study has indicated that in most cases that SFRA outputs are being interpreted correctly by consultants working on behalf of developers. However, the evidence collected in this study suggests that the ability to locate and refer quickly to many specific topics/issues in SFRA documents is made difficult by inconsistent reporting formats, content and styles. This impacts on their effective usability, the re-use of data and greater consistency is needed.
- Local authorities have different views and perceptions of the benefits of SFRA studies and some planners need additional information on the purpose, advantages, range of uses and their non planning use. This includes information on sub-regional SFRA links; advice on what evidence exists and how it can be best used; the full implications of Pitt regarding the Environment Agency's strategic overview role; the new local authority role to lead on local flood risk management and surface water issues (including SWMPs), and generally more good practice information to supplement the PPS25 Practice Guide.
- In most cases, local authorities have not used SFRA outputs to help generate indicator based information for Sustainability Appraisal and to assess nationally agreed indicators as part of Annual Monitoring Report (AMR). Whilst Regional Flood Risk Appraisal indicators are beginning to emerge, there are currently no nationally agreed SFRA flood related monitoring indicators.

10 Recommendations

Using the main study findings, the project team have identified **20 policy recommendations (6 core recommendations and 14 supplemental recommendations)** arising from the study.

Some of these recommendations are drawn from the SFRA reviews in detail, but some are also drawn from planners and consultants involved in Level 2 SFRA reviews or updates which have yet to be completed.

It should be noted that many of the recommendations identified can be implemented by improved “sign posting” and emphasising particular guidance and information currently contained within the PPS25 Practice Guide. However, in some instances, additions to the Practice Guide may be required along with additional help and training for practitioners.

Core recommendations

The **six core recommendations** arising from the study are:

- There is a need for greater direction, clearer policy and better communications from Government, supported by the Environment Agency, on the current and future role of SFRA reviews within the spatial planning process as part of the overall management of flood risk in England. This needs to be considered as part of the suite of plans and studies (CFMPs, RFRAs, SWMPs and CDAs etc.), as indicated in the Pitt Review, to better manage flood risks at national, regional and local scales. Additional process guidance, including best practice examples should be provided so that the synergies and contributions which SFRA reviews can make to local flood risk management are captured on the back of the interest shown in the Pitt Review. Without it, briefings for consultants may miss opportunities to inform the actual and potential outcomes of an SFRA.
- Additional work should be undertaken by key government departments and agencies (including DCLG and Environment Agency) to clarify and communicate the processes and responsibilities for managing and sharing data used and produced by SFRA reviews. This should include all existing and new data, information and systems used in SFRA reviews and other related FRM and local authority activities. Common data sets should be used for all flood risk management strategies, catchment, reach or local surface water management studies wherever possible, and the Environment Agency’s National Mapping Strategy should recognise and integrate SFRA mapped outputs where the data is of sufficient quality. Without being prescriptive, a standard template would help to provide a structure to the SFRA and related map outputs (including appropriate metadata). In addition, a process by which appropriate SFRA data can enhance the Environment Agency national flood map should be considered in parallel with an assessment of the benefits of a centralised national data store.

- The recent published SWMP guidance should be used to help specify methods and datasets (especially in terms of extent and detail required from water company datasets) suitable for strategic based assessment of sewer and surface water flood risk within SFRA studies. This guidance should be widely communicated to practitioners. In addition, the Environment Agency, Ofwat and Water UK should jointly pursue the data sharing protocol initiative and influence Government and the draft Floods and Water Management Bill to secure the sharing of all relevant datasets including Water Company sewer and surface water flooding information.
- Further work is needed by DCLG, with support from the Environment Agency, to examine how the PPS25 sequential approach could be more integrated with developing LDF core strategies and related Sustainability Appraisals. Local authority planning practitioners should be widely consulted during the process of this work.
- DCLG, with support from the Environment Agency, should clarify the considerations and parameters for safe development and this should be communicated widely to practitioners. SFRAs should make recommendations on what is safe in light of local circumstances. The recommendations should balance safety achieved through design against structural and non structural flood risk management measures within an area. This work should be helped by DCLG's ongoing work with the Environment Agency, local authorities and emergency services on this issue.
- It is recommended that all future SFRA studies should include a plan to ensure effective communications between local authority departments; and communication between the local authority and the wider stakeholder community. This plan should seek to involve a broad set of stakeholders in the development of the study and agreement of the final outputs of the study. It is recommended that examples of engagement and communications plans are provided to planning practitioners. There needs to be a clear mandate for this engagement work, and should avoid overlapping with the consultation work within the LDF or promotion of flood management strategies and works.

Supplemental recommendations

In addition, **14 supplemental recommendations** have been identified through the work conducted in the study. These are designed to supplement the core recommendations outlined above.

- Local Authorities and consultants should ensure that clear, comprehensive, accessible and available data registers are provided as an essential element of future SFRAs and other flood management studies (e.g. SWMPs). This will help avoid duplication of effort and ensure that the maximum benefit is derived from datasets collated during previous studies.
- DCLG and the Environment Agency should clarify the definition and mapping of functional floodplain and flow routes for fluvial and tidal sources. The

feasibility of expanding the definition to include other sources of flooding should also be explored, having regard to the emerging guidance and requirements of SWMPs. The question of whether surface water flow routes should be designated in planning terms as Flood Zone 3b and how this links with green infrastructure should be investigated further. It is important to ascertain whether an SFRA can work at that level of spatial resolution, and that a flood zone is the most appropriate outcome.

- Each SFRA should clearly state the approach used to define functional floodplain outlines. Further policy interpretation and process work is needed on safeguarding existing and future functional floodplain areas and active floodplain/flow routes for all sources. Regular reviews of the appropriate definition of functional floodplain should also be carried out to reflect changing circumstances e.g. climate change.
- In the absence of clear steer from RFRA, DCLG should provide further guidance on incorporating climate change into SFRA, particularly regarding future time horizons, climate change scenarios, development type & lifetime, and mapped outputs. This guidance should provide case study examples and be widely distributed to practitioners. This guidance should be designed to incorporate UKCIP09 climate change scenarios.
- Further guidance and good practice examples on the assessment and mitigation requirements for residual risk and risk to life. Guidance should cover safe access and egress with mapped outputs to aid safe development and emergency planning, showing existing & proposed emergency evacuation routes, depth of water and rescue route distance at that depth.
- Additional best practice examples of SFRA mapping and reporting outputs should be provided and communicated to practitioners. This should include greater use of a “settlement assessment” approach to mapping, presenting specific flood risks to urban settlements, potential major development sites, urban extensions and rural settlements. This approach has been shown in a number of SFRA studies to help different users (including developers) appreciate and understand the location, scale and links between different localised flood risk issues.
- It is recommended that local authorities do not use subdivisions of flood zones 3a and 3b within their primary sequential testing. A staged approach should be followed that starts with the primary flood zoning system outlined in PPS25 and the Practice Guide. Further guidance is needed to assist local authorities allocate land for development in accordance with the Assess, Avoid and Substitute elements of the flood risk management hierarchy, having regard to flood risks identified in the SFRA. It is recognised that more detailed risk assessment will be required for some high risk areas so that residual risks such as overtopping or breach are included in the next iteration of the sequential approach. This guidance should clarify how the sequential Test should be applied in relation to the more detailed SFRA outputs.

- It is recommended that future SFRA provide a clear hierarchical approach to the collection of data and the assessment of flood risk. This should include the multi-layer assessment of flood risk which assesses iteratively for all flood sources using appropriate data. This assessment should clearly mirror the Avoid, Substitute, Control and Mitigate flood risk management hierarchy. The adoption of these approaches will help to avoid the more standard one dimensional use of single data layers which do not draw out the iterative nature of the decision making inherent in the sequential approach.
- It is therefore recommended that further guidance with case study examples on aligning flood risk data sets with the Avoid, Substitute, Control and Mitigate, flood risk management hierarchy should be provided. Awareness raising and specific training to local authority, Environment Agency and consultant SFRA practitioners should be made available and promoted.
- It is recommended that all local authorities should make their SFRA outputs available via the internet and the location of these outputs should be communicated by local authorities, to all relevant stakeholders (including developers) working in the area. This recommendation will help to improve appreciation and understanding of flood risk issues within a particular area.
- It is recommended that DCLG consider developing additional guidance regarding the life cycle of an SFRA and the specific triggers/timescales for updating the study. This will help to improve the consistent application of PPS25 and the Practice Guide, and the sustained influence of SFRA outputs within the spatial planning processes.
- Local authorities should hold regular meetings (annual as a minimum), with the Environment Agency and other key stakeholders to discuss current and potential future flood risk issues. They should review the SFRA in the light of changed evidence and circumstances to assist partnership working, data sharing and continued evolution of a shared strategy for flood risk management.
- Local authorities should lead and determine the need for, and approach to delivering specific supplementary planning guidance (SPG) on flood or water management. The need for the development of specific SPG and how it should be implemented should be considered as part of the SFRA. This should involve direct liaison with the Environment Agency and consideration of existing national standing advice available from the Environment Agency website (<http://www.environment-agency.gov.uk/research/planning/>).
- A national set of SFRA flood related monitoring indicators should be determined to assist local authorities and other stakeholders demonstrate flood management performance and future actions. These indicators should be assessed within the Annual Monitoring Reports (AMR) produced by individual local authorities.

11 Conclusion

This study has provided evidence to show that the overall majority of local authorities have now produced or updated their SFRA since the introduction of PPS25 in December 2006. This compares favourably with the limited coverage of SFRAs in 2004/2005 when a strategic approach to flood risk assessment was required, but the need for SFRAs was not specifically stated in the Government's PPG25 published in 2003. These early PPG25 SFRAs were produced by local authorities mainly in large low lying areas, in response to the perceived land use planning and regeneration implications of the Environment Agency's indicative flood plain maps. These early documents, whilst few in number, provided a good deal of learning and experience from which the present day SFRAs have benefited.

The quality of SFRA documents has also greatly improved over the last five years, particularly in respect of the detail and extent of the evidence base on which the flood risk assessment is carried out and the digital mapping outputs now being provided. More recent SFRAs developed after June 2008 have benefited significantly from the information and advice provided in the PPS25 Practice Guide.

The influence that SFRAs are having on the land use planning process has increased progressively, and significantly, since the introduction of PPG25 in 2003. Local planning authorities were then required to apply the precautionary principle and use their powers to guide development away from areas at risk of flooding. The limited number of early SFRAs did to some degree influence land use policies and allocations in structure plans and local development plans, with more sustainable planning and flood risk joint solutions being delivered. However, some quite major developments were still occurring in high flood risk areas.

The publication of PPS25 strengthened the PPG, by seeking a more strategic approach and requiring regional assemblies to produce RFRAs and LPAs to produce SFRAs; it clarified the Sequential Test, introduced the Exception Test and required all flooding sources to be taken into account.

Evidence gained from this study shows that whilst different local authorities are at different stages in the LDF process, all of the local authorities contacted have stated that the SFRA will be used to influence the development of their primary LDF core strategy. In some cases this is already happening and timing of SFRA production and Core Strategy progress remains crucial. Examples have been provided where previously allocated land and potential land allocations, have been withdrawn from development considerations due to SFRA findings and outputs.

Whilst many of the recommendations provided in this study are based on the current use of SFRAs in the planning arena; there is a trend developing and an expectation that SFRAs are more than a land use planning tool, and can provide a much broader and inclusive vehicle for integrated, strategic and local FRM assessment and delivery. Innovation and a responsive development of

risk based approaches and techniques have been evident in the review. This is not universal and one of the outcomes of the SFRA action plan is to fuel further development of integrated and sustainable FRM that can deliver economies of scale and efficiencies in the process.

Since publication of the Pitt Review, it is apparent that SFRAs will provide the repository for data, information and consideration for all flood risk issues relating to all flooding sources at a local level; and provide the linkage between CFMPs, SMPs, RFRAs, SWMPs and appropriate sustainable land uses over a number of planning cycles. SFRAs are proving a pivotal vehicle in the introduction and promotion of a local authority, post Pitt review, role in local flood management. Issues of ownership, content, multi-agency objectives, integrated infrastructure investment and enhanced scope to introduce surface water management, communication and range of influence (including emergency planning and preparedness), start to ask the basic question of what is an SFRA and what should it be in the future. SFRAs need to be fit for the future to help communities meet the considerable FRM and climate change related challenges that lay ahead.

It is therefore appropriate that the recommendations provided in this report are considered and implemented by relevant government and non government organisations (including principally DCLG, The Environment Agency, Local Authorities and Water Companies) as soon as possible. This will help contribute to improvements in the sustainable management of flood risk and the long term and successful delivery of the Pitt Review recommendations, in the context of the Governments Making Space for Water Strategy and the draft Floods and Water Management Bill.

12 References

Cabinet Office (2007) The Pitt Review - Learning lessons from the Summer 2007 floods – Interim report, December 2007

DCLG (2006) Planning Policy Statement 25 – Development and Flood Risk

DCLG (2007a) Planning Policy Statement 25 – Development and Flood Risk: A Practice Guide Companion.

Defra (2005) Making Space for Water

Defra (2005) FD2320 Flood Risk Assessment Guidance for New Development Phase 2. HR Wallingford report for Defra/EA R & D programme

Defra (2006) FD2321 Flood Risks to People – Phase 2. HR Wallingford report for Defra/EA R & D programme

FRMRC (2007) Flood Risk Management Policy Issues – Volume 2 Urban. Flood Risk Management Research Consortium (FRMRC) Research Report UR8.

13 Acknowledgements

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Dales (York) North East - Ridings (Leeds); North West - Central (Preston); Southern - Sussex (Worthing); Thames - South East (Camberly) and Thames - North East (Hatfield). The comments received from the interviews were particularly helpful in developing the findings and recommendations for the report.

Appendix A PPS25 Development Profiles

Table A1 PPS25 flood zone definitions

<p>Zone 1 Low Probability</p> <p>Definition This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).</p> <p>Appropriate uses All uses of land are appropriate in this zone.</p> <p>FRA requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.</p>
<p>Zone 2 Medium Probability</p> <p>Definition This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.</p> <p>Appropriate uses The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D.2 are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 are only appropriate in this zone if the Exception Test (see para. D.9.) is passed.</p> <p>FRA requirements All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.</p> <p>Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.</p>

Zone 3a High Probability

Definition

This zone comprises 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.

Appropriate uses

The water-compatible and less vulnerable uses of land in Table D.2 are appropriate in this zone. The highly vulnerable uses in Table D.2 should not be permitted in this zone. The more vulnerable and essential infrastructure uses in Table D.2 should only be permitted in this zone if the Exception Test (see para. D.9) is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

FRA requirements

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

Policy aims

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

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood. SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes).

Appropriate uses

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

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

Essential infrastructure in this zone should pass the Exception Test.

FRA requirements

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

Policy aims

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

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

Table A2 PPS25 Flood Risk Vulnerability Classification⁸

Classification	Description
Essential Infrastructure	<ul style="list-style-type: none"> – Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure
Highly Vulnerable	<ul style="list-style-type: none"> – Police stations, Ambulance stations and Fire stations and Command Centres required to be operational during flooding – Electricity-generating power stations and sub-stations – Hospitals – Emergency dispersal points – Residential institutions such as residential care homes, children's homes, social services homes and student Halls of Residence and hostels – Gypsy and traveller sites using caravans or mobile homes – Mobile or park homes for permanent residential use – Dwelling houses designed, constructed or adapted for the elderly or other people with impaired mobility
More Vulnerable	<ul style="list-style-type: none"> – Buildings used for: dwelling houses (except for those in the highly vulnerable classification); drinking establishments; nightclubs; and hotels – Non-residential institutions such as health services, nurseries and educational establishments, but excluding hospitals – Landfill and hazardous waste facilities
Less Vulnerable	<ul style="list-style-type: none"> – Buildings used for: shops; financial, professional and other services; restaurants and cafés; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions; and assembly and leisure – Land and buildings used for holiday or short let caravans and camping, subject to specific warning and evacuation plan – Land and buildings used for agriculture and forestry – Waste treatment (except landfill and hazardous waste) – Mineral working and processing – Transport infrastructure.
Water-compatible Development	<ul style="list-style-type: none"> – Flood control infrastructure – Water and sewage treatment plants and pumping stations – Docks, marinas and wharves – Navigation facilities – Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location – Water-based recreation and tourism (excluding sleeping accommodation) – Lifeguard and coastguard stations – Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms – Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan)
<p>Note 1: This classification is based on advice from the Environment Agency on the flood risks to people and the need of some uses to keep functioning during flooding.</p> <p>Note 2: Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood sensitivity.</p>	

⁸ Office of the Deputy Prime Minister (ODPM). 2005. *Planning Policy Statement 25: Development and Flood Risk*. December 2005 (Table D2 of Annex D to PPS 25)

Table A3 PPS25 flood risk vulnerability and appropriate development uses

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

Key:

✓ Development is appropriate

x Development should not be permitted

Appendix B Design of Phase 1 Internet Survey

Section A - General Questions

A1-1. Name:

A1-2. Position:

A1-3. Department:

A1-4. Organisation:

A1-5. Address line 1:

A1-6. Address line 2:

A1-7. Postcode:

A1-8. Telephone Number:

A1-9. Email Address:

A1-10. Is your authority located within a government growth area?

A1-11. Are there any designated growth points within your authority boundary?

A2-1. Please could you indicate the current status of Regional Spatial Strategy (RSS) covering your area?

Date complete or to be completed:

If you answered "Complete" to Question A2-1, was Flood Risk identified as a key spatial issue?

A2-2. Please could you indicate the current status of the LDD Core Strategy document covering your area?

Date complete or to be completed:

If you answered "Complete" to Question A2-2, was Flood Risk identified as a key spatial issue?

A2-3. Please could you indicate the current status of Sustainability Appraisal (SA) covering your area?

Date complete or to be completed:

If you answered "Complete" to Question A2-3, was Flood Risk identified as a key spatial issue?

A2-4. Please can you indicate the current status of Regional Flood Risk Appraisal (RFRA) covering your area?

A2-4a. If you answered 'Complete' to Question A2-4. - Has this plan influenced the development of your SFRA document?

If you answered 'Yes' to Question A2-4a. - Please provide further details how:

A2-5. Please can you indicate the current status of the Strategic Flood Risk Assessment (SFRA) covering your area?

Section B – Questions for authorities who have completed or progressing a SFRA

B1-1. Name of your SFRA:

B1-2. Please can you provide the web address for your SFRA (or its location on your website):

If the SFRA is not available on your website - how do you provide the SFRA report/information to interested parties?

B1-3. Please indicate the status of the SFRA document?

B1-4. Please indicate the resolution or stage of the SFRA document?

B1-5. How many individual local authorities are covered by this SFRA document?

B1-6. Please can you provide the names of the individual local authorities covered by this SFRA document?

B1-7. Which year was/will the SFRA be completed?

B1-8. How long did/has the SFRA document take/taken to produce (in months)?

B1-9. Please can you indicate the total (approximate?) cost of producing the SFRA document?

B2-1. Was the SFRA developed "in-house" or through consultants?

Please provide any thoughts on how you would go about an SRFA in future?

B2-2. Please can you indicate if the SFRA document was written to conform with PPG25, draft PPS25 and PPS25, and PPS25 plus practice guide?

B2-3. Did the EA take an active involvement in the process by providing data and advice?

Please provide further information regarding Questions B2-1 to B2-3.:

B2-4. Did the SFRA use existing flood risk information or did it generate new data?

B2-5. Was a detailed flood risk model developed as part of the SFRA?

If you answered 'Yes' to Question B2-5. - What were the modelling techniques used?

B2-6. Was flooding from all sources taken into account, particularly surface water and ground water flooding?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

B3-1. Was the SFRA subject to consultation?

Please provide further details of what response was achieved:

B3-2. Have supplementary policy guidance or documents (SPD/SPG) been prepared to implement the recommendations of the SFRA?

If you answered 'Yes' to Question B3-2. - Please provide further details or URL for these documents:

B3-3. Does your Sustainability Appraisal (if published) make reference to the SFRA in its consideration of options?

If you answered 'Yes' to Question B3-3. - Please provide further details on how flood risk was appraised:

B3-4. Has the SFRA been used to shape flood risk criteria based policies in Local Development Documents and allocate land for development?

B3-5. Has the final SFRA document been used to inform PPS25 sequential testing of development sites?

B3-6. Has the final SFRA document been used to inform PPS25 exception testing of development sites?

B3-7. Are developers using the SFRA to influence the scale and nature of their site specific FRAs?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

B3-8. Has the SFRA changed the previously identified land allocations across the area significantly?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

B3-9. Do you believe your existing SFRA provides sufficient information on current and future flood risks to enable effective decisions on sustainable development having regard to identified climate change impacts?

B3-10. Did you involve other functions within the council, namely emergency planning and drainage engineers in the preparation of the SFRA?

B3-11. Is it your intention to regularly update the SFRA?

B3-12. Has the SFRA led to a better working relationship with the Environment Agency?

Optional comments - If you have any additional comments relating to the above questions, please provide in the box below

If you have any additional comments, please provide them in the box below.

Section C - Questions for authorities who have not commenced a SFRA study

C1-1. Has the Environment Agency encouraged you to undertake an SFRA study?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

C1-2. Will your organisation commission/start writing an SFRA in the next 12 months?

C2-1. Are you expecting to develop your SFRA 'in-house' or with consultants?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

C2-2. What guidance or examples, if any do you propose to use to assist in scoping and developing your SFRA?

C2-3. Will existing SFRAs will be used as examples of good practice to inform the SFRA?

C2-4. Have you approached the EA for advice and/or involvement in the future development of your SFRA?

C2-5. What level of detail do you expect the SFRA document to cover in your area?

C2-6. Do you have any specific views on the datasets and flood risk modelling which will be used to develop the SFRA study for your area?

C2-7. Will the results of an SFRA influence the selection of development sites within the LDF?

C2-8. At what stage will this influence be provided?

C2-9. Will the SFRA provide any additional map outputs indicating potential changes in flood risk due to climate change pressure?

C2-10. What region/local policies currently guide strategic consideration of flood risk in the area and where can they be found?

Optional comments - If you have any additional comments relating to the above questions, please provide in the box below

If you have any additional comments, please provide them in the box below.

C3-1. Please can you give a reason(s) for not producing an SFRA?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

C3-2. Has your decision been undertaken in consultation with the EA?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

C3-3. Will/does your Sustainability Appraisal make reference, and have regard to, strategic flood risk issues in the area?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

C3-4. Have/will you undertake the PPS25 sequential testing of development sites having regard to flood risk?

Optional comments - If you have an additional comments relating to the above question, please type them in the box below

Appendix C Stage One Respondents

Adur District Council
Arun District Council
Ashfield District Council
Babergh District Council
Basildon District Council
Basingstoke and Deane Borough Council
Bedford Borough Council
Blaby District Council
Blackburn with Darwen Borough Council
Bolton MBC
Borough Council of King's Lynn and West Norfolk
Borough of Poole Council
Boston BC
Bournemouth Borough Council
Bradford Council
Brighton & Hove City Council
Bristol City Council
Broadland District Council
Broads Authority
Burnley Borough Council
Bury MBC
Cambridge City Council
Cannock Chase Council
Canterbury City Council
Castle Point Borough Council
Charnwood Borough Council
Cheltenham Borough Council
Cherwell District Council
Chester City Council
Chichester District Council
Christchurch Borough Council
City of London Corporation
City of York Council
Colchester Borough Council
Copeland Borough Council
Corby Borough Council
Cotswold District Council
Coventry City Council
Crawley Borough Council
Crewe and Nantwicch BC
Croydon Council
Dacorum Borough Council
Darlington Borough Council
Derbyshire Dales District Council
District of Easington Council
Dover District Council
East Hampshire District Council
East Riding of Yorkshire Council
Eastbourne Borough Council
Eastleigh Borough Council

Macclesfield Borough Council
Maidstone Borough Council
Maldon District Council
Manchester City Council
Mansfield District Council
Melton Borough Council
Mendip DC
Mid Beds District Council
Mid Suffolk DC
New Forest District Council
Newcastle City Council
Newcastle-under-Lyme Borough Council
North Dorset district council
North East Derbyshire district council
North Kesteven District Council
North Norfolk District council
North Somerset Council
North Tyneside Council
Northampton Borough Council
Nottingham City Council
Oldham MBC
Peterborough City Council
Portsmouth City Council
Preston City Council
Purbeck District Council
Reading Borough Council
Redcar & Cleveland Borough Council
Redditch Borough Council
Restormel Borough Council
Ribble Valley Borough Council
Rugby Borough Council
Rutland County Council
Salford City Council
Sandwell MBC
Scarborough Borough Council
Sedgefield Borough Council
Sheffield City Council
South Bedfordshire District Council
South Derbyshire District Council
South Holland District Council
South Norfolk Council
South Oxfordshire District Council
South Shropshire District Council
South Somerset District Council
South Staffordshire Council
South Tyneside Council
Southampton City Council
Southwark Council
Spelthorne Borough Council
St ALbans City and District Council

Ellesmere Port and Neston Borough Council
Elmbridge Borough Council
Forest of Dean District Council
Forest Heath District Council
Fylde Borough Council
Gateshead Council
Gedling Borough Council
Gloucester City Council
Greenwich Council
Hambleton District Council
Harrogate Borough Council
Hartlepool Borough Council
Hastings Borough Council
Herefordshire Council
Horsham District Council
Hull City Council
Ipswich Borough Council
Kennet District Council
Kirklees Metropolitan council
Knowsley MBC
Lancaster City Council
Leeds City Council
Leicester City Council
Leicestershire County Council
Lichfield District Council
Liverpool City Council
London Borough of Bexley
London Borough of Brent
London Borough of Bromley
London Borough of Camden
London Borough of Enfield
London Borough of Hammersmith & Fulham
London Borough of Haringey
London Borough of Hounslow
London Borough of Islington
London Borough of Merton
London Borough of Redbridge
London Borough of Richmond upon Thames

St Helens BC
Stafford Borough Council
Staffordshire Moorlands District Council
Stevenage Borough Council
Stockport Metropolitan Borough Council
Stockton on Tees Borough Council.
Suffolk Coastal District Council
Sunderland City Council
Swale Borough Council
Swindon Borough Council
Tamworth Borough Council
Tandridge District Council
Taunton Deane Borough Council
Test Valley Borough Council
Tewkesbury Borough Council
Thanet District Council
The Royal Borough of Kensington and Chelsea
Three Rivers District Council
Tunbridge Wells Borough Council
Tynedale District Council
Uttlesford District Council
Vale Royal Borough Council
Verwood TC
Wakefield MDC
Wandsworth Borough Council
Warrington Borough Council
Warwick District Council
Watford borough council
Waveney District Council
Wealden District Council
Wear Valley District Council
West Lancashire District Council
West Lindsey District Council
West Oxfordshire District Council
West Sussex County Council
West Wiltshire District Council
Westminster City Council
Woking Borough Council
Wokingham Borough Council
Wycombe District Council
Wyre Forest District Council

Appendix D Stage Two Interview Log

Section 1 Summary Questions

Name of SFRA

Level of SFRA

Client

Authors

Date Published

Key contact

Key web address for SFRA

Summary Statement

Section 2 Creating the SFRA

Summary of flood risks and mechanisms

Does the SFRA provide a detailed description (including specific locations) of the key flood risks in the study area?

What level of external stakeholder engagement did the study involve and how did this help to shape and deliver a more effective SFRA (Question 2.1)?

Has the development of the SFRA involved the views/opinions of a variety of stakeholders (EA, water companies, resident groups, resilience forums etc)?

Are these views/opinions effectively reflected in the SFRA outputs?

Effective use of available datasets

How has the SFRA ensured better and repeat use of available flood risk data, with due regard to model accuracy and resolution uncertainties (Question 2.2)?

Has the SFRA team consulted with all relevant stakeholders to identify and source datasets and models concerning flood risk issues?

Has the SFRA team produced an effective register of data holdings and communicated this to other stakeholders as part of the SFRA process?

Does the SFRA consider all flood risk mechanisms (coastal, fluvial, pluvial, groundwater etc) and make effective use (i.e. analysis and presentation) of the available datasets to assess these risks?

Assessing fluvial and tidal flood risks

What were the models used in the study to assess fluvial flood risk?

How have the PPS25 fluvial flood risk zones 3a and 3b been defined?

How has Zone 2 been defined in study?

Assessing other sources of flooding

Have surface water (overland flow) flooding issues been fully considered in the SFRA?

Have groundwater flooding issues been fully considered in the SFRA?

Have sewer flooding issues been fully considered in the SFRA?

How has the SFRA considered, at an appropriate, level pluvial and surface water flood risks (i.e. has it simply mapped historical events or has new modelling of these processes been conducted)?

Assessing the implications of climate change

How has the SFRA considered the implications of climate change upon future flood risk potential?

Has the SFRA described the implications of climate change upon floodplain extents, flows and flood depths?

Has the SFRA document considered the vertical sensitivity of climate change to influence the above factors and the adaptability of flood management measures to these changes?

Residual risks and risk to life assessment

How has the SFRA considered residual risk and risk to life issues (Question 3.3)?

Has the SFRA used additional hydraulic or breach models been used to assess residual risk and risk to life issues?

* If not - please state why not considered important

Does the SFRA include a detailed assessment of residual risk issues/zones (including locations in text/mapped form)?

Does the SFRA include a detailed assessment of risks to life (in text and/or mapped forms)?

SFRA outputs

How has the functional floodplain been defined/identified for all sources within the SFRA?

Has the defined functional floodplain ensured effective safe guarding of land for future use?

What maps and outputs were produced for the SFRA?

Are the map/outputs accessible in a GIS and/or internet form?

What is the scale of the maps produced?

Positive and negative comments

Other comments

Section 3 Influence of the SFRA

How are outcomes of the SFRA being (or planned to be) used to inform the local development framework (LDF) process

Does the SFRA consider the relationship between the SFRA and the current local plans?

Does the SFRA consider the current status of the new LDD for the area?

Has the production of the SFRA influenced the land allocations in the core LDD strategy?

Are the outcomes of SFRA being used to inform the wider Sustainability Appraisal process and hence the long term delivery of flood management objectives?

How have the results of the SFRA influenced the development / outcomes of the LDF Sustainability Appraisal?

Did the SFRA developed recommendations / guidance on the weight which flood risk should be given in LDF sustainability appraisals?

Does the SFRA outputs help improve the strategic assessment of flood risks, the use of that information in spatial planning decisions and the efficacy of the sequential test?

Does the SFRA provide clear guidance for LA development control officers on how to assess the flood risk and appropriate development functions for planning applications ?

Does the SFRA provide all of the information needed to effectively assess strategic flood risks and/or implement the sequential/exception test?

Has the SFRA provided a detailed breakdown of risk based information (i.e. subdivisions of flood zone 3) to enable effective implementation of the sequential test?

How has the SFRA ensured that surface water, sewer and groundwater flooding mechanisms are given appropriate weight within the spatial planning processes?

How has the SFRA considered the management of these issues at a wider level (i.e. links to drainage functions within council and/or long term infrastructure investment by other agencies – water companies)?

Does the SFRA give a clear indication of how FRAs (for sites located in FZ 3a/3b) should consider pluvial and surface water issues?

Has the development of the SFRA provided information/subsequent guidance which helps delivering more effective planning and development decisions?

Has the SFRA led to the writing of supplemental planning guidance relating to flood risk issues?

Has the SFRA helped to improve development control processes for local authority planners?

Are there any notable barriers in the use / uptake of the SFRA outputs by other potential users (i.e. emergency planners)?

Does the SFRA give clear guidance on how FRAs (for sites located in FZ 3a/3b) should consider climate change issues?

Has the SFRA helped to enhance relationships between different stakeholders and ultimately deliver more effective flood risk management planning and operations?

Has the outcomes of the SFRA been subjected to a wider consultation process (website or workshops) and/or helped to enhance links between LA planners and stakeholders (i.e. developers, water companies etc)?

Has the SFRA helped to improve the understanding, awareness and profile of flood risk issues for local authority planners?

Has the SFRA help to change the councillors / chief executive views of the importance of flood risk management within your area?

Does the SFRA provide appropriate guidance for developers (i.e. considerations for future FRAs, design standards and use of SUDS) ?

Does the SFRA provide guidance to local communities and individuals regarding flood management measures (including flood resistance and resilience)?

Are the final outputs of the SFRA both accessible and readily updated?

Is the SFRA accessible in a format which is both “live” and accessible (i.e. a living document)?

Have you established a policy / number of issues which will trigger an update / review of their SFRA?

Has the production of the SFRA helped to improve the production of indicator based information relating to flood risk issues?

Does the SFRA outline a clear process for the acquisition, supply and update of datasets produced during the study?

Does the SFRA indicate how the outputs of the study could be used to update/enhance national flood risk models used by the Environment Agency?

Does the SFRA provide any recommendations for the capture/recording of information during future flood events?

Does the SFRA indicate planned criteria or timescale for future updates of the document?

Has the development of the SFRA introduced a hierarchal approach to risk assessment which reduce the costs of the overall process and delivers better value for money

Do local authority planners believe that the SFRA was a valuable exercise – please provide a list of what these are? – reduce friction between LA/EA, helped to enhance knowledge/awareness, will help to reduce the reduction of inappropriate development etc

**Appendix E Environment Agency Guidance
for Local Authority's Update**

Delivering Strategic Flood Risk Assessments (SFRAs) in England

Supplementary Guide for Local Authority Staff (Draft version 6)

The key objectives of SFRA studies are to:

- identify current and future, extent, hazard and nature of flooding from all sources including fluvial, tidal, surface water, groundwater, sewers, reservoirs and canals etc.;
- identify the current and future strategic requirements for the functional floodplain and help in the policy provision and investment needs of green and integrated infrastructure;
- enhance the knowledge of local planning authorities (LPAs) and other key decision-makers of the risks of flooding, determine the variations in flood risk from all sources of flooding across and from their area particularly providing a graduation of risk within key urban areas shown on the EA Flood Map;
- provide sufficient flood risk information to effectively apply the PPS25 Sequential Test and Exception Test in the development allocation and development control process and to prepare appropriate Local Authority (LA) policies for flood risk management.
- provide a framework at a Sub-Regional and/or Local scale to help inform Strategic Housing Land Availability Assessments (SHLAA), develop Core Strategy objectives, LDF policies, guide LPA development control decisions and reduce development control workload;
- improve key stakeholder joint working, sharing of data and information and the understanding of flood risk and its integration into the planning process to deliver sustainable strategic, tactical and operational decisions contribute to flood risk reduction.
- inform the Sustainability Appraisal (incorporating the SEA Directive) of Local Development Documents (LDDs) and guide emergency planning activities,
- provide information which can be readily used to scope future surface water management plans and/or Water Cycle Study;

Considerations for Local Authorities developing SFRA studies

Do:

- Produce (as a minimum) a Level 1 SFRA in accordance with PPS25 and the supporting Practice Guide (DCLG, June 2008);
- Undertake a detailed Level 2 SFRA for development areas particularly susceptible to future flooding. The need for a Level 2 study will be determined by the Level 1 SFRA study.
- Complete the SFRA as early as possible in the preparation of plans and strategies; preferably prior to the development of the LDF Core Strategy Issues and Options;
- Provide appropriate weight to flood risk when considering Core Strategy objectives, Sustainability Appraisals and decision making;
- From the outset, work closely with local Environment Agency (EA), Internal Drainage Boards (IDBs), Water Companies (WCs) and other key stakeholders (including LA Emergency Planners, Housing Professionals and Parish Councils);
- Take account of current climate change predictions when considering flood risk likelihood and consequences;
- Consider all sources of flooding including natural and artificial;
- Identify "Critical Drainage Areas" and the need for Surface Water Management Plans and provide information to assist developer drainage assessments;
- Use the SFRA to develop appropriate policies and guidance and refer to it frequently to aid ongoing land use planning and development control decisions;
- Consider developing LA Local Standing Advice as part of the SFRA outputs to enable improved & efficient consultation with the EA as part of the statutory consultee process;
- Identify appropriate flood risk development control criteria for inclusion in LA Area Action Plans to reduce cost & time in producing site specific flood risk assessments;
- Use the guidance within the Regional Flood Risk Appraisal
- Use best available data obtained from all stakeholders (particularly EA, IDBs and WC), having regard to its reliability and quality; and
- Review and update the SFRA regularly to reflect recent flooding events, improved data holdings and changing circumstances, all as part of the LDF evidence base.

Don't

- Assume a standard format and cost for SFRAs as they need to be appropriate to the extent of geographical area and flood risks in the area being assessed;
- Use a SFRA to justify preconceived land allocations and housing targets;
- Assume that the Environment Agency will produce an SFRA for you;
- Assume a SFRA is unnecessary because there is no history of flooding in the area;
- Assume that the Environment Agency has all the data and information you will need as other stakeholders will have critical data also;
- Leave strategically important data and information to be obtained at the site specific flood risk assessment level;
- Undertake a SFRA without competent technical support;
- Commence the SFRA without early discussion with the EA, IDBs, WCs and other key stakeholders;
- Ignore sources of flood risk outside the LA administrative boundaries;
- Ignore the consequences of flood risk originating within your boundaries on your neighbours;
- Provide a SFRA that is too detailed or with insufficient detail for the purpose to which it will be used as it needs to be "fit for purpose";
- Limit the area of coverage of the SFRA due to the current development areas proposed;
- Assume a SFRA will provide all of the answers and that developers won't need to do a site specific FRA; and
- Allow the SFRA to "sit on the shelf" and not be kept live and up to date.

SFRA Stage	EA Role and Actions	LA Role and Actions
Commissioning new or updated	<ul style="list-style-type: none"> Assist in steering the SFRA project group/team; Provide support and advice on how best to undertake an appropriate SFRA; Share relevant and best available existing flood risk information; Advise on data and information gaps and most appropriate format for future uploading into the National FRM data systems; Advise on scope, project brief and key stakeholders; and Take a strategic overview of the SFRA process. 	<ul style="list-style-type: none"> Contact the EA (Planning Liaison Team Leader) at the earliest opportunity for advice on what is appropriate and the scope of the SFRA; Apply the recommendations of the Regional Flood Risk Appraisal, particularly where sub-regional approaches with neighbouring planning authorities and the undertaking of a joint SFRA across catchment/s would lead to greater efficiencies and understanding of the catchment wide issues ; Learn from other SFRA's and the experiences of other LAs and utilise good/best practice; Recognize that SFRA's are an iterative process, where subsequent detailed studies maybe required when development allocations are finally chosen within the Sustainability Appraisal Maximise the use and benefit of data, models and information contained within current Water Cycle Studies, CFMPs, RFRAs and neighbouring SFRA's etc; Identify flood risks from all sources including Tidal, Fluvial, Surface Water (overland flow), Groundwater and Sewer flooding and also map Critical Drainage Areas; Undertake a Level 1 SFRA and carry out the flood risk Sequential Test (PPS25), prior to embarking on a Level 2 SFRA; Undertake a Level 2 SFRA only where it is not possible to allocate new development in full accordance with the flood risk Sequential Test (PPS25) and hence the Exception Test (PPS25) will need to be considered; and Ensure the SFRA is undertaken by an experienced and competent practitioner.
Undertaking the SFRA	<ul style="list-style-type: none"> Advise consultants or LA officers carrying out the SFRA of appropriate methodologies and modelling techniques/applications etc.; Advise on examples of case studies and good/best practice; Provide ongoing support and advice; Comment on technical quality and fitness for purpose of resulting SFRA; Advice on current and proposed FRM assets, flood warning arrangements and Environment Agency operational responses; and Advise on the overall integrated nature of strategic flood risk considerations. Explain the spatial planning implications of the policies and actions adopted in the CFMPs 	<ul style="list-style-type: none"> Ensure the scope of the SFRA is appropriate to the scale and nature of the area and the potential flood risks and hazards from all sources, now and in the future; Highlight the links between the SFRA and documents within the LDF – i.e. the Core Strategy; Preferred Options; Sustainability Appraisal and other evidence base studies; Approach the EA, WCs, IDBs and other relevant organisations early on in the process for data and information about potential sources, pathways of flooding, sewer overflows and other flood risk management infrastructure; Engage closely with Emergency Planners and consider the safety of people and the need for safe access and egress to and from development locations, including the need for emergency evacuation; Produce a data register which records the quality and confidence level of all data sources; Identify areas within the LDD which are likely to flood, now and in the future and include all appropriate information and records relevant to the plan area, including records of past flooding events; Consider the potential flooding effects of failures of defences/other structures and blockage of open and piped systems; Identify the effects of other features which act as flood pathways/overland flow routes; Identify current and future functional floodplain for all sources of flooding, linking with needs for green and integrated infrastructure, thereby safeguarding its role in flood management; Determine, within Flood Zone 3, the variation in actual flood probability and hazard (depth, velocity of flow and speed of onset etc.), now and in the future, taking into account the effect of flood risk management measures; Take account of current climate change predictions on flood levels, extent, flow and speed of inundation, over the lifetime of any proposed developments having particular regard to the vertical sensitivity on land use; Consider the runoff implications on both the study area and elsewhere, and the potential for sustainable drainage methods to manage potential impacts; Undertake additional hydraulic or breach modelling as necessary to assess residual risk and risk to life issues; Include the views and opinions of key stakeholders, Parish Councils, residence groups and resilience forums etc; Provide a suite of appropriately scaled maps clearly which show current and future flood risks from different sources, along with the nature and severity of the flooding hazard. These maps should also highlight proposed development land uses and the associated emergency evacuation routes Identify criteria which will prompt the need and timing for a review/ update of the SFRA.
Using and Reviewing the SFRA	<ul style="list-style-type: none"> Review the final SFRA and confirm when it is complete and fit for purpose; Comment on emerging RSSs, LDDs and planning applications in the light of the SFRA; Review & update Agency flood maps and other flood risk information, to take the completed SFRA into account; Use SFRA as an input to CFMPs, SMPs * and other FRM strategic and investment plans and projects; Assist with subsequent SFRA reviews including assessing the need to update; and Inform local authorities of any future updates of the Environment Agency flood risk maps/models which may influence the use of the SFRA 	<ul style="list-style-type: none"> Using the SFRA evidence base, consider the impact of LA decision making on flood risk within the plan area and elsewhere, in accordance with PPS25 and the supporting Practice Guide; The Sequential Test needs to be undertaken in a transparent manner, using the evidence base in the SFRA. A separate commentary is required to demonstrate how land has been allocated avoiding flood risk wherever possible Use the SFRA to influence key LDF documents including the Housing Land Availability Assessments and Core Strategy, identify sustainability objectives and test policy options in Sustainability Appraisals, allocate land, shape flood risk criteria-based policies in LDDs and establish flood risk criteria for inclusion in Area Action Plans; Encourage developers to use the SFRA to assist the production of site specific FRAs; Review the SFRA as part of any LDD review if not before; Continue to engage with the EA, WCs, IDBs and other key stakeholders; Use the SFRA to influence other local authority plans, including Resilience Forums as appropriate; Share the SFRA with key stakeholders and other LA departments including Development Control, Emergency Planning, Estates Management, Roads Maintenance etc. and other organisations including Regional Assembly, Regional Development Agency and County Council (where appropriate); and Monitor the use and influence of the SFRA on future land allocations, sustainable land use and other key LA decision areas impacting on delivering sustainable development. Develop monitoring indicators where these have not been identified in the RFRAs

