

South Lakeland District Strategic Flood Risk Assessment (SFRA)

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EXECUTIVE SUMMARY

Introduction

1. Situated in the North West region of England, South Lakeland covers an area of 1743 square kilometres (including tidal reaches) in the southern portion of Cumbria, including a proportion of both the Lake District National Park and the Yorkshire Dales National Park(see map below).





- 2. There are significant areas of flood risk in South Lakeland. The greatest risk of flooding is at Kendal, where the Rivers Kent and Mint flow through the town. It is estimated that over 391 properties could be affected by the 1% (100 year)¹ flood. However there are several other watercourses that could cause flooding across the District. In addition, with a large proportion of South Lakeland situated in the coastal zone, there are also a number of towns and villages that are at risk from tidal flooding. Furthermore, the level of flood risk in these areas is anticipated to increase due to the effects of climate change, which according to recent government advice, will lead to sea level rise and higher river flows.
- 3. The Council is currently preparing a Local Development Framework (LDF) in accordance with the Planning and Compulsory Purchase Act 2004. This Strategic Flood Risk Assessment (SFRA) will be used to inform planning related decisions for areas of South Lakeland *outside of the National Parks*.

Why carry out a Strategic Flood Risk Assessment (SFRA)?

4. Flooding can result not only in costly damage to property, but can also pose a risk to life and livelihood. It is essential that future development is planned carefully, steering it

¹ The 1% (100 year) flood has a 1% probability of occurring in any one year, or will occur on average once in every 100 years



away from areas that are most at risk from flooding, and ensuring that it does not exacerbate existing flooding problems.

- 5. *Planning Policy Statement (PPS) 25: Development and Flood Risk* has been developed to underpin decisions relating to future development (including urban regeneration) within areas that are subject to flood risk.
- 6. In simple terms, PPS25 requires local planning authorities to review the variation in flood risk across their district, and to steer vulnerable development (e.g. housing) towards areas of lowest risk.
- 7. Where this cannot be achieved and development is to be permitted in areas that may be subject to some degree of flood risk, PPS25 requires the Council to demonstrate that there are sustainable mitigation solutions available that will ensure that the risk to property and life is minimised (throughout the lifetime of the development) should flooding occur.
- 8. The Strategic Flood Risk Assessment (SFRA) is the first step in this process, and it provides the building blocks upon which the Council's planning and development control decisions will be made.

What is involved in a Strategic Flood Risk Assessment (SFRA)?

- 9. The South Lakeland Strategic Flood Risk Assessment (SFRA) has been carried out to meet the following key objectives:
 - Collate all significant known sources of flooding including river, tidal, surface water (local drainage), sewers and groundwater, that may affect existing and/or future development within the District;
 - Identify areas that have a 'low', 'medium' and 'high' probability of flooding in accordance with Planning Policy Statement 25 (PPS25).
 - Recommend appropriate land uses within flood affected areas in accordance with the PPS25 Sequential Test that will not unduly place people or property at risk of flooding.
 - Recommend possible flood mitigation solutions that may be integrated into the design (by the developer) in areas where flood risk has been identified as a potential constraint to future development, to minimise the risk to property and life should a flood occur (in accordance with the PPS25 *Exception Test*).

The Sequential Test

- 10. PPS25 advocates a sequential approach that will guide the planning decision making process (i.e. the allocation of sites). In simple terms, this requires planners to seek to allocate sites for future development within areas of lowest flood risk in the initial instance.
- 11. Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated. This is referred to as the Sequential Test.
- 12. As an integral part of the sequential approach, PPS25 stipulates permissible development types. This considers both the degree of flood risk posed to the site, and the likely vulnerability of the proposed development to damage (and indeed the risk to the lives of the site tenants) should a flood occur.
- 13. The PPS25 Sequential Test is depicted in Figure 3.1 of the Practice Guide Companion to PPS25 (Draft, February 2007) and Section 6.4.1 of this document.



The Exception Test

- 14. Many towns within England are situated adjacent to rivers, and are at risk of flooding. The future sustainability of these communities relies heavily upon their ability to grow and prosper. PPS25 recognises that, in some areas, including South Lakeland, restricting residential development from areas designated as Zone 3a High Probability may heavily compromise the viability of existing communities.
- 15. For this reason, PPS25 provides an Exception Test. Where a local planning authority has identified that there is a strong planning based argument for a development to proceed that does not meet the requirements of the Sequential Test, it will be necessary for the Council to demonstrate that the Exception Test can be satisfied.
- 16. 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. If the Development Plan Document (DPD) has reached the 'submission' stage, the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal;
 - 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 previously developed land; and
 - a Flood Risk Assessment (FRA) must demonstrate that the development will be safe, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall."

Outcomes of the South Lakeland SFRA

- 17. South Lakeland has been delineated into zones of low, medium and high probability of flooding, based upon existing available information provided by the Environment Agency. Detailed flood risk mapping has been made available for several of the principal rivers in the District. The Environment Agency Flood Maps (April 2007) have been adopted as the basis for the SFRA for other watercourses.
- 18. The spatial variation in flood risk across the District has been delineated in the following manner:

Zone 3b (Functional Floodplain)

19. Areas subject to flooding up to (and including) once in every 20 years on average have been identified as Zone 3b Functional Floodplain. These areas are subject to relatively frequent flooding, which may include fast flowing and/or deep water. Whilst it may be impractical to refuse all future regeneration within some of these areas (especially those which are already developed), careful consideration must be given to future sustainability. As a result, planning policies have been developed accordingly.

Zone 3a High Probability

- 20. Areas subject to flooding up to (and including) once in every 100 years on average (i.e. <u>Zone 3a High Probability</u>) have been identified. Residential development should be avoided in these areas wherever possible. It is recognised however that there may be strong planning arguments as to why housing may be required in these areas.
- 21. To meet the requirements of the Exception Test therefore, it will be necessary for the Council to demonstrate that the development provides wider sustainability benefits to the community that outweigh flood risk. The Council must also demonstrate that the development is on developable, previously developed land or if it is not on previously



developed land, that there are no reasonable alternative sites on previously developed land.

22. The SFRA has outlined specific development control conditions that should be placed upon development within Zone 3a High Probability to minimise both the damage to property, and the risk to life in case of flooding. It is essential that the developer carries out a detailed Flood Risk Assessment to consider the site-based constraints that flooding may place upon the proposed development.

Zone 2 Medium Probability

23. Areas subject to flooding in events exceeding the 100 year event, and up to (and including) once in every 1000 years on average (i.e. <u>Zone 2 Medium Probability</u>) have been identified. Essential community services, including emergency services, should be avoided in these areas. There are generally no other restrictions placed upon future development in these areas, however it is important to ensure that the developer takes account of possible climate change impacts to avoid a possible increase in the risk of flooding in future years (achieved through completion of a simple Flood Risk Assessment).

Zone 1 Low Probability

24. There are no restrictions placed on development within <u>Zone 1 Low Probability</u> (i.e. all remaining areas of the District). It is important to remember however that development within these areas, if not carefully managed, may exacerbate existing flooding and/or drainage problems downhill. It is necessary therefore to ensure that developers carry out a Drainage Impact Assessment. This should demonstrate that the proposed drainage system design will mitigate any possible increase in runoff that may occur from the site as a result of the proposed development. For sites 1 hectare or greater, a Flood Risk Assessment will be required.

The Way Forward

- 25. Several areas are at risk of flooding at across the District. The risk of flooding posed to properties arises from a number of sources including river and coastal flooding, sewer flooding and localised run-off.
- 26. A <u>planning solution</u> to flood risk management should be sought wherever possible, steering vulnerable development away from areas affected by flooding in accordance with the PPS25 Sequential Test. Planning recommendations have been provided for key service centres and potential local service centres within the District through an overview of flood risks (in section 6.5), which can be used in conjunction with the expected approach of developers towards flood risk (detailed in section 6.6).
- 27. Where other planning considerations must guide the allocation of sites and the Sequential Test cannot be satisfied, specific recommendations have been provided to assist the Council and the developer to meet the Exception Test. These should be applied as <u>development control</u> conditions for all future development. It is essential that these are applied, not only where there is a direct risk of flooding to the proposed development site, but elsewhere within the District. It is important to recognise that all development may potentially have an adverse impact upon the existing flooding regime if not carefully mitigated.
- 28. It is essential that <u>South Lakeland District Council (SLDC)</u> policy within the Local Development Framework ensures that the recommended development control conditions are imposed consistently at the planning application stage. This is needed to achieve future sustainability within the District with respect to flood risk management. It is recommended that future revision to SLDC policy is developed in light of the suggested development control conditions presented by the SFRA (refer to Section 6.4).



29. <u>Emergency planning</u> is imperative to minimise the risk to life posed by flooding within the South Lakeland. It is recommended that the Council review their adopted flood response plan in light of the findings and recommendations of the SFRA.

A Living Document

- 30. The South Lakeland SFRA has been developed in accordance with PPS25. The SFRA has been developed, building heavily upon existing knowledge with respect to flood risk within the District.
- 31. It is imperative that the SFRA is adopted as a 'living' document and is reviewed regularly in light of emerging policy directives and an improving understanding of flood risk within the District. This should specifically include a review of new Flood Maps and detailed modelling outputs produced by the Environment Agency.
- 32. In order to achieve this, it is recommended that a formal arrangement is adopted between the Environment Agency Area Office (at Penrith) and South Lakeland District Council Planning Services.
- 33. It is recommended that the SFRA text is reviewed on a regular basis.

Using the SFRA Mapping

- 34. Following the completion of the SFRA there are now two sets of maps which contain flooding information; the Environment Agency Flood Maps and the SFRA maps. This may lead to some confusion about which ones should be used by the Local Authority and developers to make planning decisions.
- 35. It is recommended that initially the Environment Agency Flood Maps are looked at. This will establish whether or not the Environment Agency will be requesting an FRA. However, the Environment Agency Flood Maps do not always contain the results of detailed modelling and at present do not show Zone 3b Functional Floodplain and localised drainage issues.
- 36. Once the Environment Agency Flood Maps have been consulted, the SFRA maps must then be examined. The SFRA maps should always contain the latest modelled flood extents and should be used to make planning decisions.
- 37. If there is a difference between the EA Flood Maps and the SFRA Maps the EA should be informed as early as possible. It is likely that the flood extents in the SFRA will be accepted as the correct ones to use.
- 38. South Lakeland District Council are seeking further clarification on the need for two sets of maps and are proposing that the Environment Agency consider the issue in more detail.

Further Information and Advice

- 39. The Environment Agency has produced standing advice to assist Local Planning Authorities in making decisions on low risk planning applications. The advice also informs applicants and agents on the requirements for flood risk assessment (FRA) for both low and higher risk developments.
- 40. The Environment Agency's Flood Risk Standing Advice for England can be found at www.pipernetworking.com/floodrisk/





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1 Introduction

1.1 Overview

- 41. Situated in the North West region of England, South Lakeland covers an area of 1743 square kilometres (including tidal reaches) in the southern portion of Cumbria, including a large proportion of both the Lake District National Park and the Yorkshire Dales National Park. This Strategic Flood Risk Assessment (SFRA) will be used to inform planning related decisions for areas of South Lakeland *outside of the National Parks*.
- 42. The Council is currently preparing a Local Development Framework (LDF) in accordance with the Planning and Compulsory Purchase Act 2004. The Local Plan (adopted in 1997 and amended 2004) sets out the Council's current proposals for future development within the District outside of the Lake District and Yorkshire Dales National Parks. This will be replaced by the Local Development Framework. Development within the District is currently focussed very much upon the major urban centres of Kendal, Ulverston, Grange over Sands, Milnthorpe and Kirkby Lonsdale. The emerging spatial development strategy will retain this focus for future development, while also identifying local service centres to receive some development.
- 43. There are significant areas of flood risk in South Lakeland. The greatest risk of flooding is at Kendal, where the Rivers Kent and Mint flow through the town. It is estimated that over 391 properties² could be affected by the 1% (100 year)³ flood. However there are several other watercourses that could cause flooding across the District. Furthermore, with a large proportion of South Lakeland situated in the coastal zone, there a number of towns and villages that could be at risk from tidal flooding.
- 44. In future, the level of flood risk across South Lakeland is likely to increase. Recent government advice, based upon an increasing body of scientific evidence, suggests that sea levels are rising and that climate change will lead to more rainy days with higher intensity rainfall events.⁴ Higher rainfall will cause river flows grow, the risk of surface water flooding to rise and place strain on drainage and sewage infrastructure. Therefore, without effective planning, properties could be built which are at an ever increasing risk of flooding.

1.2 Future Development in South Lakeland

- 45. The South Lakeland District Council Local Plan was adopted in 1997 and Alterations were adopted in 2006. It outlines the Council's broad vision for future development within the District. This will remain until superseded by the Local Development Framework which is currently in preparation and due to be adopted in 2010 in accordance with the 2007 Local Development Scheme.
- 46. The challenge for the Council is to secure a sustainable pattern of development that creates balanced communities, and meets their social needs (including of the provision of new jobs)⁵. It is anticipated that this will involve provision of moderate levels of development within the larger settlements of the district, known as **Key Service Centres**. Five Key Service Centres have been identified in South Lakeland. They are:
 - Kendal
 - > Ulverston
 - ➢ Grange-over-Sands
 - Milnthorpe
 - Kirkby Lonsdale

² Kent & Leven Catchment Flood Management Plan – Scoping Report 2006

³ The 1% (100 year) flood has a 1% probability of occurring in any one year, or will occur on average once in every 100 years

⁴ Planning Policy Statement 25: Development and Flood Risk

⁵ The North West Plan, Submitted Draft Regional Spatial Strategy for the North West of England, January 2006



- 47. Lesser scale development will be focussed upon potential Local Service Centres⁶ which are smaller, more rural villages of the District. Potential local service centres are:
 - ۶ Allithwaite
 - ≻ Arnside
 - ≻ Burneside
 - ⊳ Burton-in-Kendal
 - ≻ Broughton-in-Furness
 - , A A A Cark
 - Cartmel
 - ≻ Endmoor
 - \triangleright Flookburgh

- ۶ Great Urswick
- ⊳ Greenodd & Penny Bridge
- ⊳ Holme
- ⊳ Kirkby-in-Furness
- ⊳ Levens
- ≻ Natland
- ⊳ Oxenholme
- ≻ Storth & Sandside
- ⊳ Swarthmoor

⁶ Identified in Core Strategies Issues and Options report



2 SFRA Approach

- 48. The primary objective of the South Lakeland District SFRA is to inform the revision of flooding policies, including the allocation of land for future development, within the emerging Local Development Framework (LDF). The SFRA has a broader purpose however, and in providing a robust depiction of flood risk across the District, it can:
 - Assist the development control process by providing a more informed response to development proposals affected by flooding, influencing the design of future development within the District;
 - Help to identify and implement strategic solutions to flood risk, providing the basis for possible future flood attenuation works;
 - > Support and inform the Council's emergency planning response to flooding.
- 49. The Government provides no specific methodology for the SFRA process. Therefore, to meet these broader objectives, the SFRA has been developed in a pragmatic manner in close consultation with both the Council and the Environment Agency.
- 50. A considerable amount of knowledge exists with respect to flood risk within the District, including information relating both to historical flooding, and the predicted extent of flooding under extreme weather conditions (i.e. as an outcome of detailed flood risk modelling carried out by the Environment Agency). The South Lakeland District Council SFRA has built heavily upon this existing knowledge, underpinning the delineation of the District into zones of 'high', 'medium' and 'low' probability of flooding, in accordance with PPS25. These zones have then been used to provide a robust and transparent evidence base for the development of flooding related policy, and the future allocation of sites for housing and employment uses.
- 51. A summary of the adopted SFRA process is provided in Figure 2.1 on the following page, outlining the specific tasks undertaken and the corresponding structure of the SFRA report.
- 52. It is important to recognise that several of the rivers that affect the District flow from adjoining authorities within the region. Planning decisions within adjacent districts can impact adversely upon flooding within the District.
- 53. Authorities within Cumbria and Lancashire are carrying out or have carried out similar strategic flood risk investigations. Whilst the delivery teams and programmes underpinning these studies vary from one district to the next, all are being developed in close liaison with the Environment Agency. Consistency in adopted approach and decision making with respect to the effective management of flood risk throughout the region is important. Regular discussions with the Environment Agency have been carried out throughout the SFRA process to this end, seeking clarity and consistency where needed.





Table 2-1 Overview of PPS25 Process



3 Policy Framework

3.1 Introduction

- 54. This section provides a brief overview of the strategy and policy context relevant to flood risk in South Lakeland.
- 55. The success of the SFRA is heavily dependent upon the Council's ability to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning decisions and development control conditions (refer Section 6.4). A framework of national and regional policy directive is in place, providing guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish robust policies that will ensure future sustainability with respect to flood risk.

3.2 National Policy

3.2.1 Overview

- 56. National planning policy is set out through a number of Planning Policy Statements (PPSs) and Planning Policy Guidance Notes (PPGs). The Government is currently reviewing all PPGs with revised advice being set out in a PPS and, where necessary, accompanying best practice guidance.
- 57. PPSs and PPGs cover a full range of planning issues drawing on the central theme of sustainable development. Central themes include the re-use of previously developed land and the wish to steer inappropriate (or vulnerable) development away from areas at risk of flooding. It is a requirement that the LDF is consistent with Government planning policy.

3.2.2 Planning Policy Statement (PPS) 25: Development and Flood Risk

58. Planning Policy Statement 25 (PPS25) was released in December 2006, and underpins the process with which local planning authorities are to account for flood risk as an integral part of the planning process. The over-arching principles set out by PPS25 for the management of flood risk at a planning authority level are encapsulated in Paragraph 6 of the document:

"Regional planning bodies (RPBs) and local planning authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:

Appraising risk

- identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;
- preparing Regional Flood Risk Appraisals (RFRAs) or Strategic Flood Risk Assessments (SFRAs) as appropriate, as freestanding assessments that contribute to the Sustainability Appraisal of their plans;

Managing risk

- framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;
- only permitting development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding;



Reducing risk

- safeguarding land from development that is required for current and future flood management, e.g. conveyance and storage of flood water, and flood defences;
- reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SUDS);
- using opportunities offered by new development to reduce the causes and impacts of flooding, e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; re-creating functional floodplain; and setting back defences;

A partnership approach

- working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously; and
- ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning."
- 59. These broad objectives effectively set the scope for the specific outcomes of the SFRA process. The SFRA in turn then informs planning and development control decisions to ensure that the objectives set out above can be achieved.
- 60. The guidance in PPS25 also indicates that Sustainability Appraisals should be informed by the SFRA for their area. Under the Town and Country Planning (Local Development) (England) Regulations 2004, a Sustainability Appraisal (SA) is required for all Local Development Frameworks (LDFs). The purpose of SA is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans. The Regulations stipulate that SA of LDFs should meet the requirements of the Strategic Environmental Assessment (SEA) Directive.
- 61. It is important to reiterate that PPS25 is not applied in isolation as part of the planning process. The formulation of Council policy and the allocation of land for future development must also meet the requirements of other planning policy directives, including (for example) PPS3: Housing.
- 62. This may introduce some potential conflict in national policy direction. For example, PPS3 requires that "new housing should be built on previously developed land before greenfield land". PPS25 reiterates this directive within its Exception Test.
- 63. However, there are several locations within South Lakeland where there is previously developed land which could be considered for redevelopment but is situated within flood affected areas (for example Kendal and Ulverston). The PPS25 Sequential Test recommends that residential development should not be permitted in these areas.
- 64. Clearly a careful balance must be sought in these instances, and the SFRA aims to assist in this process through the provision of a clear and robust evidence base upon which informed decisions can be made.

3.3 Regional Planning Policy

3.3.1 Regional Planning Guidance for the North West (RPG13)

- 65. Regional planning policies provide the overarching framework for the preparation of the LDF. Regional Planning Guidance for the North West (RPG13) covers the period up to 2021, and sets out the housing requirement for each county within the region. It was adopted in March 2003.
- 66. Under new Government legislation, a Regional Spatial Strategy is to be prepared for each region of England, replacing the Regional Planning Guidance. The document for the North West is known as the North West Plan.



3.3.2 The North West Plan

- 67. The North West Plan has been prepared by the North West Regional Assembly (NWRA) and was submitted to the Government in January 2006. It sets out the out the framework for the future development of the North West of England through to 2021. The Panel Report on the Examination in Public of the submitted draft North West Plan was published on 8 May 2007. The final version of the North West Plan is expected to be published early in 2008.
- 68. The North West Plan will set a new housing requirement for each local authority district. The Panel Report supported the North West Plan proposal that 7200 additional dwellings should be built in South Lakeland District (outside of the National Parks) between 2003 and 2021. It is a requirement that the Core Strategy is in general conformity with regional planning policy.
- 69. The regional planning policies that relate to flood risk are:

Policy DP1 - Regional Development Principals

As an urgent regional priority, plans and strategies should identify, assess and apply measures to ensure effective adaptation to the likely environmental, social and economic impacts of climate-related changes. And: Proposals and schemes must take into account the local implications of climate change, particularly in vulnerable areas, coastal zones and locations at risk of flooding.

Policy EM5 - Integrated Water Management

Plans and strategies shouldmanage flood risk by.....implementing the 'Meeting the Sequential Flood Risk Test – Guidelines for the North West Region';

3.3.3 The Cumbria and Lake District Joint Structure Plan

- 70. The Cumbria and Lake District Joint Structure Plan⁷ is a statutory document which provides a strategy and policies for the development and use of land within Cumbria, including the Lake District National Park but excluding the Yorkshire Dales National Park. The aim of the Structure Plan is to secure a more sustainable pattern of development, reflecting the Government's sustainable development objectives. The Structure Plan was adopted in April 2006.
- 71. A number of policies within the document contain statements that apply to flood risk. Including:

"Policy ST3: Principles applying to all new development

All proposals for development including alterations to existing buildings and land use change will be required to reduce the risk of flooding within the development and elsewhere by a choice of location in the following order of priority:

- a. sites with little or no flood risk, followed by
- b. sites with low or medium flood risk, and only then
- c. sites in areas of high flood risk.

Design proposals should minimise or mitigate any flood risk and where practicable include sustainable drainage systems.

Policy C42: Flood risk and development

Development proposals should take into account an assessment of the risk of flooding and be in accordance with the search sequence outlined in Policy ST3. Development will not be permitted on functional floodplains within areas with a high risk of flooding, except for essential transport and utilities infrastructure that cannot be located elsewhere, including port related development. Land use changes not requiring built development may be permitted provided adequate warning and evacuation procedures are in place, and existing

⁷ Cumbria and Lake District Joint Structure Plan 2001-2016 Adopted Plan, April 2006



buildings incorporate floodproofing measures. Elsewhere development that reduces flood risk or aids the operation of functional floodplains will be supported.



Policy C43: Coastal and flood defence

Development proposals should take into account the sustainable planning and management of coastal and flood defences. Development should:

- 1. have regard to:
 - a. Flood risk statements and assessments,
 - b. Indicative Flood Plain and Flood Maps,
 - c. Coastal Habitat Management Plans
 - d. Shoreline Management Plans and Coastal Defence Strategies
- 2. avoid areas of flood risk, coastal erosion and unstable land, not prejudice coastal or flood defences, nor the ability of operating authorities to maintain them, or the capacity of the coast to form a natural sea defence or to adjust to changes, without endangering life or property, and
- 3. be allowed to relocate from areas of the coast that cannot be sustainably defended in the long term.

3.4 Local Planning Policy

3.4.1 South Lakeland District Council Local Plan (Adopted 1997)

72. The South Lakeland Local Plan (and Alterations adopted in March 2006) will be replaced with a new type of planning document called a Local Development Framework (LDF), in accordance with the Planning and Compulsory Purchase Act 2004. Whilst work is ongoing to develop the LDF, the policies within the Local Plan will remain in place. Policies in the document that relate to flood risk are:

Policy C12: COASTAL DEVELOPMENT

Development proposals will not be permitted which would conflict with the following: (a) the maintenance and enhancement of the natural coastline, its habitats and wildlife, in a way compatible with sea defences, fisheries and coastal protection;

(b) the improvement of the landscape quality of the area, where necessary, and management of visitor pressure so that the environment is protected and people's enjoyment and understanding of it is enhanced.

Policy C22: FLOOD RISK

Development will not be permitted in areas at risk from flooding, unless:

(a) appropriate flood protection or flood compensation schemes can be provided to reduce or compensate for the risk of flooding on the site; and

(b) measures are also provided to prevent an unacceptable increase in flood risk to areas downstream, due to additional surface water run-off.

Policy C23: TIDAL AND RIVER DEFENCES

Development which would adversely affect the integrity of tidal and river defences will not be permitted unless appropriate measures to ensure their stability can be implemented as part of the development.

Policy C24: WATERCOURSES AND COASTAL MARGINS

Development will not be permitted:

(a) which would have a significant adverse effect on the nature conservation, landscape or recreation value of watercourses and coastal margins; or

(b) which will result in the significant loss of access to watercourses for future maintenance; or

(c) which requires the extensive culverting of watercourses, or has a significant adverse impact on the land drainage interests of the adjacent area.



3.4.2 South Lakeland District Council Local Development Framework (LDF)

- 73. Work has commenced on the preparation of the Local Development Framework (LDF), which will eventually replace the policies of the Local Plan. The outcomes of the South Lakeland SFRA will inform the allocation of sites for future development, and the formation of policies relating to flooding for incorporation into the LDF.
- 74. The policies from the Local Plan, whilst generally in line with the broad aims of PPS25, will have to be updated to reflect the more robust guidelines and to take into consideration the findings and recommendations of this SFRA.



4 Data Collection

4.1 Overview

- 75. A considerable amount of knowledge exists with respect to flood risk within South Lakeland, including (but not limited to):
 - Historical river flooding information;
 - Information relating to localised flooding issues (surface water, groundwater and/or sewer related), collated in consultation with the Council and the Environment Agency;
 - Detailed flood risk mapping;
 - Environment Agency Flood Maps (September 2006);
 - > Topography (LiDAR).
- 76. All of this data has been sourced from the Council and the Environment Agency, forming the core dataset that has informed the SFRA process. The application of this data in the delineation of zones of 'high', 'medium' and 'low' probability of flooding, and the formulation of planning and development control recommendations, is explained in Section 5 below. An overview of the core datasets, including their source and their applicability to the SFRA process, is outlined below.

4.2 Environment Agency Flood Maps

- 77. The Environment Agency's Flood Map shows the natural floodplain, ignoring the presence of defences, and therefore areas potentially at risk of flooding from rivers or the sea. The Flood Map shows the area that is susceptible to a 1 in 100 (1% annual exceedance probability or AEP) chance of flooding from rivers in any one year. It also indicates the area that has a 1 in 1000 (0.1% AEP) chance of flooding from rivers and/or the sea in any given year. This is also known as the Extreme Flood Outline.
- 78. The Flood Map outlines have been produced from a combination of a national generalised computer model, more detailed local modelling (if available), and some historic flood event outlines. The availability of detailed modelling for the South Lakeland area is further discussed in Section 4.4. The Environment Agency's Flood Map provides a consistent picture of flood risk from rivers and the sea for England and Wales.
- 79. The Environment Agency's knowledge of the floodplain is continuously being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. They have an ongoing programme of improvement, and updates are made on a quarterly basis.
- 80. The Flood Map for the Key and Potential Local Service Centres in South Lakeland is provided in Appendix B, showing numerous locations being at risk from river flooding.
- 81. A review of the Flood Maps compared to the flood outlines from detailed modelling has taken place. The review has highlighted that in certain areas there are substantial differences between the flood extents provided from the two sources. Where available the results from detailed modelling have been used to inform the SFRA, over the Flood Maps.
- 82. The Flood Maps have only been used in the absence of any higher quality data. However, the areas with the highest flood risk or known flooding problems have been modelled.



4.3 Historical Flooding

- 83. The South Lakeland area has a considerable history of flooding with significant events (resulting in property flooding) occurring at several locations a number of times. During the most recent flooding, which happened in 2005, over 100 properties were affected in Kendal alone.
- 84. The flood extents for previous river and tidal flooding events were provided by the Environment Agency and the Council. These outlines are limited in their usefulness for SFRA purposes as the magnitude of the mapped event is not known with a great deal of accuracy. They provide a good depiction of known flood risk areas within the District however, and have been used to review the delineation of the adopted flood risk zones.

4.4 Detailed Hydraulic Modelling

- 85. A number of detailed flooding investigations have been carried out by the Environment Agency throughout South Lakeland. These studies generally incorporate the development of a detailed hydraulic model, providing a more robust understanding of the localised fluvial flooding regime in line with Section 105 (2) of the Water Resources Act.
- 86. At the time of writing, detailed model outlines were made available for:
 - River Kent & River Mint (Kendal)
- Deep Meadow Beck (Ulverston)
- River Kent & River Sprint (Burneside)
 River Eea (Cartmel & Crake)
- River Crake (Greenodd & Penny Bridge)
 Dragely Beck (Ulverston)
- 87. It should be noted that the detailed hydraulic models developed on behalf of the Environment Agency assume 'typical' conditions within the respective river systems that are being analysed. The predicted water levels may change if the operating regimes of the rivers involved are altered (e.g. engineering works which may be implemented in the future), or the condition of the river channel changes.
- 88. The flood extents derived from detailed hydraulic models are considered to be more refined and accurate than the existing Flood Maps, and therefore have been used to underpin the delineation of flood risk in this Strategic Flood Risk Assessment where available.

4.5 Flood Defences

- 89. Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding. They are generally categorised as either 'formal' or 'informal' defences. A 'formal' flood defence is a structure that is maintained. Usually, but not always, it is the Environment Agency who carries out this maintenance, even though in many instances it does not actually own the defence. An 'informal' flood defence is a structure that has often not been specifically built to retain floodwater, and is not maintained for this specific purpose. Boundary walls and industrial buildings situated immediately adjacent to rivers often act as informal flood defences.
- 90. A number of properties situated immediately adjacent to the various watercourses are reliant to some degree upon the presence of localised raised defences and/or constructed barriers to protect against flooding. The most significant area of flood defence is at Kendal, where large parts of the town are protected following several flood alleviation schemes.
- 91. The earliest flood alleviation scheme in Kendal was completed in 1978 to protect mostly residential areas. Following subsequent development in the floodplain at Mintsfeet and the Lake District Business Park, further schemes were established in 1989 and 2004 respectively. The standard of protection varies between 4% AEP (25 years) and 1% AEP (100 years). Further enhancement works at Mintsfeet were also carried out in 2006. The future sustainability of the area is reliant upon the long term structural and operational integrity of these defences.



- 92. The Environment Agency, as part of their emerging Catchment Flood Management Plan (CFMP) programme, is reviewing the sustainability of the flood defence system protecting properties within the River Kent and River Leven catchments. 'Sustainability' in this context is a consideration of the cost incurred for future maintenance offset against the environmental impacts (and/or benefits) of the defences and the social and economic benefits provided to the communities protected.
- 93. It is important to reiterate that the risk of flooding can never be fully addressed. There will always be a residual risk of flooding, due to (for example) a more extreme event, changing climatic conditions, and/or a structural failure of the constructed flood defence system. It is incumbent on both Council and developers to ensure that the level and integrity of defence provided within developing areas can be assured for the lifetime of the development.

4.6 Consultation

94. Consultation has formed a key part of the data collation phase for the South Lakeland District Council SFRA. The following key stakeholders have been consulted to inform the current investigation:

4.6.1 South Lakeland District Council

- <u>Planning:</u> Consulted to identify settlements where development is likely to be focussed in the forthcoming Local Development Framework.
- <u>Drainage</u>: Consulted to identify areas potentially at risk from river flooding and/or urban drainage.

4.6.2 Environment Agency

95. The Environment Agency has been consulted to source specific flood risk information to inform the development of the SFRA. In addition, the Environment Agency is a statutory consultee under PPS25 and therefore must be satisfied with the findings and recommendations for sustainable flood risk management into the future. For this reason, the Environment Agency has been consulted during the development of the SFRA to discuss potential flood risk mitigation measures and planning recommendations.

4.6.3 United Utilities

- 96. United Utilities (UU) is responsible for the management of urban drainage (surface water) and sewerage within the District. The underground drainage systems in many towns and cities of England are being progressively upgraded from the Victorian sewers. However, they often remain under capacity and subject to relatively frequent 'overload' (i.e. resulting in flooding on the surface).
- 97. All water companies must keep a record of occupied properties which have been subject to sewer flooding. This record is known as the DG5 register. UU was consulted to discuss the risk of localised flooding associated with the existing drainage/sewer system. General information was provided from the DG5 register, but due to UU's confidentiality policy, detailed information could not be given. Consequently, specific areas at risk of sewer flooding cannot be fully identified. The Kent and Leven CFMP states that 9% of flooding in the catchment is related to sewers.
- 98. It is highlighted however that issues associated with failures of the underground drainage/sewer systems are typically very localised, resulting in nuisance flooding to one or two properties. Issues of this nature should not preclude development. It is important to ensure that future development does not exacerbate known existing problems. Planning decisions should be made with due consideration to potential sewer capacity problems (to be advised by UU as part of the statutory LDF consultation process), and conditions should



be placed upon future development to ensure that these capacity issues are rectified before development is permitted to proceed.

99. Data regarding the flood risk as a result of reservoir failure could not be included in this SFRA. This information is regarded as particularly sensitive in terms of National Security. Consequently, its distribution is limited to Category 1 Responders under the Civil Contingencies Act 2004 (Part 1 Schedule 1). However, this aspect is believed to have been considered at county level by the Emergency Planning Unit of Cumbria County Council.

4.7 Topography

- 100. In some areas, detailed flood risk mapping has been carried out, providing a robust means of delineating zones of 'high', 'medium' and 'low' likelihood of flooding. In areas that have not been modelled to date, and/or in which the detailed modelling results could not be made available, dependence must be placed upon the Environment Agency Flood Map, which in these areas provides a relatively coarse depiction of flood risk, as explained in Section 4.2 above.
- 101. Given that this is the case, a 'sensibility' check has been carried out within areas in which detailed modelling is currently not available. The primary purpose of this check is to ensure that the adopted Environment Agency Flood Map is generally representative of anticipated flooding conditions.
- 102. In simple terms, topography provides the basis for a common sense assessment of predicted flood zone extents. Indeed it is important to ensure that the Environment Agency Flood Map reflects the fact that water flows downhill, and that water levels across the river (i.e. on either bank of the river at the same location) are equal. The Environment Agency LiDAR (Light Detection and Ranging) data has been used to reflect the topography of the District in this instance. LiDAR data provides detailed topographic data and is included in Appendix B. Note that the inclusion of this data may help the Local Authority in determining the risk of surface water flooding to future sites by identifying areas located at the base of steep slopes or in depressions.
- 103. The need for a topographical based review of flood outlines in the South Lakeland District Council area has been limited to one or two sites (for example Endmoor, Section 6.5.19). This is because the majority of locations with development pressures and which are at risk of flooding have already been modelled in detail by the Environment Agency.



5 Flood Risk in South Lakeland

5.1 Overview

- 104. The principal river in the District is the River Kent, which flows through several significant settlements including Kendal, Staveley and Burneside. The River Kent catchment includes several other large rivers, including the Sprint, Gowan and Mint. There are numerous smaller watercourses throughout the area, which drain the upland areas of the Lake District and the Pennines.
- 105. Other large watercourses such as the River Crake and the River Leven also pass through South Lakeland. Generally these rivers do not pose the same degree of flood risk to property as the River Kent, due largely to the fact that their catchments are not as developed as that of the River Kent.
- 106. The Environment Agency estimate that 68% of the properties at risk of flooding within South Lakeland are at threat from fluvial (i.e. river) flooding. A relatively large number of properties are at risk, generally as a result of historic development within the natural floodplain. Around 900 properties in total are considered to be at risk of flooding from the major rivers during a 1% AEP (100 year) flood event in the urban areas of Kendal, Ulverston, Crake, Cartmel, Staveley and Burneside⁸.
- 107. The second most significant source of flood risk is tidal flooding. This accounts for approximately 19% of the properties within the 1% AEP (100 year) flood extents. There are many large urban areas that are located on low lying coastal flats or adjacent to watercourse that are at increased risk of flooding when tides are high, including Ulverston and Kirkby-in-Furness.
- 108. Although the principal watercourses pose the primary risk to property in the District, minor watercourses still pose a significant risk of flooding. These smaller watercourses are often culverted through developed areas. Culverts are prone to blockage, collapse and may be hydraulically under capacity. Typically, the flooding from a minor watercourse affects only relatively small numbers of properties in isolated locations. However, the cumulative number of properties affected can be high.
- 109. Stock Beck and its tributaries flow through the eastern areas of Kendal, predominantly in culvert. This watercourse has flooded on numerous occasions, and it is estimated that a 1% AEP (100 year) flood event could affect up to 200 residential and commercial properties. A scheme has been developed by South Lakeland District Council which has substantially reduced the level of flood risk. The scheme cost approximately £3million, and was completed in early 2007.
- 110. Water levels in the rivers and streams of South Lakeland can respond rapidly following intense rainfall events. Steep catchments transfer water into the channels quickly, i.e. they are 'flashy'. This means that flood warning times are typically short. Even in the larger rivers such as the River Kent, water levels will take less than 6 hours to reach the point at which flooding will occur within the lower reaches of the catchment. In the smaller catchments, flood warning times of between 1 and 2 hours are more likely, and generally water levels can be harder to predict accurately. Consequently, the community may be caught by surprise, resulting in damages being sustained on a more frequent basis.
- 111. It is important to recognise that flooding may also affect transportation links, preventing access to food and medicine during extended periods of flooding, and resulting in severe disruption to communities and business. This could present a risk to settlements in isolated locations. However, it is recognised that many communities in isolated locations can be

⁸ The Kent & Level Catchment Flood Management Plan, Scoping Report, 2006



better prepared to deal with the consequences of flooding in many instances, as they expect to be self reliant.

- 112. The precise extent of fluvial flooding within the District is not known in all locations, and reliance has been placed (through necessity) upon the current Environment Agency Flood Zone Maps in some areas. Whilst somewhat coarse, the Flood Maps do provide a reasonable indication of likely flood risk areas, triggering a more detailed assessment should future development be under consideration.
- 113. It is vitally important that planning decisions recognise the potential risk that these additional sources of flooding may pose to property, and that development is planned accordingly so that future sustainability can be assured. In additional to property damage however, flooding can affect lives and livelihoods. It is absolutely essential that future development (particularly residential development) is not placed within areas of the District within which the safety of residents cannot be assured in times of flood.

5.2 Fluvial Flooding - Delineation of the PPS25 Flood Zones

- 114. It is emphasised that the **risk** of an event (in this instance a flood) is a function of both the **probability** that the flood will occur, and the **consequence** to the community as a direct result of the flood. PPS25 endeavours to assess the likelihood (or probability) of flooding, categorising the District into zones of low, medium and high probability. It then provides recommendations to assist the Council to manage the consequence of flooding in a sustainable manner, for example through the restriction of vulnerable development in areas of highest flood risk.
- 115. To this end, a key outcome of the SFRA process is the establishment of the Sequential Test in accordance with Appendix D (Table D1) of PPS25, (replicated in Appendix C of this report). To inform the planning process, it is necessary to review flood risk across the area, categorising the area in terms of the likelihood (or probability) that flooding will occur.
- 116. The District has been delineated into the flood zones summarised below.

Zone 3b The Functional Floodplain

Areas of the region susceptible to flooding within which "water has to flow or be stored in times of flood" (PPS25).

Zone 3a High Probability

Land assessed as having a 1 in 100 or greater annual probability of flooding in any year (i.e. 1% AEP).

Zone 2 Medium Probability

Land assessed as having between a 1 in 100 (i.e. 1% AEP) and 1 in 1000 (i.e. 0.1% AEP) annual probability of river flooding in any year.

Zone 1 Low Probability

Land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (i.e. 0.1% AEP).

117. The delineation of the PPS25 flood zones is discussed in Section 5, and presented in the adjoining Flood Risk Maps.

5.2.1 Delineation of Zone 3b Functional Floodplain

118. Zone 3b Functional Floodplain is defined as those areas in which "water has to flow or be stored in times of flood". The definition of functional floodplain remains somewhat open to subjective interpretation. PPS25 states that "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)." For the



purposes of the South Lakeland District Council SFRA, Zone 3b has been defined in the following manner:

- land where the flow of flood water is not prevented by flood defences or by permanent buildings or other solid barriers from inundation during times of flood;
- Iand which provides a function of flood conveyance (i.e. free flow) or flood storage, either through natural processes, or by design (e.g. washlands and flood storage areas);
- Iand subject to flooding in the 5% AEP (20 year) flood event (i.e. relatively frequent inundation expected, on average once every 20 years).
- 119. Within South Lakeland District Council, this encompasses primarily those low lying areas immediately adjoining the River Kent and its tributaries. Any development within these areas is likely to measurably impact upon the existing flooding regime, increasing the severity and frequency of flooding elsewhere.

5.2.2 Delineation of Zone 3a High Probability

- 120. Zone 3a High Probability is defined as those areas of the District that are situated below (or within) the 1% AEP (100 year) fluvial flood extent. It is emphasised that the delineation of Zone 3a High Probability does NOT consider the presence of raised defences. This is because defences do not remove the risk of flooding completely. There remains a risk that the constructed defences may fail, resulting in the rapid inundation of areas behind the defences (refer Section 5.3 below).
- 121. For planning purposes, the Environment Agency has issued a series of Flood Maps as depicted on the Environment Agency's website (www.environment-agency.gov.uk). In those areas for which detailed flood mapping is not available and/or fit for purpose, the Environment Agency's Flood Maps have been adopted to underpin the SFRA process.
- 122. At these locations, detailed topography has been used to carry out a 'sensibility check' of the Flood Maps. This check has sought to ensure that the predicted floodplain extents are sensible in light of surrounding ground levels. The topography has also been used to provide a means of sub-delineating zones of higher risk within Zone 3a High Probability, guiding vulnerable development into areas in which the risk to life can be safely mitigated against.
- 123. The detailed modelling outputs developed by the Environment Agency, where available, have been adopted for the delineation of Zone 3a High Probability, superseding the current EA Flood Map (April 2007). It is highlighted however that subsequent revisions of the EA web based mapping will incorporate this more detailed information in due course, updating the Flood Map so that it is consistent with the detailed modelled outlines provided.

5.2.3 Delineation of Zone 2 Medium Probability

- 124. Zone 2 Medium Probability is defined as those areas of the District that are situated between the 0.1% AEP (1 in 1000 year) and the 1% AEP (1 in 100 year) flood extents. In this instance, Zone 2 Medium Probability is defined in accordance with the Environment Agency Flood Map.
- 125. It is noted that, given the relatively rapid rise in topography at the periphery of the floodplain, the increase in the predicted flood extents between Zone 3a High Probability and Zone 2 Medium Probability is marginal. The exception to this is at Kendal, where the land is relatively flat and wide adjacent to the watercourse. In this location small changes in the height of flooding can lead to a considerable increase in the flood extents.



5.2.4 Delineation of Zone 1 Low Probability

126. Zone 1 Low Probability is defined as those areas of the District that are situated above (or outside of) the 0.1% AEP (1000 year) flood extent. For SFRA purposes, this incorporates all land that is outside of the shaded Zone 2 and Zone 3 flood risk areas (as defined above).

5.3 Assessment of Risk to Life (Flood Hazard)

5.3.1 Definition of Flood Hazard

- 127. The assessment of flood risk has thus far considered the maximum extent to which flooding will occur during a particular flood event. This provides the basis for assessing broadly the areas potentially impacted by flooding. Of equal importance however is the speed with which flooding occurs as water levels rise. The inundation of floodwaters into low lying areas can pose a considerable risk to life.
- 128. Substantial research has been carried out internationally into the risk posed to pedestrians during flash flooding. This research has concluded that the likelihood of a person being knocked over by floodwaters is related directly to the depth of flow, and the speed with which the water is flowing. This is referred to as 'Flood Hazard'.
- 129. For example, if a flood flow is relatively deep but is low energy (i.e. slow moving), then an average adult will be able to remain standing. Similarly, if the flow of water is moving rapidly but is very shallow, then once again an average adult should not be put off balance. If however the flow is both relatively deep and fast flowing, then a person will be washed off their feet, placing them at considerable risk. The risk to health and safety as a result of submerged hazards during flooding conditions (given the often murky nature of floodwaters) is also a consideration.
- 130. In summary, research has determined that if the product of flow depth (m) x flow velocity (m/s) is greater than or equal to $0.4m^2$ /s, then an average adult is likely to be knocked off their feet. If the product of depth x velocity is greater than or equal to $0.6m^2$ /s, then the average car will be washed away. These ratios have been determined through rigorous physical testing, and are widely accepted as reasonable threshold values above which it is deemed that there is a very real risk to life.
- 131. It is highlighted however that these figures do relate to an average healthy adult. Young children and the elderly will clearly be more vulnerable, and may be at risk in shallower and/or lower energy flow. It is also essential to emphasise that this in no way is intended to suggest that a depth x velocity ratio that is less than 0.4m²/s should be adopted as the sole measure of public safety during flooding conditions. Submerged hazards including, for example, exposed manholes and tripping obstacles pose an obvious risk. Flood water is typically both poor quality and low temperature, and these too pose obvious risks to public health.
- 132. Defra and the Environment Agency have recently collaborated to develop a document entitled 'Flood Risk to People'. This provides guidance to aid in the review of flood hazard within the UK. Future detailed site based Flood Risk Assessments should make reference to this document when assessing the potential risk to life posed by flooding (and flood defence failure) as outlined below.

5.3.2 Flood Hazard in South Lakeland

- 133. The speed and depth with which watercourses and coastal flooding occurs is an important consideration. Deep, fast flowing water may potentially pose risk to life. This must be considered when planning future development.
- 134. Detailed 2D modelling to allow quantitative assessment of flood hazard is not available for the watercourses in South Lakeland. However, in the Kent and Leven CFMP the



Environment Agency has identified that 'high risk' areas (i.e. areas within which there may be a risk to life) in South Lakeland exist at:

- Kendal (River Kent)
- Ulverston (Dragley Beck)
- 135. A qualitative review of these river systems indicates that in the areas highlighted as 'Zone 3b Functional Floodplain,' fast flowing, deep waters would be expected during a flood event. This may also affect Burneside. It is reasonable to assume that in these locations, the short warning times, and deep and fast flowing water, will pose a potential hazard to life.
- 136. Coastal flooding, whilst it can also be deep and fast flowing, does not represent the same degree of hazard as river flooding in this context. This is because coastal flooding events normally require extreme tides in combination adverse weather. Consequently, a degree of forewarning is normally available.

5.3.3 Flood Hazard due to Flood Defence Failure

- 137. There are several areas of raised defences within South Lakeland. Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding. The most important areas of defence are at Kendal, Ulverston and Levens.
- 138. There is always a residual risk that these defences may fail, as a result of either overtopping and/or breach failure. The latter could result in rapid inundation into overbank areas behind the defence, posing a potential risk to residents, pedestrians and property that may be in the path of the floodwaters.
- 139. A qualitative assessment of the potential risk to life within defended areas was undertaken. At Kendal, there are over 2km of raised flood defences. The greatest area of risk is considered to be in central Kendal, where during the daytime there are likely to be a large number of pedestrians immediately behind the defences (particularly at the New Road, Stramongate area).
- 140. In the Mintsfeet area of Kendal, industrial development has taken place in close proximity to the defences. The risk associated with a breach of the defences in an industrial area is not as high as in residential areas. This is because the number of vulnerable people likely to be in the path of a flood wave is lower. However, the nature of the defences in this area means that the depth of water is significant and is maintained for longer after a flood.
- 141. Within Ulverston and Levens, the existing flood defences are situated adjacent to existing urban development.
- 142. The issue of potential flood hazard due to flood defence failure should affect future planning considerations informed by this SFRA, particularly in these areas. The structural integrity of the existing flood defences is central to the sustainability of both existing and future development in many areas of South Lakeland. Without the raised defences, the severity and frequency of flooding in these areas will increase. It is essential that the detailed site based Flood Risk Assessment for all potential future development in defended areas of the District considers both the likelihood and consequence of defence failure in their vicinity.

5.4 Local Drainage Issues

143. As discussed in Section 4.6, consultation has been carried out with the Environment Agency and the Council to identify known and/or perceived problem areas. These drainage problems may be attributed to inundation from floodwaters from open drains and watercourses and increased overland flow due to development and/or exceptionally wet weather (the Environment Agency estimates that 4% of the total flooding in the Kent and Leven Catchment is from surface water flooding). In some instances these problems may be



due to poor maintenance, associated with (for example) culvert blockages. These issues are typically both minor and localised in nature.

- 144. A number of known localised problems have been identified throughout the District, highlighted as an outcome of flooding experienced by local residents or businesses. It is important to note that many have either subsequently been (or are in the process of being) addressed through maintenance to rectify the problem (e.g. removal of localised blockages), or they fall within the 'high' probability flood zone identified in the adjoining maps. As a result, the management of localised flooding will be an integral requirement of the detailed Flood Risk Assessment (to be completed by the developer).
- 145. Within the urban centres of the District, it is inevitable that localised flooding problems arising from under capacity drainage and/or sewer systems will occur. Input has been sought from United Utilities to pinpoint known and/or perceived problem areas, however the information provided is very general. Issues of this nature however, in addition to those outlined above, are generally localised problems that can be addressed as part of the development design process. They should therefore not preclude the allocation of land for future development.
- 146. It is essential to ensure that future development does not exacerbate existing flooding problems. Strict planning conditions should be placed upon developers to ensure that best practice measures are implemented to mitigate any potential increase in loading upon existing drainage system(s). Although if the Local Authority believes that the problem cannot be resolved or would increase flood risk elsewhere, they can rightly refuse planning permission.
- 147. The Environment Agency strongly advocates the use of Sustainable Urban Drainage Systems (SUDS). A wide variety of SUDS techniques are available (refer Section 6.6.3), potentially providing both water quality and water quantity improvement benefits on a site by site basis throughout the District. Wherever possible within previously developed areas, the developer should seek to reduce the rate of runoff from the site to greenfield runoff rates (i.e. the rate of runoff generated from the site assuming an open grassed area). Collectively, the effective application of SUDS as part of all future development will assist in reducing the risk of flooding to the District.

5.5 Groundwater Issues

- 148. There are no known significant groundwater flooding issues within the South Lakeland area. Notwithstanding this, it is recognised that the risks associated with groundwater flooding are not well understood, and it is important to ensure that future development is not placed at unnecessary risk.
- 149. In accordance with PPS25, all future development will require an appropriate Flood Risk Assessment (FRA) or Drainage Impact Assessment (DIA) at the planning application stage, commensurate with the level of flood risk posed to the site. For the majority of developments in South Lakeland, it is likely that a detailed investigation into groundwater issues will not be necessary.
- 150. However, a detailed investigation will be required for developments in close proximity to mineral extraction sites, particularly if dewatering is being carried out. The effect of groundwater rebound after the cessation of dewatering activities will have to be carefully considered.

5.6 Climate Change

151. A considerable amount of research is being carried out worldwide in an endeavour to quantify the impacts that climate change is likely to have on flooding in future years. Climate change is believed to represent a greater than ever risk to low lying areas of England, and it is anticipated that the frequency and severity of flooding will increase within our lifetime.



152. PPS25 states that a 10% increase in the 1% (100 year) Annual Exceedance Probability (AEP) river flow can be expected within the next 20 years, increasing to 20% between 2025 and 2115. In tidally affected areas, an increasing rate of change in predicted sea levels is to be assumed with time, as summarised in the following table.

1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
2.5mm/yr	7.0mm/yr	10.0mm/yr	13.0mm/yr

Table 5-1: Recommended Contingency Allowances for Net Sea Level Rise North West of England (applied to 1990 base sea level) PPS25 (Appendix B) Table B1

- 153. The result of climate change is likely to be increased flood depths and frequency of flooding. In some areas this could alter the current extents of the Flood Zones as defined in PPS25. For example, what is now identified as Zone 2 Medium Probability land could become Zone 3a High Probability.
- 154. Identifying where the risks associated to climate change are greatest is not straightforward. The detailed modelling of the rivers in South Lakeland was developed prior to current Environment Agency guidelines. As a result, the modelling has not considered the potential impact of climate change. The results of broad scale modelling, carried out by the Environment Agency as part of the Kent & Leven CFMP have not yet been made available.
- 155. However, an indication of sensitivity to changes in flood levels can be obtained by comparing the 1% AEP (100 year) flood area to the 0.1% AEP (1000 year) flood area. For the biggest flood risk area, Kendal, a large increase in the flood extents and the number of properties affected can be seen. Other areas at risk from climate change include parts of Burneside (Burneside Mill) and Ulverston (Grasmere Road, Dragley Beck Bridge).
- 156. In areas where the impacts of climate change could markedly increase flood risk, it is essential that developers and the local authority consider the implications on the planned land use. The likely increase in flow over the lifetime of the development should be assessed proportionally to the guidance provided by PPS25 as outlined above and shown in Table 5-2 below.

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115	
Peak rainfall intensity	+5%	+10%	+20%	+30%	
Peak river flow	+10%	+20%			
Offshore wind speed	+5%		+10%		
Extreme wave height	+5%		+10%		

Table 5-2: Recommended national precautionary sensitivity ranges for peak rainfall intensities, peak river flows, offshore wind speeds and wave heights.

PPS25 (Appendix B) Table B1

157. It is emphasised that the potential impacts of climate change will affect not only the risk of flooding posed to property as a result of river flooding, but it will also potentially increase the frequency and intensity of localised storms over the District. This may exacerbate localised drainage problems. It is important therefore that both the site based detailed Flood Risk Assessment and the Drainage Impact Assessment (i.e. prepared by the developer at the planning application stage as outlined in Section 6) take due consideration of climate change.



158. In summary, it is important that both the developer and the local authority consider the long term implications of climate change on the level of flood risk to potential developments. In some instances, this may mean that a precautionary approach is taken, and any vulnerable developments are considered as inappropriate. The FRA should clearly show the implications of climate change to a proposed site.

5.7 Residual Risk of Flooding

- 159. It is essential that the risk of flooding is minimised over the lifetime of the development in all instances. It is important to recognise however that flood risk can never be fully mitigated, and there will always be a residual risk of flooding.
- 160. This residual risk is associated with a number of potential risk factors including (but not limited to):
 - a flooding event that exceeds that for which the flood risk management measures have been designed;
 - the structural deterioration of flood defence structures (including informal structures acting as a flood defence) over time; and/or
 - > general uncertainties inherent in the prediction of flooding.
- 161. The SFRA process has carried out a review of flood risk within the District in accordance with the PPS25 Sequential Test, identifying a number of areas that fall within Zone 3a High Probability. The modelling of flood flows and flood levels is not an exact science. There are limitations in the methodologies used for prediction, and the models developed are reliant upon observed flow data for calibration, much of which is often of questionable quality. For this reason, there are inherent uncertainties in the prediction of flood levels used in the assessment and management of flood risk.
- 162. It is difficult to quantify uncertainty. The adopted flood zones underpinning the South Lakeland SFRA are based upon the detailed flood mapping for the area. Whilst these provide a robust depiction of flood risk for specific modelled conditions, all detailed modelling requires the making of core assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response.
- 163. Taking a conservative approach for planning purposes, it is understood that the Environment Agency generally adopt a 300mm allowance for uncertainty within areas that have been modelled in some detail (listed in section Section 4.4). The degree of uncertainty in areas reliant upon the Environment Agency's national generalised computer model will clearly be somewhat higher and should be confirmed with Environment Agency for that particular location.
- 164. It is incumbent on developers to carry out a detailed Flood Risk Assessment or Drainage Impact Assessment as part of the design process. A review of uncertainty should be undertaken as an integral outcome of this more detailed investigation.



6 Sustainable Management of Flood Risk

6.1 Overview

- 165. An ability to demonstrate 'sustainability' is a primary government objective for future development within the UK. The definition of 'sustainability' encompasses a number of important issues ranging broadly from the environment (i.e. minimising the impact upon the natural environment) to energy consumption (i.e. seeking alternative sources of energy to avoid the depletion of natural resources). Of particular importance however is sustainable development within flood affected areas.
- 166. Recent history has shown the devastating impacts that flooding can have on lives, homes and businesses. A considerable number of people live and work within areas that are susceptible to flooding, and ideally development should be moved away from these areas over time. It is recognised however that this is often not a practicable solution. For this reason, careful consideration must be taken of the measures that can be put into place to minimise the risk to property and life posed by flooding. These should address the flood risk not only in the short term, but throughout the lifetime of the proposed development. This is a requirement of PPS25.
- 167. The primary purpose of the SFRA is to inform decision making as part of the planning and development control process, taking due consideration of the scale and nature of flood risk affecting the District. Responsibility for flood risk management resides with all tiers of government, and indeed individual landowners, as outlined below.

6.2 Responsibility for Flood Risk Management

- 168. There is no statutory requirement for the Government to protect property against the risk of flooding. Notwithstanding this however, the Government recognise the importance of safeguarding the wider community, and in doing so the economic and social well being of the nation. An overview of key responsibilities with respect to flood risk management is provided below.
- 169. The <u>Regional Assembly</u> should consider flood risk when reviewing strategic planning decisions including (for example) the provision of future housing and transport infrastructure.
- 170. The <u>Environment Agency</u> has a statutory responsibility for flood management and defence in England. It assists the planning and development control process through the provision of information and advice regarding flood risk and flooding related issues.
- 171. The Local Planning Authority is responsible for carrying out a Strategic Flood Risk Assessment. The SFRA should consider the risk of flooding throughout the district and should inform the allocation of land for future development, development control policies and sustainability appraisals. Local Planning Authorities have a responsibility to consult with the Environment Agency when making planning decisions.
- 172. <u>Landowners & Developers⁹</u> have the primary responsibility for protecting their land against the risk of flooding. They are also responsible for managing the drainage of their land such that they do not adversely impact upon adjoining properties.

⁹ Referred to also as 'landowners' within PPS25



6.3 Strategic Flood Risk Management - The Environment Agency

6.3.1 Overview

- 173. With the progressive development of urban areas along river corridors, particularly during the industrial era, a reactive approach to flood risk management evolved. As flooding occurred, walls or embankments were built to prevent inundation to developing areas. Needless to say, construction of such walls should be carefully assessed so that it does not result in the redistribution of floodwater, inadvertently increasing the risk of flooding elsewhere.
- 174. The Environment Agency (EA) in more recent years has taken a strategic approach to flood risk management. The assessment and management of flood risk is carried out on a 'whole of catchment' basis. This enables the Environment Agency to review the impact that proposed defence works at a particular location may have upon flooding at other locations throughout the catchment.
- 175. A number of flood risk management strategies are underway within the region, encompassing many of the large river systems that influence flood risk within South Lakeland. A brief overview of these investigations is provided below.

6.3.2 Catchment Flood Management Plan (CFMP)

- 176. "One of the Environment Agency 's main goals is to reduce flood risk from rivers and the sea to people, property and the natural environment by supporting and implementing government policies.
- 177. Flooding is a natural process we can never stop it happening altogether. So tackling flooding is more than just defending against floods. It means understanding the complex causes of flooding and taking co-ordinated action on every front in partnership with others to reduce flood risk by:
 - Understanding current and future flood risk;
 - > Planning for the likely impacts of climate change;
 - > Preventing inappropriate development in flood risk areas;
 - > Delivering more sustainable measures to reduce flood risk;
 - Exploring the wider opportunities to reduce the sources of flood risk, including changes in land use and land management practices and the use of sustainable drainage systems.
- 178. Catchment Flood Management Plans (CFMPs) are a planning tool through which the Agency aims to work in partnership with other key decision-makers within a river catchment to explore and define long term sustainable policies for flood risk management. CFMPs are a learning process to support an integrated approach to land use planning and management, and also River Basin Management Plans under the Water Framework Directive.^{#10}
- 179. There are three CFMPs currently in development which cover parts of South Lakeland. These are:
 - ➤ Lune (due July 2008);
 - > Kent and Leven (due late 2007/early 2008); and
 - South West Lakes (June 2008).
- 180. However, the final findings of the study have not yet been made available. Consequently, the draft findings have been used in the formation of this SFRA.

¹⁰ Catchment Flood Management Plans - Volume 1 (Guidance), Version 1.0, July 2004



6.3.3 Strategic Flood Risk Management – Shoreline Management Plans

- 181. The long term sustainability of the English coastline is heavily dependant upon a robust understanding of coastal processes, and the careful management of future development within coastal areas. In an endeavour to develop this understanding, and to establish policies for effective future investment in coastal management, a series of Shoreline Management Plans have been developed across the country.
- 182. Several Shoreline Management Plans (SMPs) covering the Cumbrian coast have been prepared.
- 183. For the significant urban areas located on the coast; Ulverston, Grange over Sands, Arnside, Cark, Flookburgh and Kirkby-in-Furness, currently a 'hold the line' coastal management option has been identified. In simple terms, this means that investment will be continued to ensure that the current standard of defence provided against coastal erosion / tidal flooding will be retained in future years.
- 184. A second generation of SMPs are currently under development that will review future policy for coastline management in these areas. The outcomes of the emerging second generation SMP are not available to inform this investigation.
- 185. However, concerns have already been raised about the sustainability of maintaining defences in the Flookburgh area of the Cartmel Peninsula. According to the Environment Agency these defences are currently suffering from erosion from channel movement in Morecambe Bay.
- 186. Both the Environment Agency and Natural England have warned that the 'hold the line' policy for the section of coast between West Plain Farm and Humphrey Head could be revised (i.e. to 'coastal realignment to allow for natural coastal process to take place'). This could have significant implications to any future development that occurs in this area (see section 6.5.20).

6.4 Planning & Development Control – South Lakeland

6.4.1 Planning Solutions to Flood Risk Management

The Sequential Test

- 187. Historically urbanisation has evolved along river corridors, the rivers providing a critical source of water, food and energy. This leaves many areas of England with a legacy of key urban centres that, due largely to their close proximity to rivers, are at risk of flooding.
- 188. The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. steer urban development away from areas that are susceptible to flooding. PPS25 advocates a sequential approach that will guide the planning decision making process (i.e. the allocation of sites). In simple terms, this requires planners to seek to allocate sites for future development within areas of lowest flood risk in the initial instance. Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated.
- 189. This sequential approach is referred to as **The Sequential Test**. This is summarised in the following flow chart¹¹.

¹¹ Figure 3.1 (Application of the Sequential Test), A Practice Guide Companion to PPS25, Consultation Paper, February 2007





Table 6-1: Overview of the Exceptions Test

It is absolutely imperative to highlight that the SFRA does not attempt, and indeed cannot, fully address the requirements of the PPS25 Sequential Test. As highlighted in Section 6.4.1 and the flow chart above, it is necessary for the Council to demonstrate that sites for future development have been sought within the lowest flood risk zone (i.e. Zone 1 Low Probability). Only if it can be shown that suitable sites are not available within this zone can alternative sites be considered within the areas that are at greater risk of possible flooding (i.e. Zone 2, and finally Zone 3).

- 190. As indicated by the bottom right hand corner of the flow chart above, PPS25 stipulates permissible development types. This considers both the degree of flood risk posed to the site, and the likely vulnerability of the proposed development to damage (and indeed the risk to the lives of the site tenants) should a flood occur.
- 191. Wherever possible, the Council should restrict development to the permissible land uses summarised in PPS25 Appendix D (Table D2), (Note tables D1, D2 and D3 have been included in Appendix C of this document). This may involve seeking opportunities to 'swap' more vulnerable allocations at risk of flooding with areas of lesser vulnerability that are situated on higher ground. This is discussed further in Section 6.4.2 to 6.4.5.

The Exception Test

192. It is recognised that only a relatively small proportion of the District is situated within Zone 3a High Probability. Prohibiting future residential development in these areas is unlikely to have a detrimental impact upon the economic and social welfare of the existing community,


however there may be pressing planning 'needs' that may warrant further consideration of these areas. Should this be the case, the Council and potential future developers are required to work through the **Exception Test** (PPS25 Appendix D) where applicable. 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. If the Development Plan Document (DPD) has reached the 'submission' stage, the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal¹²;
- 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 previously developed land; and
- a Flood Risk Assessment (FRA) must demonstrate that the development will be safe, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall."
- 193. The first two points set out in the Exception Test are planning considerations that must be adequately addressed. A planning solution to removing flood risk must be sought at each specific location in the initial instance, seeking to relocate the proposed allocation to an area of lower flood risk (i.e. Zone 1 Low Probability or Zone 2 Medium Probability) wherever feasible.
- 194. The SFRA has been developed in liaison with the Council and the Environment Agency to work through the requirements of the Sequential Test (and, where necessary, the Exception Test) within the District. It will be the responsibility of the developer (in all instances within Zone 3a High Probability and Zone 2 Medium Probability) to develop a detailed Flood Risk Assessment that can demonstrate that the Sequential Test has been applied, and (where appropriate) that the risk of flooding has been adequately addressed in accordance with PPS25.
- 195. The management of flood risk throughout the District must be assured should development be permitted to proceed, and the SFRA has provided specific recommendations that ultimately should be adopted as planning conditions for all future development. It is the responsibility of the prospective developer to build upon these recommendations as part of a detailed Flood Risk Assessment to ensure that the specific requirements of PPS25 can be met.
- 196. Specific planning and development control recommendations for future development within the District are presented below. A 'user guide' to assist in the application of the SFRA recommendations is provided in Appendix A.
- 197. An overview of flood risk throughout the District has been provided in Section 6.5 and the adjoining flood risk maps. Future planning decisions should consider the spatial variation in flood risk across the District, as defined by the delineated flood zone that applies at the specified site location, and apply the recommendations provided below accordingly. It is highlighted that PPS25 applies equally to both allocated sites identified within the emerging LDF and future windfall sites.

6.4.2 Future Development within Zone 3b Functional Floodplain

Planning Recommendations - Allocation of Land for Future Development

198. Future development should be restricted to water-compatible uses and essential infrastructure that has to be there (in accordance with PPS25). A number of residential and commercial areas are affected by Zone 3b Functional Floodplain. It is recommended that

¹² Note that the Sustainability Appraisal is carried under the Town and Country Planning (Local Development) (England) Regulations 2004, and is required for all Local Development Frameworks (LDFs).



future redevelopment (including housing extensions) within this area is strongly discouraged. Careful consideration should be given to the Council's emergency response in times of flood to ensure that public safety is not compromised.

Development Control Recommendations – Minimum Requirements

199. Future development, with the exception of water compatible uses and essential infrastructure, should not be permitted. The frequency and severity of flooding within these areas are such that no engineered mitigation measures could be implemented to safely and effectively minimise the risk to life and property over the lifetime of the development incorporating an allowance for climate change.

6.4.3 Future Development within Zone 3a High Probability

Planning Recommendations - Allocation of Land for Future Development

- i. Future development within Zone 3a High Probability should be restricted to 'less vulnerable' land uses, in accordance with PPS25 (Appendix D) Table D2. 'More vulnerable' land uses, including residential development, should be steered towards zones of lower flood risk (i.e. Zone 2 Medium Probability or Zone 1 Low Probability) within which suitable land may be available in adjoining character areas.
- ii. Where non-flood risk related planning matters dictate that 'more vulnerable' (residential) development should be considered further, it will be necessary to ensure that the requirements of the Exception Test are satisfied. In planning terms, it must be demonstrated that "the development provides wider sustainability benefits to the community that outweigh flood risk", and that "the development is on developable previously developed land, or that there are no reasonable alternative sites on previously developed land".
- iii. To satisfy the remaining criteria of the Exception Test, all development within Zone 3a High Probability should be conditioned in accordance with the development control recommendations below.

<u>Development Control Recommendations – Minimum Requirements</u>

- i. All proposed future development within Zone 3a High Probability will require a detailed Flood Risk Assessment (FRA);
- ii. Floor levels must be situated above the 1% (100 year) predicted maximum flood level plus freeboard, incorporating an allowance for climate change;
- iii. Wherever possible, ensure that dry access is provided (above flood level) to enable the safe evacuation of residents and/or employees in case of flooding. As a minimum, safe access must be provided at all locations, defined in accordance with the emerging Defra research as outlined in "Flood Risks to People";
- iv. All basements must provide a safe evacuation route in time of flood, providing an access point that is situated above the 1% (100year) peak design flood level;
- Implement SUDS to ensure that runoff from the site (post redevelopment) is not increased, and where possible reduced. Any SUDS design must take due account of groundwater and geological conditions;
- vi. Ensure that the proposed development does not result in an increase in maximum flood levels within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased and/or compensatory flood storage is provided within the site (or upstream);



vii. A minimum 8m buffer zone must be provided to 'top of bank' within sites immediately adjoining any main river corridor. This byelaw requirement may be negotiated with the EA in heavily constrained locations

6.4.4 Future Development within Zone 2 Medium Probability

Planning Recommendations – Allocation of Land for Future Development

- i. In accordance with PPS25, land use within Zone 2 Medium Probability should be restricted to the 'water-compatible', 'less vulnerable' and 'more vulnerable' category (including residential development), or essential infrastructure, to satisfy the requirements of the Sequential Test.
- ii. Where non-flood risk related planning matters dictate that 'highly vulnerable' (residential) development should be considered further, it will be necessary to ensure that the requirements of the Exception Test are satisfied. In planning terms, it must be demonstrated that "the development provides wider sustainability benefits to the community that outweigh flood risk", and that "the development is on developable previously developed land, or that there are no reasonable alternative sites on previously developed land".
- iii. To satisfy the remaining criteria of the Exception Test, all development within Zone 2 Medium Probability should be conditioned in accordance with the development control recommendations below.

Development Control Recommendations – Minimum Requirements

- i. All proposed future development within Zone 2 Medium Probability will require a Flood Risk Assessment (FRA) that is commensurate with the risk posed to the proposed development;
- ii. Floor levels must be situated above the 1% (100 year) predicted maximum flood level plus freeboard, incorporating an allowance for climate change;
- iii. Wherever possible, ensure that dry access is provided (above flood level) to enable the safe evacuation of residents and/or employees in case of flooding. As a minimum, safe access must be provided at all locations, defined in accordance with the emerging Defra research as outlined in "Flood Risks to People";
- iv. Implement SUDS to ensure that runoff from the site (post redevelopment) is not increased, and where possible reduced. Any SUDS design must take due account of groundwater and geological conditions (refer Section 6.6.3)

6.4.5 Future Development within Zone 1 Low Probability

Planning Recommendations - Allocation of Land for Future Development

200. There are no flood risk related constraints placed upon future development within Zone 1 Low Probability (in accordance with PPS25). Notwithstanding this, all development should be carried out in accordance with the development control recommendation below. Within 'dry island' areas that are surrounded by a degree of flood risk, effective emergency planning measures should be in place to ensure that the risk to life is minimised in case of flooding.

Development Control Recommendations – Minimum Requirements

201. A Drainage Impact Assessment (see Section 6.4.6) will be required in compliance with PPS25 and current guidance and policy. This will involve the introduction of SUDS techniques to ensure that runoff from the site (post redevelopment) is not increased, and where possible reduced. Any SUDS design must take due account of groundwater and geological conditions.



6.4.6 Drainage Impact Assessments (DIA)

- 202. A DIA is a site specific document submitted to the planning authority which identifies how a proposed development will affect surface water and waste water drainage. It should contain information on how the developer intends to mitigate and manage any adverse impacts that the development will have. If a DIA is required, the scope of the DIA will depend on the type and scale of the development and the sensitivity of the area.
- 203. Typically DIA's are <u>not</u> applied to:
 - individual householder applications
 - > developments of less than ten new dwellings (unless a sensitive area may be affected)
 - > non-householder extensions under 100 square metres
 - changes of use not involving new buildings or hardsurfacing
 - developments which are part of a larger development for which a DIA has already been accepted
- 204. The DIA should be incorporated into a detailed FRA for developments where there are identified flood risks (to or from the development), or as a standalone document outside of flood risk areas.

6.5 Overview of Flood Risk & Development – Service Centres

The maps of the following areas are found in Appendix B.

6.5.1 Kendal Overview

205. South Lakeland District Council has been given an indicative target of providing 400 new homes annually as part of the North West Plan. There are also requirements for an increase in the availability of employment land. It should be noted that although these targets relate to all of South Lakeland outside the National Park, a proportion of future development is likely to be located in Kendal. Kendal itself is constrained by steep slopes to the east and west, and therefore most development pressure is focussed on the flatter land to the north and south.

6.5.2 Kendal North (Figure 1)

- 206. The River Kent and River Mint have both been subject to flood risk mapping studies carried out by the Environment Agency. These studies show that there are extensive areas of low lying land that fall within Zone 3b Functional Floodplain to the north of Kendal (around Kentrigg). There are also areas of Zone 3a High Risk land within the industrial area of Mintsfeet. It is worth noting that the extent of Zone 3a High Probability does have some uncertainty associated with it, as different models have produced different flood extents in this location. A conservative approach has been adopted in this location and the largest flood extents have been mapped.
- 207. There are areas of Zone 2 Medium Probability land near Mintsfeet Road South. The remaining areas of North Kendal are situated within Zone 1 Low Probability.
- 208. Within Zone 1 Low Probability, there are a number of smaller watercourses which flow from the fells on the east and western borders of Kendal. It is possible for localised and relatively small scale flooding to occur on any of these watercourses. Furthermore, the onset of flooding from small catchments is often very quick with little or no warning. An example of this is at Stock Beck where there is a localised drainage issue related to high water levels within the watercourse affecting an area near the nursery close to Spital Park on the north east outskirts of Kendal. Several other flooding problems along this watercourse have been addressed by the Stock Beck Flood Alleviation Scheme.



- 209. There are also many areas of Kendal which are located adjacent to steep slopes. As such there is the potential for surface water to cause nuisance flooding where properties are in overland flow routes.
- 210. There are two significant lines of raised defence at Mintsfeet. One is along the River Mint and the other adjacent to the River Kent. There is a residual risk of flooding at these locations, associated with the potential structural failure of the defences and overtopping. This risk will be greatest in the areas immediately behind the defence.
- 211. Groundwater flooding may be an issue in and around Kendal due to the limestone geology of the area. Within such geological locations, flooding can occur where the water table reaches the surface, usually in localised depressions. However, seepages and springs can appear anywhere.

6.5.3 Central Kendal (Figure 2)

- 212. Flood improvement works were carried out following flooding during the 1950's which included widening and deepening of the River Kent channel within this vicinity. However, modelling suggests that large areas of flood risk remain on both the east and west banks of the River Kent corridor.
- 213. The area of Zone 3b Functional Floodplain is limited to relatively narrow bands of land immediately adjacent to the river channel. However, the modelling also suggests that the area of Zone 3a High Probability is greater than previously thought. The zone includes large areas around Victoria Bridge, Canal Head and Lound Road.
- 214. There are areas of Zone 2 Medium Probability near Mintsfeet Road South. The remaining areas of central Kendal are situated within Zone 1 Low Probability land.
- 215. There are a number of smaller watercourses that have not been modelled which flow from the fells on the east and western borders of Kendal. These may potentially pose a risk of flash flooding to future development. Several localised flooding issues have been identified from such watercourses. All of these issues are related to culverted sections of channel. Culverts are particularly prone to blockage and capacity problems.
- 216. There are areas protected against flooding by defences within central Kendal, particularly in the areas around Stramongate Bridge. Once again, the greatest residual risks will be to the land immediately behind the defences, where the flows are likely be quickest and deepest if the defences were breached. It is noted that the defended areas include a police station and fire station.

6.5.4 Kendal South (Figure 3)

- 217. The southern area of Kendal, and the land to the immediate south of the urban extent, is at risk of flooding from the River Kent. There are narrow areas of low lying land which fall within Zone 3b Functional Floodplain immediately adjacent to the river corridor. These areas increase in size as the as the river passes into the undeveloped areas.
- 218. In general Zone 3a High Probability is only marginally wider than the functional floodplain. The exception to this is at Helsington Mills where the flood risk area widens, especially on the western bank.
- 219. The area of Zone 2 Medium Probability is relatively wide and incorporates areas of both developed and undeveloped land throughout the southern part of Kendal.
- 220. The remaining areas of Kendal South fall within Zone 1 Low Probability. However, local drainage issues have been identified at Helsington Laithes on the southwest outskirts of the town, and adjacent to Oxenholme Road on the south eastern outskirts.



221. There is a relatively long line of flood defences (and therefore residual risks) at Helsington Mills. Once again the greatest residual risk will be to the land immediately behind the defences where the flows are likely be quickest and deepest if the defences were breached. This incorporates most of the development at this location.

6.5.5 Ulverston North (Figure 4)

- 222. There are no significant areas of flood risk identified in Ulverston North. A relatively limited area falls within Zone 3a High Probability, associated with Town Beck on the north west outskirts of the town (i.e. at The Gill).
- 223. The remainder of the land is located in Zone 1 Low Probability. However, local drainage issues have also been identified on the western boundaries of the town at Stone Cross Gardens and Pennington Lane End, where land is flooded due to high water levels in the open channel.
- 224. There is a small length of flood defences at The Gill, providing protection against flooding from Town Beck. Consequently, there will be residual risks of flooding at this point. The greatest risk will be to the land immediately behind the defences which could be subject to relatively deep and high velocity flooding in the event of a breach of the defences

6.5.6 Ulverston South (Figure 5)

- 225. There are areas of Zone 3a High Probability and Zone 2 Medium Probability associated with the Dragley Beck and Levy Beck corridors. The area at risk of flooding is relatively narrow, apart from the Well Lane area at Dragley Beck Bridge. According to the Environment Agency's Flood Maps, the area at risk widens substantially. It appears likely that coastal influences are playing a large part in the increase of the risk area.
- 226. Also associated with this flood risk area is a line of flood defences protecting the area around Rydal Road and Watery Lane. Consequently, there will be residual risk of flooding at this point.
- 227. There are large areas of land to the east of Ulverston which are at risk of coastal inundation and are located in Zone 3a High Probability and Zone 2 Medium Probability.
- 228. The remainder of the land is Zone 1 Low Probability, although a number of localised drainage problems exist to the south of the currently developed boundary which are related to a small open watercourse.

6.5.7 Ulverston East & Canal (Figure 6)

- 229. There are large zones of both fluvial and coastal flood risk associated with the Ulverston Canal. The main area of flood risk is associated with Dragley Beck. Recent hydraulic modelling (Jacobs, 2004) results have shown that Zone 3b Functional Floodplain exists in the area named 'South Ulverston' near Fitz Bridge.
- 230. Zone 3a High Probability risk areas cover a large proportion of the land, including the Canal Head location, 'South Ulverston' and near West End Lane. Two sites at West End Lane have been allocated for employment land by South Lakeland District Council. The majority of the site to the west of West End Lane is developed or under construction.
- 231. Although significant parts of these sites are located within areas affected by flooding, the proposed land use is classified as appropriate under PPS25 providing that site layout avoids building on the small areas of Zone 3b Functional Floodplain (clarified by a detailed FRA). Another site known as the North Lonsdale Road Employment Site is located in within Zone 3a High Probability land.



- 232. Appropriate mitigation measures for sites located in Zone 3a High Probability are discussed in Section 6.4.3. Particular attention should be paid to emergency evacuation procedures as the modelled flood extents suggest that these sites could become surrounded by water.
- 233. There is a length of flood defence at Steel Street, protecting existing development. Consequently, there will be residual risks of flooding at this point.

6.5.8 Grange over Sands North (Figure 7)

- 234. The flooding issues here are relatively confined in nature. There are some locations where there is a risk of coastal flooding. However, these are generally located on the seaward side of the railway track, which provides an informal flood defence for the town (estimated as a 1 in 200 year standard of protection).
- 235. An area of Zone 2 Medium Probability is found in the vicinity of Kents Bank Road. This is a relatively minor area of flooding associated with coastal drainage structures. The remainder of the land is located in Zone 1 Low Probability.
- 236. Local drainage issues have been identified on the B5271 (Windermere Road) where flooding from the local watercourse affects some residential properties and a car park.
- 237. It should also be noted that as there is limestone geology at this location, there may also be a risk of groundwater flooding in some locations. However, no other issues have been reported.

6.5.9 Grange over Sands South (Figure 8)

- 238. The flooding issues in Grange are relatively minor in nature. There are few open channels here and the railway track provides an estimated 1 in 200 year standard of protection against coastal flooding. Consequently, the land is Zone 1 Low Probability.
- 239. Localised drainage issues have been identified at Cart Lane, where flooding from a small watercourse is believed to be related to a submerged flap valve on a pipe which discharges at the coast. Highway drainage causes localised problems near Granby Road in the Kents Bank area.

6.5.10 Kirkby Lonsdale (Figure 9)

- 240. Kirkby Lonsdale is located on the banks of the River Lune. The town is elevated above the river, and is not at risk of flooding. Consequently, most of the town is located in Zone 1 Low Probability.
- 241. An unnamed watercourse runs close to the north-west boundaries of the town. There is narrow corridor of Zone 3a High Probability, which does not currently affect any properties.
- 242. There are localised drainage problems along the A65 road at the junction with Biggins Road and near the junction at Dodgson Croft.

6.5.11 Milnthorpe (Figure 10)

- 243. Milnthorpe is situated adjacent to the River Bela and approximately 1km away from Morecambe Bay Estuary. Most of the settlement is within Zone 1 Low Probability, although there is an area of Zone 3a High Probability close to the tidal River Bela at The Strand and Recreation Ground.
- 244. Milnthorpe benefits from good transport links with the M6, A6 and the railway station located nearby. The District's only Strategic Employment Site is located at the former Milnthorpe Railway Station, approximately 1.5km to the east of the town. This site is situated on Zone 1 Low Probability land and is unlikely to be at significant risk of fluvial flooding.



6.5.12 Allithwaite (Figure 11)

- 245. Allithwaite is situated on high ground. Consequently, there are no major sources of flood risk in the village. It is located almost entirely in Zone 1 Low Probability land.
- 246. However, the steeply sloping topography can lead to localised flooding problems as a result of surface water run-off during high intensity rainfall events. This type of flooding is normally of short duration and shallow depth, and would not preclude development.

6.5.13 Arnside (Figure 12)

- 247. Arnside is situated on raised land adjacent to Milnthorpe Sands, which is a tidal stretch of the River Kent as it passes into Morecambe Bay. Due to the height of the town, the overall level of flood risk is low. Arnside located almost entirely in Zone 1 Low Probability land.
- 248. According to the Environment Agency data, there are some flood defence structures along the River Kent, near the Kent Viaduct. The tidal protection is provided to lower developed area of the town by Environment Agency maintained defences, built to a 1 in 200 year standard of protection.
- 249. Once again, the steeply sloping topography can lead to localised flooding problems following high intensity rainfall. This type of flooding would normally not preclude development.

6.5.14 Broughton-in-Furness (Figure 13)

- 250. Broughton is located in Zone 1 Low Probability. There are no restraints on development within the town in terms of flood risk. However, there are a number of local drainage issues at Church Street, to the west of the town, and at the Kepplewray area to the south east.
- 251. At Church Street there is a topographical low point where there is flooding is related to both highway run off and a small culverted section of watercourse which has been overloaded in the past. Approximately 3 properties are affected in total.
- 252. At Market Street there is a property which suffers regular cellar flooding, the source of flooding is unclear but it is believed to be from underground drainage pipes. At Kepplewray, surface water run-off direct from an adjacent field causes localised flooding. It is important that any future development is mindful of these problems and does not exacerbate existing localised flood risks.

6.5.15 Burneside (Figure 14)

- 253. Burneside is located near the confluence of the River Kent and River Sprint. The Environment Agency have identified that there are 37 properties at risk of fluvial flooding in the village. The majority of the flood risk is confined to the river corridors. However, detailed modelling has identified that to the south and south east, there is a large area of agricultural land that is at a very high risk of flooding, situated within Zone 3b Functional Floodplain.
- 254. In the area of Carling Steps there is already development within functional floodplain. Intensification of both residential and commercial land in this area (through future development) would increase the risk of flooding and should be avoided.
- 255. Localised drainage issues have been identified which are related to overloaded public sewer infrastructure at Bridge Street and near New Road.

6.5.16 Burton in Kendal (Figure 15)

256. This is a small town that is at low risk of flooding. It is located entirely in Zone 1 Low Probability land.



6.5.17 Cark (Figure 16)

257. Cark is situated on relatively low lying land adjacent to the River Eea. There is an area of Zone 3a High Probability land, which according to the Environment Agency is subject to tidally influenced flooding. The area at risk includes approximately 20 properties.

6.5.18 Cartmel (Figure 17)

258. Cartmel is situated on low lying land adjacent to the River Eea, upstream of Cark. A large proportion of the village is situated within Zone 3a High Probability land. The flood risk is associated with fluvial flooding from the River Eea (and minor tributaries). Broad scale modelling carried out by the Environment Agency indicates that 102 properties are situated within the 1%AEP (100 year) flood extents.

6.5.19 Endmoor (Figure 18)

- 259. Peasey Beck flows to the east of Endmoor in a small valley. The Beck has a relatively narrow flood risk area, with only small areas of Zone 3a High Probability land confined to the watercourse corridor. The majority of the town is located in Zone 1 Low Probability land and is not at risk of significant flooding.
- 260. However, there is an area of concern which is related to the caravan park near the Gatebeck Plantation that is situated in Flood Zone 3a. Note that a review of topographic data (see Figure 18a LiDAR in Appendix B suggests that the Environment Agency Flood Map may be incorrect here, but there are low areas which suggest the site could be at risk in places. According to PPS25, sites used for short-let (holiday) caravans and camping are classified as more vulnerable land uses as they are particularly prone to the effects of flooding. Any plans for future intensification of this land use should be carefully considered and will require an FRA.
- 261. Gatebeck Cottages on Gatebeck Road to the north of Endmoor are affected by localised flooding from the nearby minor watercourse. Another localised drainage issue is apparent at Dovenest Lane where there has been flooding from a public sewer.
- 262. An allocated employment site at Fall Beck Gatebeck, is located next to a watercourse (land at Peasey Beck Cottage). Most of the site is not within the area identified at flood risk according to Environment Agency Flood Maps, but the topographic data (see Figure 18b LiDAR) suggests that much of the land is relatively low lying and could be within the flooding envelope. Consequently, a FRA which considers the level of fluvial flood risk (and therefore which Flood Zone it is located in) is necessary for this site as a precautionary measure.

6.5.20 Flookburgh (Figure 19)

- 263. There are two areas of Zone 3a High Probability land at Flookburgh. A substantial area of risk to the south is related to tidal inundation of low lying pasture land. This flooding does not place the town at direct risk, as topographic maps indicate that it is situated on higher land.
- 264. To the north, the flood risk is associated with the tidally influenced River Eea. The Flood Maps indicate that there is existing development at risk of flooding near the railway station and including parts of Fairfield (in Zone 3a High Probability).
- 265. Recent information from the Environment Agency regarding the large area of Zone 3a High Probability land to the south has stated that this area is actually defended to a 1%AEP (100 year) level of protection. However, these defences are now showing signs of instability due to erosion of the toe. The Environment Agency is now issuing advice which requires developments in this area to have FRAs that consider the implications of erosion to the embankment, i.e. residual risks.



- 266. Furthermore, there is a risk that updates to the Shoreline Management Plan will change the current policy of 'hold the line' to 'coastal realignment' if it is found that the maintenance of these defences are unsustainable. This puts into question the long-term viability of any proposed development within this area. Consequently, any FRA for this development should also consider which Flood Zone the site would be located in if the defences were not there.
- 267. Employment land allocated at Moor Lane is within Zone 3a High Probability land. Therefore, before development can take place it will first have to be shown that the Sequential Test has been applied. Specifically, it should be demonstrated that there are no alternative sites available in lower flood risk areas. If this is the case, development control measures in detailed in Section 6.4.3 will be required.

6.5.21 Great Urswick (Figure 20)

- 268. Great Urswick is located adjacent to Urswick tarn. There is a area of Zone 3a High Probability and Zone 2 Medium Probability land that appears to be related to minor watercourses into and out of the tarn, to the west and south. The result is that there is existing development at risk.
- 269. There is also an area of Zone 1 Low Probability land to the south west of the settlement which, according to the Flood Maps, could become a dry island during a flood event (i.e. surrounded by flood water during an event). Any development in this area, particularly, residential should consider the consequences of a flood. These include the possibility of being trapped for an extended period of time without access to clean water, electricity and food. Obviously, the level of risk depends upon the length of a flood event, and the depth of the surrounding water.
- 270. However, the catchment here is limestone and consequently there is a high degree of uncertainty with the Flood Maps. The Environment Agency believes that the flood extents may be exaggerated and/or unreliable due to the limestone geology of the catchment. Limestone catchments are difficult to model due to the effects of groundwater storage and the ability of the bedrock to transfer groundwater between catchments.
- 271. Near the Church to the north of the tarn, close to the junction with Weint Lane, there is a localised drainage issue associated with surface water run off. There may also be unidentified and localised groundwater flooding issues in some locations due to the limestone geology.

6.5.22 Greenodd & Penny Bridge (Figure 21)

- 272. These settlements are located adjacent to the River Crake near Cartmel Sands in Morecambe Bay. The River Crake has been modelled in detail and extensive areas of Zone 3b Functional Floodplain can be found on flat land adjacent to the watercourse.
- 273. Existing development within these settlements is not within the functional floodplain. However, much of the development within the eastern half of Greenodd is situated in an area of Zone 3a High Probability land.
- 274. Employment land allocated to the rear of Former Hurley's Garage is located within Zone 3a High Probability land. However, commercial land uses are considered appropriate according to the Sequential Test as is it Less Vulnerable, providing it can be shown that there are no alternative sites available in lower flood risk areas Potential flood risk mitigation measures are discussed in section 6.4.3.
- 275. This area is also protected by raised defences and there will be a number of residual risks that will need to be considered for future development here. These risks include climate change, cessation of maintenance activities on the defences (by operating authorities) and the potential for breach of the defences. In the event of the defences failing, a flood wave that could pose a danger to life may be generated.



276. Greenodd and Penny Bridge are located on the sides of a steep valley, and during heavy rainfall events surface water run-off could cause localised flooding problems. There are also several watercourses that flow into the River Crake from the valley sides. These watercourses are culverted at some locations, and flood risks may be present due to the potential for blockage of the culverts.

6.5.23 Holme (Figure 22)

- 277. Holme is located entirely in Zone 1 Low Probability land. However numerous small watercourse and unnamed drains could present localised flooding issues, especially where they are culverted. Culverts pose a risk due to the potential for blockage, and are often limited in capacity.
- 278. To the south of Holme, at Station Road, close to Mill Pond, there is a localised flooding problem from an overloaded sewage pumping station.

6.5.24 Kirkby-in-Furness (Figure 23)

279. Kirkby-in-Furness is located adjacent to the Duddon Estuary. Most of the village is located in Zone 1 Low Probability land. However, immediately next to the estuary there is a narrow strip of development which is situated in the 0.5% AEP (200 year) tidal flood extents. It is therefore classified as Zone 3a High Probability.

6.5.25 Levens (Figure 24)

- 280. Levens is situated next to a wide area of flat and low agricultural land associated with the lower reaches of the River Gilpin. According to the Kent and Leven CFMP there are 41 properties in the village that are at risk of tidally influenced flooding.
- 281. This level of risk is not reflected in the latest flood extents provided by the Environment Agency (shown in Figure 24). The number of properties at risk may be based upon older modelling results, which shows a strip of residential land to the west of the village within the flood envelope. In reality, this area is protected by a long stretch of raised defences.
- 282. There is a residual risk of flooding behind the raised defences. The residual risk could be high, particularly as residential properties have been built in close proximity to the raised defences. In the event of the defences failing, a large flood wave could be generated that may put life at risk. Any future development or redevelopment should consider the risks of building in close proximity to the defences.
- 283. There is a localised flooding problem from an overloaded sewage pumping station near Cotes.

6.5.26 Natland (Figure 25)

284. This settlement is located entirely in Zone 1 Low Probability land.

6.5.27 Oxenholme (Figure 26)

285. Oxenholme is located entirely in Zone 1 Low Probability land.

6.5.28 Storth and Sandside (Figure 27)

286. These settlements are situated adjacent to Milnthorpe Sands (Kent Estuary). Most of the urban area is located on relatively high ground and is not at risk of flooding. However, there are a small number of properties to the north that are immediately adjacent to the estuary, where the land is lower and at increased risk of flooding. This land is classified as Zone 3a High Probability.



287. Land allocated for employment uses south of Quarry Lane, is partially located in an area of Zone 3a High Probability Land, on the northern border of the site. This area of flood risk is unlikely to be a significant issue, although potential developers should be aware of it at planning stage.

6.5.29 Swarthmoor (Figure 28)

288. This settlement is located entirely in Zone 1 Low Probability land. However, there is a localised drainage issues associated with the culverted watercourse near Main Road on the southern extent of the settlement.

6.5.30 Remaining Areas of the District

- 289. All remaining areas (outside of the National Park) are not subject to any significant future development pressures. Fluvial and coastal flooding and localised flooding issues may exist and these will need to be investigated on an individual basis by the developer in consultation with the Council and the EA to ensure that smaller areas of known flooding/drainage problems can be taken into account within the FRA.
- 290. There are no flood risk related constraints placed upon future development within Zone 1 Low Probability, although a FRA will be needed for sites large than 1 hectare (in accordance with PPS25). Notwithstanding this, a Drainage Impact Assessment will be required in compliance with PPS25 and current guidance and policy. This will involve the introduction of SUDS techniques. Any SUDS design must take due account of groundwater and geological conditions.

6.6 Detailed Flood Risk Assessment (FRA) – The Developer

6.6.1 Scope of the Detailed Flood Risk Assessment

- 291. As highlighted in Section 2, the SFRA is a strategic document that provides an overview of flood risk throughout the area. It is imperative that a site-based Flood Risk Assessment (FRA) is carried out by the developer for proposed developments (in all instances within Zones 3a High Probability, 3b Functional Floodplain and 2 Medium probability), and this should be submitted as an integral part of the planning application.
- 292. The Environment Agency has produced standing advice to assist Local Planning Authorities to make decisions on low risk planning applications. However, it also provides advice for applicants and agents on the requirements for flood risk assessment (FRA) for both low and higher risk developments. The Environment Agency's Flood Risk Standing Advice for England can be found at www.pipernetworking.com/floodrisk/
- 293. The FRA should be commensurate with the risk of flooding to the proposed development. For example, where the risk of flooding to the site is negligible (e.g. Zone 1 Low Probability), there is little benefit to be gained in assessing the potential risk to life and/or property as a result of flooding. Rather, emphasis should be placed on ensuring that runoff from the site does not exacerbate flooding lower in the catchment. The particular requirements for FRAs within each delineated flood zone follows:

It is highlighted that the description of flood risk provided in the previous discussions place emphasis upon the primary source of flood risk (i.e. river flooding). In all areas, a localised risk of flooding may also occur, typically associated with local catchment runoff following intense rainfall passing directly over the District. This localised risk of flooding must also be considered as an integral part of the detailed Flood Risk Assessment.



Proposed Development within Zone 3a High Probability

- 294. All FRAs supporting proposed development within Zone 3a High Probability should include an assessment of the following:
 - The vulnerability of the development to flooding from other sources (e.g. surface water drainage, groundwater) as well as from river flooding. This will involve discussion with the Council and the Environment Agency to confirm whether a localised risk of flooding exists at the proposed site.
 - The vulnerability of the development to flooding over the lifetime of the development (including the potential impacts of climate change), i.e. maximum water levels, flow paths and flood extents within the property and surrounding area. The Environment Agency may have carried out detailed flood risk mapping within localised areas that could be used to underpin this assessment. Where available, this will be provided at a cost to the developer. Where detailed modelling is not available, hydraulic modelling by suitably qualified engineers will be required to determine the risk of flooding to the site.
 - The potential of the development to increase flood risk elsewhere through the addition of hard surfaces, the effect of the new development on surface water runoff, and the effect of the new development on depth and speed of flooding to adjacent and surrounding property. This will require a detailed assessment, to be carried out by a suitably qualified engineer.
 - A demonstration that residual risks of flooding (after existing and proposed flood management and mitigation measures are taken into account) are acceptable. Measures may include flood defences, flood resistant and resilient design, escape/evacuation, effective flood warning and emergency planning.
 - Details of existing site levels, proposed site levels and proposed ground floor levels. All levels should be stated relevant to Ordnance Datum.
- 295. It is essential that developers thoroughly review the existing and future structural integrity of the defences (i.e. over the lifetime of the development), and ensure that emergency planning measures are in place to minimise risk to life in the unlikely event of a defence failure.

Proposed Development within Zone 2 Medium Probability

296. For all sites within Zone 2 Medium Probability, a high level FRA should be prepared based upon readily available existing flooding information, sourced from the Environment Agency and Local Authority. It will be necessary to demonstrate that the residual risk of flooding to the property is effectively managed through, for example, the provision of raised floor levels (refer Section 6.6.2) and the provision of a planned evacuation route and/or safe haven.

Proposed Development within Zone 2 Medium Probability and Zone 1 Low Probability

- 297. Within all areas of the District, the risk of alternative sources of flooding (e.g. urban drainage and/or groundwater) must be considered, and sustainable urban drainage techniques must be employed to ensure no worsening to existing flooding problems elsewhere within the area. This may be achieved through a Drainage Impact Assessment (see section 6.4.6).
- 298. The SFRA provides specific recommendations with respect to the provision of sustainable flood risk mitigation opportunities that will address both the risk to life and the residual risk of flooding to development within particular 'zones' of the area. These recommendations should form the basis for the site-based FRA.

6.6.2 Raised Floor Levels & Basements (Freeboard)

299. The raising of floor levels above the 1% AEP (100 year) fluvial flood level will ensure that the damage to property is minimised. Given the anticipated increase in flood levels due to



climate change, the adopted floor level should be raised above the 1% AEP (100 year) predicted flood level assuming a 20% increase in flow.

- 300. Wherever possible, floor levels should be situated a minimum of 300mm above the 1% AEP (100 year) plus climate change flood level, determined as an outcome of the site based FRA. A minimum of 600mm above the 1% AEP (100 year) flood level should be adopted if no climate change data is available. The height that the floor level is raised above flood level is referred to as the 'freeboard', and is determined as a measure of the residual risks.
- 301. The use of basements within flood affected areas should be discouraged. Where basement uses are permitted however, it is necessary to ensure that the basement access points are situated 300mm above the 1% AEP (100 year) flood level plus climate change. The basement must be of a waterproof construction to avoid seepage during flooding conditions. Habitable uses of basements within flood affected areas should not be permitted.

6.6.3 Sustainable Urban Drainage Systems (SUDS)

- 302. SUDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings. Indeed reducing the rate of discharge from urban sites to greenfield runoff rates is one of the most effective ways of reducing and managing flood risk within the District.
- 303. SUDS may improve the sustainable management of water for a site by¹³:
 - reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
 - reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites;
 - improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
 - reducing potable water demand through rainwater harvesting;
 - improving amenity through the provision of public open space and wildlife habitat;
 - replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.
- 304. In catchment terms, any reduction in the amount of water that originates from any given site is likely to be small. But if applied across the catchment in a consistent way, the cumulative affect of a number of sites could be significant.
- 305. There are numerous different ways that SUDS can be incorporated into a development and the most commonly found components of a SUDS system are described in Table 1¹⁴. The appropriate application of a SUDS scheme to a specific development is heavily dependent upon the topography and geology of the site (and its surrounds). Careful consideration of the site characteristics must be assured to ensure the future sustainability of the adopted drainage system.
- 306. For more guidance on SUDS, the following documents and websites are recommended as a starting point:
 - Interim Code of Practice for Sustainable Drainage Systems, National SUDS Working Group, 2004
 - Draft Planning Policy Statement 25, Annex F, Office of the Deputy Prime Minister, 2005
 - www.ciria.org.uk/suds/

¹³ Interim Code of Practice for Sustainable Drainage Systems National SUDS Working Group, 2004

¹⁴ Interim Code of Practice for Sustainable Drainage Systems National SUDS Working Group, 2004



SUDS Component	Description	
Pervious surfaces	Surfaces that allow inflow of rainwater into the underlying construction or soil.	
Green roofs	Vegetated roofs that reduce the volume and rate of runoff and remove pollution.	
Filter drain	Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration.	
Filter strips	Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.	
Swales	Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter.	
Basins, Ponds and Wetlands	Areas that may be utilised for surface runoff storage.	
Infiltration Devices	Sub-surface structures to promote the infiltration of surface water to ground. They can be trenches, basins or soakaways.	
Bioretention areas	Vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground	
Pipes and accessories	A series of conduits and their accessories normally laid underground that convey surface water to a suitable location for treatment and/or disposal. (Although sustainable, these techniques should be considered where other SUDS techniques are not practicable).	

Table 6-2: Overview SUDS components

6.7 Local Community Actions to Reduce Flood Damage

- 307. It is estimated that several hundred homes within the District are at risk of flooding. As South Lakeland is extensively rural, a large proportion of the properties at risk are in isolated locations and at risk of flooding from small watercourses and surface water run-off. These types of floods are typically short in duration and have a low water depth. These types of floods are not normally economically viable to alleviate.
- 308. It is essential therefore to ensure a broad awareness with respect to flood risk, providing the community with the knowledge (and tools) that will enable them to help themselves should a flood event occur.
- 309. The following 'community based measures' are cost effective solutions that local communities may introduce to minimise the damage sustained to their own homes in the case of flooding.

6.7.1 Flood Proofing

310. There are many ways to protect to 'flood proof' a property. Some of the more common ones are listed below.



For new homes and/or during redevelopment

Raising of floor levels

The raising of floor levels above the anticipated maximum flood level (including an allowance for climate change) ensures that the interior of the property is not directly affected by flooding, avoiding damage to furnishings, wiring and interior walls. It is highlighted that plumbing may still be impacted as a result of mains sewer flooding.

> Raising of electrical wiring

The raising of electrical wiring and sockets within flood affected buildings reduces the risks to health and safety, and reduces the time required after a flood to rectify the damages sustained.

For existing homes

> Flood boards

The placement of a temporary watertight seal across doors, windows and air bricks to avoid inundation of the building interior may be suitable for relatively short periods of flooding. However the porosity of structural elements may result in damage being sustained should water levels remain elevated for an extended period of time. This may lessen the effectiveness of flood proofing to existing properties affected by flooding from larger river systems.

- 311. For more guidance on flood proofing, the following documents and websites are recommended as a starting point:
 - Government Guidance on Improving the Flood Performance of New Buildings: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf
 - http://www.sepa.org.uk/flooding/protection/index.htm
 - http://www.floodforum.org.uk/flood_forum/floodprotection/index_html
 - Damage Limitation Guide, available from: <u>http://www.environmentagency.gov.uk/commondata/acrobat/dlimitation_aug03_354</u> <u>620.pdf</u>

6.7.2 Flood Warning

- 312. One the key roles of the Environment Agency is forecasting floods and warning the public. They also try to raise awareness of flooding in areas prone to it and recommend that people living there make preparations in advance.
- 313. The Environment Agency monitors rainfall, river levels and sea conditions 24 hours a day. Combined with weather data and tidal reports from the Met Office, they provide local area forecasts on the possibility of flooding and its likely severity. Areas benefiting from this service in South Lakeland include Kendal & Burneside which are affected by river flooding. Whilst the Duddon Estuary, North Morecambe Bay and Kent Estuary receive tidal flood warnings.

6.8 Emergency Planning

- 314. Emergency planning is a critical element of any sustainable flood risk management solution. Liaison with both the Environment Agency and emergency services is imperative.
- 315. The Environment Agency monitor river levels within the main rivers affecting the District, and based upon weather predictions provided by The Met Office, make an assessment of the anticipated maximum water level that is likely to be reached within the proceeding hours (and/or days). Where these predicted water levels are expected to result in the inundation of populated areas¹⁵, the Environment Agency will issue a series of flood warnings within

¹⁵ Restricted to those urban areas situated within Environment Agency flood warning zones (see 298 above)



defined flood warning areas, encouraging residents to take action to avoid risk to themselves and reduce damage to property from flooding in the first instance.

- 316. As water levels rise and begin to pose a risk to life and/or livelihood, it is the responsibility of the Police to coordinate the evacuation of residents. This evacuation will be supported and facilitated by the Council and other emergency services. It is essential that a robust plan is in place that clearly sets out (as a minimum):
 - \succ roles and responsibilities;
 - > paths of communication;
 - evacuation routes;
 - > Community Support Centres to house evacuated residents;
 - > contingency plans in case of loss of power and/or communication.
- 317. Cumbria County Council, who is the body responsible for the Emergency Planning during major events, has a long established Multi-Agency Response Plan for Flooding in Cumbria (MARP). This plan covers the co-ordination of an emergency i.e. Community Support Centres, welfare, etc. These plans are exercised regularly and have stood the test of real events.
- 318. Emergency planning in South Lakeland is complicated by the rural (and hence dispersed) nature of the population. Apart from the Key Service Centres, the district comprises relatively small villages and settlements spread out over a wide area.
- 319. During a District-wide flood event, the council and other Emergency Services could find it difficult to provide assistance to large portions of the population. Warning times are short, travel distances are long and rural roads may be cut off or damaged by flooding.
- 320. In order to manage a flood related emergency event as effectively as possible, pre-planning is essential. The council should:
 - > Identify villages or village clusters most at risk (isolation, population, vulnerability)
 - Promote local emergency response capability/plan for those centres which are unlikely to be reached by council staff or emergency services with the relevant Parish Council.
 - Develop a post-event plan (Recovery Phase Plan) to manage the after effects of the flood.
- 321. At County level, the Emergency Planning Unit has acknowledged that in certain areas the emergency response may be limited and that it is unfeasible to provide emergency cover for all of the small villages and settlements. Consequently, they are now in the process of implementing community resilience measures that will come into effect during an emergency event, which would include flooding. One measure, for example, involves a nominated person knocking on the door of known vulnerable people in the area on a receipt of a flood warning.
- 322. 'Dry' access (i.e. above flood level) should be sought wherever possible as part of future planning applications to ensure that all residents can be safely evacuated in times of flood. As part of their long term strategy for road maintenance and improvement, the County Council progressively should seek opportunities to raise critical evacuation routes above the greater of the 1% AEP + 20% flow (i.e. climate change) flood level if feasible. As an absolute minimum, 'safe' access must be assured during the 1% AEP (100 year) fluvial flood level, defined with due consideration to the emerging Defra research presented in "Flood Risk to People". It is highlighted that road raising must not have a detrimental impact upon flow routes and/or the effectiveness of floodplain storage.
- 323. Residents in areas affected by flooding on a more frequent basis (e.g. in the 5% (20 year) event) are likely to be the most vulnerable as water levels rise. These areas will flood more frequently than other areas of the District, and are likely to be the first cut off from safe evacuation routes.



- 324. Another problem for South Lakeland District Council is that it is responsible for emergency planning in the Lake District National Park, however spatial planning within the National Park is carried out by the Lake District National Park Authority. The impact of this is that, during a flood event, the effectiveness of South Lakeland District Council to evacuate people to safe places is influenced by the planning decisions of another authority.
- 325. There is a clear need for both parties to work together so that the planning decisions made do not adversely affect the ability of South Lakeland District Council to provide an adequate emergency response.
- 326. It is recognised that initiatives are in place through County, Local and Parish Councils actions. However, it is recommended that the Local and County Council's Emergency Response Plans are reviewed in light of the findings and recommendations of the SFRA to investigate areas where safety, including access, can be improved during a major flooding event, focussing the highest risk locations first.

6.9 Insurance

- 327. Many residents and business owners perceive insurance to be a final safeguard should damages be sustained as a result of a natural disaster such as flooding. Considerable media interest followed the widespread flooding of 2000 when it became clear that the insurance industry were rigorously reviewing their approach to providing insurance protection to homes and businesses situated within flood affected areas.
- 328. The precise outcome of this review remains somewhat unclear. However it is broadly understood that those property owners who are situated above the 1.33% AEP (75 year)¹⁶ flood level will be able to secure insurance policies that will protect them against damages sustained in case of flooding.
- 329. There is a lack of clarity where properties are situated below this level, though it is understood that property owners will generally be protected against damages caused by a failure of the urban drainage system (i.e. drainage and/or sewer flooding). Insurance against river flooding may be provided in some areas, however premiums are likely to be considerable. Further information in this respect is available from the Association of British Insurers (ABI).

6.10 A Living Document

- 330. The South Lakeland SFRA has been developed in accordance with PPS25. The SFRA has been developed, building heavily upon existing knowledge with respect to flood risk within the District.
- 331. The Environment Agency regularly review and update their Flood Maps (on a quarterly basis) and a rolling programme of detailed flood risk mapping within the North West region is underway. This will improve the current knowledge of flood risk within the District, and may alter predicted flood extents. The flood extents for different probability flood events could also change over time, due to factors such as climate change and sea leave rise. For example, higher river levels as a result of increased rainfall would likely enlarge the area and depth of the 1 in 100 year flood. These factors could therefore influence future planning and development control decisions within these areas.
- 332. It is imperative that the SFRA is adopted as a 'living' document and is reviewed regularly in light of emerging policy directives and an improving understanding of flood risk within the District. This should specifically include a review of new Flood Maps and detailed modelling outputs produced by the Environment Agency.

¹⁶ That is, the event that has a 1.33% probability of occurring in any one year. In other words, the event that will occur on average (or be exceeded) once every 75 years.



- 333. In order to achieve this, it is recommended that a formal arrangement is adopted between the Environment Agency Area Office (at Penrith) and South Lakeland District Council's Development Plans Manager. This arrangement should ensure that any updated detailed modelling flood extents are issued by the Environment Agency and are incorporated into the Local Authorities relevant Development Plans as early as possible.
- 334. It is recommended that the SFRA text is reviewed on an annual basis during the first quarter of each year (January to March). Appendix E contains recommended key questions that should form part of the review.

6.11 Using the SFRA Mapping

- 335. Following the completion of the SFRA there are now two sets of maps which contain flooding information; the Environment Agency Flood Maps and the SFRA maps. This may lead to some confusion about which ones should be used by the Local Authority and developers to make planning decisions.
- 336. It is recommended that initially the Environment Agency Flood Maps are looked at. This will establish whether or not the Environment Agency will be requesting an FRA. However, the Environment Agency Flood Maps do not always contain the results of detailed modelling and at present do not show Zone 3b Functional Floodplain and localised drainage issues.
- 337. Once the Environment Agency Flood Maps have been consulted, the SFRA maps must then be examined. The SFRA maps should always contain the latest modelled flood extents and should be used to make planning decisions.
- 338. If there is a difference between the EA Flood Maps and the SFRA Maps the EA should be informed as early as possible. It is likely that the flood extents in the SFRA will be accepted as the correct ones to use.



7 Conclusion & Recommendations

- 339. A considerable proportion of South Lakeland is at risk of flooding. The risk of flooding posed to properties within the District arises from a number of sources including river and coastal flooding, localised runoff and sewer flooding.
- 340. The District has an extensive coastline and a number of major river systems including the River Kent, the River Crake and the River Leven and their tributaries. Collectively, these represent major sources of flood risk to properties within the District, including the Key Service Centres of Kendal and Ulverston.
- 341. A collation of potential sources of flood risk has been carried out in accordance with PPS25, developed in close consultation with both the Council and the Environment Agency. The District has been broken down into zones of 'high', 'medium' and 'low' probability of flooding in accordance with PPS25, providing the basis for the application of the PPS25 Sequential Test.
- 342. A <u>planning solution</u> to flood risk management should be sought wherever possible, steering vulnerable development away from areas affected by flooding in accordance with the PPS25 Sequential Test. Specific planning recommendations have been provided for all towns and larger villages within the District (refer Section 6.4).
- 343. Where other planning considerations must guide the allocation of sites and the Sequential Test cannot be satisfied, specific recommendations have been provided to assist the Council and the developer to meet the Exception Test. These should be applied as <u>development control conditions</u> for all future development (refer Section 6.4).
- 344. <u>Council policy</u> is essential to ensure that the recommended development control conditions can be imposed consistently at the planning application stage. This is essential to achieve future sustainability within the District with respect to flood risk management. It is recommended that future revisions to Council policy in the Local Development Framework are developed in light of the suggested development control conditions presented by the South Lakeland District SFRA (refer Section 6.4).
- 345. <u>Emergency planning</u> is imperative to minimise the risk to life posed by flooding within the District. It is recommended that the South Lakeland District Council and Cumbria County Council review their adopted flood risk response plan in light of the findings and recommendations of the SFRA. It is also vital to ensure that spatial planning supports flood risk management policies and emergency planning.
- 346. The core data used to underpin the development of the SFRA will be superseded over time as the Environment Agency provides further investment in detailed modelling of the major rivers in the district, reviewing its Flood Maps on a quarterly basis. It is recommended that the Environment Agency Flood Maps are retained as the 'first pass' filter at the development application stage, triggering (or otherwise) the need for a more detailed site-based investigation. However, the SFRA Maps will be more accurate and show more information, such as local flooding issues and Flood Zone 3b Functional Floodplain.
- 347. The SFRA should be retained as a <u>'living' document</u>, reviewed on a regular basis in light of better flood risk information and emerging policy guidance.





Glossary

AEP	Annual Exceedance Probability e.g. 1% AEP is equivalent to 1% probability of occurring in any one year (or, on average, once in every 100 years)	
Core Strategy	The Development Plan Document within the Council's Local Development Framework which sets the long-term vision and objectives for the area. It contains a set of strategic policies that are required to deliver the vision including the broad approach to development.	
DCLG	Department of Communities and Local Government	
Defra	Department of Environment, Food and Rural Affairs	
Development	The carrying out of building, engineering, mining or other operations, in, on, over or under land, or the making of any material change in the use of a building or other land.	
Development Plan Document (DPD)	A spatial planning document within the Council's Local Development Framework which set out policies for development and the use of land. Together with the Regional Spatial Strategy they form the development plan for the area. They are subject to independent examination.	
DPD	Development Planning Document	
EA	Environment Agency	
Flood Map	Nationally consistent delineation of 'high' and 'medium' flood risk, published on a quarterly basis by the Environment Agency	
Formal Flood Defence	A structure built and maintained specifically for flood defence purposes	
Functional Floodplain	PPS25 Flood Zone, defined as areas at risk of flooding in the 4% AEP (25 year) design event	
Habitable Room	A room used as living accommodation within a dwelling but excludes bathrooms, toilets, halls, landings or rooms that are only capable of being used for storage. All other rooms, such as kitchens, living rooms, bedrooms, utility rooms and studies are counted.	
Zone 3a High Probability	PPS25 Flood Zone, defined as areas at risk of flooding in the 1% AEP (100 year) design event	
Informal Flood Defence	A structure that provides a flood defence function but has not been built and/or maintained for this purpose (e.g. boundary wall)	
Local Development Framework (LDF)	Consists of a number of documents which together form the spatial strategy for development and the use of land	
Zone 1 Low Probability	PPS25 Flood Zone, defined as areas less likely to flood than those in Zone 2 Medium Probability	
Zone 2 Medium Probability PPS25 Flood Zone, defined as areas at risk of flooding in ever greater than the 1% AEP (100 year), and less than the 0.1% year) design event		



Planning Policy Guidance (PPG)	A series of notes issued by the Government, setting out policy guidance on different aspects of planning. They will be replaced by Planning Policy Statements.
Planning Policy Statement (PPS)	A series of statements issues by the Government, setting out policy guidance on different aspects of planning. They will replace Planning Policy Guidance Notes
PPG25	Planning Policy Guidance 25: Development and Flood Risk Office of the Deputy Prime Minister (ODPM), 2001
PPS25	Planning Policy Statement 25: Development and Flood Risk Department of Community & Local Government, December 2006
Previously Developed (Brownfield) Land	Land which is or was occupied by a building (excluding those used for agriculture and forestry). It also includes land within the curtilage of the building, for example a house and its garden would be considered to be previously developed land.
Residual Risk	A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the review process
SEA	Strategic Environmental Assessment
	5
SLDC	South Lakeland District Council
SLDC	South Lakeland District Council Sustainable Urban Drainage System
SLDC SUDS Supplementary Planning Document (SPD)	South Lakeland District Council Sustainable Urban Drainage System Provides supplementary guidance to policies and proposals contained within Development Plan Documents. They do not form part of the development plan, nor are they subject to independent examination.
SLDC SUDS Supplementary Planning Document (SPD) Sustainability Appraisal (SA)	South Lakeland District Council Sustainable Urban Drainage System Provides supplementary guidance to policies and proposals contained within Development Plan Documents. They do not form part of the development plan, nor are they subject to independent examination. Appraisal of plans, strategies and proposals to test them against broad sustainability objectives.





Appendix A South Lakeland District Council SFRA User Guide









Strategic Flood Risk Assessment **User Guide (Development Plans)**







Appendix B Key and Potential Local Service Centre Maps



The flood zones used in the maps correspond to the following risk levels (see section 5.2 for more detail:

PPS Flood Zones		Flood Frequency	Annual Probability
Zone 1	Low Probability	1 in 1000 year or less	<0.1%
Zone 2	Medium Probability	1 in 100 year to 1 in 1000 year	1% to 0.1%
Zone 3a	High Probability	1 in 20 year to 1 in 100yr	4% to 1%
Zone 3b	Functional Floodplain	1 in 20 year or higher	>4%





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Appendix C Tables D1, D2 & D3 from PPS25





Table D.1: Flood Zones

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 Low Probability

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%).

Appropriate uses

All uses of land are appropriate in this zone.

FRA requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. 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 and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 2 Medium Probability

Definition

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

Appropriate uses

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure 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 is passed.

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.



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:

- i. 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;
- ii. relocate existing development to land in zones with a lower probability of flooding; &
- iii. 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.

Policy aims

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

i. 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 D.2: Flood Risk Vulnerability Classification

Essential Infrastructure

• Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.

Highly Vulnerable

- Police stations, Ambulance stations and Fire stations and
- Command Centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent.

More Vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; nonresidential institutions not included in 'more vulnerable'; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment plants.
- Sewage treatment plants (if adequate pollution control measures are in place).

Water-compatible Development

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



Table D.3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

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

Key:

✔ Development is appropriate

X Development should not be permitted



Appendix D Examples of Development Plan Flood Risk Policies







Policy XX – Flood Risk Management

Flood risk assessment (FRA) will be required for major development proposals within Flood Zone 1 and all new development within Flood Zones 2 and 3 (3a and 3b).

The FRA should be commensurate with the degree of flood risk posed to and by the proposed development and take account of the advice and recommendations set out in the Strategic Flood Risk Assessment 2007, including measures to be adopted by new development to reduce flood risk and meet the requirements of PPS25 (Development and Flood Risk)

Within Flood Zone 3b, functional floodplain, only water compatible uses and essential infrastructure (PPS25 Table D3) will be permitted.

Within High Risk Zone 3a, development proposals should include the flood mitigation measures set out below as an integral part of the design process:

- land use on the ground floor must be limited to non-residential uses;
- floor levels must be situated above the 1% predicted maximum flood level plus climate change, incorporating an allowance for freeboard. The SFRA, section 6 provides further guidance on raised floor levels and predicted flood depths;
- safe escape routes must be provided for evacuation in times of flood;
- access to basement areas must be situated above the predicted maximum flood level plus climate change, incorporating an allowance for freeboard and all basements must be of a waterproof construction;
- development must not result in an increase in maximum flood levels within adjoining properties.

Within Medium Probability Zone 2 development proposals must have:

- floor levels situated above the 1% (100) year predicted maximum flood level plus climate change, incorporating an allowance for freeboard. The SFRA, section 6, provides further guidance on raised floor levels and predicted flood depths;
- safe escape routes must be provided for evacuation in times of flood, even within areas where buildings are not directly affected.

Within all areas (including Low Flood Risk Zone 1), development proposals should, where appropriate, include SUDS (Sustainable Urban Drainage Systems) to reduce surface water runoff rates, or as a minimum ensure that future redevelopment does not increase runoff.



Example 2

Policy A - Minimising the Risk from Flooding

Development will not be permitted where it would, either in itself or cumulatively with other development, materially;

- increase the risk of flooding elsewhere by impeding the flow of floodwater;
- reduce the capacity of the floodplain to store water;
- increase the number of people, property or infrastructure at risk of flooding; or
- inhibit the effectiveness or maintenance of an artificial drainage channel or flood control defences,

unless it is demonstrated through a Flood Risk Assessment that;

- a) there are no other alternative reasonably available sites at lower risk from flooding; and
- b) the above effects can be overcome by mitigation measures that will provide adequate protection for the lifetime of the development secured through planning conditions or planning agreements.

Even in Zone 1 development can potentially affect flooding elsewhere through the addition of hard surfaces and effects on surface water run-off. Planning applications for development in Zone 1 which include additional floorspace or the loss or addition of external hard surface areas on sites of 1 ha or more¹⁷ should therefore include as a minimum a Drainage Impact Assessment. The Drainage Impact Assessment should demonstrate how the proposed drainage system will adequately mitigate any possible increase in runoff that may occur as a result of the development. It is suggested that Drainage Impact Assessments are prepared in consultation with the Environment Agency.

In the first instance new development should be guided towards areas of low and subsequently moderate flood risk (i.e. Zones 1 or 2). For development proposals in Zone 3a Policy B and supporting text set out the Council's requirements for applying the Sequential Test and Exceptions Test.

When seeking to overcome the effects of development on flooding, either within the site or elsewhere, applicants will be required to set out in an FRA the most suitable mitigation measures for the proposed development and individual circumstances of the site. Early dialog with the Environment Agency at the pre-application stage is recommended to enable suitable mitigation measures to be incorporated at the design stage and reduce the risk of abortive work, delays to the decision making process or ultimately refusal of planning permission.

Mitigation measures incorporated in site based FRAs will need to be reasonable and enforceable through planning conditions or planning agreements and agreed in advance with the Environment Agency. Applicants should consider one or more of the following Sustainable Urban Drainage components, 'flood proofing' measures or localised flood defences as potential mitigations to be incorporated into FRAs:

Potential SUDS Components

- Pervious surfaces
- Green roofs
- Filter drains or filter strips
- Swales
- Basins, ponds or wetlands
- Infiltration devises

¹⁷ Ref: PPS25, Appendix D.



• Bioretention areas

Flood Proofing Measures

- Raising of floor levels a minimum of 600mm, plus 20%¹⁸, above peak flood levels (reduced to 300mm where detailed flood models are available)
- Incorporation of flood boards
- Raising of electrical wiring

Localised Flood Defences

- Low level bunding
- Raised curbs
- Reprofiling of roads
- Dry routes, safe escape routes or 'safe havens' above peak flood levels

Policy B - Development in Areas of High Flood Risk

Planning permission will be granted for development on sites of 0.5ha or more, or of 10 dwellings or more or 100 m^2 or more of non-residential development within Flood Zone 3a provided it is demonstrated:

- a) that there are no other alternative reasonably available sites in areas of low to moderate flood risk (Flood Zones 1 and 2); and
- b) through the application of the 'sequential test', there are no other alternative reasonably available sites in Zone 3a that are at less risk from flooding or if developed would have less of an effect on flooding elsewhere.

The above policy is consistent with the guidance provided in PPS25 that requires proposals for new development to be subject to a Sequential Test. The purpose of the Sequential Test is to encourage non-water compatible development to take place in areas at lowest risk from flooding. However in some instances it may not be possible or preferable, in the wider planning context, to restrict all forms of development to Zones 1 and 2.

A proportion of the District is situated within Zone 3a and it is broadly recognised that in order to support the future sustainability of the area some degree of development may be required within Zone 3a.

FRAs should also includes appropriate mitigation measures to overcome any individual or cumulative effects of the proposal on flooding either on the site or elsewhere, as referred to in Policy A and supporting text.

Policy C -Development in Close Proximity to Flood Defences

Development on sites of 0.5ha or more, or of 10 dwellings or more or 100 m² or more of nonresidential development, that are within 1000m of a raised flood defence will only be permitted if it is demonstrated the structural integrity of the defences are, or will be, sufficient to provide flood defence for the lifetime of the development. If improvements are required to flood defences these will be sought through planning conditions or legal agreements.

Areas situated closely behind raised flood defences are referred to in the SFRA areas of high flood hazard where there is a measurable risk to life should the defence fail. It is essential that development proposals in these areas take into account the future structural integrity of these flood defences over the lifetime of the development.

¹⁸ PPS25 states that a 20% increase in the 1% AEP (100 year) within the next 100 years.



In order to assess the structural condition of flood defences applicants are encouraged to undertake a detailed breach assessment in liaison with the Environment Agency. Breach assessments should focus on the structural integrity of the existing flood defences and the risk to human life should a defence overtopping or any type of breach failure take place over the lifetime of the development, taking into account climatic change.

Where the structural integrity of the defences is considered to be inadequate and it is considered, in the event of a breach, there would be an unacceptable risk to human life planning permission will not be granted unless flood defence improvements are agreed with the Environment Agency and can be delivered through a condition of planning permission or legal agreement.



Appendix E SFRA Review Procedure





The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the district. A rolling programme of detailed flood risk mapping within Cumbria is underway. This, in addition to observed flooding that may occur throughout a year, will improve the current knowledge of flood risk within the district and may marginally alter predicted flood extents. Furthermore, Communities and Local Government (CLG) are working to provide further detailed advice with respect to the application of PPS25, and future amendments to the PPS25 Practice Guide are anticipated. Given that this is the case, a periodic review of the SFRA is imperative.

It is recommended that the South Lakeland District Council SFRA is reviewed on a regular basis. The following key questions should be addressed as part of the SFRA review process:

Question 1

Has any flooding been observed within the District since the previous review? If so, the following information should be captured as an addendum to the SFRA:

- > What was the mapped extent of the flooding?
- > On what date did the flooding occur?
- > What was the perceived cause of the flooding?
- If possible, what was the indicative statistical probability of the observed flooding event? (i.e. how often, on average, would an event of that magnitude be observed within the District?)
- If the flooding was caused by overtopping of the riverbanks, are the observed flood extents situated outside of the current Zone 3a? If it is estimated that the frequency of flooding does not exceed, on average, once in every 100 years then the flooded areas (from the river) should be incorporated into Zone 3a to inform future planning decision making.

Question 2

Have any amendments to PPS25 or the Practice Companion Guide been released since the previous review? If so, the following key questions should be tested:

- Does the revision to the policy guidance alter the definition of the PPS25 Flood Zones presented within the SFRA? (refer Section 5.2)
- Does the revision to the policy guidance alter the decision making process required to satisfy the Sequential Test? (refer Section 6.4.1)
- Does the revision to the policy guidance alter the application of the Exception Test? (refer Section 6.4.1)
- Does the revision to the policy guidance alter the categorisation of land use vulnerability, presented within Table D2 of PPS25 (December 2006)?

If the answer to any of these core questions is 'yes' then a review of the SFRA recommendations in light of the identified policy change should be carried out.

Question 3

Has the Environment Agency issued any amendments to their flood risk mapping and/or standing guidance since the previous policy review? If so:

- ➤ Has any further detailed flood risk mapping been completed within the District, resulting in a change to the 20 year, 100 year or 1000 year flood outline? If yes, then the Zone 3b and Zone 3a flood outlines should be updated accordingly.
- Has the assessment of the impacts that climate change may have upon rainfall and/or river flows over time altered? (refer Section 5.6) If yes, then a review of the impacts that climate change may have upon the District is required.
- Do the development control recommendations provided in Section 6.4 of the SFRA in any way contradict emerging EA advice with respect to (for example) the provision of emergency access, the setting of floor levels and the integration of sustainable drainage techniques? If yes, then a discussion with the EA is required to ensure an agreed suite of development control requirements are in place.

It is highlighted that the Environment Agency review the Flood Zone Map on a quarterly basis. If this has been revised within the District, the updated Flood Zones will be automatically



forwarded to the Council for their reference. It is recommended that only those areas that have been amended by the Environment Agency since the previous SFRA review are reflected in Zone 3 and Zone 2 of the SFRA flood maps. This ensures that the more rigorous analyses carried out as part of the SFRA process are not inadvertently lost by a simple global replacement of the SFRA flood maps with the Flood Zone Maps.