High Peak Borough Council

Strategic Flood Risk Assessment for
Local Development Framework
Level 1
Volume 1 - FINAL
September 2008

Halcrow Group Limited

High Peak Borough Council

Strategic Flood Risk Assessment for Local Development Framework Level 1 - FINAL Volume 1

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Executive Summary

In December 2007 Derbyshire Dales District Council, High Peak Borough Council and the Peak District National Park Authority commissioned Halcrow to produce a Level 1 Strategic Flood Risk Assessment (SFRA) in accordance with Planning Policy Statement 25 (PPS25). The purpose of the SFRA is to assess and map all forms of flood risk from groundwater, surface water, sewer and river sources, taking into account future climate change predictions, and use this as an evidence base to locate future development primarily in low flood risk areas. The outputs from the SFRA will also help the Councils to prepare sustainable policies for the long-term management of flood risk.

The plan area of High Peak Borough Council drains into two major river catchments. The northern and central parts of the plan area drain into the Goyt and Etherow catchments, which ultimately drain into the River Mersey. The southern part of the plan area drains into the River Wye catchment, which ultimately drains into the River Trent. The effects of climate change mean that flood risk areas in the Borough are likely to flood more frequently, and flooding from other sources is also likely to increase.

The SFRA is a tool which will inform the Council of the nature of flood risk in the area. It will provide an important part of the evidence base for the preparation of the Local Development Framework (LDF), in particular the Core Strategy. Furthermore the SFRA will provide useful information for the Sustainability Appraisal (SA) and will assist in the development of appropriate flood risk management policies. The suggested policies in the SFRA take direction from PPS25, Making Space for Water, the Water Framework Directive and Catchment Flood Management Plans (CFMPs). There are opportunities for the Council to assist in the reduction of risk by vigorously applying PPS25, promoting the use of SUDS, seeking opportunities for flood storage, ensuring that Flood Zones 2 and 3 remain undeveloped where possible and reinstating previously developed areas of functional floodplain (e.g. reduce building footprints or relocate to lower flood risk zones).

In accordance with PPS25 and its Practice Guide, areas of 'low', 'medium' and 'high' risk have been mapped using data collected from the Environment Agency, High Peak Borough Council and Derbyshire Dales District Council, the Peak District National Park Authority, Severn Trent Water, Yorkshire Water, United Utilities, the County Council and British Waterways. This has included information on flooding from rivers, surface water, groundwater, artificial water bodies and sewers. This provides the basis for the Sequential Test to be applied. The Council will need to apply the Sequential Test to all sites within the 'high' and 'medium' risk flood zones to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed. In instances where there is an area of overlap between the site boundary and area at risk of flooding, this should be utilised as an opportunity to reduce flood risk within the site, by using flood risk areas for recreation, amenity and environmental purposes. It is important that policies should recognise the positive contribution that avoidance and management of flood risk can make to the development of sustainable communities. Where the need to apply the Exception Test is identified, if the Council considers that there are an insufficient number of suitable sites in Flood Zone 1 for development, the scope of the SFRA should be widened to a Level 2 SFRA. It is recommended that this is undertaken by a suitably qualified technical expert.

The SFRA has been reviewed and approved by the Environment Agency, and a letter which signs off the SFRA can be found in Appendix A.

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1 Introduction

1.1 Terms of Reference

In December 2007 Derbyshire Dales District Council, High Peak Borough Council and the Peak District National Park Authority commissioned Halcrow to produce a Level 1 Strategic Flood Risk Assessment (SFRA) in accordance with Planning Policy Statement 25 (PPS25). These authorities make up the Peak Sub-Region as defined by the Draft East Midlands Regional Plan 2006. The SFRA is split into three reports; this report presents the findings of the SFRA for the area for which High Peak Borough Council is the local planning authority.

1.2 Project Aims

The aims of PPS25 planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is necessary in such areas, exceptionally, the policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall. 'Safe' in the context of this study means that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain; emergency vehicular access is possible during times of flood; and the development includes flood resistance and resilience measures to ensure it is safe.

The aim of the SFRA therefore is to map all forms of flood risk and use this as an evidence base to locate new development primarily in low flood risk areas (Zone 1). Where development cannot be located in Flood Zone 1 the planning authority will need to apply the Sequential Test to land use allocations and, where necessary, the Exception Test (requiring a Level 2 SFRA). In addition, the SFRA allows the planning authority to:

- Prepare appropriate policies for the management of flood risk
- Inform the Sustainability Appraisal (SA) so that flood risk is taken account of, when considering options and in the preparation of strategic land use policies
- Identify the level of detail required for site-specific Flood Risk Assessments (FRAs)
- Determine the acceptability of flood risk in relation to emergency planning capability

The SFRA will inform the site selection process for future development sites and provide recommendations for policies to deal with non-allocated sites. The SFRA will feed into the Local Authority's SA of the Local Development Documents (LDDs) and will enable informed decisions to be made relating to land use and development allocation within the respective Development Plan Documents (DPDs).

1.3 Project Objectives

Halcrow has carried out this project in accordance with the Project Brief, dated November 2007, though the methodology and deliverables have been aligned to the document "Development and Flood Risk: A Practice Guide Companion to PPS25" (2006). The SFRA has also followed advice from the Environment Agency.

For this study, a Level 1 SFRA approach has been agreed with the Council and the Environment Agency. A Level 1 SFRA is defined in the Practice Guide Companion to PPS25 as a desk-based study using existing information to allow application of the Sequential Test on the basis of Table D1 of PPS25 and to identify whether application of the Exception Test is likely to be necessary.

The best available data within the study timescale has been collected for use in this study; however it is important to recognise that the SFRA is a 'living' document. As new information becomes available (such as improved river models) updates will be made to the Flood Zone maps and this should be reflected in the SFRA document, to ensure that the best information is used to guide the site selection process for future developments.

1.4 Project Deliverables

The project outputs for a Level 1 SFRA have been adopted for this study. The deliverables of this assessment are: a technical report; a summary document and a series of maps.

Following the advice from Section 2.34 of the Practice Guide Companion to PPS25, the key project outputs are as follows:

1) Plans showing the administrative boundaries of the study area, watercourse centrelines, modelled watercourses, canals, defences, Areas Benefiting from Defences (ABDs) and culverted watercourse sections (Volume 2, Tiles A1-A14)

2) Strategic flood risk maps showing flooding from all sources, including fluvial Flood Zones (including the functional floodplain, Flood Zone 3b, where possible), and areas at risk of flooding from sources other than rivers (Volume 2, Tiles B1-B15)

3) An assessment of the implications of climate change for flood risk in the study area over an appropriate time period (Volume 2, Tiles C1-C3)

4) The location of any flood risk management measures, including both infrastructure (Volume 2, Tiles A1-A14) and the coverage of flood warning systems (Volume 2, Tile F1)

5) Guidance on the application of the Sequential Test (see Chapter 8)

6) Guidance on the preparation of FRAs for development sites (see Chapter 9).

7) Guidance on the likely applicability of different Sustainable Drainage System (SUDS) techniques for managing surface water run-off at key development sites (see Chapter 10)

1.5 Outcomes of the SFRA Process

The Level 1 SFRA provides sufficient data and information to enable the planning authority to apply the Sequential Test to land use allocations and can therefore identify, where necessary, the Exception Test needs to be applied (see sections 1.5.1 and 1.5.2 respectively).

PPS25 also indicates that SAs should be informed by the SFRA for their area. Under the Town and Country Planning (Local Development - England) Regulations 2004, an SA is required for all LDFs. The purpose is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans. The Regulations stipulate that SAs for LDFs should meet the requirements of the Strategic Environmental Assessment (SEA) Directive. An SFRA

is used as a tool by a planning authority for the production of development briefs, setting constraints, identifying locations of emergency planning measures and requirements for FRAs.

It is important to reiterate that PPS25 should not be applied in isolation, but 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. 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. Importantly, policies should recognise the positive contribution that avoidance and management of flood risk can make to the development of sustainable communities.

1.5.1 The Sequential Test

The primary objective of PPS25 is to steer vulnerable development towards areas of lowest flood risk. PPS25 therefore advocates a sequential approach to 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 first instance. Preference should therefore be given to locating new development in Flood Zone 1, Low Probability (see section 3.3.1). If there is no reasonably available site in Flood Zone 1, the flood vulnerability (see table D3 of PPS25, below) of the proposed development can be taken into account in locating development in Flood Zone 2 (Medium Probability) and then Flood Zone 3 (High Probability). Within each Flood Zone new development should be directed away from 'other sources' of flood risk and towards the adjacent zone of lower probability of flooding, as indicated by the SFRA. Appendix B shows the Sequential Test process as advocated in PPS25.

As an integral part of the sequential approach, PPS25 stipulates permissible development types in Table D3 (flood risk vulnerability and Flood Zone 'compatibility'). 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.

Table 1.1: Flood Risk Vulnerability and Flood Zone 'Compatibility' (Table D3 of PPS25)

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

Key:

✔ Development is appropriate

✗ Development should not be permitted

Table D2 of PPS25 (reproduced below) classifies different types of development under different flood risk vulnerabilities, and should be used in conjunction with Table D1 in allocating new development as part of the Sequential Test.

Table 1.2: Flood Risk Vulnerability Classification (Table D2 of PPS25)

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[19]
More Vulnerable	• Hospitals • Residential institutions such 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[20] • Sites used for holiday or short-let caravans and camping, subject to specific warning and evacuation plan
Less Vulnerable	• Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure • Land and buildings used for agriculture and forestry • Waste treatment (except landfill and hazardous waste facilities) • Minerals working and processing (except for sand and gravel working) • Water treatment plants • Sewage treatment plants (if adequate pollution control measures are in place)
Water-compatible Development	• Flood control infrastructure • Water transmission infrastructure and pumping stations • Sewage transmission infrastructure and pumping stations • Sand and gravel workings • Docks, marinas and wharves • Navigation facilities • MOD defence installations • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location • Water-based recreation (excluding sleeping accommodation) • Lifeguard and coastguard stations • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan

References:

[19] DETR Circular 04/00 – Para 18: Planning controls for hazardous substances.

www.communities.gov.uk/index.asp?id=1144377

[20] See Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10 for definition. www.communities.gov.uk/index.asp?id=1500757

1.5.2 The Exception Test

If, following application of the Sequential Test, it is not possible, or consistent with wider sustainability objectives, for the development to be located in zones of lower probability of flooding, the Exception Test can be applied. This test provides a method of managing flood risk while still allowing necessary development to occur.

The Exception Test is only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons (the need to avoid social or economic blight and the need for essential civil infrastructure to remain operational during floods). It may also be appropriate to use it where restrictive national designations such as landscape, heritage and nature conservation designations, e.g. Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS), prevent the availability of unconstrained sites in lower risk areas.

For the Exception Test to be passed:

a) It must be demonstrated that the development provides wider sustainability benefits to the community which outweigh flood risk, informed by an SFRA where one has been prepared. If the DPD has reached the 'submission' stage (see Figure 4 of PPS12: Local Development Frameworks) the benefits of the development should contribute to the Core Strategy's SA;

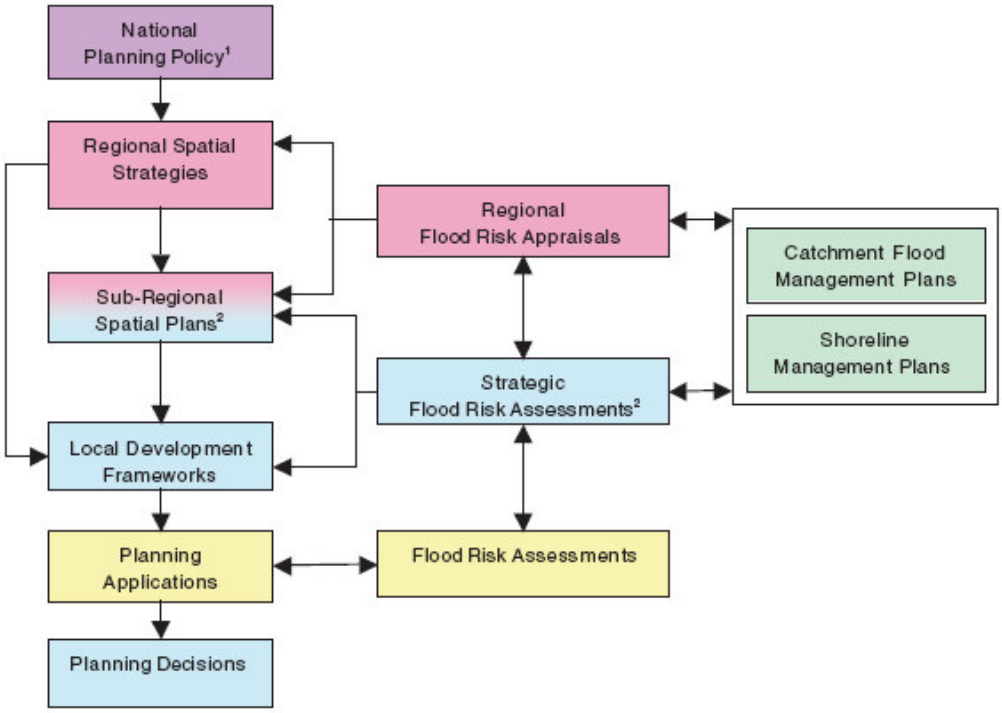
b) The development should be on developable previously-developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously-developed land; and,

c) A flood risk assessment must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

It is possible that the Council will need to apply the Exception Test if sites fall within Flood Zone 2 and 3, although it is not possible to fully determine this until the Sequential Test process has been undertaken.

1.6 SFRA Context

The figure overleaf, taken from the PPS 25 Practice Guide, illustrates the responsibilities for the production of key documents required to effectively manage flood risk through each stage of the spatial planning process, and, importantly, shows the link between other strategic documents.



Notes

1 Including Planning Policy Statement 25 *'Development and Flood Risk'* and the other flooding-related national planning policy listed in Appendix B of this Practice Guide.

2 SFRAs may cover more than one local planning authority region, and the adoption of a catchment-based approach by a number of LPAs working in partnership could be highly beneficial.

3 This diagram has been developed from the original within the Defra/EA 2005 report FD2320.

Figure 1.1: Development Planning Process for Flood Risk

1.7 The Study Area

High Peak Borough Council is located in northwest Derbyshire, in the north western part of the East Midlands. It sits substantially in the Peak District National Park, where the Borough Council has no planning powers; however, much of the western side of the Borough falls outside the National Park, where the Borough resumes planning power. The area outside the National Park is referred to as High Peak plan area, for which the SFRA study area covers. The implications of this are explored in greater detail in Section 3.4.

The plan area falls in two separate sections. The first, at the north western side of the Borough, covers 23.5km² and includes Glossop, Gamesley and much of Tintwistle. The second sits immediately south and covers much of the western and south western side of the Borough, with an area of some 104.5km². This area includes New Mills, Hayfield, Whaley Bridge, Chapel-en-le-Frith and Buxton. The latest figure of the population of the Borough (mid 2005) is estimated to be 91,140, though most of the population is concentrated within the plan area.

1.7.1 Main Rivers and Hydrology

The plan area of High Peak Borough Council drains into two major river catchments. The northern and central parts of the plan area drain into the Goyt and Etherow catchments, which ultimately drain into the River Mersey. The southern part of the plan area drains into the River Wye catchment, which ultimately drains into the River Trent. Main Rivers and minor watercourses can be viewed in Volume 2, Tiles A1-A14. A plan of Main Rivers within the Borough is included within Appendix C.

The **River Goyt** is a major watercourse in the study area. There are three main tributaries of the River Goyt: River Etherow, River Sett and Black Brook, all of which drain into the Goyt from the High Peak Borough area. The total area of the River Goyt and Etherow catchments is approximately 365km^2.

The River Goyt rises outside the plan area but still within the Borough, on Whetstone Ridge, to the south west of Buxton at an altitude of 520m AOD. The watercourse flows north through Errwood and Fernilee reservoirs (SK 0140 7510 and SK 0130 7740 respectively), then enters the plan area at SK 0080 7990. The watercourse passes through Horwich End, where it is met on the right bank by Randal Carr Brook. Upstream, this brook is called Meveril Brook. On the right bank lies an off line reservoir called Combs Reservoir, which is a canal feeder.

As the River Goyt continues downstream it flows through Whaley Bridge, continuing in a northerly direction. The river is met on the right bank by Black Brook. The Main River section of **Black Brook** rises at SK 0725 7983, which is directly on the plan area border. The watercourse forms the boundary of the Borough with the Peak District National Park area for approximately 1.8km, flowing in a northerly direction. At SK 0688 8095, to the west of Chapel-en-le-Frith, an unnamed drain enters the Black Brook from the west. Black Brook then flows in a westerly direction along the north western side of Chapel-en-le-Frith. At SK 0601 8126, around the Bowden Park area of Chapel-en-le-Frith, Black Brook is met by Warm Brook on the left bank. Warm Brook flows directly through the centre of Chapel-en-le-Frith, flowing in a south to north orientation. Downstream of Bowden Park, Black Brook flows north west towards Chapel Milton. It is met on the right bank by an unnamed Main River which predominantly drains fields to the north west. Continuing downstream in a north westerly direction, Black Brook is met by another unnamed Main River on the right bank. As Black Brook flows through the south of Chinley it is joined on the right bank by Otter Brook, flowing directly through Chinley in a north to south orientation. As Black Brook continues west it flows through Buxworth before meeting the River Goyt.

The River Goyt continues north past Bridgemont and Furness Vale, during which time the Peak Forest Canal runs parallel to it on the left bank. As the River Goyt approaches New Mills, it is joined by the River Sett on the right bank. The **River Sett** rises in the Peak District National Park on the Pennine Way and enters the plan area at SK 0500 8700. The watercourse flows in a westerly, then south-westerly direction through a narrow valley, draining the Hayfield area. Just downstream of Hatfield the River Sett is met by Hollingworth Clough on the right bank, which drains north to south through Little Hayfield. The River Sett continues west through Birch Vale and Thornsett, before turning to flow in a more south westerly direction, at which point it is met by an unnamed Main River on the right bank. The River Sett then continues south west directly through New Mills, after which it joins the right bank of the River Goyt at SK 0010 8530.

The River Goyt then continues in a predominantly western orientation, following the Borough and plan area boundary for approximately 2.5km, before exiting the plan area and indeed the Borough at SK 9800 8590.

The **River Etherow** rises in the north western side of the Borough and drains the Pennines, flowing in a predominantly south westerly direction. At its headwaters it flows through a succession of reservoirs including Woodhead, Torside, Rhodeswood, Valehouse and Bottoms Reservoirs. After this it enters the plan area of the High Peak and flows through Hollingworth, and then forms the western boundary of High Peak Borough Council and indeed the plan area, before joining the River Goyt to the north of Marple, outside of the Borough. The main tributary of the River Etherow is Glossop Brook. **Glossop Brook** drains the Pennines to the east of Glossop, flowing in a westerly direction through the plan area before joining the left bank of the River Etherow south of Hadfield. Three main tributaries of the Glossop Brook flow through the Glossop itself: Long Clough Brook, Hurst Brook and Shelf Brook.

The **River Wye** forms a large tributary of the River Derwent rising on the Axe Edge to the west of Buxton, entering the plan area at SK 0350 7220, where approximately 0.9km downstream it becomes designated Main River. Initially the watercourse flows in a northerly direction before turning to flow in an easterly direction passing through the centre of Buxton. At SK 0846 7251 the River Wye forms the boundary between the plan area and the Peak District National Park, before turning to flow in a southerly direction and exiting the plan area at SK 0867 7221. It should be noted that in Buxton, thermal springs have risen since records began. The flow has been fairly consistent, in both quantity (250,000 gallons per day) and temperature.

1.7.2 Geology and Topography

The topography, geology and soil are all important in influencing the way the catchment responds to a rainfall event. The degree to which a material allows water to percolate through it, the permeability, affects the extent of overland flow and therefore the amount of run-off reaching the watercourse. Steep slopes or clay rich (low permeability) soils will promote rapid surface runoff, whereas more permeable rock such as limestone and sandstone may result in a more subdued response.

The Peak Sub-Area is dominated by Carboniferous rocks occupying a large, broad structural dome at the heart of the Sub-Area. This has the Carboniferous Limestone of the White Peak at its heart, with younger rocks progressively outcropping to both the east and west and to a lesser degree north and south, as illustrated in the figure overleaf (http://www.peakdistrict-education.gov.uk/Fact%20Sheets/fz10geo.htm).

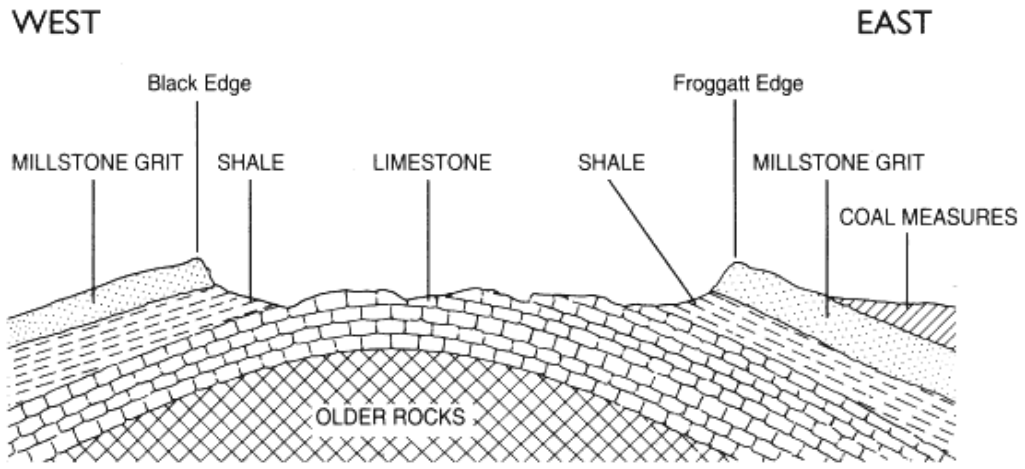


Figure 1.2: Cross section showing the profile of different rock types in the Peak District National Park

The south eastern side of High Peak Borough and indeed the plan area comprises the core of the dome, the massive Carboniferous Limestone, which gives rise to the limestone plateau of the White Peak. This area demonstrates landforms typical of the weathering and solution of limestone such as sinkholes and steep-sided valleys. A few patches of igneous intrusions are also seen in this area; igneous rocks are highly compact and less pervious. The Carboniferous Limestone gives way to the coarse sandstones and shales of the Millstone Grit, which form the upland area of the Dark Peak and the scarp for the remainder of the Borough and most of the plan area. On the western side of the plan area lie coal measures.

In terms of what the solid geology means for catchment response to runoff: limestone is a compact rock but also soluble in water, resulting in much solution activity, causing caves and karsts. The fractured nature of the limestone means water is allowed to percolate and hence runoff is relatively slow in these areas. Valley sides are very steeply sloping but due to the moderately permeable limestone geology, the combination of steep slopes and high rainfall does not result in waterlogged conditions. It is instead relatively well drained, but has the potential to respond very rapidly to rainfall following long periods of wet weather. Millstone grit is coarse sandstone, porous, but strongly cemented and resistant to erosion. It is also impervious due to its compact nature. Therefore the catchments on this geology respond quickly to runoff, partly due to the presence Millstone grit and shale and partly due to the high elevations, which vary between 130m AOD and 335m AOD. Reservoirs are ideally situated on shale due to the highly impervious nature of the rock.

Various drift deposits of Quaternary age occur in the Borough, though drift mainly occurs to the north and west where the topography is relatively lower and flatter. Till (or boulder clay), which formed in and beneath glaciers and ice-sheets, occurs in most of the plan area, except at the southern end. These have been deposited by ice sheets and meltwater over the past 500,000 years. Peat occurs towards the south western and north eastern extents of the plan area. These are typically waterlogged and result in fast runoff.

Solid geology and drift layers are shown in Volume 2, Tiles D1 and D2 respectively.

1.7.3 Summary

Using information on the geology of the Borough and topographical and fluvial information, a summary of local catchment response to rainfall can be made for the plan area in the High Peak. The headwaters of the Main Rivers in and around the plan area are steeply sloping, the runoff response of which is exacerbated by the Millstone grit geology and highly waterlogged peat soils. The flashy catchment responses exhibited by the high upstream catchments convey flashy flows downstream, which can be made worse downstream by the impervious Millstone grit, meaning that flood risk is a real issue in the plan area. The only exception is the headwaters of the River Wye to the south of the plan area, which lies on Carboniferous limestone, resulting in a relatively slow response to rainfall.

2 Study Methodology

2.1 Level 1 SFRA Methodology

A Level 1 SFRA is defined in the PPS25 Practice Guide Companion as a desk-based study using existing information to allow application of the Sequential Test and to identify where the Exception Test is likely to be necessary. The main tasks undertaken during the study were as follows:

a) Establishing relationships and understanding the planning context:

An Inception meeting was held to build relationships between the project team, the Councils and Authority and the Environment Agency. This allowed the partnering approach to form, and allow the free exchange of available information. Discussions were held on the status of the Councils' LDF and planning pressures to gain a clear picture of the challenges faced by the planning teams, and the various opportunities and constraints guiding the site allocation process. The study area was also discussed in detail, giving an overview of local features and flooding experienced from all sources.

b) Gathering data and analysing it for suitability:

A quality review of flood risk information was carried out by an experienced core team, who reviewed the collated data, assessed its significance and quality and advised on which data would be needed to drive the SFRA. The main approach adopted for the SFRA was to build on previous studies and existing information, supplied during the data collection phase.

c) Producing strategic flood risk maps, GIS deliverables and a technical report

A series of GIS maps were produced using the data gathered in the early phases of the study. The main mapping output is the strategic flood risk maps of the entire study area, which shows Flood Zones 1, 2 and 3 and flooding from all other sources, and should be used to carry out the Sequential Test. Other maps include study area maps showing canals and fluvial features, climate change maps showing the impacts of climate change on flood probability, geological maps, historic flood outline maps, and maps showing flood watch and warning areas. Hardcopy maps are provided in Volume 2 of the SFRA report, while GIS layers can be found in the CD at the front of this report.

d) Providing suitable guidance

Sections have been written in the report providing guidance on policy considerations, the application of the Sequential Test, guidance for the preparation of FRAs and guidance for the application of SUDS in the study area. A planning workshop will also provide further guidance on the application of the Sequential Test. This will establish the principles of Sequential Test, provide mock Sequential Testing scenarios and help to develop broad policy recommendations.

2.2 Need for a Level 2 SFRA

Where the need to apply the Exception Test is identified, due to there being an insufficient number of suitably available sites for development within zones of lower flood risk or due to possible increases in flood risk arising from climate change, the scope of the SFRA may need to be widened to a Level 2 assessment.

This increased scope involves a more detailed review of flood hazard (flood probability, flood depth, flood velocity, rate of onset of flooding) taking into account the presence of flood risk management measures such as flood defences. This could include 2D modelling and breach/overtopping analysis for certain locations.

Level 2 SFRA outputs include:

- An appraisal of the condition of flood defence infrastructure and likely future policy
- An appraisal of the probability and consequence of breach or overtopping of flood defence infrastructure
- Maps showing distribution of flood risk across zones
- Guidance on appropriate policies for making sites which satisfy parts a) and b) of the Exception Test safe; and the requirements for satisfying part c) of the Exception Test
- Guidance on the preparation of FRAs for sites with varying flood risk across the Flood Zone

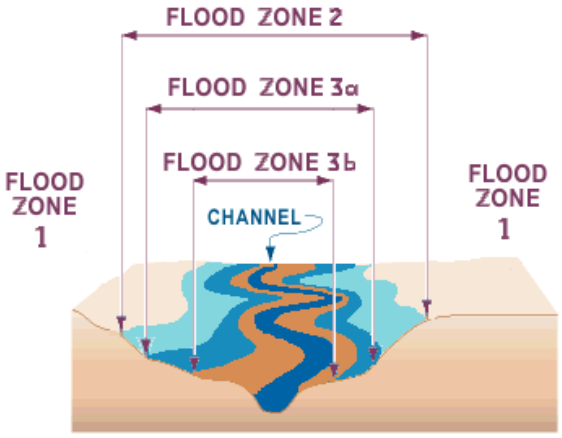
In general, the Level 2 SFRA should aim to provide clear guidance on appropriate risk management measures for adoption on sites within Flood Zone 3, which are protected by existing defences. This should minimise the extent to which individual developers need to undertake separate studies on the same problem. The scope of a Level 2 SFRA cannot be fully determined until the Sequential Test has been undertaken by the Council on all possible site allocations.

2.3 Technical Background

It is useful to gain a good understanding of Flood Zones and the approaches taken to satisfy the Level 1 SFRA requirements, using existing data.

2.3.1 Flood Zones

Flood Zones show the areas potentially at risk of flooding from rivers or the sea, ignoring the presence of defences (although areas benefiting from formal defences are identified).



PPS25 defines the flood zones as follows:

Zone 1: Low Probability

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%).

Zone 2: Medium Probability

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.

Zone 3a: High Probability

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.

Zone 3b: The Functional Floodplain

This zone comprises land where water has to flow or be stored in times of flood (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 agreed between the LPA and the Environment Agency, including water conveyance routes).

Flood Zone maps in the SFRA have been produced from two sources: Environment Agency Flood Zone maps, published and updated quarterly in their website, and detailed local hydraulic modelled outlines.

2.4 Environment Agency Flood Zone Maps

A national flood map dataset has been produced by the Environment Agency. Most fluvial Flood Zones 2 and 3 are derived from the modelling package JFlow, which is a national broadscale model and as such has known limitations (see Appendix D for further details). In many places the results of flood mapping studies have superseded the JFlow outlines. Generally these studies have included detailed hydrological research, surveyed river cross sections, and more precise digital modelling such as ISIS, TuFlow and HecRas.

It should be noted that not all minor watercourses have had Flood Zone maps produced for them. Only watercourses with a catchment area greater than 3km² have been modelled using JFlow software and, therefore, smaller watercourses as identified on the 10K or 25K OS maps within Flood Zone 1 may not be covered by the Environment Agency Flood Zone maps. As such, for any development site located adjacent to an unmapped watercourse within Flood Zone 1, it is recommended that an 8m development easement from the top of bank is applied, and a site specific FRA is undertaken.

The Environment Agency flood maps do not show the functional floodplain, Flood Zone 3b, which is a recent PPS25 requirement.

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3 Planning Context

3.1 Introduction

This section provides an overview of the planning policy framework relevant to High Peak Borough Council.

This report has been prepared in accordance with the PPS25 Practice Guide and fulfils the requirements of PPS25: Development and Flood Risk. Information contained in the SFRA will provide evidence to facilitate the preparation of robust policies for flood risk management, used to inform the SA of LDDs and enable informed decisions to be made relating to land use and development allocations within the respective DPD.

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. It is ultimately the responsibility of the Council to establish robust policies that will ensure future sustainability with respect to flood risk.

3.2 Planning Policy Framework

The UK planning system has a comprehensive hierarchy of policies and plans, beginning with national guidance. This provides a policy basis for regional plans through to development plans at the local level. Development plans are intended to provide the framework for the future development of an area. They are prepared following public and stakeholder involvement and are intended to reconcile conflicts between the need for development and the need to protect the wider built and natural environment.

The Government is currently implementing reforms to the planning system, with Planning Policy Statements (PPS) replacing Planning Policy Guidance (PPG), Regional Spatial Strategies (RSS) replacing Regional Planning Guidance (RPG) and Local Development Frameworks (LDF) replacing Structure Plans, Local Plans and Unitary Development Plans.

The following paragraphs provide an overview of the relevant policy documents for the SFRA.

3.3 National Planning Policy

3.3.1 PPS1: Creating Sustainable Communities (2005)

PPS1 sets out the Government's objectives for the planning system. It confirms that good planning should deliver the development in the right place, at the right time, and protect the environment. It identifies sustainable development as the core principle underpinning planning and requires that development plans ensure it is pursued in an integrated manner.

3.3.2 Planning and Climate Change (Supplement to PPS1)

Planning and Climate Change was published in December 2007 as a supplement to Planning Policy Statement 1. The Statement requires planning authorities to tackle both the causes of climate change (reduction of green house gas emissions) and the impacts of a changing climate (flooding, habitat migration).

3.3.3 PPS3: Housing (2006)

PPS3 has been developed in response to recommendations in the Barker Review of Housing Supply (March 2004). Its principal aim is to underpin the necessary step change in housing delivery, improving the supply and affordability of housing in all communities including rural areas.

PPS3 states that the Government's key housing policy goal is to ensure that everyone has the opportunity of living in a decent home, which they can afford, in a community where they want to live. The specific outcomes that the planning system should deliver in relation to housing are:

- Well designed, high quality housing that is built to a high standard
- A mix of market and affordable housing for all households in all areas
- A sufficient quantity of housing, taking into account need and demand and seeking to improve choice
- Housing developments in suitable locations offering a good range of community facilities and with good access to jobs, key services and infrastructure
- A flexible, responsive supply of land; which is used efficiently and effectively, including the use of previously developed land

Housing policies should help to deliver sustainable development objectives, in particular seeking to minimise environmental impact taking account of climate change and flood risk, and take into account market information, in particular housing need and demand.

3.3.4 PPS4: Planning for Sustainable Economic Development (2007)

The new PPS on Planning for Sustainable Economic Development sets out how planning bodies should, in the wider context of delivering sustainable development, positively plan for sustainable economic growth and respond to the challenges of the global economy, in their plan policies and planning decisions.

3.3.5 PPS7: Sustainable Development in Rural Areas (2004)

PPS7 sets out the Government's planning policies for rural areas, including country towns and villages and the wider, largely undeveloped countryside up to the fringes of larger urban areas.

3.3.6 PPS9: Biodiversity and Geological Conservation (2005)

PPS9 sets out policies on protection of biodiversity and geological conservation through the planning system. The broad aim is that development should have minimal impacts on biodiversity and geological conservation interests and enhance them where possible. Appropriate weight should be attached to the need to protect international and national designated sites.

3.3.7 PPG15: Planning and the Historic Environment (1994)

PPG15 sets out policies on the protection of the historic environment and recognises that planning plays an important role in preserving built and natural heritage.

3.3.8 PPG17: Planning for Open Space and Recreation (2002)

PPG17 recognises the importance that public open spaces, green areas and recreational rights of way can play in supporting regeneration and contributing to local quality of life.

3.3.9 PPS25: Development and Flood Risk (2006)

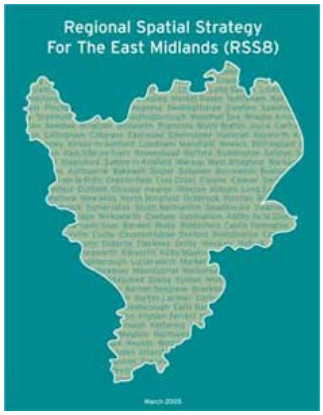
PPS25 sets out a plan led approach to flood risk. It confirms that all forms of flooding and their impact on the natural and built environment are material planning considerations. It introduces the Sequential Test, a process that matches types of development to degrees of flood risk and strengthens the requirement to include FRAs at all levels of the planning process. Regional planning bodies and local planning authorities (LPAs) should, amongst other things, reduce flood risk by safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water and flood defences.

3.3.10 Town and Country Planning Legislative Changes

Amendments to the Town and Country Planning (General Development Procedure) Order 1995 came into force on 1 October 2006 introducing further requirements for LPAs to consult the Environment Agency before determining applications for development in flood risk areas.

The Town and Country Planning (Flooding) (England) Direction 2007 (which came into force on 1st January 2007) seeks to safeguard against inappropriate development in flood risk areas. The Direction introduces a requirement for LPAs to notify the Secretary of State of any application for major development (e.g. 10 or more dwellings) in a flood risk area which it proposes to approve against Environment Agency advice.

3.4 Regional Planning Policy



Regional planning policies provide the overarching framework for the preparation of the LDFs. The Draft East Midlands Plan is the Regional Spatial Strategy for the East Midlands (EMRSS) and provides a broad development strategy for the East Midlands up to 2026. For the purposes of the Regional Plan, the whole of the Peak District National Park, which includes areas outside of Derbyshire (notably parts of the Districts of Oldham, Kirklees, Barnsley, Sheffield, North-east Derbyshire, Macclesfield and Staffordshire Moorlands) is treated as part of the East Midlands Region.

The purpose of the EMRSS is to provide a long term land-use and transport planning framework for the East Midlands Region. It guides the preparation of local authority development plans and local transport plans, and determines (amongst other things) the scale and distribution of housing and economic development for each Local Authority within the region, investment priorities for transport and sets out policies for enhancing the environment. The Regional Plan does not, however, descend into site-specific issues or a level of detail more appropriate to LDFs and cross refers to, rather than repeats, national policy guidance where there is little to add at the Regional level.

The Draft EMRSS was prepared by the East Midlands Regional Assembly (EMRA) and was made available for public consultation from 28th September to 20th December 2006. Following the issue of proposed changes by the Secretary of State in Spring/Summer 2008, and subsequent public

consultation, the RSS is expected to be published in its final form in the latter part of 2008, and will replace RSS8 issued by the Government in March 2005.

The EMRSS is divided into two parts: the Regional Strategy and the Sub-Regional Strategies. The Regional Strategy is divided into three sections:

- **The Core Strategy,** which sets the Regional Plan firmly within the framework of the Region's Integrated Regional Strategy and outlines 10 Regional Core Objectives in Policy 1, which establish the context for the delivery of sustainable development in the Region
- **The Spatial Strategy**, which provides the framework for meeting the region's development needs in a way that promotes a more sustainable pattern of development, and contains policies in respect of the Region's five Sub-areas, of which the Peak Sub-area is one
- **Topic Based Priorities,** which cover a series of topic specific policies, including the Regional Transport Strategy, Housing, Economy and Regeneration, Natural and Cultural Resources and finally an Implementation Framework and an updated list of Core Indicators.

The Core Strategy Section of the Regional Plan sets out 10 Core Objectives intended to translate broader policy context into a spatial strategy that will deliver sustainable development in the East Midlands. Of significance to this study are the following objectives:

- **To protect and enhance the environment** through the protection, enhancement, sensitive use and management of the Region's natural and historic assets; avoidance of significant harm and securing adequate mitigation or compensation for any unavoidable damage; and recognition of the limits to the capacity of the environment to accept further development without irreversible damage.
- **To reduce the impacts of climate change,** in particular the risk of damage to life and property from flooding and sea level change and the decline in water quality and resources, through the location, design and construction of new development.

Recommended flood risk management policies, to be developed as part of the LDF, are put forward in Chapter 7. These have been developed in accordance with the above core objectives.

The Spatial Strategy sets out a Regional approach to selecting land for development. Sub-area priorities are discussed. The Regional Plan describes the Peak Sub-area as largely rural in character, and a major visitor destination. This local authority grouping has been used as the starting point for determining key policies in the Regional Plan, including levels of new housing provision. The Peak District National Park covers a significant proportion of the Peak Sub-area, and such designation confers the highest status of protection for landscapes and scenic beauty. The purpose of National Parks is to conserve and enhance their natural beauty, wildlife and cultural heritage and to promote opportunities for public understanding and enjoyment of their special qualities. All relevant authorities which fall in the National Park area are required to have regard to these purposes when acting in a way that could affect the National Park (Environment Act 1995, Section 62). Major developments should not take place in the National Park, save exceptional circumstances and where it is demonstrated to be in the public interest and that is not possible to meet that need in another way. Planning policies will continue to be applied to protect the National Park, whilst addressing the social

and economic needs of the Park's communities and supporting the regeneration of the surrounding urban areas.

Parts of Oldham, Kirklees, Barnsley, Sheffield, North-East Derbyshire, Macclesfield, Staffordshire Moorlands, High Peak Borough Council and Derbyshire Dales District Council fall within the National Park boundary. Within these areas the Peak District National Park is the local planning authority. Whilst two-thirds of the Borough of the High Peak lies in the Peak District National Park, most (93%) of its population lives outside the Park, with the major population centres being around Glossop to the north and Buxton to the south. Given the effects of the restraint policy in the National Park, towns in the other Sub-region planning areas may be subject to development pressure, particularly Buxton, Glossop, New Mills, Whaley Bridge and Chapel-en-le-Frith in the High Peak, and Matlock and Ashbourne in Derbyshire Dales. The Regional Plan states, however, that the restrictions on housing in the National Park do not imply that compensatory general market housing should be met elsewhere in the Sub-area, as it would be inconsistent with the objectives of urban regeneration of the surrounding conurbations.

Policy 10 states that development in the Peak District towns outside the National Park should aim to meet local needs whilst reducing past levels of in-migration, discouraging additional commuting to, and supporting the regeneration of, the nearby conurbations. The emphasis should be on:

- Retaining and generating local employment. In particular, policies should make provision for the growth of indigenous firms and attracting inward investment to support their own population and the population of the surrounding rural hinterland; and
- Restraining new housing development except where the local need for modest growth is identified.

Care must be taken to ensure that all new development respects and enhances the high quality environment of the area, notably the built heritage, particularly in Matlock, Ashbourne and Wirksworth, as well as the setting of the National Park, the Derwent Valley Mills World Heritage Site, and the areas of landscape and nature conservation value.

The Regional Plan sets out an annual average housing provision rate between 2001 and 2026 for the Peak Sub-Area as[1]:

- Derbyshire Dales: 150[1]
- The High Peak: 270
- Peak District National Park: 0

[1] The annual average housing rates for the Peak Sub Region may alter following the proposed changes to the RSS arising from the Panel Report

Other policies in the Draft East Midlands RSS of particular relevance to this study are:

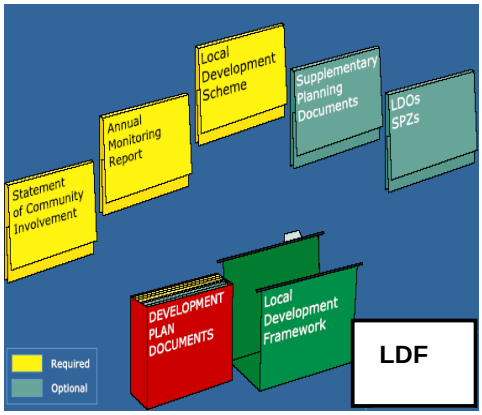
- **Policy 32, 'A Regional Approach to the Water Resources and Water Quality'.** This discusses how LPAs should take water related issues into account at an early stage of the process of identifying land for development. This includes promoting water efficiency, reducing unsustainable abstraction, improving water quality, using sustainable drainage (SUDS) techniques (see Chapter 10) and ensuring that sewage treatment capacity is sufficient to meet the needs of development whilst maintaining water quality. LPAs should work with the Environment Agency and other partners to ensure LDDs take into account the emerging River Basin Management Plans, Catchment Extraction Management Strategies and other water resource strategies. Information on groundwater source protection zones should also be used to inform the LDF, and this can be found in Chapter 10.

- **Policy 33, 'Regional Priorities for Strategic River Corridors'.** This identifies the River Derwent and its tributaries as watercourses which should be protected and enhanced. LPAs should work together to protect and enhance the multi-functional importance of strategic river corridors as part of the Region's Green Infrastructure, as well its importance in managing flood risk.

- **Policy 35, 'A Regional Approach to Managing Flood Risk'.** This discusses the Regional Flood Risk Assessment, the findings of which can be found in Section 4.3. Policy 35 says that LDFs should be informed by an SFRA, in accordance with PPS25. The application of the Sequential Approach (Section 1.5.1 and Chapter 8) and Exception Test (Section 1.5.2) is advocated, and the inclusion of policies to prevent inappropriate development in the floodplain is promoted. It also states that new development should contribute positively towards flood risk reduction, mainly through the implementation of SUDS. Where development in flood risk areas is deemed necessary to meet wider sustainability objectives, development should incorporate flood mitigation measures, and retro-fitting of flood proofing to existing properties should be promoted. When considering the provision, maintenance or improvement of defences, emphasis should be on a natural approach (storage areas, managed retreat etc.) The SFRA meets all these requirements, through the provision of suitable flood risk management and development control policies put forward in Chapter 8. Crucially, Policy 35 states that development should not be permitted if it would be at unacceptable risk of flooding or if it creates flood risk elsewhere; if it inhibits the capacity of the floodplain to store water; if it impedes the flow of water in a way which would create unacceptable risk elsewhere and if it has a detrimental impact upon infiltration of rainfall to groundwater storage. Development should be steered away from such locations through the application of the Sequential Test, though in exceptional circumstances, development in such locations will need to be facilitated by a Level 2 SFRA. Developer contributions for measures to mitigate the effects on the overall flood regime can be sought, though any such measures must be in accord with the local flood management regime.

3.5 Local Planning Policy

3.5.1 Local Development Framework



The reforms to the planning system, discussed in Section 3.2, mean that the LPA will gradually depart from the Local Plan and create new planning policies within the new planning system, known as the Local Development Framework (LDF). The LDF will deliver the vision of the EMRSS, at the local level. Unlike its predecessors such as the Local Plan or Structure Plan, the LDF is not a single document but rather a 'folder' into which a series of documents are placed. This flexible approach enables some aspects of the Framework to be revised quickly in response to changing circumstances, whilst leaving others to endure for the longer term. The component documents (termed the Local Development Documents, or LDDs) have different purposes, some used to guide and others to inform. The main documents involved are:

- The Statement of Community Involvement
- The Annual Monitoring Report
- The Local Development Scheme
- Supplementary Planning Documents (SPDs)
- The Core strategy
- Site Specific Allocations
- Adopted Proposals map

SPDs may be prepared to add further detail or guidance to DPDs.

The LDF will supersede the Adopted Local Plan which has now been replaced by a Local Plan Saved Policies Document. Policies contained within the Adopted Local Plan will continue to be used in the determination of planning applications until documents in the Local Development Scheme (LDS) are adopted.

The Local Development Scheme (LDS) explains what each of the LDDs are, what areas they cover and how they relate to each other. The Scheme also sets out a timetable for the production of new documents over the next three years or so. The Council will measure progress against this published timetable and it will also form part of external assessment of the Council's planning services.

A discussion paper has been issued by High Peak Borough Council as the first step in preparing the joint Core Strategy. The purpose of the discussion paper is to gather views and opinions about the issues existing in the High Peak, and how they might be addressed in very broad terms. Consultation for the discussion paper began on Thursday 8 November 2007, and will run until 25 July 2008.

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4 Data Collection and Review

4.1 Overview of Flooding Sources

Flooding can come from a variety of sources, including rivers, rainfall on the ground surface (surface water), rising groundwater, overwhelmed sewer and drainage systems and breached or overtopped reservoirs and canals. This chapter gives a strategic assessment of the risk posed to the study area from these sources.

4.2 Approach to Data Gathering

Throughout the data collection and review process it has been critical to make best use of the significant amount of information which already exists with respect to flood risk (held by the Councils, Environment Agency, British Waterways, Severn Trent Water, Yorkshire Water, United Utilities and other key consultees). The data gathering process has resulted in a review of:

- Historical flooding information from Environment Agency historic flood outlines and various datasets from water companies, the Councils and British Waterways, detailing flooding experienced from 'other sources'
- Environment Agency Flood Zone maps and detailed flood risk mapping outputs, including fluvial climate change outputs
- Information on flood risk management infrastructure, including defences, culverts and structures (supported by information from the Councils and the Environment Agency's National Flood and Coastal Defence database(NFCDD)
- Existing flood risk management reports including Catchment Flood Management Plans (CFMPs)
- Environment Agency flood warning and flood watch information

The project team has been able to review the collected data, assess its significance and quality, and advise on which part of the collected data should be used for the SFRA. The main approach to the SFRA has been to build on previous studies and gathered information.

Consultation has formed a key part of the data gathering stage of the SFRA. The aforementioned stakeholders were consulted during the SFRA and as part of the consultation process, an Inception meeting was held to allow key stakeholders to share their experience and knowledge of flooding issues across the study area. The benefits of adopting a partnering approach (as advocated by PPS25) are significant and have helped to ensure that the findings and recommendations of the SFRA are relevant and workable for the Council.

4.3 Findings of the Regional Flood Risk Appraisal

The East Midlands Regional Flood Risk Appraisal (RFRA) was completed in July 2006, to inform the Regional Sustainability Appraisal (RSA) for the RSS. This will assist in the allocation of housing numbers and the development of flood risk management policies at the regional level.

Flood risk profiles (FRPs) were developed for each for each LPA, in a two-stage process. Stage 1 involved the consideration of the inherent flood risk in each LPA area, i.e. the extent of flooding which would occur if no defences existed in the area, and was measured as a percentage of the total LPA

area (using the Environment Agency's Flood Zone 3 for fluvial floods). The percentage values were then placed into 4 bands:

- A In which less than 10% is in Flood Zone 3
- B In which 10% to 20% is in Flood Zone 3
- C In which 21% to 50% is in Flood Zone 3
- D In which >50% is in Flood Zone 3

To supplement the banding classification, two indicators were added:

- A Zero to One factor, which shows whether or not the LPA has a SFRA available at the time of the RFRA (0 = No, 1 = Yes)
- The score allocated by the LPA to indicate their perception of the significance of flood risk in the making of strategic planning decisions

In stage 2 of the process actual flood risk was reviewed, i.e. those arising from primary sources (watercourses), those arising from secondary sources (arterial drainage systems operated by drainage boards and/or surface water sewers maintained by water companies) and those arising from residual sources (when an event of greater magnitude than a defence's standard of protection causes overtopping of the defence, or when there is a premature failure of the defence).

Under the primary sources assessment, the probability and consequence of flood risk in each LPA was considered and the types of flood defences were identified. Probability and consequences were assessed as being high, medium or low, according to the following criteria:

Table 4.1: Probability & Consequence of Flood Risk in each LPA

Probability	**Probability Level**
If none (or very few) of the flood defences currently meet the target standard	High
If flood defence standards are variable – a mixture of high and low	Medium
If all (or most) of the flood defences currently meet the target standards	Low
Consequence	**Impact Rating**
If flooding from Primary Sources would impact on:	
Dense urban areas	High
Semi-urban, scattered developments	Medium
Rural areas (undeveloped land)	Low

Secondary sources of flooding are very significant at the local level, but not as significant regionally as primary sources. To consider secondary sources of flooding, similar criteria for probability and consequences were used as per primary sources. However, because Drainage Board systems

usually have adequate capacity and Water Companies are required to accept surface water flows from development, neither the probability nor the consequences of flooding from secondary sources were deemed likely to be high (relative to those from primary sources). Taking this into account, only one indicator was used to illustrate flood risk from secondary sources:

- Either M, where the probability or consequence was medium
- Or L, where both the probability and consequence are low

By their very nature, residual risks have a low probability of occurrence. However, consequences can vary from low (e.g. marginal overtopping of a flood defence wall) to high (e.g. sudden collapse of high flood defence bank, where property is close by). One indicator was therefore used to illustrate the possible consequences of residual risk, i.e. H, M or L, depending on the extent and height of the flood defences in the locality and the density, and proximity of development relative to the defences.

The FRP for the High Peak is as follows:

Table 4.2: The FRP for the High Peak

Inherent Risk	Significance	Actual risk			
		Primary		Secondary	Residual
		Probability	Consequence		
A 1	7	M	M	L	L

The overall profile for the Peak Sub-region states that although there is less than 10% of land in Flood Zone 3, flood risk is a significant factor in planning of new development and some existing defences require improving, on primary sources

4.4 Historical Flooding

Recent years have seen a number of large scale flood events throughout the UK including Easter and October 1998, autumn 2000, February 2002, New Year 2003, February 2004 and more recently summer 2007. Local historical flooding is explained more fully in Section 4.5, to compliment the information on fluvial flood risk. In addition, the Environment Agency has produced a number of historic flood outlines for the Peak Sub-region (Volume 2, Tiles E1-E2). In the High Peak area, the following events have been mapped:

- January 1965
- November 2000

4.4.1 January 1965

The January 1965 flood event occurred on the River Wye and flooded predominantly natural floodplain areas within the plan area including locations at Buxton including Ashwood Park (to the east of Bakewell Road), Bakewell Road adjacent to Lovers Leap, Wye Dale (towards the south-western extent of the plan area), and adjacent to the mineral railway and quarry by Ashwood Dale. A

small area to the south of Duke's Drive in Buxton (including part of a caravan park) is also shown to have flooded from an un-named tributary of the River Wye during the January 1965 flood event.

4.4.2 November 2000

The November 2000 flood event occurred on the River Wye and flooded predominantly natural floodplain areas within the plan area at Wye Dale (towards the south western extent of the plan area).

4.5 Fluvial Flood Risk in the High Peak

Flood Zones show the areas potentially at risk of flooding from rivers, ignoring the presence of defences (although areas benefiting from formal defences are identified. This information has been used, in conjunction with other data, to give an account of flood risk in the study area. This has focused primarily on the Main Rivers occurring mainly in the plan area (Section 4.5.1) including the River Etherow, River Goyt, River Wye and their tributaries. In general, the Non Main Rivers in the Borough have narrow Flood Zones, constrained by the local steep gradients. The smaller tributaries which feed them occur in abundance, but due to their small size they do not have Flood Zones. It is clear that many of these watercourses, though small, do pose local flood risk issues. In addition, local knowledge suggests that the Borough is covered by pipelines and springs which are not identified on OS maps. Site-specific FRAs will be required for all new developments, to appropriately take these drainage systems into account.

While the main focus has been given to the plan area of the High Peak (Section 4.5.1), an overview of flood risk has also been given for the remainder of the Borough, where information exists.

PPS25 discusses small, steep catchments, where local intense rainfall can result in the rapid onset of deep and fast-flowing flooding that can cause considerable damage and possible threat to life. Land use, topography and the form of local development can have a strong influence on the velocity and volume of water and its direction of flow at particular points. This is a significant factor in, the High Peak and is explored within this section and links with the findings in sections 1.7.1, 1.7.2 and 1.7.3.

Starting at the north of the Borough, Salter's Brook flows eastwards, possessing well-defined Flood Zones. The setting is distinctly rural and does not pose risk to any properties, nor do the incoming tributaries. The river passes through a number of on-line reservoirs before entering the north of the plan area.

In the central and eastern parts of the Borough lie a number of headwater tributaries of the River Derwent. The drainage setting of each tributary is complex and a vast number of smaller watercourses, which do not have Flood Zones, drain into them. The Flood Zones of the major tributaries are generally narrow and well-defined, and given the rural nature of the upland setting, pose risk to very few properties. It is at the eastern corner of the Borough, where settlements start to occur and the River Derwent and its tributaries become Main River that fluvial flood risk is posed to parts of Goosehill, Castleton, Brough and Shatton.

To the south of the Borough lies the River Wye, the flood risk of which is explained fully in Section 4.5.1.

4.5.1 Fluvial Flood Risk in the Plan Area

At the north of the plan area, Salter's Brook becomes the River Etherow and flows in from the east. While there is development to the north and south, the floodplain is well defined and the Flood Zones do not encroach any properties. Hollingworth Brook enters from the north and again poses little risk. However, as the River Etherow flows south between Hollingworth and Hadfield, a number of industrial buildings fall within the Flood Zones. As it flows south, following the plan area boundary, Glossop Brook enters on the left bank.

Glossop Brook is a major tributary of the River Etherow. Both the brook and its tributaries pose fluvial flood risk in Glossop, even though the Flood Zones are relatively narrow. There are issues with Flood Zone misalignments (i.e. the Flood Zone maps do not follow the path of the associated watercourse) and culverted sections which show Flood Zones (tabulated in Section 4.6). At the downstream end of Glossop Brook where the Flood Zones are slightly wider, flood risk affects an industrial estate and the A57.

As the River Etherow continues south, following the plan area boundary, the Flood Zones are relatively wide but the floodplain is undeveloped therefore little risk is posed to properties. The watercourse passes Gamesley to the east, which lies fully in Flood Zone 1. The river passes a sewage works which lies fully in Flood Zone 3. Continuing south, the floodplain narrows considerably around Broadbottom. It then widens again, causing a number of properties to fall in Flood Zone 3, though these are just outside the High Peak. The watercourse continues in a south eastern manner and then out of the Borough and the plan area. The Flood Zones are relatively large but the setting in this area is rural.

In Charlesworth, numerous watercourses exist but do not have any associated Flood Zones. These cause local risk, the extent of which is difficult to define in the absence of any Flood Zone information. Clearly any future development in Charlesworth would need an FRA to ensure the local drainage characteristics are appropriately examined. This point applies to all development in the plan area, as this fluvial setting is prevalent.

The River Goyt flows into the plan area at Horwich End, where some industrial buildings lie in Flood Zone 3. Downstream, houses on Goyt Road lie in Flood Zone 2. Immediately downstream, Randal Carr Brook enters on the right bank.

Upstream of Randal Carr Brook, the watercourse is called Meveril Brook. As it flows adjacent to Combs Reservoir there are no associated Flood Zones, therefore should development be proposed at this location, further analysis of flood risk will be required. Further, as the watercourse becomes Randal Carr Brook around Tunstead Milton, the Flood Zones are severely misaligned, though in some places are picked up by small drains. The misaligned Flood Zones on this watercourse continue downstream, though there are no properties in this area. At Horwich End a number of properties fall in Flood Zone 3.

The River Goyt continues north through New Horwich and Whaley Bridge, where a number of properties fall in Flood Zones 2 and 3. East of Whaley Bridge, downstream of the railway line, Flood Zone 3 becomes very narrow, posing little risk, while Flood Zone 2 remains larger. The watercourse is then met by Black Brook on the right bank.

Black Brook rises south east of Chapel-en-le-Frith where the Flood Zones are very narrow. Flowing north of Chapel-en-le-Frith the Flood Zones remain narrow and mainly affect industrial buildings. It is then met on the left bank by Warm Brook, which flows directly through Chapel-en-le-Frith. The floodplain is very narrow and flood risk is constrained by this, exhibited by the fact that Flood Zones 2 and 3 are identical in most places. The effect of the culvert under Market Street has also been modelled to show the actual risk, therefore only Flood Zone 2 affects this area. Downstream, Flood Zone 2 affects a large area encompassing a number of properties at the Black Brook/Warm Brook confluence.

As Black Brook continues north a number of properties fall in Flood Zone 3 at Burnside Avenue. At Chapel Milton it is then met on the right bank by an unnamed tributary. This drains a very rural area to the north, where very few properties are affected. Continuing west, a sewage treatment works falls in Flood Zone 3. A second unnamed tributary again enters on the right bank, draining a rural area and posing little risk. Approaching Chinley, the Flood Zones become wider at the confluence with the Otter Brook, a third right bank tributary. At its upstream end the Otter Brook has narrow Flood Zones posing little risk, though through Chinley the Flood Zones are wider and a number of properties are affected. Continuing west the Flood Zones of the Black Brook are narrow, and though misaligned in some places, pose little risk to properties.

As the River Goyt continues north it passes Furness Vale to the west, where a sewage treatment works falls fully in Flood Zone 3. Approaching New Mills the floodplain is wide and undeveloped; though immediately south of New Mills it narrows considerably, though no properties are affected by Flood Zones 2 or 3. The River Sett enters on the right bank. At its upstream end, the Flood Zones are very narrow. Flowing through Hayfield, few properties are at risk. In Hayfield itself an unnamed tributary enters on the left bank. This does not have any Flood Zones but is likely to pose risk to properties. Downstream, Hollingworth Clough, entering on the right bank, drains from the north and has very narrow Flood Zones, which are considerably misaligned in places. As the River Sett continues west the floodplain widens and a sewage treatment works falls into Flood Zone 3, as do some industrial buildings at Birch Vale and Thornsett. An unnamed tributary, entering on the right bank, drains the rural area to the north, where again the Flood Zones are very narrow. As the River Sett approaches New Mills the floodplain widens and initially only a few industrial buildings are at risk. Through the centre of New Mills the floodplain narrows again and only a few properties and their gardens are affected.

After the River Sett/River Goyt confluence the River Goyt flows west and the floodplain widens in places. The watercourse follows the plan area boundary, affecting a few industrial buildings, then out of the plan area.

The southern part of the plan area drains into the River Wye, where flood risk from this watercourse affects Buxton. At the upstream extent of the River Wye, to the west of Buxton, the Flood Zones are narrow with relatively few properties located within the Flood Zone maps. As the watercourse progresses east, a number of properties and industrial buildings to the east of The Park are located within the Flood Zones, though in this area the watercourse is culverted so it is not an accurate representation of flood risk. Consultation with the Environment Agency has indicated that the culvert into which the Wye flows upstream of The Crescent may not be sufficient to convey the 1 in 100 year flow. Historically, flooding to property has been experienced in the residential area adjacent to the point at which the Hogshaw Brook joins the River Wye. Downstream of the confluence of the River

Wye and Hogshaw Brook, the floodplain has remained undeveloped and while the Flood Zones are narrow and well defined, it is evident that few properties are at risk. This situation prevails as the River Wye exits the plan area, as well as on the tributaries that enter it.

The onset of flooding in the plan area and indeed the Borough is deemed to be rapid due to the steep catchment, causing high water velocities. Certain types of flooding can be directly hazardous to people. Shallow, slow moving water presents very little threat to life, while fast flowing, deep water is more hazardous. The nature of flood risk in the High Peak is more characteristic of the latter description. River corridors are characterised by steep, incised channels which, when in flood, produce deep, sometimes fast flowing flood waters. Higher return periods do not tend to produce a greater aerial extent of flooding, rather, the flood depth increases. This is relevant across the plan area of the High Peak and indeed the Borough, and is illustrated by the fact that across the study area, the difference in the aerial extent of Flood Zones 2 and 3 is often marginal. The incised nature of river channels mean that there is limited floodplain for flood flows to spread, resulting in deeper flooding than would be experienced in flatter areas. The severity of the hazard (i.e. rate of rise, water velocities and depth) will also have impact on the consequence of a flood event. The Flood Zone maps, however, only provide information on the likelihood of flooding and do not convey the impact of flooding. While hazard maps do not currently exist for the study area, the local fluvial setting leads to the conclusion that flood hazard is deemed to be of particular relevance in the High Peak. The river catchments can cause high runoff and rapid response (exacerbated by the geological conditions, as described in Section 1.7.3), resulting in flashy flows which can be conveyed downstream to the plan area.

Floods result from out of bank flows, though this is made worse by local channel restrictions and under capacity structures, i.e. some culverts are not big enough to adequately convey flood flows. This results in back-up of river flows and flooding. The combination of rapid runoff and the catchments' flashy responses, as well as the steep gradients, means water velocities in the flooded areas can be high. If coupled with a depth of around 1m, this would pose a high flood hazard (for example, it would not be possible to stand in this water). If the need to apply the Exception Test is required in the High Peak, a Level 2 SFRA would need to assess this hazard.

4.6 Issues With Existing Flood Zone Maps

During the review of the Flood Zone information, some inaccuracies were identified and these are detailed in the table overleaf. It should be noted that most of the Flood Zone information in the study area has been derived from the modelling package JFLOW, which is derived from a national broadscale model and as such has known limitations (see Appendix D). The accuracy of the Flood Zones in some areas is course, and is likely to be due to the upland fluvial setting and complex nature of drainage. The Flood Zones can be misaligned from the channel, show flood risk when a culvert is present, or follow a path which does not have a watercourse. Allocations which fall into these areas are likely to require a Level 2 SFRA, to refine the Flood Zone information. It may be prudent for a suitably qualified flood risk management specialist to review and assess preliminary site allocations, as recommended in Section 11.5, to advise on local Flood Zone issues. An example template of a site assessment table that can be used to assist this process can be found in Appendix E.

Table 4.3: Inaccuracies with Flood Zone maps within the High Peak Borough

Applicable To	Location	Watercourse	Problem
High Peak Plan Area	Wesley Street area of Old Glossop	Shelf Brook and Tributary	Watercourse is culverted in some sections and misaligned
High Peak Plan Area	Glossop	Glossop Brook	Misalignments along much of its length
High Peak Plan Area	Glossop	Long Clough Brook	Misalignments along much of its length
High Peak Plan Area	New Mills	River Sett	Flood Zone 2 is misaligned in some places
High Peak Plan Area	Horwich End	River Goyt	Flood Zone 2 is misaligned in some places
High Peak Plan Area	Tunstead Milton	Meveril Brook	As the watercourse flows adjacent to Combs Reservoir, there are no associated Flood Zones
High Peak Plan Area	Tunstead Milton	Randal Carr Brook	Misalignments with Flood Zones 2 and 3
High Peak Plan Area	Downstream of Tunstead Milton	Randal Carr Brook	Misalignments along much of its length
High Peak Plan Area	SE of Chapel-en-le-Frith	Black Brook	Misalignments at the upstream section of Main River, and at locations along its length
High Peak Plan Area	West of Hayfield	Unnamed Tributary	Misalignments along much of its length

4.7 Flooding from Other Sources Introduction

Methodologies for recording flooding from sources other than fluvial or tidal were not standardised until 2006. Therefore records held of such flooding can be incomplete, or not to a uniform standard. Records of flooding from other sources also tend to show locations that have flooded in the past, rather than give an indication of flood risk areas based on probabilities, like the Flood Zone maps.

Information has been gathered on flooding experienced from sources other than rivers, and is described herein.

4.8 Flooding from Artificial Drainage Systems and Surface Water Runoff

4.8.1 Artificial Drainage Systems

The High Peak plan area is covered by Severn Trent Water and United Utilities, who were consulted for information on flooding from surface water and artificial drainage sources and this has been provided where data exists.

All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding from the public sewerage system, and this is shown on the DG5 Flood Register. This includes records of flooding incidents from foul sewers, combined sewers and surface water sewers which are deemed to be public and therefore maintained by the Water Company. Flooding from land drainage, highway drainage, rivers/watercourses and private sewers is not recorded within the register.

The DG5 register tends to show, to a greater or lesser extent: the location of the incident, the date of the incident, a description of the incident, whether the incident occurred internally or externally and the register the incident has been recorded on. When an incident is reported, a decision chart is used to asses whether the properties/areas are 'at risk' and then the record is added to the appropriate register.

The recording of flood events by the authorities has often led to improvements intended to prevent reoccurrence, so historical flooding is not necessarily evidence of propensity for future flooding.

The data received has been provided at four-digit postcode level, hence no street level information on flooding was available. In summary it is evident that seven postcode areas within the High Peak plan area have properties which have flooded from artificial drainage systems and surface water runoff. It is not possible to identify the exact location of these properties due to the Data Protection Act.

In general the level of flood risk from artificial drainage systems within both the plan area and the remainder of the Borough has been medium to low

Table 4. 4: Flooding From Artificial Sources as Recorded in the Severn Trent Water & United Utilities DG5 Register

Postcode Area	No. Properties Affected	Level of Risk
SK13 1	1	Low
SK17 0	2	Low
SK17 6	10	Medium
SK17 7	5	Medium
SK17 8	1	Medium
SK17 9	3	High
SK23 7	1	Low

The data for the plan area is illustrated in Volume 2, Tile B15.

Severn Trent Water has stressed that Local Planning Authorities should adopt a planning policy requiring the use of SUDS as proposed in PPS25 and that the Sequential Test should be used to allocate land for development within low risk Flood Zones, so that the risk of fluvial flooding is minimised. This reduces the risk of fluvial flood waters entering public foul and surface water sewers and resultant widespread flooding and pollution. Individual developments should be designed so that natural flood pathways are left free of buildings. These recommendations are put forward as policy considerations, in Chapter 7. Guidance on the application of SUDS can be found in Chapter 10, which includes information on the adoption and maintenance of SUDS. Severn Trent Water is currently only willing to adopt hard structures and not softer SUDS systems, such as swales or ponds, which provide a break between pipe networks. United Utilities will not currently adopt any SUDS systems. However, both water companies fully support the use of SUDS on all developments and encourage alternative adoption methods as outlined in Section 10.4.

4.8.2 Surface Water Flooding

Surface water flooding occurs when excess water runs off across the surface of the land. Flooded roads and waterlogged land result when the amount of water arriving on a particular area is greater than the capacity of the drainage facilities that take it away. Exceptional rainfall, low lying areas, run off from adjacent fields or urbanised areas and rivers overflowing are some situations that can lead to surface water flooding. Suspended material can be carried into drains by overland flows or floodwaters and this can also lead to them becoming blocked. Drainage grills and gratings (e.g. on gullies) can become blocked very quickly when materials are deposited on the road or when there is a heavy fall of leaves.

The Highways Agency does not look after any roads through the plan area. The County Council looks after the roads in the Borough, therefore they were contacted in order for any records of surface water flooding to be reviewed and included in this study. These have been mapped as GIS points and can be found in Volume 2, Tiles B1-B14. This shows that in the High Peak plan area a number of properties have been flooded by surface water from open land or highways. However, it should be recognised that extensive records of surface water flooding do not exist, nor do maps showing predicted areas of surface water flooding. The geology and topography of the Borough contribute to the rainfall response within the High Peak plan area and therefore the likelihood and nature of surface water flooding (see Section 1.7.2). In light of this, surface water flooding is a significant problem, posing risk to areas in Flood Zone 1 in addition to high and medium fluvial flood risk areas. This can be made worse by local insufficient drainage capacity. Where discharge is directly to a watercourse, locally high water levels can cause back-up and prevent drainage taking place. Any site-specific FRA would need to adequately assess the local topography and geology to ensure the risk posed from surface water is appropriately taken into account.

A further issue is surface water flows carrying large amounts of debris, which, when deposited in watercourses, can reduce channel capacity and cause local flood risk issues.

The flood events of summer 2007 highlighted the risks of surface water flooding and the extent of damage that can result. Approximately 57,000 homes were affected nationally, of which around two-thirds were flooded from surface water runoff overloading drainage systems[2]. It is clear that the High

2 Environment Agency Review of 2007 summer floods (December 2007)

Peak is sensitive to surface water flooding and this should be taken into consideration as part of future development. Sir Michael Pitt's interim report of the summer floods put forward a number of recommendations to improve the way that surface water is currently managed. These included:

1. Establishing Surface Water Management Plans as a tool to improve co-ordination of activities between stakeholders involved in surface water drainage

2. Clarifying responsibilities for ownership and adoption of sustainable drainage systems - encouraging SUDS as a viable alternative to connecting surface water into sewers

3. Reviewing automatic right to connection (Section 106 of the water Industry Act 1991) – developers and property owners can currently connect surface water drains or sewers to the public sewerage system, which could act as a potential barrier to SUDS. Although the right to connect foul drains and sewers to the public sewerage system will remain however, to prepare for climate change and continuing development pressures, a more extensive range of drainage approaches should be considered when surface water drainage systems are designed, constructed and improved in the future.

The Government's new Water Strategy, Future Water[3], also sets out a vision for more effective management of surface water. It states that by 2030 surface water will be managed more sustainably by allowing for the increased capture and reuse of water, slow absorption through the ground, and more above-ground storage and routing of surface water separate from the foul sewer, where appropriate. There will be less reliance on the upgrading of the sewer system to higher design standards and rather that water will be increasingly managed on the surface. Opportunities to realise this should be explored by the Council.

4.9 Flooding from Impounded Water Bodies

As part of the SFRA it is necessary to consider the risk of overtopping or breach of reservoirs and canals. British Waterways (BW) was consulted to gain information on past reservoir breach and overtopping incidents of canals, while the Environment Agency was consulted to gain a comprehensive overview of reservoirs currently held under the Reservoirs Act, and any breach and overtopping information of these reservoirs.

4.9.1 Canals

It is important that canals are included in an SFRA as they form a vital land drainage function. Any FRA should also take account of canals. Occasionally, canals can overtop due to high inflows from natural catchments and if overtopping occurs from adjacent watercourses. This additional water can be routed/conveyed by the canal which may cause issues elsewhere, not only within the catchment of interest but also in neighbouring catchments where the canal might cross a catchment boundary.

There is just one canal in the Borough, and this falls in the plan area to the east of Furness Vale and Newtown, called the Peak Forest Canal. Liaison with BW indicated that there are no recorded incidents of breaches or overtopping, or any other local flood risk instances associated with this canal.

3 Defra – Water Strategy, Future Water (2008)

At present canals do not have a level of service for flood recurrence (i.e. there is no requirement for canals to be used in flood mitigation), although BW, as part of its function, will endeavour to maintain water levels to control the risk of flooding from canals to adjacent properties. It is important, however, that any development proposed adjacent to a canal be investigated on an individual basis regarding flooding issues and should be considered as part of any FRA.

4.9.2 Reservoirs

Reservoirs with an impounded volume in excess of 25,000 cubic metres (measured above natural ground level) are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. Due to high standards of inspection and maintenance required by legislation, normally flood risk from registered reservoirs is moderately low. The reservoir register for the High Peak Borough Council is detailed below.

Table 4.5: Reservoir Register for the High Peak Borough Council

Reservoir	Physical Status	Situation	NGR	Category	Year Built	Dam Type	Maximum Height	Capacity	Surface Area
Arnfield Reservoir	In Operation	Near Glossop	SK0140097400	Impounding	1,852	Gravity and Earthfill	17	977000	158000
Birch Vale Lodge	In Operation	Near Hayfield	SK0250087000	Impounding	1,900	Not Known	5.4	60000	20470
Combs	In Operation	Near Chapel-en-le-Frith	SK0370079600	Impounding	1,806	TE Earthfill	16	1484000	267000
Toddbrook	In Operation	Near Whaley Bridge	SK0060080900	Impounding	1,837	Gravity and Earthfill	23.2	1287000	158000

Consultation with the Environment Agency has indicated that there is one record of breaching/overtopping from impounded water bodies contained within the reservoir register within the High Peak Borough Council area at Toddbrook in 1964.

Reporting of dam incidents to the Environment Agency is a voluntary process and the system has only been in place since 2007. Prior to that reports of incidents were collected on an ad hoc basis by the Building Research Establishment, from published papers and questionnaires. Due to the voluntary nature of incident reporting the records held by the Environment Agency are not complete and the incidents provided only represent those overtopping incidents or breaches that the Environment Agency have been informed of. Despite this, it should be noted that due to high standards of inspection and maintenance required by legislation, normally flood risk from registered reservoirs is moderately low.

It should also be noted that when referring to 'overtopping' the records held by the Environment Agency are referring to the overtopping of an embankment and are not referring to water flowing down a reservoir spillway. A spillway operating in the way that it was designed is not a reportable reservoir incident under the post-incident reporting system.

4.10 Flooding from Groundwater

The Environment Agency can monitor groundwater levels using boreholes and the records of these are held on the WISKI database. Both the Environment Agency and planning authorities can keep records of instances where a high water table has led to individual groundwater flooding events.

Local knowledge suggests that the Authority is covered by springs which are not identified on OS maps. Site-specific FRAs will be required for all new developments, including those greater than one hectare in Flood Zone 1, to appropriately assess these drainage systems.

Consultation with the Environment Agency has suggested that there are no other known problems with flooding from groundwater within the Borough. It should however be noted that peat deposits are found on the south eastern side of the plan area, and occur in abundance at the northern side of the Borough (refer to Volume 2, Tile D2). These are typically waterlogged and may breach the surface.

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5 Strategic Flood Risk Mapping

5.1 Strategic Flood Risk Maps

This chapter provides a clear description of the data that has been used for the purpose of strategic flood risk mapping. These maps, which can be found in Volume 2, Tiles B1-B15, show flood risk from sources including fluvial, surface water, foul and combined sewers, groundwater and impounded water bodies including reservoirs and canals. This information is based on the findings in Chapter 4, which has included an assessment of suitability. The Sequential Test process primarily uses the Flood Zone maps to locate developments in low fluvial flood risk areas. Mapping flooding from other sources ensures new developments are located away from areas which have experienced flooding from such sources.

The strategic flood risk information is also presented as GIS layers, and can be interrogated to gain the associated descriptive information. These can be found in the CD attached to this report.

In accordance with the PPS25 Practice Guide, wherever possible the Level 1 SFRA has used Flood Zone outlines which have been produced using detailed modelling techniques in preference to the Environment Agency's Flood Zone maps. When representing the Flood Zones, Level 1 SFRAs should also show the functional floodplain, Flood Zone 3b, where such outlines have been modelled. If Flood Zone 3b has not been produced as part of a detailed modelling project, similar outlines, such as the 1 in 25 year outline can be used, upon agreement with the Environment Agency. In the absence of such detailed information, the PPS25 Practice Guide recommends that all areas within Flood Zone 3 should be considered as Flood Zone 3b unless, or until, an appropriate FRA shows to the satisfaction of the Environment Agency that it can be considered as falling within Flood Zone 3a. Therefore, when carrying out the Sequential Test the LPA should assume that where Flood Zone 3b does not exist, its extent would be equal to Flood Zone 3a.

5.1.1 Hydraulic (River) Models

Mapping outputs from river models have been collected and used for the production of the SFRA flood maps. Within the study area, Environment Agency hydraulic models exist for Glossop Brook, Long Clough Brook, Hurst Brook, Shelf Brook, Blackshaw Clough, River Sett, Hollingworth Clough, River Goyt, Warm Brook, Randal Carr Brook, and the River Wye. The table overleaf gives details of the modelled Flood Zone outlines, and the outlines presented in Volume 2, Tiles B1-B14. In all cases the approach has been discussed and agreed with the Environment Agency.

For the remainder of watercourses in the study area, the Environment Agency's Flood Zone information has been used and is also presented in Volume 2, Tiles B1-B14. It should be noted that some smaller watercourses (with a catchment area of less than 3km^2) do not have Flood Zones produced for them.

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Table 5. 1: Environment Agency Hydraulic Models within the High Peak Borough

Planning Area	Watercourse	Modelled Flood Zones			Modelled Extents		Comments
		3b	3a	2	Upstream	Downstream	
High Peak Plan Area	Glossop Brook	✓	✓		SK 03970 94006	SK 00975 95279	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline used as Flood Zone 3a
	Long Clough Brook	✓	✓		SK 03491 92833	SK 02295 94175	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline used as Flood Zone 3a
	Hurst Brook	✓	✓		SK 05848 93613	SK 03970 94006	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline used as Flood Zone 3a
	Shelf Brook	✓	✓		SK 05310 94919	SK 03970 94006	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline used as Flood Zone 3a
	Blackshaw Clough	✓	✓		SK 04492 95303	SK 04234 94741	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline used as Flood Zone 3a
	River Sett	✓	✓		SK 05006 87032	SK 00114 85197	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline already adopted by Environment Agency.
	Hollingworth Clough		✓	✓	SK 03208 88299	SK 02981 87197	1 in 100 year outline used for Flood Zone 3a. 1 in 1000 year outline used for Flood Zone 2.
	River Goyt	✓	✓		SK 00764 79658	SK 01579 82363	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline already adopted by Environment Agency.
	Warm Brook	✓	✓		SK 05896 79998	SK 06015 81258	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline already adopted by Environment Agency.
	Randal Carr Brook	✓	✓		SK 01804 80245	SK 01021 80839	1 in 25 year outline used as Flood Zone 3b. 1 in 100 year outline already adopted by Environment Agency.
	River Wye	✓	✓		SK 04142 72682	SK 25973 65456	1 in 25 year outlined used as Flood Zone 3b. Flood Zones are a mixture of HR Wallingford outlines and historic events. Flood Zone 2 stretched to match Flood Zone 3 where 3 is larger. Flood Zones stretched to match 25 year outline where 25 year outline is bigger

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5.1.2 Sewer Flooding

Due to the Data Protection Act, it is not possible to specify the exact locations of past incidents. Instead, data has been received at four-digit postcode level. These postcode polygons outline a series of large geographical areas. Within each postcode area it has been indicated how many incidents have occurred. This information is presented in a separate high-level historical flooding map in Volume 2, Tile B15.

Sewer flood risk has been classified according to the number of properties flooded from overloaded sewers within each postcode area. The categorisation is as follows:

- Low sewer flood risk: 0 to 5 properties Denoted by a yellow polygon
- Medium sewer flood risk: 6 to 15 properties Denoted by an orange polygon
- High sewer flood risk: >16 properties Denoted by a red polygon

This information has also been digitised as a GIS layer, giving information on the amount of affected properties within each postcode area. The colour system is designed to indicate that even though a whole postcode area might be shown as at risk, only a few incidents might have been recorded in that area.

Future updates to the DG5 flood register should be fed into future updates of the SFRA. Furthermore, the relatively coarse resolution of data limits the use of data for the purpose of spatial planning. In future updates to the SFRA, water companies may provide full location information. In the meantime there is an onus on developers to assess sewer flood risk as fully as possible as part of site-specific FRAs.

5.1.3 Flooding from Surface Water, Impounded Water Bodies and Groundwater

Flooding from surface water, canals, reservoirs and groundwater has been mapped using the historical data collected in Section 4. GIS 'points' have been used to indicate where flooding from these sources has occurred. This is not considered to be exhaustive since the data is based on historical events rather than predictive modelling (and therefore may not represent very rare events) so the full extent of these flooding mechanisms may not have been captured. It is therefore recommended that during future updates to the SFRA, reviews and consultations are undertaken to ensure that any new surface water, canal, reservoir and groundwater flooding locations and issues are fully taken into account.

5.2 Climate Change

In its November 2006 publication of the predicted effects of climate change on the United Kingdom, Defra described how short duration rainfall could increase by 30% and flows by 20%, and suggested winters will become generally wetter whilst summers, although drier, will be characterised by more intense rainfall events. These effects will tend to increase both the size of Flood Zones and the depth of floodwater associated with rivers, and the amount of flooding experienced from 'other sources'. PPS25 sets current guidance for changes to flood risk as a result of climate change, shown overleaf.

Table 5.2: PPS25 Guidance for Changes to Flood Risk as a Result of Climate Change

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%	

5.2.1 Methods used to derive the Climate Change maps

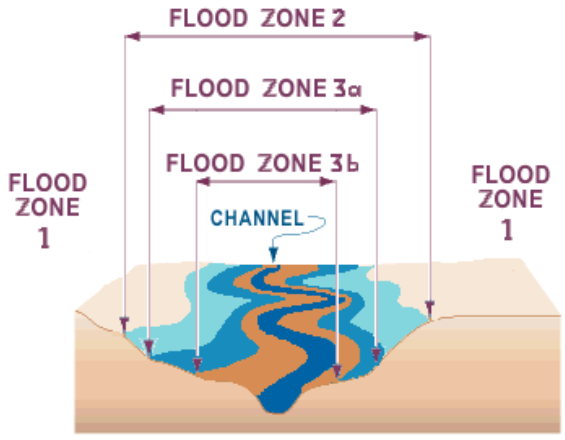
Sensitivity testing of the national Flood Zone maps has been carried out by the Environment Agency, using the 20% increase in peak river flows expected between 2025 and 2115. In very flat areas, the extent of inundation becomes bigger, while in narrow floodplains, the depth of the floodwaters increases. This means that areas currently located in a lower-risk zone (e.g. Flood Zone 2) could in future, be re-classed as lying within a higher risk zone (e.g. Flood Zone 3). In line with these findings, and to represent fluvial climate change scenarios in the SFRA where no other information exists, the Environment Agency Flood Zone maps have been used to infer climate change scenarios. The current Flood Zones have been 'reassigned' to show the following:

- The current Flood Zone 2 (1 in 1000 year return period) will, over a period of 50 to 100 years, become Flood Zone 3 (1 in 100 year return period)
- The current Flood Zone 3a (1 in 100 year return period) will become Flood Zone 3b, functional flood plain (1 in 20 year return period)

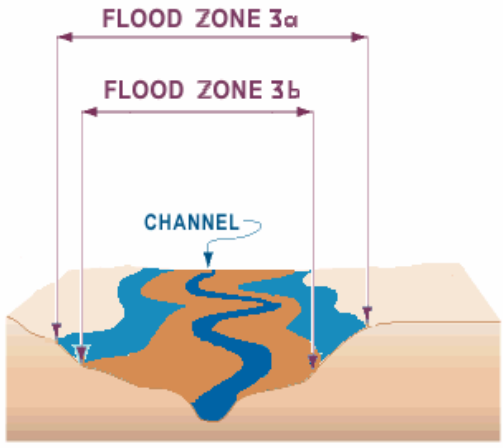
This approach gives an indication of how Flood Zones and flood probabilities are likely to change over time. The technique adopted is precautionary but one which is suitable to infer possible climate change impacts on fluvial flood risk, in the absence of any modelled climate change outlines.

This approach is explained in the images below.

Current Flood Risk



Future Flood Risk



A number of watercourses in the study area have been modelled and are detailed in the table below. Wherever possible, this study has sought to use modelled information for the 1 in 100 year climate change scenario (i.e. 100 +20%) in preference to the technique outlined previously, outlines by either:

- Using modelled climate change scenarios for the 1 in 100 year event (Flood Zone 3a), or
- Where modelled climate change outlines do not exist, using the 1 in 200 year or 1 in 100 year modelled outlines as a climate change proxy for the 1 in 100 year event (Flood Zone 3a). This method is supported by the fact that the 1 in 1000 or 1 in 200 year outlines often show similar extents to the climate change scenarios of the 100 year event.

Table 5.3: Modelled Flood Outlines used for the 1 in 100 year Climate Change Scenario

Planning Area	Watercourse	Modelled Flood Outlines			Comments
		1 in 100 year + 20%	1 in 150 year	1 in 200 year	
High Peak Plan Area	Glossop Brook	✓		✓	1 in 100 year +20% outline used for 1 in 100 year climate change scenario
	Long Clough Brook	✓		✓	1 in 100 year +20% outline used for 1 in 100 year climate change scenario
	Hurst Brook	✓		✓	1 in 100 year +20% outline used for 1 in 100 year climate change scenario
	Shelf Brook	✓		✓	1 in 100 year +20% outline used for 1 in 100 year climate change scenario
	Blackshaw Clough	✓		✓	1 in 100 year +20% outline used for 1 in 100 year climate change scenario
	River Sett				No climate change outlines or proxies exist
	Hollingworth Clough				No climate change outlines or proxies exist
	River Goyt				No climate change outlines or proxies exist
	Warm Brook				No climate change outlines or proxies exist
	Randal Carr Brook				No climate change outlines or proxies exist
	River Wye		✓		Flows for the 1 in 150 year event are too small to be used as a climate change proxy for the 1 in 100 year event. Flood Zone 2 used for climate change scenario.

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Table 5.3 shows that climate change outlines for Glossop Brook, Long Clough Brook, Hurst Brook, Shelf Brook and Blackshaw Clough exist, and have been used to represent the climate change scenario for the 1 in 100 year event. While 1 in 150 year outline exists for the River Wye, analysis of the flows has shown that they are not big enough to meet the 1 in 100 year +20% flows. Therefore for this watercourse, Flood Zone 2 has been used to denote the climate change outline for the 1 in 100 year event. While models exist for the other watercourses in the table, climate change outlines and proxies do not exist, therefore the existing Flood Zones have been re-assigned, as outlined in the technique above, to gain climate change scenarios.

The climate change outlines are provided in a series of maps covering the study area (Volume 2, Tiles C1-C3).

5.2.2 Likely Climate Change Impacts

The Flood Zones in the High Peak plan area are generally narrow. For floodplains with incised channels, the extent of flooding is not likely to increase significantly under the climate change scenario. In areas where no detailed climate change modelling exists, this finding is supported by the relatively small difference in the aerial extents of Flood Zone 2 and Flood Zone 3a. However, it is important to note that as a result of climate change, the depth of flooding is likely to increase in these areas. This will have a significant impact on the flood hazard. A Level 2 SFRA, which assesses flood hazard, will therefore be required for site allocations which need to satisfy the Exception Test.

By contrast, the effect of climate change on fluvial flood risk in flatter areas can be dramatic. Where climate change is expected to increase flood risk considerably, for example, where current Flood Zones are large (usually on wider, flatter floodplains), the LPA might wish to use the climate change maps to carry out the Sequential Test, in order to give a particularly long-term risk-based approach to planning.

It is expected that flood risk from surface water, sewers, groundwater and impounded water bodies will generally increase due to the expected wetter winters (causing more frequent groundwater flooding) and incidence of short-duration high-intensity rainfall events associated with summer convective storms (causing more frequent surface water and sewer flooding).

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6 Flood Warning Systems and Flood Risk Management Measures

6.1 Flood Risk Management Introduction

Flood risk management can reduce the probability of flooding occurrence though the management of land, river systems and flood defences, and reduce the impact though influencing development in flood risk areas, flood warning and emergency response.

6.1.1 Catchment Flood Management Plans

A Catchment Flood Management Plan (CFMP) is a high-level strategic plan through which the Environment Agency seeks to work with other key-decision makers within a river catchment to identify and agree long-term **policies** for sustainable flood risk management (in contrast to flood risk management strategies overleaf, which provide strategic **options** for flood risk management). It is produced in discussion with other key decision makers within a river catchment. CFMPs are being developed for the whole of England and Wales and are intended to define appropriate policies for the management of flood risk over the next 50 to 100 years. They will not set specific flood risk reduction measures at defined areas within the catchment, but will promote a range of activities for managing flood risk across the whole catchment. High Peak plan area is covered by two CFMPs: the Trent CFMP in the Midlands Region, Upper Mersey/Glaze CFMP in the North West Region. The geographical coverage of these CFMPs across the High Peak plan area is detailed in Figure 6.1 below.

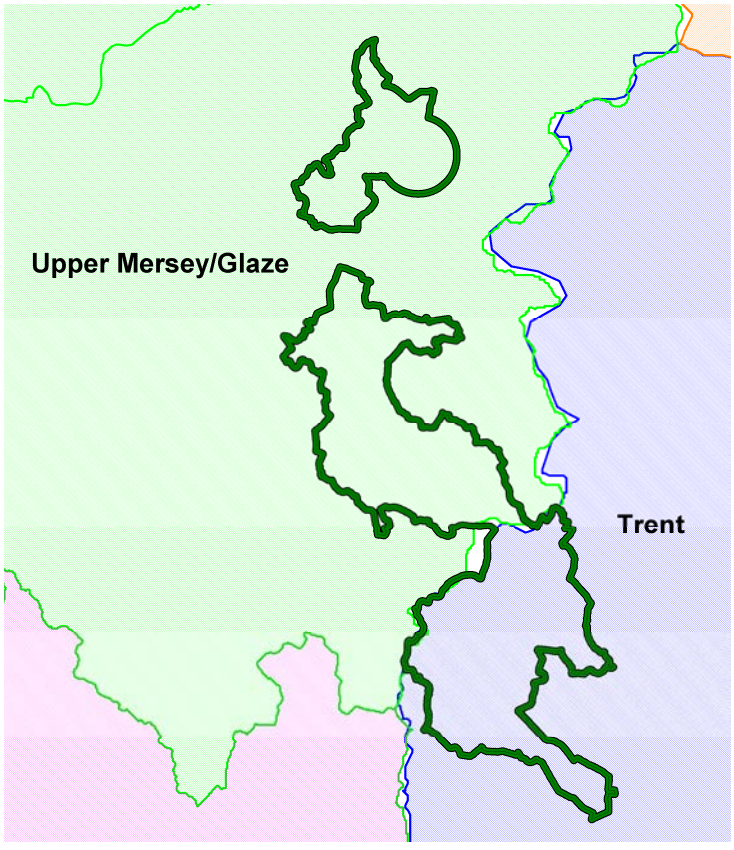

Figure 6.1: Geographical coverage of CFMPs across the High Peak plan area

6.1.2 River Trent CFMP

The River Trent CFMP is currently in draft format. The study considers flood risk management over the entire River Trent catchment and all of its tributaries, which is a total area of over 10,000km^2. The document gives an overview of flood risk in the catchment and sets out a preferred plan for sustainable flood risk management over the next 50 - 100 years, including policies to manage flood risk in the future. These policies will help the Environment Agency achieve their vision for a more sustainable, cost effective and natural approach to managing flood risk.

The Trent catchment and its tributaries have been divided into 10 policy units. Each policy unit has been assessed to decide which policy will provide the most appropriate level and direction of flood risk management for both now and the future. Out of the six standard flood risk management policies listed above, one has been applied to each policy unit. These policies have been agreed nationally and are being applied to CFMPs in a standard way across England and Wales.

The allocation of the policies to each unit involved the review of large amounts of information, alongside feedback and extensive consultation and consideration was given to how the policy units would interact with each other. The policy unit which covers the High Peak plan area is **Policy Unit 3**.

The policy was chosen on how well the policy actions would meet catchment objectives. The table overleaf provides a summary of the main factors considered when selecting the most appropriate policy option for the Policy Units. The section also indicates likely consequence of implementing the policy.

Table 6.1: Trent CFMP Policy Unit 3

Policy Unit 3	Peaks and Moorlands
Problem/Risk	**Physical characteristics:** • The Peak District with elevations of more than 440 metres forms the highest part of the catchment. • River Derwent falls rapidly, losing approximately 400m within the first 50km. The River Dove has a similar slope in the head waters but quickly levels out once it leaves the Peak District. • The Peak District National Park is itself a statutory landscape designation, and includes the South West Peak Environmentally Sensitive ESA and the North Peak ESA. • Characterised by the harder millstone grit and carboniferous limestone of the Dark and White Peaks respectively. • Peaty soils found in the upland areas where rainfall is high. • Farming in the upland White Peak District area is characterised by well-drained soils, promoting its use as improved grassland. In contrast, the surrounding Dark Peak soils are acidic and generally covered by scrubland and raised bogs with some rough grazing.
	Flood mechanism: • Rapid run-off from the Peak District and Staffordshire moors results in the rapid onset of flooding in downstream towns and villages. The valley is relatively narrow, and settlements tend to be concentrated near the rivers. Bridges and other constrictions associated with urban fabric along the watercourses tend to make the flooding within the towns and villages worse.
	Receptor (Areas affected): • Main towns at risk are Buxton, Bakewell, Matlock, Ashbourne and Leek. • Infrastructure – In Bakewell and Matlock significant disruption may be caused by flooding within a large area of the town centre, affecting a number of local transport routes. • SSSIs – Churnet Valley. • Landscape designations – Peak District National Park. • Environmental sensitive areas (ESAs) – the South West Peak ESA, the North Peak ESA.
	Flood risk: • Flood risk is low across the largely rural policy unit, but high within the main towns along the river network. **Potential source of future flood risk** • Climate change – increase in flow.
	Opportunities and constraints: ***Opportunities:*** • Reduce peak run-off rates from the uplands of the Peak District and Staffordshire Moorland. • Help Create and support natural habitats and BAP targets. ***Constraints:*** • Pockets of relatively high flood risk. • Highly valued existing landscape (Peak District National Park) and existing habitats.
	Policy unit objectives • Reduce the number of people at risk from deep and fast flowing waters or fast onset of flooding through the towns of Buxton, Bakewell, Matlock, Ashbourne and Leek. • Reduce the disruption caused by flooding to transport and infrastructure. • Minimise the increase in the cost of flood damage, taking into account future pressures, which may increase flood risk. • Sustain and improve the status of environmentally designated areas through appropriate frequency, extent and duration of flooding, including using existing and future flood storage areas and floodplains more to benefit nature conservation. • Support and encourage land management and land use in the River Derwent and River Dove catchments that will reduce run-off rates from upland areas. • Sustain and increase the amount of BAP habitat in the catchment.

Policy selected	**Policy option 6 -** Take action to increase the frequency of flooding to deliver benefits locally or elsewhere, which may constitute an overall flood risk reduction (for example for habitat inundation).
Justification	This is a large policy unit area with generally low flood risk, but with small pockets of flood risk in locations such as Buxton, Bakewell, Matlock, Ashbourne and Leek. There is a need to reduce flood risk locally, but there are large areas where water could remain on the catchment for longer, with no increased damage, but with environmental and flood risk management benefits. There are also significant benefits in the downstream, in policy unit 5 (AAD is reduced from £1110m to £80m) through applying policy 6 in this policy unit. The benefit diminishes rapidly further downstream as the influence from other parts of the catchment increases, and the tidal influence becomes increasingly dominant.
Alternative policies considered	Policy 1 – do nothing. Although this could be considered as a possible policy option, and would have a similar long-term result as policy 6, it would happen in an unmanaged and unpredictable way. There are small pockets of significant flood risk within this policy unit, and 'do nothing' would result in a significant increase in localised flood damages. Policy 2 – reduce current level of flood risk management. This could also be considered a possible policy option for this area, and it could allow the floodplain to flood more whilst controlling the changes that would happen in time. However, this policy does not reflect the scale of the likely changes and it does not ensure the level of investment and commitment to meet the catchment objectives. Policy 3 – maintain current level of flood risk management. This option results in the worst possible outcome, with increased damages locally but with none of the benefits that would come from a managed approach. Policy 4 – maintain the current level of flood risk into the future. This policy could apply to this policy unit, but it implies increased flood risk management in the future and does not consider the opportunity to potentially reduce flood risk significantly elsewhere. Policy 5 – reduce the level of flood risk, both now and in the future. This policy id not justified by the level of flood risk within the policy unit, and would require an unsustainable investment in flood defences to meet future changes.
Uncertainties and dependencies	The effectiveness of land use change in reducing run-off rates has been clearly demonstrated at a small scale, however; there is still uncertainty regarding the overall impact at a catchment scale. This policy relies on wide scale commitment from land owners, as well as significant financial and practical assistance and support from government. The requirement for existing and future schemes is uncertain under the selected policy in the future.

In summary, Policy Option 6 has been selected for Policy Unit 3. This means that opportunities to provide increased flood storage and attenuation areas should be explored, in order to realise benefits downstream. Partnership working between the Authority, LPAs and the Environment Agency should be explored in order to achieve this. Clearly, areas which currently exist as undeveloped floodplain, and any natural flood storage areas, should remain intact in order to continue to provide the flood storage and conveyance areas which help to mitigate flood risk downstream. Any development in these very important floodplain areas has the potential to increase flood risk downstream, by displacing flood water and reducing flood storage. The Authority can therefore help to deliver this Policy Option by safeguarding these areas from development.

6.1.3 Upper Mersey CFMP

The Upper Mersey CFMP covers the north and central parts of the High Peak plan area, encompassing the River Goyt and River Etherow catchments. As a whole the CFMP covers the River Mersey catchment from the headwaters of the River Tame and Goyt in the Pennines down to the Manchester Ship Canal at Irlam and includes Sinderland Brook and the River Bollin. The CFMP is currently in draft form.

The Upper Mersey CFMP area was divided into eight areas (or Policy Units) based on current and predicted flooding issues, hydrological characteristics, land use and development pressures with each

being assigned an appropriate policy. Two policy units were identified as being relevant to the High Peak Plan area: Policy Unit 6 – Goyt, and, Policy Unit 7 – Etherow.

For the High Peak Borough area, the preferred policy for Policy Unit 6 (Goyt) is Policy Option 3: continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline). In general, flood risk within the policy unit is considered to be moderate both now and in the future and as such the scale of flood risk is not sufficient to warrant undertaking significant flood risk management measures to improve the existing standard of flood defence. Continuing the current level of maintenance will ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard. It is thought that the provision of flood warning areas and awareness campaigns will provide a cost-effective method of reducing the impacts of flooding to people and properties. In terms of flood risk, it is considered to be more efficient to concentrate resources and expenditure on the key flood risk areas and reduce or remove expenditure in the more rural locations within this unit.

For policy Unit 7 – Etherow, the preferred policy option was Policy Option 4: Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change). Within the policy unit, future flood risk is considered to be unacceptable compared to the existing risk because of the potential for channel blockages. Increasing the current level of maintenance will ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard. It is thought that the provision of flood warning areas and awareness campaigns will provide a cost-effective method of reducing the impacts of flooding to people and properties. In terms of flood risk, it is considered to be more efficient to concentrate resources and expenditure on the key flood risk areas and reduce or remove expenditure in the more rural locations within this unit.

Upon completion of the final CFMP, the Council should review the selected Policy Options and how these could be delivered through partnership working between the Authority, LPAs and the Environment Agency, as well as other flood management bodies.

6.2 Flood Risk Management Strategies

The Environment Agency also produces flood risk management strategies, which aim to deliver flood risk management at a catchment-specific level. Aims of strategies generally include the following:

- To identify a 100 year framework for sustainable management of flood risk
- To provide a five year plan for capital investment on a project level for flood risk management
- To identify measures to maximise the environmental /social enhancement opportunities

Liaison with the Environment Agency concluded that no strategies are being carried out for any of the watercourses in the High Peak plan area.

6.3 Summary of Environment Agency Policies and Options

The general direction of the Environment Agency in the Midlands Region covered by the **River Trent CFMP (southern part of plan area, including Buxton)** is to take action to increase the frequency of flooding to deliver benefits locally or elsewhere, which may constitute an overall flood risk reduction.

In particular, opportunities to provide increased flood storage and attenuation areas should be explored, in order to realise benefits downstream, with the Council working in partnership with the Environment Agency to achieve this. Areas which currently exist as undeveloped floodplain, and any natural flood storage areas, should remain intact in order to continue to provide the flood storage and conveyance areas which help to mitigate flood risk downstream. Any development in these very important floodplain areas has the potential to increase flood risk downstream, by displacing flood water and reducing flood storage. The Council can therefore help to deliver this Policy Option by safeguarding these areas from development.

Within the Environment Agency's North West Region covered by the Upper Mersey/Glaze CFMP, the general direction of the Environment Agency is:

- **Goyt catchment (central part of plan area, including New Mills, Hayfield, Whaley Bridge, Chinley and Chapel-en-le-Frith):** continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline). Continuing the current level of maintenance will ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard.

- **Etherow catchment (northern part of plan area, including Glossop):** take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change). Within the policy unit, future flood risk is considered to be unacceptable compared to the existing risk because of the potential for channel blockages. Increasing the current level of maintenance will ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard.

The Council can help deliver this by reviewing their maintenance procedures. Developer contributions should be sought to assess options to reduce this flood risk locally, without increasing flood risk elsewhere. Developer contributions should also be sought to maintain and regularly clear culverts, to reduce risk of blockage during flood events, thereby reducing residual risk.

6.4 Flood Defences

Flood defences are structures which affect flow in times of flooding and therefore prevent water from entering property. They generally fall into one of two categories: 'formal' or 'informal'. A 'formal' defence is a structure which has been specifically built to control floodwater. It is maintained by its owner (this is not necessarily the Environment Agency) so that it remains in the necessary condition to function. An 'informal' defence is a structure that has not necessarily been built to control floodwater and is not maintained for this purpose. This includes road and rail embankments and other linear infrastructure (buildings and boundary walls) which may act as water retaining structures or create enclosures to form flood storage areas in addition to their primary function. A study of informal defences has not been made as part of this assessment. Should any changes be planned in the vicinity of road or railway crossings over rivers in the study, it would be necessary to assess the potential impact on flood risk to ensure that flooding is not made worse either upstream or downstream. Smaller scale informal defences should be identified as part of site-specific detailed FRAs and the residual risk of their failure assessed.

The reduction in flood risk that a defence provides depends on the standard of protection (SoP) and the performance and reliability of the defence. Flooding may still occur in defended areas if the defence is overtopped or breached, or if flooding occurs as a result of non-fluvial sources such as groundwater flooding, surface water flooding or poor drainage. Development behind defences should, therefore, be planned with due regard to the flood risk in the defended area. This will need to be facilitated by a Level 2 SFRA.

In accordance with the scope of a Level 1 SFRA, a high level review of formal flood defences has been carried out using data from the National Flood and Coastal Defence Database (NFCDD) and information from the Council. NFCDD is a good starting point for identifying significant flood defences and potential areas benefiting from defence, but the quantity and quality of information provided differs considerably between structures. The NFCDD is intended to give a reasonable indication of the condition of an asset and should not be considered to contain consistently detailed and accurate data (this would be undertaken as part of a Level 2 SFRA where the need arises).

There are a number of locations at risk of flooding that are currently protected by permanent defences within the High Peak plan area and these can be viewed in Volume 2, Tiles A1-A14.

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Table 6.2: Environment Agency NFCDD Defences within the High Peak

Watercourse	Location	NGR	Type of Defence	Owner	SOP	Approx. Length (m)	Comments
River Etherow	Brookfield from Melandra Castle to Home Farm	SK 0080 9524	Unknown	-	-	1059	Defence runs along left and right banks
Outfall discharging to River Etherow	Hadfield to Woolley Bridge Road	SK 0105 9585	Unknown	-	-	90	
River Etherow	Hollingworth through works of Water Lane	SK 0114 9609	Unknown & culvert	-	-	250	Defence runs along left and right banks
Glossop Brook	Glossop upstream of Milltown	SK 0391 9394	Unknown	-	-	20	
Black Brook	Chinley between Reservoir and Spring Meadow	SK 0456 8210	Unknown	-	-	381	Defences of various lengths run along watercourse between the reservoir & Spring Meadow
Black Brook	Bridgeholm Green adjacent to Mill	SK 0519 8183	Unknown	-	-	132	
Black Brook	Bridgeholm Green downstream of railway	SK 0550 8178	Unknown	-	-	219	
Black Brook	Chapel Milton by Bowden Lane	SK 0575 8171	Unknown	-	-	67	
Black Brook	Chapel Milton from Townend to Mills upstream of Bowden Lane	SK 0618 8126	Unknown	-	-	120	
Tributary of Black Brook	Wash downstream of Wayside Farm	SK 0622 8207	Unknown	-	-	55	
Hogshaw Brook	Hogshaw between Ashwood Park & Brown Edge Road	SK 0633 7387	Masonry channel sides, retaining walls, gabion basket, wooden channel side & culverted channel	Environment Agency	1:10 Year	740	Series of defences on left & right banks

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In addition to this information, the Council has supplied details of council-owned defences and flood alleviation schemes.

The River Etherow FAS scheme was constructed following a series of flood events in the last 60 years with the most significant event occurring in 1991 following heavy rainfall. Numerous properties located along the watercourse in the Etherow Industrial Estate and along Woolley Road Bridge have been inundated. The Environment Agency commissioned Halcrow to design a flood alleviation scheme within the Etherow Industrial Estate. This comprised a series of stone walls, extensive grouting to existing walls to reduce ground permeability, the construction of two steel flood gates across the ends of Sterling Coated Materials access bridge, a new service bridge and strengthening of existing riverside walls.

The Glossop Brook FAS was constructed as a result of the inability of the watercourses to cope with flood flows. The alleviation scheme involves a range of operations including channel regrading, widening of channels, improving flows at bridges and culverts and constructing bed-checks and boulder traps. The FAS comprised four phases of work:

- Phase 1 – Boulder traps were constructed on the Shelf Brook downstream of the footbridge and channel excavations undertaken to deepen the channel to help alleviate flooding in the lower reaches of the catchment that had occurred following sediment build-up.

- Blackshaw Clough & Phase 2 –Flooding to property occurred in Glossop due to insufficient channel capacity at the downstream extent of Blackshaw Clough. Two key locations causing problems are Shepley Culvert and Wellgate Road Culvert. The Shepley Street Culvert was replaced by a pre-cast concrete box culvert and two 100mm ramps were constructed at either end of the upstream footbridge, with a 100mm high ramp built at the left end of the downstream footbridge to prevent flooding into Wesley Street. Phase 2 works were located in a reach extending from upstream of the A57 road bridge. An access bridge across Glossop Brook 40m upstream of the confluence with the River Etherow formed a severe restriction and therefore the channel was regraded throughout the reach with the upstream extent replaced with a reinforced concrete channel. Downstream of the concrete channel the bed is regraded and lowered to a depth of 1m below previous levels. The channel was also widened at the caravan centre with the construction of a 3.5m vertical wall. An existing wall on the right bank was replaced with reinforced concrete. The caravan centre access bridge was replaced by a new bridge a few metres downstream.

- Phases 3 & 4 – were concerned with solving specific problems at seven sites across Dinting Vale, Glossop town centre and Charlestown. Adjacent to Keroc paints and Carpenter's factory at Dinting Vale the channel had an insufficient capacity to cope with flood flows. Further upstream, in a section from Wren Nest Mill downstream to Lancashire Chemical Works, there were a series of bridges and culverts which restrict flood flows, some of which have resulted in flooding to High Street West. Phases 3 and 4 of the FAS comprised a series of operations designed to increase channel capacity. These included construction of boulder traps, bed-check to prevent bed scour, replacement and improvement of bridges and culverts, strengthening and raising of flood walls and banks, widening and deepening of the channel and removal of some weirs. Phase 3 involved a reach about 800m in length stretching from Wren Nest Mill to Lancashire Chemical Works and a second reach adjacent to Keroc paints and Carpenter's factory at Dinting Vale. Phase 4 involved work at five sites in the town centre and at Charlestown; the programme comprising both channel

works, road resurfacing and the construction of a boulder trap at the confluence of Long Clough and Bray Clough at Charlestown.

The Black Brook FAS was constructed in August 1994. The National Rivers Authority (NRA) commissioned Scott Wilson Kirkpatrick to undertake a flood alleviation study of a 6.5km reach of the Black Brook between Chapel-en-le-Frith and the river's confluence with the River Goyt downstream of the village of Buxworth. Historically a number of properties have been affected by flooding along the watercourse with extensive flooding occurring in 1973, estimated as a 1 in 50 year event. Since the 1973 flooding a number of local improvements were made to the watercourse by landowners and the NRA. These have included channel regrading, widening and bank raising. General river maintenance of the channel and culverts has been carried out by the Environment Agency. The work has included individual blockage clearance, annual routine maintenance, culvert inspection with general blockage clearance, retaining walls repair and river bed work. The following works were undertaken as part of the FAS:

- New and replacement of 150m of flood walls and 100m of raised flood wall at Stephanie Works near Chinley. The estimated standard of protection was to a 1 in 25 year event
- New and replacement flood walls and banks and replacement of Whitehough Head Lane road bridge providing protection to 19 residential properties and industrial works
- Construction of 4.5m of flood wall approximately 1.2m high on the north side of the eastern-most building adjacent to the track. The flood-defence is continued around the eastern end of the same building as a flood embankment approximately 60m in length and 1.2m high. The defences provide protection to eight commercial units at Bridgeholm Green.
- A mixture of reinforced concrete flood walls with natural stone cladding, mortared natural stone-walling and earth bunding providing protection to three industrial units and six residential properties at Chapel Milton
- Widening of the watercourse and construction of 40m of reinforced concrete flood walls and 40m length of earth bunding at Bowdenhay Mill Chapel-en-le-Firth providing protection to two industrial units and six residential properties. A section of the brook between the two mill buildings was culverted and a 40m long flood-wall built on the left bank to the road-bridge on Bowden Lane.
- Reinforced concrete flood walls with natural stone cladding and earth bunding and culverts providing protection to twelve industrial units and two residential properties at Sheffield Road in Chapel-en-le-Frith.

6.5 Culverts

Sections of culverted watercourse as identified within NFCDD have been demonstrated in Volume 2, Tiles A1-A14. During analysis of the Flood Zone maps it was clear that not all culverts in the study area are identified on NFCDD. The Council is currently producing a GIS layer of culvert locations within the Borough and this information should be incorporated into the SFRA upon completion. When locating development, OS tiles should be analysed to identify any culverts in the vicinity of development sites. In some cases site visits may be required. Further details of the implications of culverts on new development can be found in Section 6.5.

On any new development site and indeed on existing sites, further culverting and building over of culverts should be avoided. All new developments with culverts running through their site should seek to de-culvert rivers for flood risk management and conservation benefit.

Table 6.3: Culverted Watercourses as identified within NFCDD

Watercourse	Location	NGR	Owner	Approx. Length (m)	Description
Black Brook	Bowden Park	SK 0620 8123	Unknown	10	-
Black Brook	Bowden Park	SK 0622 8125	Unknown	44	-
Hogshaw Brook	Ashwood Park under rail track	SK 0634 7373	Private	37	-
Hogshaw Brook	Ashwood Park rear of houses	SK 0635 7374	Private	22	Masonry channel with PCC roof slab
Hogshaw Brook	Hogshaw – culvert under Lightwood Road	SK 0632 7383	Private	88	Masonry culvert with natural bed
Hogshaw Brook	Hogshaw Wood – culvert under rail track	SK 0614 7403	Private	97	PCC circular pipe culvert
Hogshaw Brook	Hogshaw Wood – culvert under Brown Edge Road	SK 0598 7414	Private	61	PCC rectangular culvert

6.6 Storage Areas

There areas of extended floodplain acting as natural storage within the High Peak Borough Council., including the River Goyt through Furness Vale. It is imperative that natural storage areas used as a means of attenuation of flood waters should be safeguarded from development and maintained to ensure their efficient operation during a flood event. If the storage areas are not maintained this may lead to an increased risk of flooding at locations downstream.

6.7 Residual Risk

In producing Flood Zone maps the Environment Agency takes the presence of defences into account by showing the area that benefits from the defence (ABD). This area can also be deemed an area which is at risk of defence overtopping or failure. It can therefore also be described as a residual risk zone. Residual flood risks from defences can arise can arise due to:

- The failure of flood management infrastructure such as a breach of a raised flood defence
- A severe flood event that exceeds a flood management design standard and results in, for example, overtopping

Residual risk polygons do not exist for the High Peak plan area, despite defences existing, therefore an assessment of residual risk should be made at the site-specific level. Actual levels of residual risk will vary spatially depending on flow routes, velocities, flood depths and proximity to the breach or overtopping location. In the event that development is located in or near a residual risk area (e.g. behind a defence) the scope of the SFRA should be extended to a Level 2 assessment to refine information on the flood hazard in these locations. Known defence locations are mapped in Volume 2, Tiles A1-A14 to assist with this.

Residual risks can also arise from the following sources:

- Blockage or collapse of a culvert
- Blockage of a surface water conveyance system
- Overtopping of an upstream storage area
- Failure of a pumped drainage system

There is currently no dataset which identifies precise residual risk areas from these sources, therefore again any development in the vicinity of culverts, surface water conveyance systems, storage areas and pumped drainage systems should assess residual risk through a Level 2 SFRA. Known culvert locations are mapped in Volume 2, Tiles A1-A14. These should be referenced by those proposing development to identify the possibility of localised residual risks as well as opportunities for de-culverting and restoring the natural channel. OS tiles should be analysed to identify any culverts in the vicinity of development sites which are not recognised in Volume 2, Tiles A1-A14. In some cases site visits may be required.

Poorly maintained trash screens and rubbish inappropriately dumped in watercourses can reduce culvert and structure capacity, therefore presenting residual risk. This can be mitigated by regular inspection and clearance of culverts and trash screens.

Information received from the Environment Agency indicated that there is an issue with culverts falling into a state of disrepair, particularly in buried valleys or under tips. These pose a particularly high risk of collapse, therefore they pose residual risk. It is recommended that any development in the vicinity of culverts should assess the potential of de-culverting. If this is not possible, an assessment of the state of the culvert should be made, and any remedial works carried out prior to the development of the site.

6.8 Existing Flood Warning System

The Environment Agency is the lead organisation on flood warning and its key responsibilities include direct remedial action to prevent and mitigate the effects of an incident, to provide specialist advice, to give warnings to those likely to be affected, to monitor the effects of an incident and to investigate its causes. This requires the Agency, local authorities and the emergency services to work together to protect people and properties. The High Peak plan area falls within the Environment Agency Midlands Region as well as the North West Region.

When conditions suggest that floods are likely, it is the responsibility of the Environment Agency to issue flood warnings to the Police, Fire and Rescue Service, to the relevant local authorities, to the public and to the flood wardens. It is the responsibility of individuals in the community to receive flood warnings via Flood warnings Direct (FWD) which passes messages over the telephone network.

A flood warning system is in operation for the main rivers within the High Peak Borough and is outlined below in four stages (flood watch and flood warning areas can be seen in Volume 2, Tile E1).

Flood Watch: Flooding of low lying land and roads is expected. Be aware, be prepared, watch out! The following actions are recommended:

- Watch water levels
- Stay tuned to local radio or TV
- Ring Floodline on 0845 988 1188
- Make sure you have what you need to put your flood plan into action
- Alert your neighbours, particularly the elderly
- Check pets and livestock
- Reconsider travel plans

Flood Watches are issued for expected flooding, which could occur anywhere within the Flood Watch Area but with low or minor impact. The trigger for Flood Watch is a forecast that flooding of low impact land is expected.

Flood Warning: Flooding of homes and businesses is expected. Act now! The following actions, in addition to those associated with Flood Watch, are recommended:

- Move pets, vehicles, food, valuables and other items to safety
- Put sandbags or floodboards in place

- Prepare to turn off gas and electricity
- Be prepared to evacuate your home
- Protect yourself, your family and others that need your help

Severe Flood Warning: Severe flooding is expected. There is extreme danger to life and property. Act now! The following actions, in addition to those associated with Flood Warning, are recommended:

- Be prepared to lose power supplies - gas, electricity, water, telephone
- Try to keep calm, and to reassure others, especially children
- Co-operate with emergency services and local authorities
- You may be evacuated

All Clear: Flood Watches or Warnings are no longer in force. The following is recommended:

- Flood water levels receding
- Check all is safe to return
- Seek advice

The table below details the flood warning coverage within the High Peak Borough.

Table 6.4: Flood Warning coverage within the High Peak Borough

Type of Warning	Coverage	EA Region
Flood Watch	Stoke on Trent and Ashbourne Area including Newcastle under Lyme, Leek and Stone	Midlands
Flood Watch	The Mersey Uplands	North West
Flood Watch	The Derwent and Wye Valleys in Derbyshire including Derby, Buxton and Matlock and The River Trent through Derbyshire	Midlands
Flood Warning	River Etherow at Woolley Bridge	North West
Flood Warning	Glossop and Long Clough Brooks at Glossop	North West
Flood Warning	River Wye (Derbys) from Buxton to Rowsley including Rowsley C	Midlands

6.9 Flood Response Plan

The Council has an emergency plan called the Integrated Emergency Management Plan which would be activated in the event of a major emergency. The plan sets out the steps that each agency involved would have to take in order to deal with an emergency and also tries to envisage the many scenarios of such an emergency. The Council is as prepared as possible to deal with the aftermath of an emergency, and regular training events are carried out to deal with major flooding, train or plane crashes, major fires, chemical spillages etc.

One of the most important elements of any emergency is communication, particularly with members of the public, and the Council has systems in place to very quickly ensure that as much information is generated and passed on.

The Civil Contingencies Act came into force in April 2005 and is an important element of the Government's work to enhance and update the resilience of the United Kingdom to the disruptive challenges of the 21st Century. The legislation and accompanying non-statutory measures aim to deliver a single framework for civil protection in the UK, to improve the UK's ability to deal with the consequences of major disruptive incidents by improving the planning process at a local level, building better contacts between agencies and improving the link between local areas and central government.

The Act sets out the roles and responsibilities of local responders, ensuring consistency in civil protection activity and enhancing performance to ensure that the front line can deal with the full range of emergencies, from localised major incidents through to catastrophic emergencies.

The Council's website directs users to the Environment Agency's website, to gain details of Flood Warning (as outlined in section 6.5) and flood resilience.

It is recommended that the Council's Emergency Response Plan is reviewed and updated in light of the findings of the SFRA to ensure that safe evacuation and access for emergency services is possible during times of flood both for existing developments and those being promoted as possible sites within the LDF process. It is further recommended that the Council works with the Environment Agency to promote the awareness of flood risk to maximise the number of people signed up to the FWD service (previously this has involved targeted mail shots to those identified as living within Flood Zone 3a). It should be noted however that flood warning alone is not considered appropriate mitigation against flood risk for new development. Within the study area particular attention should be given to vulnerable people including those with impaired hearing or sight and those with restricted mobility.

With respect to new developments, those proposing the development should take advice from the LPA's emergency planning officer and for large-scale developments, the emergency services, when producing an evacuation plan as part of a FRA. As a minimum these plans should include information on:

How flood warning is to be provided:

- Availability of existing warning systems
- Rate of onset of flooding and available warning time and

- Method of dissemination of flood warning

What will be done to protect the infrastructure and contents:

- How more easily damaged items could be relocated
- The potential time taken to respond to a flood warning
- Ensuring safe occupancy and access to and from the development
- Occupant awareness of the potential frequency and duration of flood events
- Provision of safe (i.e. dry) access to and from the development
- Ability to maintain key services during an event
- Vulnerability of occupants and whether rescue by emergency services may be necessary and feasible
- Expected time taken to re-establish normal practices following a flood event

In some areas, particularly for existing properties and proposed developments behind defences, it may be necessary to extend the scope of the SFRA to Level 2. The outputs from detailed overtopping and breach analysis of the key defences will provide refined hazard information on flood depths, velocities and flow paths, which could be used by the LPA emergency planning teams to define new or refine existing emergency plans for these areas.

7 Flood Risk Management Policy Considerations

7.1 Overview

This chapter provides recommendations for what should be included in the Council's policy for flood risk management. Council policy is considered essential to ensure that the recommended development control conditions can be imposed consistently at the planning application stage.

The policy recommendations provided in this chapter are not exhaustive and it is therefore recommended that the Council refers to the following key flood risk management documents in order to fully inform their own flood risk management policies:

- **Planning Policy Statement 25: Development and Flood Risk** – sets out national policy for development and flood risk and supports the Government's objectives for sustainable communities.
- **River Trent and Upper Mersey CFMPs** - strategic planning document through which the Environment Agency will work with other stakeholders to identify and agree policies for long-term flood risk management over the next 50 to 100 years. The findings of the draft Trent CFMP have been summarised in section 6.1.1; however it is recommended that the final report is reviewed once complete and any changes to the draft incorporated into this document. The Upper Mersey CFMP should also be reviewed once available.
- **Making Space for Water** - outlines the Government's proposals for forward planning of flood management over the next 20 years advocating a holistic approach to achieve sustainable development. The protection of the functional floodplain is central to the strategy.
- **Water Framework Directive** - European Community (EC) water legislation which requires all inland and coastal waters to reach good ecological status by 2015.
- **Draft East Midlands Regional Spatial Strategy** – Regional Spatial Strategy providing a broad development strategy for the East Midlands up to 2026. The findings of the strategy have been summarised in Section 3.4; however, it is recommended that the final report is reviewed upon completion (expected in the latter part of 2008) and any changes to the draft incorporated into this document.

7.2 Policy Considerations

A key aim of an SFRA is to define flood risk management objectives and identify key policy considerations. It should be noted that it is ultimately the responsibility of the Council to formally formulate these policies and implement them.

It is recommended that the following flood risk objectives are taken into account during the policy making process and, where appropriate, used to strengthen or enhance the development control policies provided in Section 7.3.

Flood Risk Objective 1: To Seek Flood Risk Reduction through Spatial Planning and Site Design:

- Use the Sequential Test to locate new development in least risky areas, giving highest priority to Flood Zone 1
- Use the Sequential Approach within development sites to inform site layout by locating the most vulnerable elements of a development in the lowest risk areas. For example, the use of low-lying ground in waterside areas for recreation, amenity and environmental purposes can provide an effective means of flood risk management as well as providing connected green spaces with consequent social and environmental benefits
- Build resilience into a site's design (e.g. flood resistant of resilient design, raised floor levels)
- Identify long-term opportunities to remove development from the floodplain through land swapping
- Ensure development is 'safe'. For residential developments to be classed as 'safe', dry pedestrian egress out of the floodplain and emergency vehicular access should be possible. The Environment Agency states that dry pedestrian access/egress should be possible for the 1 in 100 year +20% for climate change return period event, and residual risk, i.e. the risks remaining after taking the sequential approach and taking mitigating actions, during the 1 in 1000 year event, should also be 'safe'.
- Avoid development immediately downstream of reservoirs which will be at high hazard areas in the event of failure.

Flood Risk Objective 2: To Reduce Surface Water Runoff from New Developments and Agricultural Land:

- SUDS required on all new development. As outlined in section 10.3 which outlines appropriate SUDS techniques for the Borough, infiltration systems should be the preferred means of surface water disposal, provided ground conditions are appropriate. Above ground attenuation, such as balancing ponds, should be considered in preference to below ground attenuation, due to the water quality and biodiversity benefits they offer. The adoption and maintenance of SUDS should also be considered at the earliest opportunity in their planning (refer to Section 10.4).
- All sites require the following:

  - Greenfield discharge rates with a minimum reduction of 20%, as required by the Environment Agency

  - 1 in 100 year on-site attenuation taking into account climate change

- Space should be specifically set aside for SUDS and used to inform the overall site layout
- Promote environmental stewardship schemes to reduce water and soil runoff from agricultural land

Flood Risk Objective 3: To Enhance and Restore the River Corridor:

- An assessment of the condition of existing assets (e.g. bridges, culverts, river walls) should be made. Refurbishment or/and renewal should be made to ensure the lifetime is commensurate with lifetime of the development. Developer contributions should be sought for this purpose.
- Those proposing development should look for opportunities to undertake river restoration and enhancement as part of a development to make space for water. Enhancement opportunities should be sought when renewing assets (e.g. de-culverting, the use of bioengineered river walls, raising bridge soffits to take into account climate change)
- Avoid further culverting and building over of culverts. All new developments with culverts running through their site should seek to de-culvert rivers for flood risk management and conservation benefit
- Set development back from rivers, seeking an 8 metre wide undeveloped buffer strip

Flood Risk Objective 4: To Protect and Promote Areas for Future Flood Alleviation Schemes:

- Protect Greenfield functional floodplain (our greatest flood risk management asset) from future development and reinstate areas of functional floodplain which have been developed (e.g. reduce building footprints or relocate to lower flood risk zones)
- Develop appropriate flood risk management policies for the Brownfield functional floodplain, focusing on risk reduction
- Identify sites where developer contributions could be used to fund future flood risk management schemes or can reduce risk for surrounding areas
- Seek opportunities to make space for water to accommodate climate change

Flood Risk Objective 5: To Improve Flood Awareness and Emergency Planning:

- Seek to improve the emergency planning process using the outputs from the SFRA
- Encourage all those within Flood Zone 3a and 3b (residential and commercial occupiers) to sign-up to Flood Warnings Direct service operated by the Environment Agency
- Ensure robust emergency (evacuation) plans are implemented for new developments greater than 1 Ha in size

7.3 Council-Specific Policy Considerations (Plan Area)

The following council-specific policies should also be considered:

- In the southern part of plan area, including Buxton (Trent catchment), opportunities should be sought to provide flood storage areas which may have flood risk benefits downstream and may benefit nature conservation.
- Reduce the number of people at risk from deep and fast flowing waters or fast onset of flooding through the town of Buxton by ensuring the Sequential Test is carried out on all new

development. Where the Exception Test is required, a Level 2 SFRA is required, which should assess the flood hazard and ensure the development will be safe for its lifetime.

- In the central part of plan area, including New Mills, Hayfield, Whaley Bridge, Chinley and Chapel-en-le-Frith (Goyt catchment), the Council should **continue** the current level of maintenance and should ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard. Developer contributions should also be sought to maintain and regularly clear culverts, to reduce risk of blockage during flood events, thereby reducing residual risk.

- In the northern part of the plan area, including Glossop (Etherow catchment), the Council should **increase** the current level of maintenance and ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard. Developer contributions should also be sought to maintain and regularly clear culverts, to reduce risk of blockage during flood events, thereby reducing residual risk.

- Minimise the increase in the cost of flood damage, taking into account future pressures, by ensuring flood resistance and resilience measures are incorporated into all new developments in flood risk areas (which have passed the Sequential and Exception Tests, where necessary).

- Surface water flooding as a result of runoff from fields within the plan area occurs at a number of locations. Environmental stewardship schemes should be promoted across the plan area to reduce water and soil runoff from agricultural land.

- Valuable undeveloped floodplain, providing a flood storage area, exists on the River Goyt through Furness Vale and should be safeguarded from future development.

- A significant water protection issue relates to Buxton Mineral Water, where groundwater issues are significantly affected by the extraction of the mineral water by Nestle. The area surrounding Buxton has been highlighted by DEFRA as a Nitrate Vulnerable Zone (NVZ) and there are also several areas around Buxton classified as a Groundwater Source Protection Zone (GSPZ) by the EA. Any boreholes, water wells or other extraction points should be identified and taken into account in the design process. SUDS techniques should be carefully selected to ensure groundwater contamination does not occur, for example, the use of soakaways should be prohibited.

7.4 Development Control Policies

For the purposes of development control, detailed policies will need to be set out to ensure that flood risk is taken account of appropriately for both allocated and non-allocated 'windfall' sites. The following reflects the minimum requirements under PPS25 (reference should be made to Tables D1-D3 in PPS25).

Future Development within Flood Zone 1

In this zone, developers and local authorities should realise opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development. There is no significant flood risk constraint placed upon future developments within the Low Probability Flood Zone 1, although the vulnerability from other sources of flooding should be considered as well as the effect of the new development on surface water runoff.

Typically, a Drainage Impact Assessment will be required to demonstrate that runoff from the site is reduced, thereby reducing surface water flood risk. This will involve the use of SUDS techniques which should take into account the local geological and groundwater conditions. For all sites, the post development runoff volumes and peak flow rates should be attenuated to the Greenfield discharge rates with a minimum reduction of 20%, as required by the Environment Agency.

Future Development within Flood Zone 2

Land use within Medium Probability Flood Zone 2 should be restricted to the 'water compatible', 'less vulnerable' and 'more vulnerable' category. Where other planning pressures dictate that 'highly vulnerable' land uses should proceed, it will be necessary to ensure that the requirements of the Exception Test are satisfied. The following should be considered:

- A detailed site-specific Flood Risk Assessment should be prepared in accordance with PPS25 and Council Development Control policies
- Floor levels should be situated above the 100 year plus climate change predicted maximum level plus a minimum freeboard of 600mm
- The development should be safe, meaning that dry pedestrian access to and from the development should be possible above the 1 in 100 year plus climate change flood level; emergency vehicular access should be possible during times of flood; and flood resistance and resilience is incorporated into the design.
- SUDS should be implemented to ensure that runoff from the site (post development) is reduced. For all sites, the post development runoff volumes and peak flow rates should be attenuated to the Greenfield discharge rates with a minimum reduction of 20% as required by the Environment Agency, for both Greenfield and Brownfield sites. Space should be set aside for SUDS.
- The proposed development should be set-back from the watercourse with a minimum 8m wide undeveloped buffer zone, to allow appropriate access for routine maintenance and emergency clearance.

Future development within High Probability Flood Zone 3a

Land use with High Probability Flood Zone 3a should be restricted to the 'less vulnerable' uses to satisfy the requirements of the Sequential Test. For 'more vulnerable' uses it is necessary to ensure that the requirements of the Exception Test are satisfied. The following should be considered:

- A detailed site-specific FRA should be prepared in accordance with PPS25 and Council Development Control policies. Properties situated within close proximity to formal defences or water retaining structures (reservoirs/canals) will require a detailed breach and overtopping assessment to ensure that the potential risk to life can be safely managed throughout the lifetime of the development. The nature of any breach failure analysis should be agreed with the Environment Agency.
- The development should not increase flood risk elsewhere, and opportunities should be taken to decrease overall flood risk (such as use of SUDS and de-culverting). This can be achieved by developing land sequentially, with areas at risk of flooding favoured for green space.

- Floor levels should be situated above the 100 year plus climate change predicted maximum level plus a minimum freeboard of 600mm. Within defended areas the maximum water level should be assessed from a breach analysis.

- The development should allow dry pedestrian access to and from the development above the 1 in 100 year plus climate change flood level and emergency vehicular access should be possible during times of flood. An evacuation plan should be prepared. With respect to new developments, those proposing the development should take advice from the LPAs emergency planning officer and for large-scale developments, the emergency services, when producing an evacuation plan as part of a FRA. All access requirements should be discussed and agreed with the Environment Agency.

- Basements should not be used for habitable purposes. Where basements are permitted for commercial use, it is necessary to ensure that the basement access points are situated 600 mm above the 1 in 100 year flood level plus climate change.

- SUDS should be implemented to ensure that runoff from the site (post development) is reduced. For all sites, the post development runoff volumes and peak flow rates should be attenuated to the Greenfield discharge rates with a minimum reduction of 20%, as required by the Environment Agency for both Greenfield and Brownfield sites. Space should be set aside for SUDS.

- The proposed development should be set-back from the watercourse with a minimum 8m wide undeveloped buffer zone, to allow appropriate access for routine maintenance and emergency clearance.

Future development within Functional Floodplain Zone 3b

Development should be restricted to 'water-compatible uses' and 'essential infrastructure' that has to be there. Table D2 from PPS 25 (reproduced in Section 1.5.1 of this report) outlines the types of development included within this classification. It should be noted that 'essential infrastructure' includes essential transport infrastructure (including mass evacuation routes) which may have to cross the area at risk as well as strategic utility infrastructure such as electricity generating power station and grid and primary substations. Reference should be made to Table D2 of PPS25 when considering development within Flood Zone 3b to ensure only appropriate development is considered. 'Essential infrastructure' in this zone must pass the Exception Test and be designed and constructed to remain operational in times of flood and not impede water flow.

7.5 Sensitive Development Locations

Assuming that future site allocations and windfall sites are guided by PPS25 and the recommendations provided in this report, there are few locations in which development would significantly increase flood risk.

The study area is covered by small watercourses, pipelines and springs, many of which are not shown on the OS Maps. Given the steep topography, underlying geology and local drainage systems, the study area is sensitive to surface water runoff and resultant localised flooding.

Developments situated in these complex drainage situations will need site-specific FRAs to fully appreciate the drainage regime and ensure flood risk is appropriately managed, both on site and downstream. In general, throughout the study area, any development (including developments in Low

Probability Flood Zone 1) which does not incorporate appropriate SUDS methods may increase the risk of surface and/or fluvial flooding both on-site and off-site (downstream). As such, effective development control policies to incorporate SUDS on all new development should be implemented. Site-specific assessments will be required to ensure the appropriate SUDS method is implemented in accordance with local issues, for example, by adopting a design approach to ensure existing systems are not overloaded.

Areas of the High Peak plan area are protected by defences, with resultant residual risk areas. Any development situated behind defences will need careful consideration. The following paragraph comes from "Development and Flood Risk: A Practice Guide Companion to PPS25, 2007"

"When proposing new development behind flood defences, the impact on residual flood risk to other properties should be considered. New development behind flood defences can increase the residual flood risk, should these defences breach or overtop, by disrupting conveyance routes (flow paths) and/or by displacing flood water. If conveyance routes that allow flood water to pass back into a river flowing failure of a flood defence are blocked this will potentially increase flood risk to existing properties. If there is a finite volume of water able to pass into a defended area following a failure of the defences, then a new development, by displacing some of the flood water, will increase the risk to existing properties".

The natural floodplain of watercourses in the study area is an important feature in terms of flood risk management. Future development sites should be guided away from these areas using the Sequential Test and, in line with recommended policies, should be safeguarded for the future. Any development in these areas would have detrimental effect on flood risk in the immediate vicinity and downstream.

Finally, it is clear that numerous culverts exist in the study area, some of which have been blamed for local flooding due to lack of capacity. Culverts pose a residual risk if river flows are greater than their capacity, if they become blocked, or if they collapse. Any development upstream of culverts should appropriately assess the structural integrity, clearance and maintenance regime and capacity, to ensure all residual risks to the development are minimised. All options for de-culverting should be explored.

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8 Guidance on the Application of the Sequential Test

This section provides guidance on how to apply the Sequential Test.

8.1 Step One: Strategic Overview of flood risk across all potential development areas

The recommended initial step is to determine the extents of potential land allocations on large scale maps showing the most up-to-date Flood Zones, in accordance with PPS25. The presence of defences and culverts should also be reviewed. Summary tables of flood risk issues should then be prepared for each location, indicating if the potential areas overlap Zones 2, 3, localised flooding areas or if there are records of previous flood incidents shown in the maps (using the template put forward in Appendix E). It is then recommended that the summary tables and proposed locations are sent to the Environment Agency for verification. Particular care should be taken to avoid land allocations on which development would lack dry access and flood risk could increase elsewhere (e.g. flood incident points, localised flooding areas, flood zones).

8.2 Step Two: Flood Risk Issues in Zone 1

The next step should be to analyse all potential sites within Zone 1 by identifying those that have any flood risk issues (for example those affected by other sources of flooding or those that do not have dry access routes during flood events).

For the sites with flood risk issues, an assessment of likely significance of flood risk should then be carried out in terms of likely probability of flooding and potential consequences/flood damages (advice from a drainage specialist may be required, such as the SFRA consultant, the Environment Agency, a highways drainage engineer and/or the planning authority drainage specialist). The purpose is to identify sites with significant flood risk - high probability of flooding and significant flood damages with deep flooding and high velocities which could result in loss of property and potentially loss of life.

If a site with significant flood risk is identified within Zone 1, this would be considered as if it was in the High Probability Zone 3a, for further application of the Sequential Test in Zone 3a (see Section 8.3), bearing in mind that if a more vulnerable land use is required for the site, it will have to pass the Exception Test.

For those sites within localised flooding areas or with flood incident records where flood risk issues are not significant (for example shallow flooding and non-frequent blockages, etc), development should still be acceptable provided that adequate policies are in place for mitigating the risk (for example contributions may be required from the developer for the upgrade of the surface water system in the area).

It is important to note that most potential sites that pass the Sequential Test in Zone 1 will still require site-specific FRAs. The vulnerability to flooding from other sources (as well as from river 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 runoff, should be incorporated in an FRA. This need only be brief unless the factors above or other local considerations require particular attention. It is recommended that FRAs are still produced for Zone 1 sites of less than one hectare, at locations where there are records of previous flood incidents.

8.3 Step Three: Sequential Test in Zones 2 and 3

The third step is to sequentially allocate sites as part of a SA. It is recommended that prior to incorporating the Sequential Test within the SA, the following actions take place:

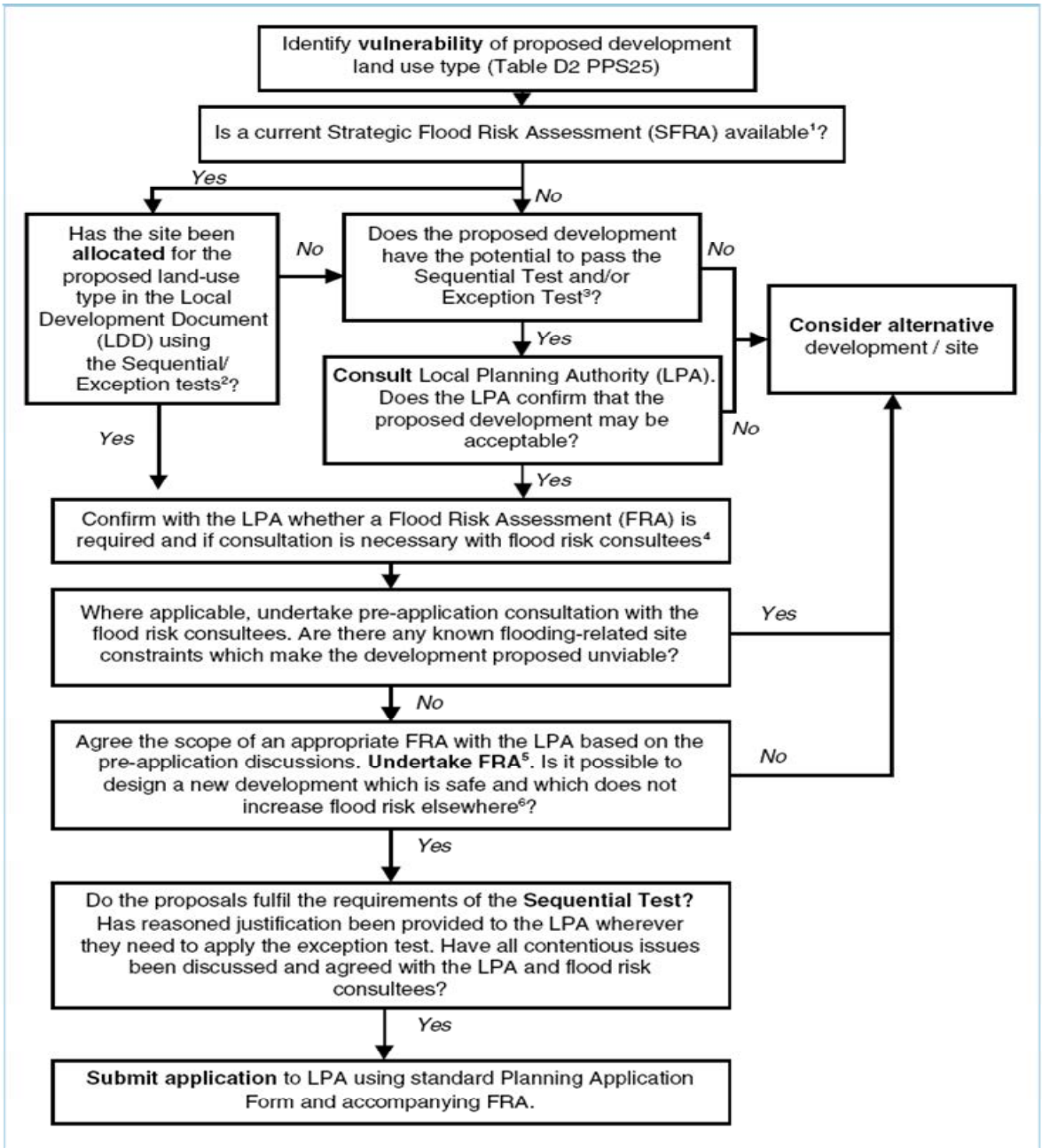
a) Apply the measure of avoidance/prevention by moving the boundaries of the potential sites away from Zones 2, 3a and 3b, for those cases where the loss of site area is acceptable. This is generally the case at locations where the loss in area is of the order of 10%.

b) Provisionally adopting land uses that are fully compatible with the vulnerability classification of PPS 25, to try to avoid the need to apply the Exception Test where possible.

9 Guidance for Developers

An SFRA is a strategic document that provides an overview of flood risk throughout the study area. Site-specific FRAs will be required for most proposed developments and the level of detail will depend on the level of flood risk at the site (see general details about FRA requirements in Appendix E in PPS25). The onus is on the developer to provide this information in support of a planning application.

Since the release of PPS25 in December 2006, the Environment Agency has become a statutory consultee for planning applications, with flood risk becoming a potential subject for call-in. Should the Council wish to disregard the advice of the Environment Agency then in exceptional circumstances the planning application could be put before the Secretary of State. It is therefore imperative that developers hold discussions over the need for FRAs early on within the planning process. Consultation should be undertaken with the Environment Agency and the relevant Council to ensure that the Council's policies on flood risk management are respected and taken account of, and that the scope of the FRA is commensurate with the level of flood risk. The following reflects best practice on what should be addressed within a detailed FRA. Those proposing development should also be directed towards Annex F of PPS25 (the figure overleaf shows the recommended process of undertaking an FRA as part of an individual planning application).



Notes

1 A SFRA can be defined as current if it has been prepared in accordance with PPS25.
2 If the site has been allocated in this way then subsequent steps in the process are likely to be significantly more straightforward.
3 If a site has not been allocated in the LDD because it was considered that the flood risk is unacceptable, it is unlikely that a proposed development at the site will be accepted by the LPA.
4 See pages 30-31 for key consultees to the planning process with regard to flood risk.
5 Guidance on undertaking a FRA can be found in Chapter 2.
6 Including surface water management.

Figure 9.1: Guidance for developers for individual planning applications

9.1.1 Proposed Developments within Functional Floodplain Flood Zone 3b

In line with PPS25, development will not normally be allowed in the Functional Floodplain unless it is classified as a 'water compatible' or 'essential infrastructure' use. Table D2 from PPS 25 (refer to Section 1.5.1 of this report) details the type of developments classified as 'water compatible' or 'essential Infrastructure.'

9.1.2 Proposed Developments within High Probability Flood Zone 3a

All FRAs supporting proposed development within High Probability Zone 3a should assess the proposed development against all elements of the Council's flood policy, and include an assessment of the following:

- The vulnerability of the development to flooding from other sources (surface water drainage, sewers, impounded water bodies, 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.
- It is highlighted that all forms of flooding need to be considered within a FRA. Localised flooding may occur as a result of flooding from a number of sources (surface water drainage, sewers, impounded water bodies, groundwater) and not solely from fluvial flooding. For example, local catchment runoff following intense rainfall passing directly over the area may result in surface water flooding and this localised risk of flooding must also be considered as an integral part of the detailed FRA.
- 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.

It is essential that developers thoroughly review the existing and future structural integrity of informal defences, if present, upon which the development will rely (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. This would be particularly important for development that could potentially be affected as a result of a breach of any canals in the study area.

9.1.3 Proposed Development within Medium Probability Zone 2

For all sites within Medium Probability Zone 2, a scoping level FRA should be prepared based upon readily available existing flooding information, sourced from the Environment Agency. If there is a significant flood risk from other sources (surface water drainage, sewers, impounded water bodies, groundwater) identified then a more detailed FRA should be prepared. It will be necessary to demonstrate that the residual risk of flooding to the property is effectively managed throughout, for example, the provision of raised floor levels and the provision of planned evacuation routes or safe havens. In addition, it should ensured that there is no worsening of existing flooding problems elsewhere within the area.

9.1.4 Proposed Development within Low Probability Flood Zone 1

The risk of alternative sources of flooding (surface water drainage, sewers, impounded water bodies, groundwater) must be considered, and SUDS techniques must be employed to ensure no worsening of existing flooding problems elsewhere within the area.

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.

9.2 Raised Floor Levels and Basements (Freeboard)

The raising of floor levels above the 1 in 100 year peak 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 100 year peak flood level assuming a 20% increase in flow over the next 20 to 100 years.

It is highlighted that many of those areas currently situated within Medium Probability Zone 2 could become part of the High Probability Zone 3. This is important as it means that properties that are today at relatively low risk will, in 20 to 100 years, be within High Probability Zone 3a. It is imperative therefore that planning and development control decisions take due consideration of the potential risk of flooding in future years.

Wherever possible, floor levels should be situated a minimum of 600 mm above the 100 year peak flood level plus climate change flood level (+20% flows), determined as an outcome of the site-based FRA. Additional freeboard may be required because of the risk of blockages to the channel, culverts or bridges. The height that the floor level is raised above the flood level is referred to as the 'freeboard', and is determined as a measure of residual risks.

The use of basements within flood affected areas should be discouraged. Where basements are permitted however, it is necessary to ensure that the basement access points are situated a minimum of 600 mm above the 100 year peak flood level plus climate change. The basement must have unimpeded access and waterproof construction to avoid seepage during flooding conditions. Habitable uses of basements within Flood Zone 3 should not be permitted, while basement dwellings can be allowed in Flood Zone 2 provided they pass the Exception Test.

9.3 Development Behind Defences

Areas behind defences are at particular risk due to breach or overtopping, resulting in the rapid on-set of fast-flowing, deep water flooding with little or no warning. Risks will therefore be highest closest to these defences and as such it is recommended that the LPAs should set back developments and ensure that those proposing developments develop robust evacuation plans as part of their FRA in consultation with the Environment Agency.

Consideration of flood risk behind defences should be made as part of detailed FRAs. Developers should review Volume 2, Tiles A1-A14 to determine the location of structures and defences in proximity to the site and therefore identify the possibility of localised residual flood risk. The FRA should take into account:

- The potential mechanisms of failure of flood defence infrastructure
- The standard of protection and design freeboard
- The asset condition of the flood defence
- The height of the flood defence infrastructure and retained water levels compared to ground levels
- The potential location, width and invert level of breach(es) in the flood defences
- The duration of water levels during a flood event or tidal cycle
- The period it would take the operating authority to close the breach
- The period it would take for water to drain from the flooded area following a breach or overtopping event

In addition to this it is recommended that should any development be proposed in a defended flood area, the potential cumulative impact of loss of storage on flood risk elsewhere should be considered.

9.3.1 Car Parks

Car parking may be appropriate in areas subject to shallow, low velocity flooding (in High Probability Zone 3a) provided sufficient flood warning is available, and appropriately located and worded signs are in place. However, this would need to be discussed and agreed with the LPA and Environment Agency. As part of an FRA, the developer should consider the likelihood of people being able to move their cars within the flood warning time.

9.4 Developer Contributions

If new developments are placed on Flood Zones 2 or 3, it might be necessary for local infrastructure to be increased. With regards to flood risk, it might also be necessary to extend flood warning system coverage, or increase the maintenance of flood defences. The LPA and other authorities might wish to request developer contributions to cover the cost of this, and if so this should be achieved through a Section 106 Legal Agreement.

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10 Guidance for the Application of Sustainable Drainage Systems

10.1 Introduction

PPS1: Delivering sustainable development and PPS25 requires that LPAs should promote SUDS. LPAs should therefore ensure policies encourage sustainable drainage practices in their LDDs. 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 (with a minimum reduction of 20%) is one of the most effective ways of reducing and managing flood risk within the area.

10.2 Types of SUDS Systems

SUDS may improve the sustainable management of water for a site by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream
- Reducing volumes of water flowing directly to watercourses or sewers from developed sites
- Improving water quality compared with 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

Any reduction in the amount of water that originates from any given site is likely to be small however if applied across the catchment, the cumulative effect from a number sites could be significant.

There are numerous different ways that SUDS can be incorporated into a development. The appropriate application of a SUDS scheme to a specific development is heavily dependent upon the topography and geology of the site and the surrounding areas. Careful consideration of the site characteristics is necessary to ensure the future sustainability of the adopted drainage system. When designing surface water drainage systems, the Environment Agency states that climate change should be taken into account appropriate to the predicted lifetime of the development, and designed to account for the predicted increases in rainfall intensity, as outlined in Table 5.2.

The most commonly found components of a SUDS system are described below:

- 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. They comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover/ landscaping/ permeable car parking, over a drainage layer. They are designed to intercept and retain precipitation, reduce the volume of runoff and attenuate peak flow.

- Filter drains: 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).

The Environment Agency requires both Greenfield and Brownfield sites to achieve Greenfield discharge rates with a minimum reduction of 20% to account for the future effects that climate change will have on runoff volumes.

For more guidance on SUDS, the following documents and websites are recommended as a starting point:

- PPS25
- Practice Guide Companion to PPS25
- The SUDS Manual – CIRIA C697 (2007) provides the best practice guidance on the planning, design, construction, operation and maintenance of SUDS and facilitates their effective implementation within developments.
- CIRIA c644 – Green Roofs (2007) provides guidance on the design, construction and operation of Green Roofs. The guidance also describes how ‘quick wins’ for biodiversity can be achieved in the built environment by incorporating nesting and roosting boxes for birds, bats and other animals.
- Interim Code of Practice for Sustainable Drainage Systems, National SUDS Working Group, 2004
- www.ciria.org.uk/suds/

10.3 Application of SUDS for the High Peak Plan Area

The plan area has a mixture of freely draining and slowly permeable, seasonally wet soils which are predominantly acidic loams and clays. The more permeable sites should have priority given to infiltration drainage techniques, as opposed to discharging surface water to watercourses. Where less permeability is found and infiltration techniques that rely on discharge into the existing soils are not viable (also due to a high water table, source protection zones, contamination etc), discharging site runoff to watercourses is preferable to the use of sewers. Integrated urban drainage should also be used throughout the design process. Such techniques include green-roofs and water harvesting techniques which can greatly reduce run-off volumes and rates from non-permeable structures and can be implemented close to the surface water source and are unaffected by local soil permeability. Storage areas such as ponds, basins or bio-retention areas can also be used to provide attenuation during peak rainfall events and allow the reduction of runoff rates from low permeable soil sites. The developer should investigate the most appropriate SUDS techniques at an early stage of the design to ensure that the most effective options are used and sufficient space is made available

A significant water protection issue relates to Buxton Mineral Water, where groundwater issues are significantly affected by the extraction of the mineral water by Nestle. The area surrounding Buxton has been highlighted by DEFRA as a Nitrate Vulnerable Zone (NVZ) and there are also several areas around Buxton classified as a Groundwater Source Protection Zone (GSPZ) by the EA. Any boreholes, water wells or other extraction points should be identified and taken into account in the design process. SUDS techniques should be carefully selected to ensure groundwater contamination does not occur, for example, the use of soakaways should be prohibited.

NVZs are generally indicative of the agricultural nature of the surrounding land and the use of fertilisers. Nitrate levels in many English waters are increasing principally due to surface water runoff from agricultural land entering receiving water bodies. The level of nitrate contamination will have an impact on the choice of SUDS and will have to be assessed for specific sites.

The GSPZs are situated over the Permo-Triassic Sandstone Aquifer and are designated as inner, outer and total catchment areas. The Inner Zones of the GSPZ are the most sensitive areas and vary in diameter from 0.1 to 0.2 Kilometres. The Outer Zones are also sensitive to contamination and vary in diameter from 0.4 to 1.0 Kilometres. The GSPZ requires attenuated storage of runoff to prevent infiltration and contamination.

Four GSPZ Inner Zones have been identified by the Environment Agency in the plan area and they are all situated around Buxton. They are found in the town centre, Stanley Moor, Staden and Dane Valley Way, as shown below.

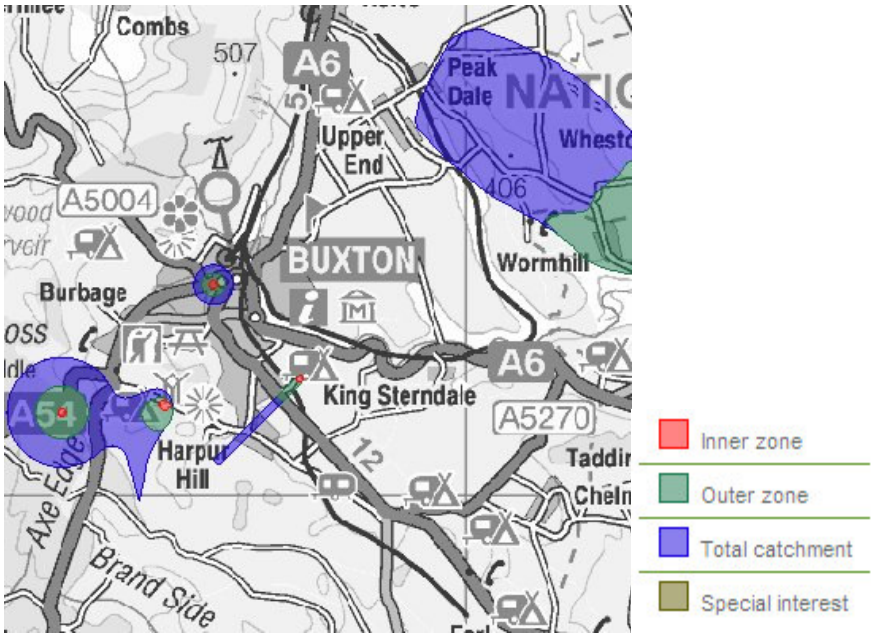

Figure 10.1: GSPZ Inner Zones identified by the Environment Agency

Runoff which is likely to be heavily contaminated must be treated by a proprietary device, which should be carefully considered to ensure the correct system is selected to remove pollutants. PPS 3 (2006) states that source control SUDS must be considered and incorporated where suitable. For example; surface water drained from a car park should implement a filter bed wherever possible before considering an interceptor device to remove contaminants.

If the local soil is contaminated then a lined system is generally required. This may include a drainage design which allows infiltration in the upper layer, but should incorporate an impermeable layer at its base to prevent contamination. In such cases lined underground attenuation storage is used to store a 1 in 100 year +20% (for climate change) storm event and discharges into a nearby watercourse.

10.4 Adoption and Maintenance of SUDS

PPS25 states that when planning SUDS, it is important that developers carefully consider maintenance to ensure that SUDS continue to function over time. Poorly maintained SUDS could lead to an increase in flood risk rather than a reduction.

The future ownership and management of all elements of the SUDS system will need to be addressed at an early stage as the maintenance responsibility must be given to durable and accountable bodies which have the resources to meet the long term needs of the system.

The interim conclusion of the Pitt Review states that 'ensuring the developers make a full contribution to the costs of both building and maintaining' such systems is vital to their long term effectiveness. The costs of maintaining SUDS devices will be dependant on the types of system used and this should be considered by the developer at an early stage.

Traditional drainage systems are criticised that problems are often hidden underground and take time to eventually be discovered. The majority of SUDS devices are at the surface and pollution or silt build up can be observed as it happens. This means that any issues can be dealt with as they occur, but requires a regular monitoring regime and suitable body to provide the maintenance support.

As the majority of SUDS are at the surface elements they are best incorporated into local landscape maintenance regimes where possible. An advantage of this is that the site managers and landscape contractors will have a good knowledge of the site through regular maintenance operations such as grass cutting and litter removal. This should also ensure regular monitoring and a quick response to any maintenance needs.

Severn Trent Water is currently only willing to adopt hard structures and not softer SUDS systems, such as swales or ponds, which provide a break between pipe networks. United Utilities will not currently adopt any SUDS systems. Until this process changes there will be issues with adoption and developers will have to consult with local authorities to establish the best long term maintenance plan.

SUDS in new developments are usually constructed by the developer and offered for adoption to the responsible organisation. The consultation offers three options for determining who might take responsibility for adoption and maintenance of SUDS: Local Planning Authorities, Sewerage Undertakers or Specialist SUDS undertakers or companies. This consultation also aims to identify the mechanisms needed to ensure that SUDS can be delivered.

Existing legislation (e.g. Section 38 of the Highways Act, 1980 and Section 106 of the Town and Country Planning Act, 1990) can provide a mechanism for SUDS adoption. PPS25 recommends that early consultation with the relevant stakeholders is made to establish and agree responsibilities for long-term maintenance. In addition, the National SUDS Working Group (NSWG) has developed an Interim Code of Practice for SUDS (NSWG, 2004) which provides a set of planning model agreements for use between those public organisations with statutory or regulatory responsibilities relating to SUDS. The model agreements are based on current legislation and the current planning system. This code of practice is complemented by CIRIA publication C625 Model agreements for SUDS.

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11 Summary and Recommendations

A number of recommendations have been made throughout this report on the basis of the findings of the SFRA. This considers information from Making Space for Water, the Water Framework Directive, PPS25 and CFMPs, summarised below.

11.1 Summary of Flood Risk Issues

Based on the findings of the SFRA, the following summary of flood risk issues within the Borough's plan area can be made:

- The plan area of High Peak Borough Council drains into two major river catchments. The northern and central parts of the plan area drain into the Goyt and Etherow catchments, which ultimately drain into the River Mersey. The southern part of the plan area drains into the River Wye catchment, which ultimately drains into the River Trent.

- Fluvial flood risk is influenced by topography and the underlying geology. The headwaters of the Main Rivers in and around the plan area are steeply sloping, the runoff response of which is exacerbated by the Millstone grit geology and highly waterlogged peat soils. The flashy catchment responses exhibited by the high upstream catchments convey flashy flows downstream, which can be made worse downstream by the impervious Millstone grit, meaning that flood risk is a real issue in the plan area. The only exception is the headwaters of the River Wye to the south of the plan area, which lies on Carboniferous limestone, resulting in a relatively slow response to rainfall.

- Historic flood outlines received from the Environment Agency indicate that significant fluvial flooding occurred along the River Wye and an unnamed tributary in both January 1965 and November 2000.

- River corridors are generally characterised by steep, incised channels which, when in flood, produce deep, sometimes fast flowing flood waters. Higher return periods do not tend to produce a greater aerial extent of flooding, rather, the flood depth increases.

- Local channel restrictions and under capacity structures can cause flooding, i.e. some culverts are not big enough to adequately convey flood flows which can cause/exacerbate flooding due to the back-up of river flows.

- Seven postcode areas within the High Peak plan area are identified as having properties which have been affected by flooding from sewers and surface water runoff. In general the level of flood risk from artificial drainage systems within both the plan area and the remainder of the Borough is medium to low.

- Surface water flooding within the Borough is a significant problem due to the underlying geology and topography which contribute to rainfall response. A number of properties have been flooded by surface water from open land or highways. This can be made worse by local insufficient drainage capacity.

- A further issue is surface water flows carrying large amounts of debris, which, when deposited in watercourses, can reduce channel capacity and cause local flood risk issues.

- One canal is located in the Borough to the east of Furness Vale and Newtown, called the Peak Forest Canal. There are no recorded incidents of breaches or overtopping, or any other local flood risk instances associated with this canal.
- Four reservoirs are located within the Borough. There is one record of breaching/overtopping within the High Peak Borough Council area at Toddbrook in 1964.
- There are no known problems with flooding from groundwater within the Borough. However, peat deposits are found on the south eastern side of the plan area which are typically waterlogged and may breach the surface.
- There are a number of locations at risk of flooding that are currently protected by permanent defences within the High Peak plan area.
- Areas of extended floodplain acting as natural storage within the plan area and used as a means of attenuation of flood waters should be maintained to ensure their efficient operation during a flood event. If the storage areas are not maintained this may lead to an increased risk of flooding at locations downstream.

11.2 Summary of Flood Zone Data Issues

Some inaccuracies were identified with the Flood Zone information, where in some places the Flood Zones are misaligned from the channel, show flood risk when a culvert is present, or follow a path which does not have a watercourse. When viewing the Flood Zone data with OS Tiles these inaccuracies are clear. Allocations which fall into these areas are likely to require a Level 2 SFRA, to refine the Flood Zone information.

11.3 Summary of Climate Change Issues

Climate change effects mean upland areas are likely to be subject to deeper, faster flowing water, while in lowland areas the extent of flooding is likely to become greater. In the upland areas which characterize the Borough, an increase in flood extent is not expected, however, flood water may become deeper and faster flowing. This means that the flood hazard is likely to increase over time, creating increased risk to humans, more damage to property and higher economic damages. A Level 2 SFRA, which assesses flood hazard, will therefore be required for site allocations which need to satisfy the Exception Test. Certainly, sites that are currently within Flood Zones 2 and 3 will be subject to more frequent and potentially deeper flooding.

It is expected that flood risk from surface water, sewers and groundwater will generally increase due to the expected wetter winters (causing more frequent groundwater flooding) and incidence of short-duration high-intensity rainfall events associated with summer convective storms (causing more frequent surface water and sewer flooding).

The LPA should consider using the climate change maps to carry out the Sequential Test, in order to give a particularly long-term risk-based approach to planning.

11.4 Site Allocation Process

It is recommended that the outputs from this study are used as an evidence base from which to direct new development to areas of low flood risk (Flood Zone 1). Where development cannot be located in Flood Zone 1, the Council should use the flood maps to apply the Sequential Test to their remaining land use allocations. The following should be noted:

- Flood Zone 3b has been mapped where it has been modelled. Where it has not, the Council should assume that Flood Zone 3a is equal to Flood Zone 3b unless, or until, an appropriate FRA shows to the satisfaction of the Environment Agency that it can be considered as falling within Flood Zone 3a.

- The Council should take note of Section 4.7 which outlines areas where the existing Flood Zones outlines are deemed to be of poor resolution. Allocations which fall into these areas are likely to require a Level 2 SFRA, to refine the Flood Zone information.

- Following application of the Sequential Test, a detailed interrogation of emerging allocations should be carried out (using Appendix E), in accordance with the Practice Guide Companion to PPS25. This will ensure that that all potential flood risk issues to the site are identified, such as incorrect Flood Zones, residual risk areas and so on. The review should identify resultant required works if necessary (Level 2 SFRA, FRA etc.)

The Sequential Approach should be applied within development sites to inform site layout, by locating the most vulnerable elements of a development in the lowest risk areas (in accordance with Table D3 of PPS25). The use of Flood Zones 2 and 3 for recreation, amenity and environmental purposes can provide an effective means of flood risk management as well as providing connected green spaces with consequent social and environmental benefits.

Where the need to apply the Exception Test is identified, due to there being an insufficient number of suitable sites for development within zones of lower flood risk, the scope of the SFRA will need to be widened to a Level 2 assessment. The need for a Level 2 SFRA cannot be fully determined until the Council has applied the Sequential Test. It is recommended that as soon as the need for the Exception Test is established, Level 2 SFRA(s) are undertaken by a suitably qualified expert so as to provide timely input to the overall LDF process. The following should be noted:

- Breach and overtopping assessments will be required for developments situated behind raised defences

- The effects of structures in the vicinity of development sites (culverts etc.) might need to be assessed to determine the capacity and identify residual risk areas that might result from blockage. This will inform the appropriate placement of development and ensure appropriate mitigation is put in place. This could also address any mitigation works that might be deemed appropriate.

11.5 Council Policy

It is recommended that the following core considerations should be included within the Council's flood risk management policy documents:

- Use the Sequential Test to locate new development in least risky areas, giving highest priority to Flood Zone 1

- Use the Sequential Approach within development sites to inform site layout by locating the most vulnerable elements of a development in the lowest risk areas, in accordance with Table D3 of PPS25

- Protect the functional floodplain from development, promote the use of green corridors in flood risk areas and restore the natural course of rivers. These will all act as a means of risk reduction
- Seek to reinstate functional floodplain wherever possible (e.g. reduce building footprints or relocate to lower flood risk zones)
- Ensure all new development is 'safe', meaning that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain, emergency vehicular access is possible, and flood resistance and resilience is incorporated
- No new building should be allowed in a flood risk area that is not flood resilient
- Require the use of SUDS in all Flood Zones for both Brownfield and Greenfield sites, to achieve Greenfield discharge rates with a minimum reduction of 20%. Space should be set-aside for SUDS.
- Seek developer contributions (to be determined in consultation with the Environment Agency) via S106 planning obligations to fund (or part fund) strategic flood risk management facilities (such as storage areas) and bring benefit to the wider community.
- Safeguard possible sites for flood storage and other channel works

11.6 Environment Agency Policy Relevant to the Council

The general direction of the Environment Agency in the Midlands Region covered by the **River Trent CFMP (southern part of plan area, including Buxton)** is to take action to increase the frequency of flooding to deliver benefits locally or elsewhere, which may constitute an overall flood risk reduction. In particular, opportunities to provide increased flood storage and attenuation areas should be explored, in order to realise benefits downstream, with the Council working in partnership with the Environment Agency to achieve this. Areas which currently exist as undeveloped floodplain, and any natural flood storage areas, should remain intact in order to continue to provide the flood storage and conveyance areas which help to mitigate flood risk downstream. Any development in these very important floodplain areas has the potential to increase flood risk downstream, by displacing flood water and reducing flood storage. The Council can therefore help to deliver this Policy Option by safeguarding these areas from development.

Within the Environment Agency's North West Region covered by the Upper Mersey/Glaze CFMP, the general direction of the Environment Agency is:

- **Goyt catchment (central part of plan area, including New Mills, Hayfield, Whaley Bridge, Chinley and Chapel-en-le-Frith):** continue with existing or alternative actions to manage flood risk at the current level (accepting that flood risk will increase over time from this baseline). Continuing the current level of maintenance will ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard.
- **Etherow catchment (northern part of plan area, including Glossop):** take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change). Within the policy unit, future flood risk is considered to be unacceptable compared to the existing risk because of

the potential for channel blockages. Increasing the current level of maintenance will ensure that river conveyance and the river structures, such as culverts, bridges and weirs, are maintained to the appropriate standard.

The Council can help deliver this by reviewing their maintenance procedures. Developer contributions should be sought to assess options to reduce this flood risk locally, without increasing flood risk elsewhere. Developer contributions should also be sought to maintain and regularly clear culverts, to reduce risk of blockage during flood events, thereby reducing residual risk.

11.7 Emergency Planning

It is recommended that the Council's Emergency Response Plan is reviewed and updated in light of the findings of the SFRA to ensure that safe evacuation and access for emergency services is possible during times of flood both for existing developments and those being promoted as possible sites within the LDF process. It is further recommended that the Council works with the Environment Agency to promote the awareness of flood risk and encourage communities at risk to sign-up to the Environment Agency Flood Warning Direct service.

11.7 Future Updates to the SFRA

The SFRA should be retained as a 'living' document and reviewed on a regular basis in light of better flood risk information and emerging policy guidance. It is recommended that outputs from the following studies are used to update future versions of the SFRA report and associated maps:

- Final version of the River Trent CFMP
- Upper Mersey CFMP
- Future Flood Risk Mapping Studies
- Future Flood Risk Management Strategies
- Future groundwater flood risk maps, surface water flood risk maps and reservoir inundations maps. These should also feed into emergency planning documents

11.7.1 Missing or Incomplete Data

Data gaps have been assessed throughout the Level 1 SFRA data collection and review exercise. This has flagged the missing or incomplete data, which should be incorporated into the SFRA as it becomes available.

Table 11.1: Missing or incomplete data within Level 1 SFRA

Data	Description	Source
Flood outlines	1 in 20 year return period (or similar – to allow production of Flood Zone 3b), for all rivers except Glossop Brook, Long Clough Brook, Hurst Brook, Shelf Brook, Blackshaw Clough, River Sett, River Goyt, Warm Brook, Randal Carr Brook and the River Wye.	Environment Agency (this data does not yet exist)
CFMPs	River Trent and Upper Mersey CFMPs – Final version	Environment Agency (Documents in production)

It should be noted that any further updates to the Flood Zones carried out by the Environment Agency as a result of further modelling work undertaken under the SFRM Framework, should be incorporated into the SFRA. This information is made available from the Environment Agency in the form of quarterly updates.

11.8 Level 2 SFRA

The Level 1 SFRA will allow the Council to assess their current proposed site allocations using the Sequential Test, and as an integral part of this test, Table D3 of PPS25. This will seek to allocate as many sites as possible to Flood Zone 1. Beyond this, it will ensure compatibility between the proposed land use and Flood Zone.

A Level 2 SFRA should be viewed as rather more site specific than a Level 1 SFRA, addressing flood risk to potential development sites which have gone through the Sequential Test and have been located in Flood Zones 2 or 3, or behind existing defences. The data required for a Level 2 SFRA will therefore depend upon which, if any, of the Council's final list of preferred sites remain in Flood Zones 2 and 3 following application of the Sequential Test and hence where the Exception Test needs to be applied.

It is important that a Level 2 SFRA considers the variation of flood risk in a Flood Zone. This increased scope involves a more detailed review of flood hazard (flood probability, flood depth, flood velocity, rate of onset of flooding). If development is to be located behind defences, it would be necessary to model constructional failure of the defence (breach) and water levels rising to exceed the level of the defence (overtopping). In some instances improvements to existing flood defences may be required to manage residual flood risks. Here, the SFRA should include and appraisal of the extent of works to provide or raise the flood defence to appropriate standard.

Level 2 SFRA outputs would include:

- Maps showing distribution of flood risk across zones (depth, velocity, rate and onset of flooding)
- An appraisal of the probability and consequence of breach or overtopping of flood defence infrastructure
- An appraisal of the condition of flood defence infrastructure and likely future policy

- Guidance on appropriate policies for making sites which satisfy parts a) and b) of the Exception Test, and the requirements for satisfying part c) of the Exception Test
- Guidance on the preparation of FRAs for sites with varying flood risk across the Flood Zone

11.9 Next Stage of Work

Following completion of the Level 1 SFRA, it is recommended that a more detailed interrogation of emerging allocations is carried out by a suitably qualified expert, in accordance with the Practice Companion Guide to PPS25. This would take the form of a desk top study, using the data gathered and analysed as part of the Level 1 SFRA. The flood risk posed to each site should be assessed, as well as the presence of defences and culverts. Any issues with the Flood Zones in each development site (mis-alignments etc.) should be reviewed. In line with the assessment, appropriate recommendations for each site should be put forward. Depending on the level of risk posed to each site, this could include recommendations on the appropriate zoning of the site based on Table D3 of PPS25, or the complete relocation of a site to a lower risk Flood Zone. Where the resolution of flood risk data is poor, recommendations for appropriate development easements, or further modelling work, should be put forward, in consultation with the Environment Agency.

Following this, where implementation of the Exception Test is identified, a Level 2 assessment will be required in accordance with the PPS25 Practice Guide. Depending on the nature of the site, this should take into account each of the bullet points outlined above. It is recommended that the Level 2 SFRA approach is agreed with the Environment Agency.

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12 Glossary

1) **AAD** - Annual Average Damages

2) **ABD -** Area Benefiting from Defences

3) **AONB** - Area of Outstanding Natural Beauty. These are areas of countryside with significant landscape value.

4) **BAP -** Biodiversity Action Plan. This is an international program concerning protection and rehabilitation of threatened species and habitats.

5) **CFMP** – Catchment Flood Management Plan. A CFMP is a high-level strategic plan through which the Environment Agency seeks to work with other key-decision makers within a river catchment to identify and agree long-term policies for sustainable flood risk management.

6) **Core Strategy -** The Development Plan Document 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.

7) **Defra -** Department of Environment, Food and Rural Affairs Development

8) **DETR –** Department for Environment, Transport and the Regions. This has since been subsumed into the Department for Transport, Local Government and the Regions and Defra.

9) **DG5 Register -** A register of properties at risk from sewer flooding maintained by UK water companies.

10) **DPD -** Development Plan Document. A DPD is 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.

11) **Dry pedestrian egress -** Routes to and from buildings that will remain dry and allow pedestrian/wheelchair evacuation to dry land in times of flood.

12) **EMRSS** - East Midlands Regional Spatial Strategy. The EMRSS is a regional planning policy providing the overarching framework for the preparation of LDFs. It provides a broad development strategy for the East Midlands up to 2026.

13) **Environment Agency -** The leading public body for protecting and improving the environment in England and Wales.

14) **Environment Agency Flood Map -** Nationally consistent delineation of 'high' and 'medium' flood risk, published on a quarterly basis by the Environment Agency.

15) **Environmental Stewardship** - Environmental Stewardship is a new agri-environment scheme which provides funding to farmers and other land managers in England who deliver effective environmental management on their land. The scheme is intended to build on the recognised success of the Environmental Sensitive Areas scheme and the countryside Stewardship Scheme. Flood risk management is among its secondary objectives.

16) **Exception Test -** If, following application of the Sequential Test, it is not possible (consistent with wider sustainability objectives) to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed, the Exception Test may apply. PPS25 sets out strict requirements for the application of the Test.

17) **Flood Estimation Handbook (FEH) -** The latest hydrological approach for the estimate of flood flows in UK.

18) **Flood Risk –** Flood risk is a combination of two components: the chance (or probability) of a particular flood event and the impact (or consequence) that the event would cause if it occurred

19) **FRA –** Flood Risk Assessment. Assessment of **flood risk** posed to a defined area (usually a new development site) as defined above.

20) **FWD –** Flood Warnings Direct. FWD is a system maintained by the Environment Agency which sends out warning messages to homeowners and businesses over the telephone network when floods are likely.

21) **Flood Risk Vulnerability -** PPS25 provides a vulnerability classification to assess which uses of land maybe appropriate in each flood risk zone.

22) **Formal Flood Defence -** A structure built and maintained specifically for flood defence purposes.

23) **Functional Floodplain Zone 3b -** Defined as areas at risk of flooding in the 1 in 20 year design event. In any one year the chance of a 1 in 20 year event occurring is 5%.

24) **GIS –** Geographic Information System. GIS is any system which stores geographical data, such as elevations, location of buildings and extent of flood outlines.

25) **High probability Zone 3a -** Defined as areas at risk of flooding in the 1 in 100 year design event. In any one year the chance of a 1 in 100 year event occurring is 1%.

26) **Informal Flood Defence -** A structure that provides a flood defence function however has not been built and/or maintained for this purpose (e.g. boundary wall).

27) **JFLOW -** A computer river model based on routeing a flood calculated by Flood Estimation Handbook methodology along a river corridor the levels of which are derived from a Side Aperture Radar (SAR) remote sensed Digital Terrain Model.

28) **Land Swapping** - looking for long term opportunities to remove development from areas that flood at present and relocate in lower risk locations which is essentially restoration of the floodplain.

29) **LDD** – Local Development Documents

30) **LiDAR -** Light Detection and Ranging. LiDAR is an airborne terrain mapping technique which uses a laser to measure the distance between the aircraft and the ground.

31) **LDF -** Local Development Framework. The LDF consists of a number of documents which together form the spatial strategy for development and the use of land.

32) **LDS –** Local Development Scheme. A schedule and timetable for production of LDF documents.

33) **Low Probability Zone 1 –** The area outside Zone 2. Defined as an area with less that 1 in 1000 year chance of flooding. In any one year the chance of a 1 in 100 year event occurring is less than 0.1%.

34) **LPA –** Local Planning Authority

35) **Main River –** All watercourses shown on the statutory main river maps held by the Environment Agency and the Department for Environment, Food and Rural Affairs. This can include any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. The Environment Agency has permissive power to carry out works of maintenance and improvement on these rivers.

36) **'Making Space for Water' (Defra 2004) -** The Government's new evolving strategy to manage the risks from flooding and coastal erosion by employing an integrated portfolio of approaches, so as: a) to reduce the threat to people and their property; b) to deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles, c) to secure efficient and reliable funding mechanisms that deliver the levels of investment required.

37) **Medium probability Zone 2 -** Defined as an area at risk of flooding from flood events that are greater than the 1 in 100 year, and less than the 1 in 1000 year design event. The probability of flooding occurring in this area in any one year is between 1% and 0.1%.

38) **m AOD –** Metres Above Ordnance Datum

39) **NFCDD –** National Flood and Coastal Defence Database. Owned by the Environment Agency, NFCDD containing details of the location, standard and condition of all Environment Agency maintained defences.

40) **NNR –** National Nature Reserve. NNRs are designated natures reserves of national significance for biological or earth science interest

41) **Ordinary Watercourse (non-main river, minor watercourse)** – Any section of watercourse not designated as a Main River.

42) **PPG** – Policy Planning Guidance. PPG notes are statements of the Government's national policy and principles towards certain aspects of the town planning framework, and have been superseded by Planning Policy Statements in many cases (below).

43) **PPS -** Planning Policy Statements. The Government has updated its planning advice contained within Planning Policy Guidance Notes with the publication of new style Planning Policy Statements.

44) **PPS 25 -** Planning Policy Statement 25: Development and Flood Risk. PPS 25 reflects the general direction set out in 'Making Space for Water'.

45) **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.

46) **Residual Risk -** The risk which remains after all risk avoidance, reduction and mitigation measures have been implemented.

47) **Return Period –** The probability of a flood of a given magnitude occurring within any one year e.g. a 1 in 100 year event has a probability of occurring once in 100 years, or a 1% chance in any one year. However, a 1 in 100 year event could occur twice or more within 100 years, or not at all.

48) **SAC –** Special Area of Conservation. SACs are designated to protect various endangered habitats and species.

49) **Sequential Test -** Informed by a SFRA, a planning authority applies the Sequential Test to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed.

50) **SEA -** Strategic Environmental Assessment.

51) **SFRA -** Strategic Flood Risk Assessment. An SFRA is used as a tool by a planning authority to assess flood risk for spatial planning, producing development briefs, setting constraints, informing sustainability appraisals and identifying locations of emergency planning measures and requirements for flood risk assessments.

52) **SPD** - Supplementary Planning Document. An SPD 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.

53) **SA -** Sustainability Appraisal. An SA is an appraisal of plans, strategies and proposals to test them against broad sustainability objectives.

54) **SoP –** Standard of Protection. The design event or standard to which a building, asset or area is protected against flooding, generally expressed as a return period or annual exceedence probability

55) **SSSI** – Site of Special Scientific Interest. SSSIs are designated protected areas in the UK. NNRs and SACs are both SSSIs.

56) **SUDS –** Sustainable Urban Drainage Systems. SUDS are drainage systems which are designed to reduce the impact of urbanisation on the hydrology of a river system.

57) **Sustainable Development –** "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987)

APPENDIX A

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

creating a better place

Environment Agency

Beccy Dunn
Halcrow Group Limited
Lyndon House
62 Hagley Road
Edgbaston
Birmingham
B16 8PE

Our ref: TMA/795/000
Your ref:

Date: 15 October 2008

Dear Beccy

PEAK DISTRICT – Strategic Flood Risk Assessment

Thank you for your emails received on the 11th September 2008, containing the final drafts for the three sub-sections of the above report, covering the areas of Derbyshire Dales District Council, High Peak Borough Council, and Peak District National Park Authority. We acknowledge that they have been amended to take into account the comments and advice from the Environment Agency.

I can confirm that the Environment Agency is satisfied with this Level 1 SFRA, which is generally in line with the draft guidance on SFRA's within the PPS25 practice guide.

It should be noted that we cannot provide any guarantee that this level of detail provided in the Level 1 SFRA would be considered as providing an adequate evidence base by the Planning Inspectorate in assessing the soundness of a submitted Core Strategy. This assessment is made by the Planning Inspectorate and will depend on their policy at the time of examination and the amount of detail within the authority's Core Strategies.

Should the authorities decide that they would wish you to be involved in the Level 2 stage of the SFRA, we would also wish to be consulted from the outset of the project, so that all Level 2 requirements are satisfied. We would welcome the opportunity to provide the local area officer experience to enable area specific specialist comments and assistance throughout the SFRA process.

I would be pleased if you could send four copies of the finalised report, in order that I can forward a copy to each of the Environment Agency offices whose areas are covered by the overall report.

Should you wish to discuss any related matters, please do not hesitate to contact me.

Yours sincerely,

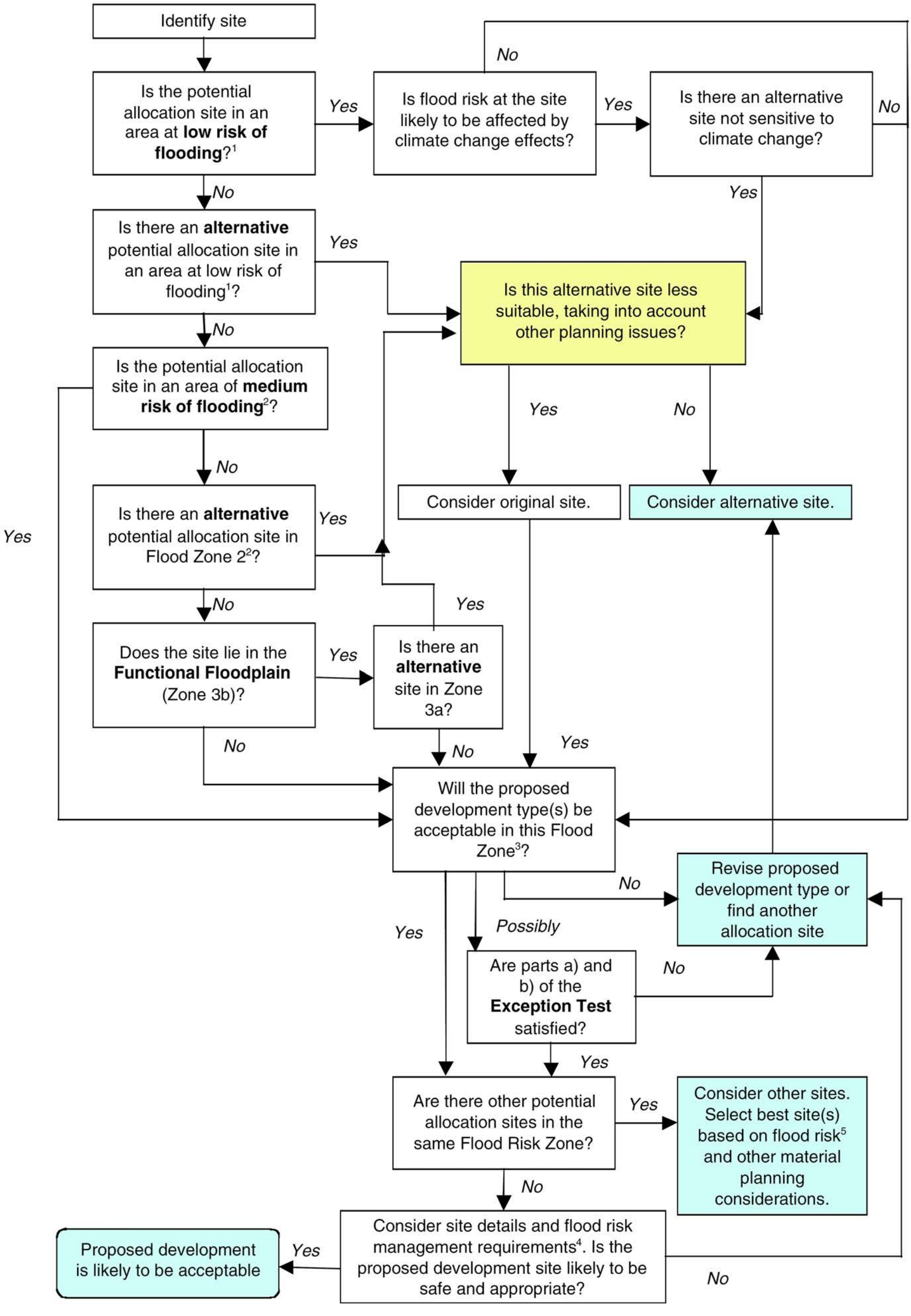
A. Disney
Team Leader - Development Control

Direct dial 0115 846 3655
Direct e-mail tim.andrews@environment-agency.gov.uk

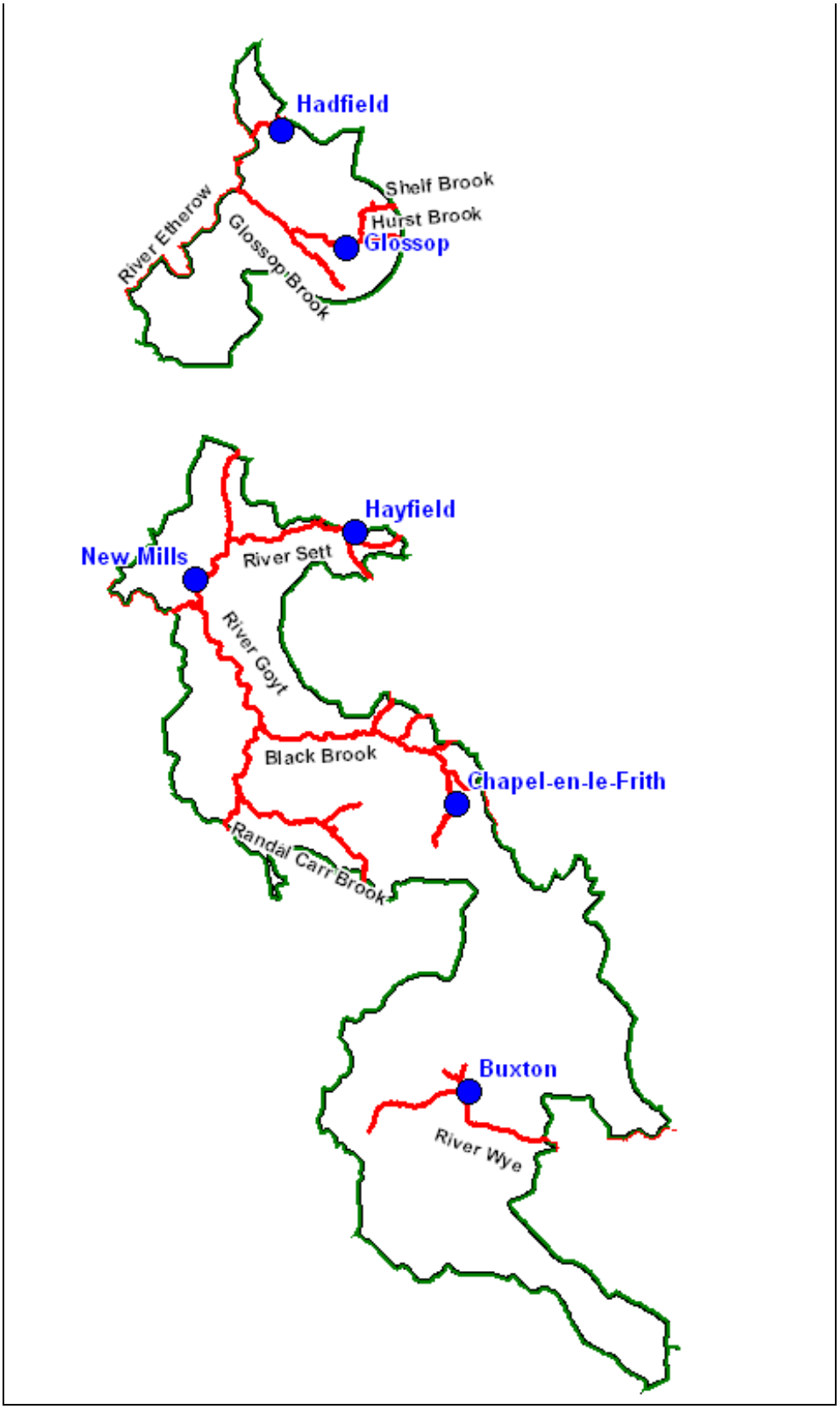
Cont/d..

Appendix B

SEQUENTIAL TEST PROCESS



Appendix C: Main Rivers within High Peak Borough Council



Appendix D

Details of the Environment Agency Flood Zones

Introduction

A more detailed understanding of the Environment Agency Flood Zones and their limitations is important, as these are often used (unless more accurate flood outlines are available) for the production of SFRA flood maps.

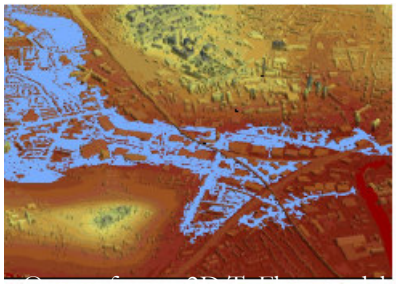
Environment Agency Fluvial Maps

Data for fluvial Flood Zones 3 and 2 is derived from a number of sources. Most fluvial flood outlines are derived from the "JFlow" generalised computer modelling, which is a 'coarse' modelling approach. Some observations of flooding by the Environment Agency's predecessors are included, for instance the extent of the severe 1947 floods, and this usually applies to Flood Zone 2. If a flood event extends further than Flood Zone 2 then the outline would be changed to reflect the wider flood risk area.

Caution must be exercised in interpreting JFlow derived flood outlines due to the large number of assumptions incorporated into the JFlow model. For instance, at some locations the river centreline incorporated into the model was found to be erroneous with the result that the associated flood plains deviate from the natural valleys.

All Environment Agency Flood Zone Maps show the flood extent without the influences of defences.

Updates of the Environment Agency Flood Maps from Modelling



In many places the results of flood mapping studies have superseded the JFlow model. Generally these studies included high quality hydrological research, surveyed river cross sections, and more precise digital modelling such as ISIS, TuFlow and HecRas.

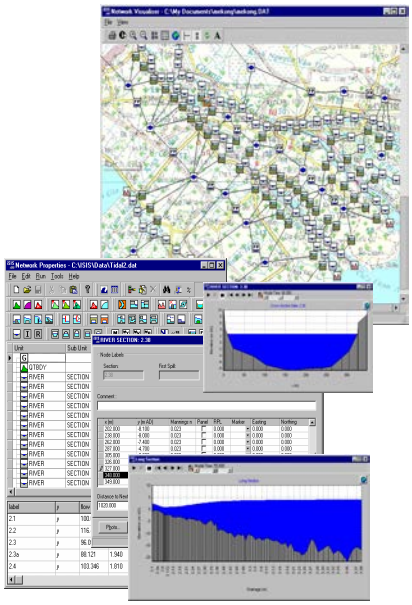
Although fluvial flooding is dependent on the standard of maintenance of watercourses and structures, the degree of maintenance allowed for tends to vary from model to model, with the result that flood maps based on modelling do not offer a uniform approach in this respect. As a consequence, serious blockages occurring during a flood might produce much more flooding than shown on previous modelling for a similar hydrological event.

Updates of the Environment Agency Flood Maps from Recent Events

Records of recent flood events have been used to modify the flood map. In these cases the Environment Agency has determined the return frequency of the observed event and modified the appropriate flood zone accordingly.

When evidence of flooding is based on aerial photographs, there is often uncertainty about a) whether the flooding has emanated from the river or is the result of other land drainage, b) the precise flood return period and c) whether the flooding was the result of blockage or some other maintenance factor.

ISIS Software Graphic Interface



Non Main River flooding in the Environment Agency Flood Maps

Fluvial Flood Zone maps show some non main river watercourse flooding as well as main river watercourse flooding. Main rivers are principal watercourses defined by Section 93 of the Water Resources Act, 1991 and shown on a formal map held by the Environment Agency – the Environment Agency flood zones. Larger ordinary watercourses are shown on the background Ordnance Survey mapping.

All watercourses with a catchment area greater than 3km^2 have been modelled using JFlow software.

Areas Benefiting from Defences

The current flood maps, although they are based on the "undefended situation", show selected raised formal flood defences (built since 1998), and selected "areas benefiting from defences" (ABDs). This is land where flooding is prevented by defences, although it is assumed that the defences are robust, leak free and maintained, which is not always the case. Improved channels are not normally regarded as defences for the purposes of flood zone mapping.

Climate Change Effect on Flood Zones

In the absence of better information, the current fluvial Flood Zone 2 can be considered an estimate of the extent of fluvial Flood Zone 3 within 100 years. Similarly, Flood Zone 3a can be considered an estimate of the extent of fluvial Flood Zone 3b within 100 years.

As noted, current Environment Agency formal flood maps generally do not take into account the effect of climate change on winter rainfall and tide levels, or the effect of changes in the levels of tectonic plates on tide levels.

Site No.	Site Description	Land use	Vulnerability Classification	Watercourse(s)	Flood Zone Information	Method used to derive Flood Zones	Fluvial Flood Risk Posed to Site	Canals	Flooding from 'Other Sources' Description

Sewer Flooding	Defences							Culverts				Flood Watch/Warning Coverage?	LiDAR Coverage?	Notes
	Summary	Asset Ref	Location	Type	Protection Type	Length (m)	Residual Risk from defences	Location	Watercourse	Occurs under	Residual Risk from culverts			