High Peak Borough Council

Level 2 SFRA

April 2014

Document Control

Project: Viability Report

Client: Keppie Massie

Job Number: A083519

File Origin: Reports

Document Checking:

Prepared by: M.S Elliott	Signed: 
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Issue	Date	Status
1	17/01/2014	Draft (For comment)
2	27/01/2014	2nd Draft (for comment)
3	11/03/2014	3rd Draft (for comment)
4	04/04/2014	FINAL

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Appendices A-O: EA River Model Data and Plans for the Individual Sites.

Appendix P: Correspondence with the (Flood) Risk Authorities (EA, DCC and High Peak)

1.0 Introduction

1.1 Purpose and Context of Level 2 SFRA

The Level 2 Strategic Flood Risk Assessment (SFRA) is required to support the High Peak Viability Study which in turn seeks to consider the viability of allocating specific identified sites for a variety of purposes to deliver the assessed future growth needs of the High Peak Borough.

Flood Risk is a material planning consideration and the National Planning Policy Framework (NPPF) and the supporting Technical Guidance (TG) requires land to be allocated adopting a sequential approach with new development being restricted to areas of least flood risk (Flood Zone 1) prior to considering allocating land that is assessed as being more prone to flood risk (Flood Zones 2 and 3).

A Level 1 SFRA is a refinement of the Environment Agency (EA) Flood Maps for Planning. The High Peak Level 1 SFRA was completed in September 2008.

A Level 2 SFRA looks in more detail at the flood risk to sites, where, having adopted a Sequential Approach, it is still found necessary to consider allocation of land despite the identification of apparent flood risks to that land. The Level 2 SFRA considers the flood risk of the identified sites (with a known flood risk following the Level 1 SFRA) in more detail.

Where it is proposed to allocate land in Flood Zones 2 and 3, the Level 2 SFRA examines the flood risk of the sites under consideration to provide, if possible, sufficient evidence to demonstrate that for development proposed on the allocation, the Exception Test can be passed.

Further detail of what is required for the Exception Test (ET) to be passed is provided in Section 2.4.5. The ET requirement of the NPPF and the TG is based on a consideration of the Flood Zone of the site and the Vulnerability Classification of the proposed end use.

1.2 Structure of Level 2 SFRA

This Level 2 SFRA provides an Overview of the Hydrology of the High Peak area together with a review of relevant legislation in Section 2. Section 3.0 sets out the methodological approach of the Level 2 SFRA and Section 4 sets out the findings of that approach applied to each of the 15 sites considered. For each of the 15 sites there is an accompanying Appendix (Appendices A-O) where generally the following information is provided:

(i) EA River Model Data
(ii) The Site Plan showing the area of the allocation under consideration
(iii) The Site Plan with the EA Flood Map for Planning Purposes
(iv) The Site Plan with Existing Public Sewers
(v) The Site Plan with Contours derived from LIDAR data
(vi) The Site Plan with 1 in 100 Year Flood Depths
(vii) The Site Plan with 1 in 1000 Year Flood Depths

In Addition more general correspondence with the (Flood) Risk Management Authorities established by the Flood and Water Management Act 2010 (The Environment Agency, Derbyshire County Council and High Peak) is contained in Appendix P

1.3 Appointment

Keppie Massie were appointed by High Peak to undertake the Viability Assessment and WYG were appointed to provide the Level 2 SFRA element of the Viability Assessment on behalf of Keppie Massie.

1.4 Scope of Level 2 SFRA

1.4.1 The sites considered in the Level 2 SFRA are as set out below:

Area	Site Name	Site Ref	Allocation End Use under Consideration
Glossopdale	Woods Mill	G16	Mixed use
Glossopdale	Bank St	G18	Residential
Glossopdale	Charlestown	G31	Mixed use
Glossopdale	Adderley Place		Residential
Glossopdale	Hadfield		Employment
Central	Wharf Rd	C8	Residential

Area	Site Name	Site Ref	Allocation End Use under Consideration
Central	Buxworth (Britannia Mills)		Mixed Use
Central	Bingswood		Mixed Use
Central	Furness vale		Mixed Use
Central	Torr Vale Mill		Mixed Use
Central	Thornsett PEZ		Employment
Central	Birch Vale PEZ		Mixed Use
Buxton	Spring Gardens Regeneration Area (North)		Regeneration
Buxton	Spring Gardens Regeneration Area (South)		Regeneration
Buxton	Spring Gardens Regeneration Area (East)		Regeneration

A Level 2 SFRA is required in locations where there is a significant portion of land that is in Flood Zones 2 and 3 and it becomes necessary in order to support growth to allocate land in Flood Zones 2 and 3. However, not all land in Flood Zones 2 and 3 necessarily has the same degree of exposure to flood risk. This is because the Flood Maps for Planning do not take account of the presence of defences, because taking a long term view, it is always better to develop on land that does not require the presence of defences.

However, in many parts of the country this is simply not possible to meet growth targets without developing on land in Flood Zones 2 and 3. When this occurs it becomes necessary to consider by means of a Level 2 SFRA more precisely how the defences benefit the defended land. This typically requires 2-D modelling to allow an assessment of the speed of flooding onset, the duration of flooding and the velocity and depth of flooding. It is often also necessary to consider what would be the consequences on new development of a breach in the defences.

In the case of the sites to be considered above, none benefit from defences.

Given the above, this Level 2 SFRA has adopted a proportionate approach and has not included 2-D modelling. However, to provide the evidence to demonstrate that the Exception Test can be passed for the sites considered (where, this is the conclusion of this report) the flood risk has been more accurately assessed by comparing modelled flood levels provided by the EA with ground levels derived from LIDAR supported by actual site inspections.

A detailed description of the methodology used to undertake the Level 2 SFRA is provided in Section 3.0.

2.0 Overview

2.1 Characteristics of High Peak Catchments

2.1.1 Introduction

The Borough of High Peak is within the upper reaches of two of the primary river basin districts of England: the North West River Basin District (Upper Mersey river catchment division) and the Humber River Basin District (Derbyshire Derwent river catchment division). More specifically, of the major High Peak areas considered in this report, both Glossopdale (Woods Mill, Bank Street, Charlestown, Adderley Place and Hadfield) and the Central Area (Whaley Bridge, Wharf Road and Bingswood, Furness Vale, Buxworth, Thornsett and Torr Vale Mill) are within the Upper Mersey river catchment division, whereas the Buxton Area is within the Derbyshire Derwent river catchment division.

In greater detail, it is useful to review the rivers and watercourse systems in the High Peak area considering first the Upper Mersey river catchment division. High Peak drains into the Mersey via the River Goyt which drains out of High peak through Marple. The Goyt valley has its headwaters on the moors to the west of Buxton. At Whaley Bridge there are confluences from Todd Brook (draining from Kettleshume) and Randall Carr Brook draining the southern part of Chapel-en-le Frith. The combined waters pass adjacent to both the Wharf Road and Bingswood Sites.

Black Brook drains the valley in which Chinley resides and has headwaters originating in the ridges that extend southwards from Kinder Scout. Black Brook passes along the frontage of the Britannia Mills site (Buxworth) before joining the Goyt just downstream of the Bingswood Site but upstream of the Calico Works site at Furness Vale.

The River Sett originates on the western flanks of Kinder Scout and drains via Hayfield, passing through the Birch Vale and Thornsett Site Primary Employment Zones joining the River Goyt in New Mills just upstream of the Torr Mills Site.

At Marple the Goyt is joined from the north east by the River Etherow which conveys water from Longendale and Glossopdale. The confluence between the Etherow and Glossop Brook (which drains Glossopdale) occurs just to the south west of Hadfield and the Hadfield Site.

The headwaters of the Glossop Brook system originate in the valleys between the various ridges that extend from Kinder Scout and Bleaklow. The Adderley Place site is in a filled valley that has a confluence

with Glossop Brook near the north eastern boundary of the site. Woods Mill and Bank Street sites are either side of Glossop Brook in the vicinity of the confluence between Shelf Brook and Hurst Brook (the name change occurs downstream of this confluence). The Charlestown site is on a separate tributary of Glossop Brook that has its source in Bray Clough.

Buxton, which is in a basin surrounded by a number of peaks on all sides other than to the east. A number of watercourses combine upstream of the town centre to form the River Wye which then flows through the Spring Gardens Regeneration Area (Southern and Eastern areas).

As the High Peak Borough is located at the south western end of the Pennines, the area is typified by elevated land dissected by deep valleys. In hydrological terms the watercourses are typical of 'upland headwater streams' that become 'piedmont streams' (or transitional) on progressing downstream. The elevated nature of High Peak means that there are few watercourses that would be characterised as 'Lowland'.

'Upland' streams have confined valleys, low stream order, are fast flowing, have coarse substrate, high stream energy and steep gradients. 'Piedmont' streams will tend to be less confined, have a higher stream order, are slower flowing, have variable substrate, high to medium stream energy and have lower gradients. All watercourses are dynamic systems, and unless controlled by human intervention will have a tendency to migrate by erosion and altering patterns of sedimentation.

The general abundance of water located within steep sided valleys makes the High Peak an obvious location for the capture of water by impoundments for both water supply and industrial purposes.

2.1.2 History of Urbanisation

The abundant source of water to both power industry and for use in industrial processes resulted in substantial industrial development, with supporting residential development and infrastructure along the steep sided valleys of High Peak during the Industrial Revolution. As a result many of the watercourses have been heavily modified with stone built training walls, culverts, weirs, mill ponds, sluices and goyts with buildings placed in close proximity to the water. As a result there is a legacy of old and often derelict industrial land in close proximity to the watercourses, sometimes within zones identified as being at risk of flooding.

Semi-Derelict Mill Pond Infrastructure: Birch Vale, Sett valley

However, the very attractive landscapes of High Peak mean that choices for growth often lie between the conflicting interests of either incursion onto greenfield land or re-development of brownfield land that may be within flood zones 2 and 3. How this conflict can be resolved is set out in more detail in the individual reports for each of the sites considered below.

As noted above, the High Peak area is a noteworthy source area for potable water for the large conurbations of north-west England with large reservoirs and systems of reservoirs being located in the Upper Goyt Valley. Todd Brook Valley and Toddbrook Reservoir are located immediately upstream of the Wharf Road site in Whaley Bridge and the reservoirs of Longdendale (just upstream of the Hadfield Site).

2.1.3 Flood Risk in High Peak

Upland streams will respond rapidly to heavy rainfall on the elevated catchments and are therefore vulnerable to relatively short duration flash flooding that can be exacerbated by large movements of sediment and debris. In this type of situation flood warning notification periods are likely to be short. Progressing downstream, whilst flood volumes and durations are greater warning notification periods are likely to be longer. Flood hazard is generally a function of water velocity, volume and depth. The steeply

sloping nature of the High Peak topography and watercourses does mean that flood hazard is likely to be a matter that requires due consideration.

However, due to the absence of lowland rivers in High Peak, the areas of flood plain are relatively small and the percentage of land within Flood Zones 2 and 3 within the High Peak as an overall proportion of land area is unusually low for an English authority. For most of the sites considered, the fluvial flood issue relates to the extent that the sites encroach onto the narrow flood plains of the bordering rivers and watercourses.

In recent years the significance of surface water flooding has been recognised. Such surface water flooding occurs when in sustained wet weather surface water flows across the surface of undeveloped land without necessarily being within a defined watercourse. Additional contributions to such flows can arise from groundwater which will emerge at the surface (in locations other than known springs) during periods of elevated groundwater due to sustained wet weather.

In urban areas, as well as the overland surface water flowing downhill from the surrounding undeveloped land, there will be surface water flows that occur because the capacity of underground drainage systems has been exceeded. This may be due to poor maintenance or simply due to the inherent incapacity of the pipes and conduits or simply inadequate spacing and capacity of gullies to allow the water to actually get into the underground system. The net effect of all of the above is for flows of surface water to run across the surface of the land that is neither within a watercourse, a designated route or an underground drainage system. Such flows can cause substantial flooding of property. To address this issue, maps have been prepared showing surface water flooding and these can be viewed on the EA website.

The steep topography of the High Peak area, the typically impermeable soil conditions, contributions from emerging groundwater and a legacy of older underground drainage systems installed during the industrial revolution means that surface water flooding is a significant issue within the High Peak area. Whilst surface water flooding (other than in identified critical drainage areas, of which there are none within the High Peak area) is not generally an issue that would lead to rejection of development proposals as a matter of policy. However, it is a matter that requires careful consideration at the master-planning stage being supporting by a Flood Risk Assessment that is undertaken not simply to address planning policy but also to inform the approach to flood risk management in the development.

A significant contributor of surface water flooding in urban areas is 'exceedance water' that is unable to enter underground sewer systems that become overloaded in wet weather. Further information in respect

of the various types of sewer systems is provided below. However, new public sewer systems are only required to provide a 1 in 30 year protection against surface flooding. Many older systems provide a standard of protection against surface flooding considerably less than a 1 in 30 year standard. Given that for planning purposes the key return period considered is the 1 in 100 year standard, it should be appreciated that the risk from surface water flooding from urban 'exceedance water' is considerable.

A further flood risk is that arising from impounded water. The largest bodies of impounded water are the major water supply reservoirs. Those which impound more than 25,000m^3 of water have been covered by a strict inspection regime for many years. Following the implementation of the Flood and Water Management Act 2010, this regime is in the process of amendment bringing the impounded volume where management measures require consideration down to 10,000m^3.

The risk of flooding from a reservoir breach is extremely low and this risk is not normally a planning consideration. However, to assist in civil emergency planning and to know which locations may be at risk, maps assessing the sphere of influence of a reservoir breach have been undertaken and are publicly available on the EA website. It should also be noted, that due to the urban history of the High Peak there is a legacy of mill ponds (some still impounding water and in poor repair) along with canals in elevated positions on valley sides.

2.2 Site Surface Water Drainage and Opportunities for SUDS

Providing appropriate surface water drainage to avoid exacerbating downstream flood risk is an important consideration for new development. Because climate change may increase the severity of future rainfall events, the TG to the NPPF includes factors for increasing present rainfall intensities to be applied to surface water drainage calculations. The factors vary according to the expected life of the development. Residential developments typically have an assumed life of 100 years.

In order to demonstrate that the new development will not exacerbate existing downstream flood risk it is necessary to 'baseline' the existing run off from the development area. This needs to be done consistently. Greenfield areas should use standard methodologies available to assess the baseline run off rates for a range of return periods (typically1 in 1 year, Q_{bar}, 1 in 30 year, 1 in 100 year and 1 in 100 year plus 20% climate change). Post development run off rates should not be increased above these levels.

Where there are existing impermeable surfaces (as will be the case for most of the brownfield sites) it will be necessary to investigate the existing drainage systems and determine where these discharge and at

what rates. Such investigations will need to take account of the fact that the drainage systems may be inadequate or derelict such that they may be the cause of existing actual or potential flooding problems. Redevelopment should ensure that such problems are resolved without discharging at increased rates into existing drainage networks. The policy that is normally applied is as follows:

1. Rates of discharge to existing drains or watercourses is maintained at a status quo with existing discharge rates (with climate change factors applied to the redevelopment flows)
2. It may be appropriate to consider the above for a range of return periods (typically 1 in 1 year, Q_{bar}, 1 in 30 year, 1 in 100 year and 1 in 100 year plus 20% climate change).
3. Any exceedance flows within the site should be retained within the site boundaries for all events up to a 1 in 100 year event.
4. The impact of increases in annual volume of run-off will require investigation and where reasonably possible a status quo on pre-development annual run off volumes should be maintained.

In the case of overland surface water flows that run into the site from surrounding elevated land, it is usually not possible to do significantly more that make sure that such flows can be safely routed through the proposed development taking care to ensure that any proposed re-routing of such flows does not lead to the creation of new problems at downstream boundaries and beyond. Where it is possible, to alleviate surface water flooding problems, by introducing additional storage on site or re-routing such flows into watercourses then such measures should be included in the redevelopment.

Development of greenfield land will always result in an intensification of impermeable surfaces within the site that will cause an increase in both the volume and rate of run-off of surface water unless mitigating measures are built into the design. In the case of redevelopment of brownfield sites, it is necessary to undertake the investigations and analysis set out above to determine the post development situation.

The Building Regulations establish a hierarchy for the disposal of surface water as follows: (i) disposal by infiltration (ii) disposal to a watercourse (iii) disposal to a public sewer. In the case of the latter, disposal to a dedicated surface water sewer is always preferable to disposal to a combined sewer.

In recent years the government has sought to promote the use of SUDS (sustainable urban drainage systems). SUDS objectives are 'to minimise the impacts from the development on the quantity and quality of run off, and maximise amenity and biodiversity opportunities' (SUDS Manual CIRIA C697 para 1.1). Whilst SUDS are not limited to the use of methodologies involving infiltration techniques, in line with the Building Regulation hierarchy, those SUDS that do utilise infiltration should be considered first.

It is therefore necessary to consider the suitability of the High Peak area for the use of SUDS and specifically infiltration methods. Infiltration may be impossible due to ground condition or inappropriate due to the proximity of potable water abstractions from groundwater. Such abstractions are protected by Source Protection Zones (SPZ).

There are no SPZs within the Upper Mersey river catchment division. However, the south of Buxton is within the inner SPZ (Zone 1). This SPZ 1 extends to the southern boundary of the southern third of the Spring Gardens Regeneration Area.

There are no identified primary aquifers located in superficial deposits within High Peak. However, some areas associated with the river valleys are designated as 'Secondary' A, which suggests that these could be both a source of water and that also the deposits may be able to receive water by infiltration. The bedrock is all designated as 'Secondary A' apart from land to the south and south east of Buxton town centre which is designated as a principal aquifer, and is used for abstraction of water hence the SPZ 1 designation. Buxton's Mineral Water is important to the High Peak, and, therefore, whilst the primary source of the spring water may be outwith the urban extent of Buxton, the introduction of any new potential pollution pathways within the SPZ 1 area, must be prevented by compliance with EA Groundwater Protection Policy and Practice (GP3).

The nitrate pollution prevention regulations bring into force the European Commission nitrates directive. Each country must review them regularly. The latest review came into force on 17 May 2013. The regulations mean that land that drains into waters polluted by nitrates are designated as Nitrate Vulnerable Zones. The EA mapping of Nitrate Vulnerable Area (NVA) only identifies the south west margin of the High Peak Area as being a NVA. None of the sites considered in this report is within or will affect water in the NVA.

As a result of the general ground conditions in the High Peak area opportunities for the use of SUDS that are reliant on infiltration are limited. However, following best practice, geotechnical investigation work to support new development proposals should include infiltration testing as there will be in some localities, especially along the valleys, river deposits which may contain granular deposits that are not necessarily unsuitable on account of a high water table. Such natural features should be used where these are available and the proposals will, following best practice, not result in pollution of groundwaters.

The steeply sloping nature of the catchments can present a challenge to the use of SUDS ponds given that SUDS features generally require gently sloping surfaces in order to avoid excessive earthworks. SUDS

should generally be located outside of Flood Zone 3. However, as already described, the topography of High Peak does mean that gently sloping land is at a premium and that which is available is often located in the Flood Zone 3 areas. However, it is also the case that some of the former industrial mill ponds, could be re-used as SUDS, and not all such features are located within Flood Zone 3.

The use of filter strips, swales and pervious pavements (with or without infiltration) should be able to be accommodated within development layouts as it would be usual for highways to follow contours where possible in order to provide economical designs.

In conclusion, whilst some of the natural features of the High Peak area may not seem to be highly favourable to the use of SUDS, if development is approached sensitively, there are significant opportunities to implement SUDS.

2.3 Review of Previous Work

2.3.1 Level 1 SFRA

The High Peak SFRA was prepared by Halcrow and completed in September 2008. It was prepared following the guidelines of PPS 25 and the associated PPS 25 Practice Guide. The document provides a comprehensive review of the hydrology of the High Peak area. It does note in Section 4.4.1 that the area does not have a substantial flood risk history.

Whilst there have been some very significant changes in regulatory framework since September 2008 (such as the Flood and Water Management Act 2010 and the Introduction of the National Planning Policy Framework (March 2012)) the flood risk management policy objectives for the High Peak area set out in Section 7 remain valid and are taken into account in this Level 2 SFRA.

Section 10 provides Guidance on the 'Application of Sustainable Drainage Systems' (SUDS). Section 10.4 on the 'Adoption and Maintenance of SUDS' has been superceded by the introduction of the Flood and Water Management Act 2010 which will provide the legislative framework for Derbyshire County Council as Lead Local Flood Risk Authority to adopt SUDS constructed in accordance with the National SUDS Standards when Schedule 3 of the Act is implemented on the order of the Secretary of State.

2.4 Review of Legislation and Planning Policy

2.4.1 Introduction

Since the production of the Level 1 SFRA there have been two major changes in legislation which are relevant to this level 2 SFRA.

2.4.2 The Flood and Water Management Act (2010)

The Flood and Water Management Act (2010) (F&WMA) arose as a response to the major floods that occurred across England in the summer of 2007 and broadly captured the recommendations set out in the Pitt Report which was commissioned after the floods to look at how flood risk was managed in England.

The F&WMA established six distinct (flood) risk management authorities that have flood risk responsibilities these being the EA (which has over-riding responsibility both locally and nationally for flood risk management), Lead Local Flood Risk Authorities (which are county councils and unitary authorities and in the High Peak Area is Derbyshire County Council (DCC)), Borough and District Councils, Internal Drainage Boards, the Water Utilities and Highway Authorities.

Generally the EA, along with its national and local over-viewing role, is responsible for managing flood risk associated with main rivers and the Lead Local Flood Authorities (DCC) are responsible for surface water flooding and flooding from ordinary watercourses. The Lead Local Flood Authority may arrange for aspects of its duties to be shared with the Boroughs and Districts within its area. The Water Utilities are responsible for flooding from the public sewers and the Highway Authorities for flood risk management in association with the highway. Internal Drainage Boards (IDB) are responsible for the drainage of low lying agricultural land that is kept sufficiently drained for the practice of agriculture by extensive land drainage networks often involving pumping. There are no IDBs affected by the sites considered in this report.

This new arrangement is a radical change and the various authorities are in early stages of understanding how flood risk management can be delivered holistically and the part each needs to play in providing a seamless flood risk management function.

2.4.3 The NPPF and Associated TG

In March 2012, The National Planning Policy Framework (NPPF) was introduced which set aside Former Planning Policy Statement 25 (PPS25) and its associated Practice Guide. PPS 25 had been developed in response to the growing problem of flooding that had in part been historically exacerbated by planning

decisions permitting development on the flood plain. The PPS 25 Practice Guide contained a significant amount of guidance on the undertaking of Strategic Flood Risk Assessments (SFRA), the Sequential Test (ST) and the Exception Tests (ET). In 2012 a lot of concern was expressed about the potential loss of important guidance that would occur if PPS 25 was simply set aside. As a result Technical Guidance (TG) was provided to the NPPF which more or less retains the key features of PPS 25 and its Practice Guide, albeit, in a much shorter version. A replacement is planned to the PPs 25 Practice guide aligned to the new NPPF and TG.

This Level 2 SFRA has been prepared taking account of the NPPF and its TG.

2.4.4 The Sequential Test

The NPPF and TG retain the Sequential Test originally implemented via PPS 25. The Sequential Test (for flood risk) is introduced in paragraph 100 of the NPPF and its aim is set out in paragraph 101: 'to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment (SFRA) will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding'.

2.4.5 The Exception Test

The NPPF and the supporting TG retain the Exception Test that was developed in PPS 25. For the Exception Test to be passed there are two elements (NPPF Paragraph 102):

(i) It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and

(ii) A site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The matter of wider sustainability benefits is not considered in this report but is covered elsewhere within the wider Viability Assessment of which the flood risk study is a part.

In paragraph 8 of the TG the following is stated:

'Where local planning authorities have been unable to allocate all proposed development in accordance with the Sequential Test, taking account of the flood vulnerability category of the intended use, it will be necessary to increase the scope of the SFRA to provide the information necessary for application of the Exception Test. This should, additionally, consider the beneficial effects of flood risk management infrastructure in generally reducing the extent and severity of flooding when compared to the flood zones on the flood map'.

Paragraph 8 continues by stating:

'the increased scope of the Strategic Flood Risk Assessment will enable the production of mapping showing flood outlines for different probabilities, impact, speed of onset, depth and velocity variance of flooding taking account of the presence and likely performance of flood risk management infrastructure'.

However, given the absence of lowland rivers with extensive flood plains and flood defence infrastructure in the High Peak area, the Strategic Flood Risk Assessment has allowed the vast majority of sites to be brought forward for consideration to be totally outside of Flood Zones 2 and 3. The sites considered in this report, whilst generally being predominantly outside of Flood Zone 2 and 3 have flood zone issues along the site boundaries. None of the sites considered benefit from formal flood defence infrastructure so do not require consideration of the potential impact of defence breach or overtopping.

For each specific site, evidence is provided to demonstrate that the Exception Test requirements can be met and therefore allocation (for the vulnerability classification considered) is appropriate and deliverable, when supported by a site specific FRA.

2.4.6 Legislation Covering Drainage Infrastructure

There are a number of distinct categories of infrastructure that provides the over-all system of both natural, modified natural and constructed assets that result in water draining through and out of the High Peak area.

From a legal perspective watercourses (natural or modified) can be divided into main rivers and ordinary watercourses. The main rivers are indicated on the EA flood maps (planning) by a dark blue line. The EA

have consenting responsibility for any works that may have an impact on the main rivers under the Water Resources Act 1991. Local bye laws indicate that the zone of consideration as to where an impact may occur is an 8m set off from the normal watercourse edges.

All other watercourses (as distinct from public sewers and private drains) are 'ordinary' watercourses. Consenting responsibility for works which may affect an ordinary watercourse lies with either the Lead Local Flood Authority (Derbyshire County Council) or High Peak (as a risk authority as defined by the Flood and Water Management Act 2010). The Land Drainage Act 1991, provides a statutory basis for controlling works which could adversely affect flows in all watercourses that are not main rivers. The local drainage bye laws generally indicate that the zone of consideration as to where an impact may occur is an 8m set off from the normal watercourse edges.

Whilst Ordnance Survey maps show most significant watercourses (both main rivers and 'ordinary' watercourses) ultimately it is not definitive as to the presence of a watercourse. The recently published surface water flood maps are useful in identifying where water will collect and run in wet weather in rural locations, thus identifying potential watercourses not found on the OS map. Ultimately, the presence of watercourses can only be determined by detailed site inspection.

Public sewers are shown on the public sewer record and are basically subdivided as being foul, surface water or combined depending on the contents conveyed. Generally, it is only surface water and combined sewers that are significant in terms of flood risk management. Unfortunately, the public sewer record is far from definitive as to the presence of a public sewer, a situation that was greatly exacerbated by the wholesale transfer of most private drainage assets to become public sewers owned and operated by the water utilities in October 2011.

Notwithstanding the above transfer there remain a large number of private surface water conveyance assets that were not subject to the transfer. The urban history of the High Peak means that this is a significant issue because there are a large number of culverts and mill goyts that were constructed and remain in place in various states of repair and operational use. Identification of such assets, which can have a major impact on flood risk management, requires detailed site investigation. It is not unusual for such assets to become integrated into the operational watercourse network therefore requiring approval for alteration or potential impact under the Land Drainage Act 1991.

2.5 Review of Site Specific FRA Requirements

All major development proposals that require planning permission must be supported by a flood risk assessment (FRA) according to the National Planning Policy Framework (NPP) and the associated Technical Guide. To assist Local Planning Authorities in determining when an application must be supported by a flood risk assessment the Environment Agency have developed a matrix setting out situations where an FRA is required. This matrix is available on the EA website and is updated from time to time and the requirement for an FRA for any non permitted development within the proposed allocations considered in this report should be determined by reference to this matrix.

Similarly, The EA provides detailed guidance on the requirements for FRAs. The guidance is split between that required for land within Flood Zone 1 (or a critical drainage area) and that for land within Flood Zones 2 and 3. The guidance can be found on the EA website and is updated from time to time.

In this report supplementary guidance is provided at each site clarifying how the generic guidance should be applied and any specific issues which should be addressed. The guidance provided in this report supplements without replacing that available on the EA website.

3.0 Level 2 SFRA Methodology

The Level 2 SFRA approach has been to undertake necessary and sufficient work to robustly inform the Viability Test and to demonstrate that the Exception Test can be passed at minimum cost to the Authority. Where more elaborate flood risk analysis can be deferred for inclusion within detailed flood risk assessments (FRA) to be provided with detailed development proposals this is identified by means of providing further specification requirements for the site specific FRA (over and above that required by the EA guidelines for production of an FRA).

The NPPF Technical Guide states the following in paragraph 8:-

'Where Local Planning authorities have been unable to allocate all proposed development and infrastructure in accordance with the Sequential Test, taking account of the flood vulnerable category of the intended use, it will be necessary to increase the scope of the SFRA to provide the information necessary for application of the Exception Test. This should, additionally, consider the beneficial effects of flood risk management infrastructure in generally reducing the extent and severity of flooding when compared to the flood zones on the flood map. The increased scope of the SFRA will enable the production of mapping showing flood outlines for different probabilities, impact, speed of onset, depth and velocity variance of flooding taking account of the presence and likely performance of flood risk management infrastructure'.

The more detailed SFRA referred to in paragraph 8 of the NPPF TG is generally relevant to authorities which have a high proportion of land within Flood Zone (FZ) 3 where the location of some development in Flood Zone 3 is unavoidable. In such areas a finer grained analysis of the flood risk within FZ 3 is required thus further refining the over-arching sequential approach established by extant Strategic Flood Risk Assessments. This fine grained analysis of Flood Zone 2 and 3 areas is generally not economically advantageous in the High Peak given the relatively small extent of Flood Zone 2 and 3 areas under consideration where such analysis would be justified.

Therefore the approach has been as follows:

1. Obtain LIDAR data for the sites under consideration. LIDAR Data is obtained from aircraft reconnaissance and is available for most of the country and is accurate to plus or minus 150mm.

2. Obtain the latest river model data from the EA for the rivers and watercourses alongside the sites under consideration. Generally the data is in the form of specific levels for identified key return periods at identified nodes. The exception to this is information provided from the River Wye model, which provides a grid of levels across the area of potential inundation for a number of return periods.
3. All the sites have been inspected to identify the potential flood risk issues at the sites by experienced flood risk specialists.
4. Using the model data cross sections have been placed on the site LIDAR data to allow a two dimensional surface to be prepared of the floods predicted for the 1 in 100 year and 1 in 1000 year events. The flood depth maps are then calculated by comparing the two dimensional flood surface with the topography as derived from the LIDAR data.
5. In the case of the data from the River Wye Model, a similar process has been adopted, but this is rather more fine-grained, as the flood surface is triangulated between the nodes and the resultant flood depth then calculated. A flood depth map has only been provided for the 1 in 100 year flood.
6. Items 4 and 5 have allowed a more accurate assessment of Flood Zones 2 and 3 within the sites considered.
7. In all cases, because the renovation of existing buildings within Flood Zones 2 and 3 is a relevant consideration, the outlines of these have been indicated on the flood depth maps.
8. To support the overall review of flood risk United Utilities sewer records have been obtained from High Peak Borough Council.
9. High Peak BC and Derbyshire County Council have been invited to comment on any known flood risk issues at the sites and any proposals to undertake flood risk management measures in the vicinity of the proposed sites.
10. Additionally, the recently published EA surface water flood maps have been consulted.
11. Brief consideration has been given of the River Basin Management Plan and the potential to improve water quality associated with the site.
12. A report has been prepared for each site identifying the flood risk issues at each site, the relevance of the Exception Test and whether or not the evidence robustly demonstrates that this can be passed.
13. Site specific specifications for supporting FRAs have been provided including measures for the future management of surface water (including the use of SUDS) such that downstream flood risk is at the very least not exacerbated, but, where possible, reduced.

4.0 Assessment of Individual Sites

4.1 Glossopdale Site G16: Woods Mill, Glossop

4.1.1 Summary Statement

The site is to be considered for allocation for Mixed Use and the review of flood risk supports such allocation. Whilst there are areas of Flood Zone 3 and 2 alongside Shelf Brook and Glossop Brook the extent of the flood zones does not make development of this site unviable. The series of Plans supporting this site can be found in Appendix A.

4.1.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the watercourse, which is a main river, which flows along the eastern and southern boundary of the site. This watercourse is known as Shelf Brook up to the point of confluence with Hurst Brook. Downstream of the confluence the watercourse is known as Glossop Brook.

These watercourses are the upper reaches of the Mersey catchment and are just downstream of the Pennine watershed. Upstream of Glossop these watercourses have steep gradients and occupy deep valleys. Such watercourses are capable of producing very rapid responses to major rainfall events on the source catchments of the adjacent moors. The steep gradients upstream also mean that these watercourses can have high sediment and debris loads which can result in rapid blockage of culverts, bridges and any other 'in channel' restrictions.

The adjacent watercourses were a rich resource during the industrial revolution and as a result much of the site has been occupied by now derelict industrial buildings which harnessed the resource provided by the water. As a result the watercourse is now identified within the River Basin Management Plan as being heavily modified, being constrained by artificial walls, several bridges and several weirs.

The walls alongside the watercourse have not been assessed in respect of their ability to withstand hydrostatic pressure. The maps provided in the Appendices assume that the walls will not provide any constraint to the incursion of floodwaters into the site. Where buildings are present within the more accurately assessed flood footprint of the 1 in 100 year and 1 in 1000 year events, these are shown as hatched on the maps. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint which it would be practical to renovate. The Environment

Agency has indicated that existing buildings could be renovated using flood resilient construction techniques as part of re-development of the site.

Adopting a Sequential Approach within the allocation more vulnerable uses, such as residential, should be located in the areas of lowest flood risk.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank. Renovation of existing buildings would not normally be subject to this restriction.

Additionally, surface water flood routes are identified on the EA surface water flood maps as entering the site from the north and south. A specific flood risk is the low spot on the Cross Cliffe/Mill Town highway.

The flood zones are shown on the plans in Appendix A based on the information provided and the methodology adopted. Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.1.3 Exception Test Issues

Whilst the parts of the site alongside Glossop Brook and Shelf Brook have associated areas of Flood Zones 2 and 3 the majority of the site lies within Flood Zone 1. Adopting a sequential approach, there is a significant area of land within Flood Zone 1 which is sequentially preferential for all re-development and specifically for residential.

Nonetheless, development pressures may justify development of 'more vulnerable' and 'less vulnerable' development within the Flood Zone 2 areas. According to Table 3 of the NPPF TG, Exception Test evidence would not be required. It can be seen from the plans within the Appendices that the Flood Zone 3 area is a relatively narrow strip on the northern side of the watercourse.

A substantial part of this Flood Zone 3 strip is occupied by existing buildings. If it is proposed to re-use, the existing buildings within the Flood Zone 3 strip, Exception Test issues could be addressed by setting new floor levels above the 1 in 100 year flood level with an appropriate freeboard to account for uncertainty and climate change (typically taken as 600mm). The layout of the development would need to ensure that 'dry' (i.e. above the 1 in 100 year flood level) access/egress routes could be provided. In principle, this approach if supported by a site specific FRA, is deliverable.

4.1.4 Additional Specification for Site Specific FRA

The Level 2 SFRA has identified that based on the existing model of Glossop Brook, Shelf Brook and Hurst Brook, most of the site is outside of Flood Zone 3.

However, any re-development proposals within the Flood Zone 3 areas (as shown on the published EA Planning maps) will require detailed modelling of Glossop Brook and Shelf Brook. This modelling will require supporting survey information in respect of the following:

(i) Additional channel survey data
(ii) Detailed site investigation to establish whether or not there are old culverts and mill goyts present on the site area under consideration which may or may not be operation in certain circumstances.
(iii) Survey of watercourse and building walls to establish ability of these to withstand the hydrostatic forces generated by the flood scenarios considered.
(iv) Proposals to renovate existing buildings that the model indicates would flood unless designed to exclude floodwater.

The above would provide a reliable baseline model which can then be used to test the development proposals to demonstrate that the proposals meet the requirements of the NPPF. Opportunities to provide some enhancement are set out below and should be considered at an early stage of redevelopment masterplanning.

Overland exceedance flows will run into this site from the higher land to the north. In many urban situations exceedance flows become routed along highways.

At this site, due to the layout of existing highways and walls, overland flows could also enter the site from the south along Cross Cliffe.

4.1.5 Opportunities (to reduce flood risks and enhance the water environment)

This former industrial site alongside Shelf Brook and Glossop Brook offers a number of opportunities to enhance the watercourse and reduce flood risks to adjacent properties. The following potential opportunities are identified which might be considered in conjunction with re-development of part or this entire site:

(i) Considerable portions of the site are covered by impermeable surfaces. It would be reasonable to require redevelopment to reduce peak surface water run off rates from the present day baseline to a percentage to be agreed with the Local Planning Authority by the use of SUDS or underground attenuation.

(ii) The use of SUDS could also include measures to improve the quality of surface water discharging from the site.

(iii) Restoration of all or part of the Mill Pond at the northern extremity of the site to provide some flood storage and ecological enhancement.

(iv) Localised removal of hard watercourse boundary treatments and redundant bridges to improve ecological linkage along the watercourse, provide improved channel conveyance and some new flood storage areas.

(v) Raising levels on the Cross Cliffe/Milltown highway to remove the low spot which is clearly vulnerable to flooding (see below).

4.2 Glossopdale Site G18: Bank Street, Glossop

4.2.1 Summary Statement

The site is to be considered for allocation for residential. In that the site is almost entirely within Flood Zone 1 allocation of this site for residential is supported by this review of flood risk. The series of Plans supporting this site can be found in Appendix B.

4.2.2 Identified Flood Risks and Constraints

This site is almost entirely within Flood Zone 1. However, Glossop Brook, which is a main river, forms part of the northern boundary of the site and there is a very small strip of associated Flood Zones 3. The steep topography of the majority of the site will present a constraint on development, but means that the Flood Zone 3 strip associated with Glossop Brook is narrower than the 8m bye law set off requirement. Therefore, fluvial flood risk is not a constraint on development at this site.

There are surface water flood routes identified on the EA surface water flood maps that drain into the site from the south following the natural gradient of the land. These discharge into Glossop Brook. It is quite likely, given the steeply sloping nature of the site, that such flows may be supplemented by emerging groundwater within the site itself.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted.

4.2.3 Exception Test Issues

Given that the developable part of the site is entirely within Flood Zone 1, there are no Exception Test issues at this site.

4.2.4 Additional Specification for Site Specific FRA

The site specific FRA should give appropriate consideration to management of overland surface water flood routes entering the site and the need to manage potentially emerging groundwater.

4.2.5 Opportunities (to reduce flood risks and enhance the water environment)

This site does not afford significant opportunity to mitigate downstream flood risks or improve the water environment in that it is currently largely undeveloped and the watercourse boundary is naturally elevated with exposed rock.

Surface water discharges from any development on the site should be restricted to present day greenfield run off values with allowances to climate change included in the developed scenario.

4.3 Glossopdale Site G31: Charlestown Works, Glossop

4.3.1 Summary Statement

The site is to be considered for allocation for Mixed Use and the review of flood risk supports such allocation. Whilst there are areas of Flood Zone 3 and 2 alongside the main river watercourse which runs through the site, the extent of the flood zones does not make development of this site unviable. The series of Plans supporting this site can be found in Appendix C.

4.3.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the watercourse that is designated as a main river, which flows through the site. The headwaters of this watercourse are known as Bray Clough which is joined by a number of tributaries before entering the site from the south.

These watercourses are the upper reaches of the Mersey catchment and are just downstream of the Pennine watershed. Upstream of Charlestown these watercourses have steep gradients and occupy deep valleys. Such watercourses are capable of producing very rapid responses to major rainfall events on the source catchments of the adjacent moors. The steep gradients upstream also mean that these watercourses can have high sediment and debris loads which can result in rapid blockage of culverts, bridges and any other 'in channel' restrictions.

Partial Blockage of Culvert Immediately downstream of A629

The adjacent watercourses were a rich resource during the industrial revolution and as a result much of the site has been occupied by now derelict industrial buildings which harnessed the resource provided by the water. As a result the watercourse is now identified within the River Basin Management Plan as being heavily modified, being constrained by artificial walls, several bridges, significant lengths of culvert and a number of weirs. This site also has a number of buildings constructed directly over sections of culverted watercourse.

The walls alongside the watercourse have not been assessed in respect of their ability to withstand hydrostatic pressure. The maps provided in the Appendices assume that the walls will not provide any constraint to the incursion of floodwaters into the site. Where buildings are present within the more accurately assessed flood depth maps for the 1 in 100 year and 1 in 1000 year events, these are shown as hatched on the maps.

Unfortunately EA modelling data for the watercourse downstream of the crossing under the A629 (Charlestown) is not available, so it has not been possible to produce flood depth maps for these areas. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint which it would be practical to renovate. The Environment Agency has indicated that

existing buildings within the identified 1 in 100 year flood footprint could be renovated using flood resilient construction techniques as part of re-development of the site.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank. Renovation of buildings that are actually over the culverted watercourse is generally undesirable and should be avoided. Where there are over-riding considerations that dictate that retention of buildings over the watercourse is necessary, detailed structural surveys of the culverts will be required along with analysis of the impacts of culvert blockage on flood risk.

Where the watercourse leaves the site, it is at significant depth (greater than 5m) relative to the adjacent ground. This indicates that issues in respect of flooding associated with the watercourse are likely to be less extensive in the more northerly downstream parts of the site.

The published surface water flood maps indicate two stream of water entering the area of site to the east of the A629 from along its eastern boundary. Any redevelopment should consider how these flows are to be safely routed through this part of the site to the main river.

The dip in the A629 within the site has been subject to a number of flooding incidents and there is evidence of occasional standing water on site. The lowest point in the road is to the north of the actual culverted crossing of the main river through the site and is reliant for drainage on constructed drainage systems which are probably of inadequate capacity and possibly in a poor state of repair. Any exceedance water will drain along the highway on either side of the low spot, possibly supplemented by river water in the event of culvert blockage or incapacity and will collect in this location. Any re-development of the site that includes this area will need to consider this local flooding problem.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted. Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.3.3 Exception Test Issues

Whilst the parts of the site alongside the main river have associated areas of Flood Zones 2 and 3, there remain significant areas of the site within Flood Zone 1. Adopting a sequential approach, all development and residential development in particular should be located within the areas of lowest flood risk.

Nonetheless, development pressures may justify development of 'more vulnerable' and 'less vulnerable' development within the Flood Zone 2 areas. According to Table 3 of the NPPF TG, Exception Test evidence would not be required for residential or commercial development in Flood Zone 2 areas.

The exception test is not required for commercial development in the Flood Zone 3 areas.

It can be seen from the plans within the Appendices that the Flood Zone 3 area is a modestly wide strip of land either side of the watercourse (main river) covering both sides of the site which is bi-sected by the A629. There are a significant number of existing buildings within this footprint which could be retained and appropriately renovated. If it is proposed to re-use, the existing buildings within the Flood Zone 3 strip, Exception Test issues could be addressed by setting new floor levels above the 1 in 100 year flood level with an appropriate freeboard to account for uncertainty and climate change (typically taken as 600mm). The layout of the development would need to ensure that 'dry' (ie above the 1 in 100 year flood level) access/egress routes could be provided. In principle, this approach if supported by a site specific FRA, is deliverable, even within much of the Flood Zone 3 area.

4.3.4 Additional Specification for Site Specific FRA

The Level 2 SFRA has identified that based on the existing model of the main river watercourse that runs through the site (which is only modelled to the east and south of the A629) a significant portion of the site is outside of Flood Zone 3.

However, any re-development proposals within the Flood Zone 3 areas (as shown on the published EA Planning maps) will require detailed modelling of the main river watercourse. This modelling will require supporting survey information in respect of the following:

(i) Additional channel survey data
(ii) Detailed site investigation to establish whether or not there are old culverts and mill goyts present on the site area under consideration which may or may not be operation in certain circumstances.
(iii) Survey of watercourse and building walls to establish ability of these to withstand the hydrostatic forces generated by the flood scenarios considered.
(iv) Proposals to renovate existing buildings that the model indicates would flood unless designed to exclude floodwater.

The above would provide a reliable baseline model which can then be used to test the development proposals to demonstrate that the proposals meet the requirements of the NPPF. Opportunities to provide some enhancement are set out below and should be considered at an early stage of redevelopment masterplanning.

Overland exceedance flows will run into this site from the higher land to the east. In many urban situations exceedance flows become routed along highways and this site is no exception with evidence of flooding in the dip in the highway at the centre of the site.

At this site, due to the topography, overland surface water flows could also enter the site from the east as identified on the surface water flood maps and how the flows will be conveyed safely through the site requires appropriate consideration.

4.3.5 Opportunities (to reduce flood risks and enhance the water environment)

This former industrial site alongside a main river watercourse offers a number of opportunities to enhance the water environment and reduce flood risks to adjacent properties. The following potential opportunities are identified which might be considered in conjunction with re-development of part or this entire site:

(i) Considerable portions of the site are covered by impermeable surfaces. It would be reasonable to require redevelopment to reduce peak surface water run off rates from the present day baseline to a percentage to be agreed with the Local Planning Authority by the use of SUDS or underground attenuation.
(ii) The use of SUDS could also include measures to improve the quality of surface water discharging from the site.
(iii) Restoration of all or part of the Mill Pond at the southern extremity of the site to provide some flood storage and ecological enhancement.
(iv) Localised removal of hard watercourse boundary treatments and redundant bridges to improve ecological linkage along the watercourse, provide improved channel conveyance and some new flood storage areas.
(v) Improving the highway drainage in the area of the dip in the A629 which is prone to flooding.

4.4 Glossopdale Site, Adderley Place, Glossop

4.4.1 Summary Statement

This site is to be considered for allocation for residential development. In that the site is almost entirely within Flood Zone 1 allocation of this site for residential is supported by this review of flood risk. The series of Plans supporting this site can be found in Appendix D.

4.4.2 Identified Flood Risks and Constraints

This site is almost entirely within Flood Zone 1. However, the outer boundary of the flood zones associated with Glossop Brook, which very slightly impinge on the northern boundary of the site. However, given the very minor degree of incursion it has not been considered necessary to produce flood depth maps based on Lidar data and EA model information.

However, the eastern edge of the site is located on the line of a former valley that has been filled. The ordinary watercourse which formally occupied the valley has been routed through a 900 mm diameter culvert. The topographical information indicates that the depth of fill above this culvert is in excess of 10m in places. The watercourse source is in Horse Clough to the south of Simmondley.

Inlet to 900mm Culvert

It would appear that the Horse Clough watercourse was joined by a further tributary from the south west which runs around the northern perimeter of the recent development in Simmondley. The Lidar data suggests that this ordinary watercourse is also culverted through the site and probably joins the Horse Clough culvert at an unknown location within the site.

There are surface water flood routes identified on the EA surface water flood maps that appear to represent the flows associated with these culverted watercourses.

The culverts and associated overland flows which would occur should these become blocked present a constraint to development of the site. Allowance should be made for a wide set off zone (16m) from the culverts that should be kept free of development.

It would be expected that any outfall from the developed surface water management scheme would outfall into the culverted watercourse

4.4.3 Exception Test Issues

Given that the developable part of the site is entirely within Flood Zone 1, there are no Exception Test issues at this site.

4.4.4 Additional Specification for Site Specific FRA

The site specific FRA should give appropriate consideration to how the development is going to accommodate the presence of deep culverts through the site and the management of any overland surface water flood routes which would occur should the culverts become blocked.

In conjunction with the above, it will be necessary to undertake internal surveys of the culverts to enable accurate location and assessment of their condition.

4.4.5 Opportunities (to reduce flood risks and enhance the water environment)

Surface water discharges from any development on the site should be restricted to present day greenfield run off values with allowances to climate change included in the developed scenario.

4.5 Glossopdale: Waterside, Hadfield

4.5.1 Summary Statement

This site is to be considered for allocation for employment. In that the site is almost entirely within Flood Zone 1 allocation of this site for employment is supported by this review of flood risk. The series of Plans supporting this site can be found in Appendix E.

4.5.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Etherow that is designated as a main river, which flows through the site. The headwaters of this river is in the Longendale Valley, the reservoirs of which are a major source of potable water for substantial parts of the North-West. The presence of the reservoirs will have an attenuating affect on the flows in the River Etherow.

The River Etherow runs through the site in a purpose built corridor that is provided with a series of retaining walls and constructed banks which contain the river from elevated development platforms on both sides of the river.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted. These indicate that the Flood Zone 2 area is all within the 8m set off strip form the main river edge and so flood zoning provides no greater constraint to re-development than does simple compliance with typical river bank set off criteria.

The published surface water flood maps indicate a potential overland flow route entering the site from Waterside on the northern side of the River Etherow. Any re-development needs to consider how this overland flow route can be safely conveyed through the site, possibly utilising future road layouts.

It is noteworthy that the site is immediately downstream of the large impounded Bottoms Reservoir and would be directly in line for inundation in the event of a dam failure. Dam failure is extremely rare and is not normally a planning consideration.

4.5.3 Exception Test Issues

As the developable parts of the site (outside of the well defined River Etherow corridor) are all in Flood Zone 1, the Exception Test is not required.

4.5.4 Additional Specification for Site Specific FRA

The site specific FRA should consider how the overland flow route will be managed safely through the site.

4.5.5 Opportunities (to reduce flood risks and enhance the water environment)

This site does not afford significant opportunity to mitigate downstream flood risks. However, future surface water discharges from any development on the site should be restricted to present day run off values with allowances to climate change included in the developed scenario.

There are opportunities to provide ecological enhancement to the River Etherow corridor through the site.

4.6 Central Area Site C8: Wharf Road, Whaley Bridge

4.6.1 Summary Statement

This site is being put forwards for allocation as residential. The series of Plans supporting this site can be found in Appendix F.

The review of flood risk has identified that the overwhelming majority of the level developable area is within Flood Zone 3 and review using LIDAR data confirms this position. In these circumstances allocation of the site for residential purposes will require the Sequential Test to be re-considered applied and passed.

Whether or not the Sequential Test can be passed depends on the other available sites in an agreed geographical search area and whether or not such other available sites outside Flood Zone 3 are viable development propositions. (See NPPF Para 101). As noted in the introduction to this report, the very attractive landscapes of High Peak mean that choices for growth often lie between the conflicting interests of either incursion onto greenfield land or re-development of brownfield land that may be within Flood Zones 2 and 3.

This report has identified that further work is required to provide sufficient evidence to demonstrate, that, in the event that the Sequential Test can be passed, the Exception Test can also be passed.

4.6.2 Identified Flood Risks and Constraints

Flood level data has been obtained from the EA and this has confirmed 1 in 100 year levels on the River Goyt as shown on the plan in the Appendices. LIDAR data has been used to compare the 1 in 100 year flood levels with site levels to gain an overview of the flood risk to the potential allocation.

The conclusion of the above exercise is that the site is vulnerable to flooding from overtopping of river banks upstream of the weir on the River Goyt. During a 1 in 100 year event existing properties would be flooded and water would be routed between the properties into the allocation area where it would accumulate on account of a slight depression in the local topography.

Once the depression was filled, water would overtop from the flood pool within the site via the Wharf Road railway bridge. The level at which overtopping would commence is approximately 163.0 metres Above Ordnance Datum (mAOD) at which point water within the site would, at its deepest, be approaching 0.4m deep. The rate at which water can escape from the site under the Wharf Road railway bridge has not been investigated in this report. However, it will be constrained by the width of the bridge, the gradient of the road and the downstream water levels in the River Goyt. In view of this complication, the methodology adopted in the report for providing flood depth maps is not considered to be applicable and, therefore, flood depth maps have not been provided.

Wharf Road railway bridge

The designation of the site as Flood Zone 3 is not open to serious challenge without a detailed re-examination of the river model and its supporting hydrology. Such re-examination by re-modelling is unlikely to be successful in challenging the FZ 3 designation because of the risk of flooding to the site by the mechanism set out above.

It is noteworthy that the site is immediately downstream of the large impounded Todd Brook Reservoir and would be directly in line for inundation in the event of a dam failure. Dam failure is extremely rare and is not normally a planning consideration.

4.6.3 Exception Test Issues

Assuming that the Sequential Test can be passed, it is necessary for the exception test to be passed.

The review of flood risk to the site has identified the following:

(i) The site is at risk of flooding during a 1 in 100 year event. Floodwater would enter the site from the south west and would accumulate to a depth of 0.4m (approximately) before overtopping commences via the Wharf Road railway bridge.

(ii) The rate of flow of water through what would be the only vehicular access route from the site is not known and would require further more sophisticated modelling to establish. Excessive depth and speed of water flow along the only vehicular access route in and out of the site is not a desirable scenario.

Despite the issues identified above there are a number of potential approaches which could allow the Exception Test to be passed. These could be classified as follows:

(i) Approaches that reduce the flood risk to the allocation by undertaking flood prevention measures that bring wider benefits to the locality

Possible measures under the above heading are as follows:

(a) Provide a higher flood wall alongside of the River Goyt upstream of the weir.
(b) Consider lowering the weir thereby lowering critical upstream water levels.
(c) Investigation of re-opening of the former mill race (assumed) which would allow the collection of water over-topping into the allocation to be drained away. (The downstream impact of this solution would need detailed investigation)
(d) A combination of various elements of the above.

(ii) Measures that allow the second limb of the Exception Test to be passed.

Possible measures under this heading are as follows:

(a) Any residential development in this allocation to have living accommodation set 600mm above the predicted 1 in 100 year flood level (initially, this should be assumed to be 164.75 mAOD). The option of providing garages and storage at ground level could be explored.
(b) In conjunction with (a) above provide 'dry access' to Reservoir Road. Provision of vehicular access out of the site by this means could be examined in more detail but the level differential and highway configuration suggest that this would be expensive and technically difficult to achieve.

It is considered that implementation of an appropriate combination of the above measures would allow the second limb of the Exception Test to be passed. The first limb of the Exception Test requires consideration in conjunction with the wider Viability Study.

4.6.4 Additional Specification for Site Specific FRA

Residential development on this site would require a flood risk assessment in accordance with EA guidelines for a FRA in a Flood Zone 3 area.

Specifically the FRA would need to consider the velocity and depth of water through the road bridge under the railway and the impact of water escaping from the site via the former Mill Goyt to be utilised. Whilst, utilising the former Mill Goyt may reduce flood risk at the site it would be necessary to consider the downstream impacts of such a scheme.

If the flood risk exposure of the site were to be reduced by reducing the heights of the weir on the River Goyt, the upstream and downstream impacts of such a measure would also require consideration. This is likely to involve a Water Framework Directive Assessment and hydro-geomorphological analysis of the River Goyt in this area.

This site does not have direct access to a watercourse for discharge of surface water from a new development. It would therefore be necessary to give careful consideration to future surface water drainage given the constrained nature of the site.

4.6.5 Opportunities (to reduce flood risks and enhance the water environment)

The site is adjacent to existing properties and some of the measures discussed above to enable passing of the Exception Test would also reduce the flood risk exposure to these properties.

4.7 Central Area, Brittania Mill, Buxworth

4.7.1 Summary Statement

The site is to be considered for allocation for mixed use. In that the site is almost entirely within Flood Zone 1 allocation of this site for residential is supported by this review of flood risk. The series of Plans supporting this site can be found in Appendix G.

4.7.2 Identified Flood Risks and Constraints

This site is almost entirely within Flood Zone 1. However, Black Brook, which is a main river, forms part of the southern boundary of the site and there is a very small strip of associated Flood Zones 3. The steep topography of the majority of the site will present a constraint on development, but means that the Flood Zone 3 strip associated with Black Brook is generally narrower than the 8m bye law set off requirement. Therefore, fluvial flood risk is not a constraint on development at this site.

The EA surface water flood maps indicate one overland surface water flood route discharging from New Road into the site. Given that the site is located on land sloping steeply in a southerly direction down towards Black Brook, there is a risk that other potential overland flood routes will exist. It is quite likely, given the steeply sloping nature of the site, that the overland flows may be supplemented by emerging groundwater within the site itself.

The former mills in the site with associated mill ponds and goyts may introduce localised flood risk within the site.

The flood zones are shown on the plans in the appendices are based on the EA modelling information provided and the methodology adopted.

4.7.3 Exception Test Issues

Given that the developable part of the site is entirely within Flood Zone 1, there are no Exception Test issues at this site.

4.7.4 Additional Specification for Site Specific FRA

The FRA will need to take account of the potential overland flooding issues and the potential for former mill ponds and goyts to cause localised flooding problems.

4.7.5 Opportunities (to reduce flood risks and enhance the water environment)

This former industrial site alongside Black Brook offers a number of opportunities to enhance the watercourse and reduce flood risks within the area. The following potential opportunities are identified which might be considered in conjunction with re-development of part or this entire site:

(i) Parts of the site are covered by impermeable surfaces. It would be reasonable to require redevelopment to reduce peak surface water run-off rates from the present day baseline to a percentage to be agreed with the Local Planning Authority by the use of SUDS or underground attenuation.
(ii) The use of SUDS could also include measures to improve the quality of surface water discharging from the site.
(iii) Restoration of all or part of the Mill Pond at the eastern extremity of the site to provide some flood storage and ecological enhancement.
(iv) Localised removal of hard watercourse boundary treatments to improve ecological linkage along the watercourse, provide improved channel conveyance and some new flood storage areas.

4.8 Central Area, Bingswood, Whaley Bridge

4.8.1 Summary Statement

This site is being put forwards for allocation for mixed use and residential. The series of Plans supporting this site can be found in Appendix H.

A specific consideration is the possibility of a new bridge over the River Goyt providing access from the Tesco junction onto the A5004. The review of flood risk comparing EA modelled river levels with LIDAR data has established that the overwhelming majority of the site is within Flood Zone 1. This review has concluded that the flood risk at this site is rather less than that shown on the EA planning flood maps. Therefore allocation of the site for mixed use and residential purposes, adopting a sequential approach within the site, is not likely to be problematic.

4.8.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Goyt that is designated as a main river, which flows through the site.

The River Goyt runs through the site and has to a degree modified banks in order to prevent the development of significant lateral migrations of the channel which would be problematic to the existing development and associated services (such as the public sewer). In the northern extremity of the site, there is a significant area of Flood Zones 2 and 3 on the western side of the river and this area is not suitable for development.

Flood risk does not of itself pose a significant problem to construction of a new bridge across the River Goyt from the existing Tesco access to the A5004.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted. These indicate that the Flood Zone 2 area is all within the 8m set off strip from the main river edge and so flood zoning provides no greater constraint to re-development than does simple compliance with typical river bank set off criteria.

The published surface water flood maps indicate a potential overland flow route entering the site from the east. Any re-development needs to consider how this overland flow route can be safely conveyed through the site, possibly utilising future road layouts, into the River Goyt. Additionally the surface water flood maps show surface water generally accumulating the in the identified Flood Zone 2 and 3 areas.

It is noteworthy that a canal, at elevated locations relative to the bulk of the site, runs along the western and northern boundary. Canal bank failure could therefore result in flooding. However, the locations affected by this risk are the strip of land between the River Goyt and the canal and the northern area of the site which is within Floods 2 and 3 in any case.

4.8.3 Exception Test Issues

Given that the developable part of the site is entirely within Flood Zone 1, there are no Exception Test issues at this site.

4.8.4 Additional Specification for Site Specific FRA

The site specific FRA should consider how the overland flow route will be managed safely through the site.

The construction of a new bridge, although not unduly impacted by flood risk issues, will require detailed consideration in a supporting FRA and indeed within the 'Approval In Principle' Document (AIP) for the bridge. It is usual for the bridge soffit level to be set at 600mm above the 1 in 100 year level which may need to take account of a blockage under the bridge where the River Goyt passes under the canal.

Additionally, investigations will be required in respect of the risk of scour to any bridge abutments and foundations in proximity to the river.

4.8.5 Opportunities (to reduce flood risks and enhance the water environment)

An opportunity to provide some minor mitigation of downstream flood risk may be available through some local regarding of some of the flood zone 2 and 3 areas of the site at its northern extremity.

However, future surface water discharges from any development on the site should be restricted to present day run off values with allowances to climate change included in the developed scenario.

There are opportunities to provide ecological enhancement to the River Goyt corridor through the site.

4.9 Central Area, Furness Vale Industrial Estate

4.9.1 Summary Statement

This site is to be considered for allocation for mixed use and the review of flood risk supports such allocation. Whilst there are areas of Flood Zone 3 and 2 alongside the River Goyt the extent of the flood zones does not make further re-development of this site unviable. The series of Plans supporting this site can be found in Appendix I.

4.9.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Goyt, which is a main river, which flows along the northern boundary of the site.

The adjacent watercourses were a rich resource during the industrial revolution and as a result much of the site has been occupied by industrial buildings which harnessed the resource provided by the water. As a result the watercourse is now identified within the River Basin Management Plan as being heavily modified, being constrained by artificial walls, several bridges and several weirs. To the south of the site and Calico Lane is a former Mill Pond which continues to impound water. The Peak Forest Canal follows the contour of the valley and is elevated above the site towards the south west.

The walls alongside the watercourse have not been assessed in respect of their ability to withstand hydrostatic pressure. The maps provided in the Appendices assume that the walls will not provide any constraint to the incursion of floodwaters into the site. Where buildings are present within the more

accurately assessed flood footprint of the 1 in 100 year and 1 in 1000 year events, these are shown as hatched on the maps. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint which it would be practical to renovate. The Environment Agency has indicated that existing buildings in Flood Zone 2 and 3 areas could be renovated using flood resilient construction techniques as part of re-development of the site.

Adopting a Sequential Approach within the allocation more vulnerable uses, such as residential, should be located in the areas of lowest flood risk.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank. Renovation of existing buildings would not normally be subject to this restriction.

There are no surface water flood routes identified on the EA surface water flood maps entering the site. However, it is the case that account should be taken of high levels of run off entering the site from the elevated ground between the south west boundary of the site and the canal.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted. Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.9.3 Exception Test Issues

Whilst the parts of the site alongside the River Goyt have associated areas of Flood Zones 2 and 3 the vast majority of the site lies within Flood Zone 1. Adopting a sequential approach, there is a significant area of land within Flood Zone 1 which is sequentially preferential for all re-development and specifically for residential.

Nonetheless, development pressures may justify development of 'more vulnerable' and 'less vulnerable' development within the Flood Zone 2 areas. According to Table 3 of the NPPF TG, Exception Test evidence would not be required. It can be seen from the plans within the Appendices that the Flood Zone 3 area is a narrow strip alongside the River Goyt that widens out near the centre of the site boundary with the Goyt.

A substantial part of this Flood Zone 3 strip is occupied by existing buildings. If it is proposed to re-use, the existing buildings within the Flood Zone 3 strip, Exception Test issues could be addressed by setting new floor levels above the 1 in 100 year flood level with an appropriate freeboard to account for uncertainty and climate change (typically taken as 600mm). The layout of the development would need to ensure that 'dry'

(ie above the 1 in 100 year flood level) access/egress routes could be provided. In principle, this approach if supported by a site specific FRA, is deliverable.

4.9.4 Additional Specification for Site Specific FRA

The Level 2 SFRA has identified that based on the existing model of the River Goyt, most of the site is outside of Flood Zone 3.

However, any re-development proposals within the Flood Zone 3 areas (as shown on the published EA Planning maps) will require detailed modelling. This modelling will require supporting survey information in respect of the following:

(i) Additional channel survey data
(ii) Detailed site investigation to establish whether or not there are old culverts and mill goyts present on the site area under consideration which may or may not be operation in certain circumstances.
(iii) Survey of watercourse and building walls to establish ability of these to withstand the hydrostatic forces generated by the flood scenarios considered.
(iv) Proposals to renovate existing buildings that the model indicates would flood unless designed to exclude floodwater.

The above would provide a reliable baseline model which can then be used to test the development proposals to demonstrate that the proposals meet the requirements of the NPPF. Opportunities to provide some enhancement are set out below and should be considered at an early stage of redevelopment masterplanning.

4.9.5 Opportunities (to reduce flood risks and enhance the water environment)

An opportunity to provide some minor mitigation of downstream flood risk may be available through some local regrading of some of the Flood Zone 2 and 3 areas of the site and there are opportunities to provide ecological enhancement to the River Goyt corridor through the site.

Future surface water discharges from any development on the site should be restricted to present day run off values with allowances to climate change included in the developed scenario.

4.10 Torr Vale Mill, New Mills

4.10.1 Summary Statement

The site is to be considered for allocation as mixed use noting that redevelopment would require a heritage led regeneration proposal. The site comprises existing mill buildings located in the very steep sided valley of the Goyt in New Mills. The series of Plans supporting this site can be found in Appendix J.

In New Mills the Goyt is located in a gorge with exposed rock faces. The combination of weirs on the river, the steep sided valley with exposed rock and the industrial heritage make the location interesting and attractive. The new millennium walkway makes this interesting site accessible with good viewpoints.

The existing mill buildings have high vertical walls built up from the river bank, so the key consideration in terms of flood risk policy is establishment of an appropriate floor level for the vulnerability of the end users. Provided that appropriate setting of floor levels according to the vulnerability of users is adopted, the proposed allocation is viable from a flood risk perspective. Given the large vertical differential available within the existing mill buildings, this should not be problematic, although the renovations costs associated with working in this location may be considerable.

4.10.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Goyt, which is a main river, and formed the resource that led to the original construction of the mill. Both downstream and upstream of New Mills, the Goyt valley is less constrained with small flood plains.

The River Goyt was a rich resource during the industrial revolution and as a result much of the site has been occupied by now derelict industrial buildings which harnessed the resource provided by the water. The watercourse sides through the site have been modified, being constrained by artificial walls, several bridges and several weirs.

The walls alongside the watercourse have not been assessed in respect of their ability to withstand hydrostatic pressure or the long term scouring affect to the turbulent water of the Goyt. The weir alongside of the former mill directs a flow of water into the mill race which can be observed passing into the mill building and exiting through two outfalls on its downstream side. The size and condition of this mill race system has not been examined or assessed.

Flood depth maps have not been prepared for this site, as given the exaggerated vertical differential between the river bed and the mill building sides located in the gorge, such an exercise would be of little value. EA modelled data at the node adjacent to the mill indicates a 1 in 100 year flood level of 131.44 mAOD and a 1 in 1000 year level of 139.21 mAOD. This is an exceptionally large differential, and whilst a large differential would be expected in a narrow constrained valley, the level of differential in the quoted figures would appear to require refinement by more detailed modelling.

The Lidar data indicates an approximate level for the weir that activates the mill race as being at approximately 125.0 mAOD. There is a small 'building free' level area at the downstream side of the mill (the north west corner of the site) and the Lidar data indicates levels here are also approximately 125.0 mAOD.

Fig 4.10.1: Torr Vale Mill with upstream weir

Fig 4.10.2 Torr Vale Mill (Side View)

Based on the 1 in 100 year flood level, and some approximate assumptions about floor heights, it would seem reasonable to conclude, with reference to Fig 4.10.2, that the top 3 floors (and any other floors within the site that have an equal level or higher) will be above the 1 in 100 year flood level of 131.4 mAOD and would therefore be suitable for 'more vulnerable' (e.g residential and hotel accommodation) and 'less vulnerable' uses. Floors below these levels (131.4m AOD) would only be suitable for 'less vulnerable' uses.

As a general principle the Environment Agency indicates that existing buildings could be renovated using flood resilient construction techniques as part of re-development of the site.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank. However, renovation of existing buildings would not normally be subject to this restriction.

The EA surface water flood maps do not identify any significant overland surface water flows entering the site.

Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.10.3 Exception Test Issues

Formal identification of the footprint of Flood Zones 2 and 3 for this site, given the high level of vertical differential and the almost entire occupation of the plot by existing buildings, renders this a theoretical exercise rather than one that would allow meaningful application of planning guidance. That said, there is no doubt a strip of land that would arguably be classified as Flood Zone 3 and 2 alongside the River Goyt. However, this Flood Zone 3 strip is almost entirely occupied by existing buildings.

Given that re-development is to be within a heritage context, it is assumed that proposals will be to re-use the existing buildings within the Flood Zone 3 strip. Exception Test issues for such a proposal would be addressed by setting new floor levels above the 1 in 100 year flood level with an appropriate freeboard to account for uncertainty and climate change (typically taken as 600mm) as indicated above. Provision of 'dry' (ie above the 1 in 100 year flood level) access/egress routes would necessarily be provided given that the existing mill building links back to the elevated land on the steep valley side. In principle, the using the above methodologies, supported by a site specific FRA, would allow the Exception Test to be passed.

4.10.4 Additional Specification for Site Specific FRA

It is considered that, given the expense of renovating the existing building, and therefore, the need to maximise its commercial use, it will be necessary to more accurately determine the 1 in 100 year flood level, 1 in 100 year level plus 20% climate change and the 1 in 1000 year flood level through the site. Given the constrained nature of the watercourse through this site and both upstream and downstream, it is considered that this could be achieved by improving the current model by the addition of further surveyed river cross-sections, modelling in more detail the river for a further 200m upstream and downstream of the site.

Furthermore, any proposal involving the retention of the existing mill races (see below) will need to consider what impact on the structures would result during an extreme flood.

4.10.5 Opportunities (to reduce flood risks and enhance the water environment)

Given the constrained nature of the site and the fact that the former industrial uses of the mill and the associated river are now matters of significant heritage value, it is considered that removal of watercourse modifications at this site would generally not be appropriate.

Clearly, the weir may be capable of being harnessed for hydro-electricity as has taken place upstream. Furthermore, in line with policies to improve fish migration, the possibility of introducing a fish pass onto the weir is an enhancement that might be considered.

Future surface water discharges from any re-development of the site should be restricted to present day run off values with allowances to climate change included in the developed scenario. It is noted that given the constrained nature of the site, rigorous application of this policy may be difficult.

4.11 Central Area, Thornsett Industrial Estate

4.11.1 Summary Statement

Thornsett Industrial Estate is an existing Primary Employment Zone (PEZ). It is intended to extend this primary employment zone eastwards alongside the River Sett. The extension is on brownfield land that appears to have been previously used for industrial purposes. This review has also considered the continued designation of the existing Primary Employment Zone. The series of Plans supporting this site can be found in Appendix K.

The review has concluded that much of the existing PEZ is in Flood Zone 2 (according to the EA flood planning maps) and only a thin strip of Flood Zone 3 alongside the River Sett in the proposed PEZ extension. Allocation of the PEZ extension is appropriate in accordance with the NPPF and the associated TG and there is no requirement for the Exception Test to be demonstrated. As the land is brownfield, it is not functional flood plain (Flood Zone 3b).

However, a comparison of existing EA model data for both sites with ground levels derived from Lidar data combined with an absence of a significant history of flooding indicates that the EA model is producing unrealistically high flood levels. Given the uncertainty introduced by the current EA model data, any new planning application being brought forward on the PEZ extension should be supported by modelling of the River Sett to more accurately determine the 1 in 100 year flood level at the site. This would then enable any site specific flood plan measures required and allow due consideration of flood risk for the end users.

4.11.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Sett, which is designated as a main river, which flows along the southern boundary of the extension site and through and along the northern boundary of the existing Primary Employment Zone.

The River Sett was a rich resource supporting industry development. As a result much of the site has been occupied by industrial buildings which harnessed the resource provided by the water. As a result the watercourse is identified as being heavily modified, being constrained by artificial walls, several bridges, culverts and several weirs. Both to the south and north of the site former Mill Ponds are evident which continue to impound water which are likely to be connected to the River Sett by mill races and goyts. Exactly how these operate is not known.

Impounded Water on North Side of River Sett

Impounded Water on South Side of River Sett

The walls alongside the watercourse have not been assessed in respect of their ability to withstand hydrostatic pressure. Where buildings are present within the Flood Zone 2 and 3 footprints (based on the EA flood maps for planning purposes) these are shown as hatched on the maps. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint. The Environment Agency has indicated that generally existing buildings in Flood Zone 2 and 3 areas can be retained or renovated using flood resilient construction techniques as part of re-development of the site.

Flood depth maps have not been developed because the model information provided by the EA indicates unrealistically high flood levels relative to ground levels derived from Lidar data. The Lidar data is consistent with Ordnance Survey level data. Modelled flood levels of 160.80 mAOD (both 1 in 100 year and 1 in 1000 year) are stated for the node located near the centre of the existing Primary Employment Zone and 167.03 mAOD (1 in 100 year) and 167.58 mAOD (1 in 1000 year) at the node just upstream of the eastern extremity of the Extension Area. However, Lidar data indicates prevailing levels of 156.0 mAOD (plus or minus 1.0m) for most to the existing PEZ and 159.0 mAOD in the proposed PEZ extension. The resultant flood depths (typically 4m for the existing PEZ and 8m for the proposed PEZ extension) are not considered to be realistic for a 1 in 100 year event, given the lack of flooding history and consideration of the available valley width to accommodate a wide stream of flowing water.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank. Renovation of existing buildings would not normally be subject to this restriction.

The Lidar data and site inspection has identified that an overland flood route exists at the upstream mouth of the culvert where the River Sett turns in a northerly direction under Garrison Works. This flood route would direct any build up of water at the upstream mouth of the culvert westwards and onto the main access road into the PEZ. Whilst this potential flood route may be important for relieving any build up of water at the upstream mouth of the Garrison Works culvert, there is a risk that this flow of water could erode unprotected elements of the mill pond embankment to the south. The flood relief channel is becoming overgrown and has been compromised by some building construction.

Surface water flood routes are identified on the EA surface water flood maps entering the site. The largest of these represents a watercourse which drains into the site from the south near the eastern end of the existing PEZ. There are smaller surface water flood routes that draining into the PEZ extension from the north.

Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.11.3 Exception Test Issues

As the proposed uses of the site are classified as 'Less Vulnerable' in the NPPF TG Table 2, according to Table 3 of the NPPF TG, the Exception Test is not required.

4.11.4 Additional Specification for Site Specific FRA

This review has identified that there is a potential risk of flooding to both to the existing PEZ and the proposed PEZ extension. However, the proposed PEZ extension is on land that is significantly higher (159.0 mAOD) than much of the existing PEZ (156.0 mAOD plus or minus 1.0m). It is evident from the current model information that flood levels on the River Sett through the PEZ and its proposed extension are of insufficient accuracy for detailed consideration of flood risk.

A new planning application for an employment purpose on the proposed PEZ extension would need to be supported by an FRA that includes modelling of the River Sett upstream from the culvert in the existing PEZ to a reasonable point to be agreed with the EA upstream of the PEZ extension. The modelling should include the relief that would be provided to any flows that cannot pass through the downstream culverts by

a potential flood relief channel that can identified on site and on the Lidar data. Given the huge discrepancy between the existing modelled levels and the Lidar data, it seems likely that the flood modelling would need to be combined with a review of the hydrology of the River Sett.

In the event that the modelling shows that there is a significant flood risk at the application site, measures to manage the identified risk should be set out in the FRA.

4.11.5 Opportunities (to reduce flood risks and enhance the water environment)

This site through which the River Sett flows offers a number of opportunities to enhance the water environment and reduce flood risks to adjacent properties. The following potential opportunities are identified which might be considered in conjunction with re-development of parts or this entire site:

(i) Considerable portions of the site are covered by impermeable surfaces. It would be reasonable to require redevelopment to reduce peak surface water run-off rates from the present day baseline to a percentage to be agreed with the Local Planning Authority by the use of SUDS or underground attenuation.
(ii) The use of SUDS could also include measures to improve the quality of surface water discharging from the site.
(iii) Restoration of all or part of the Mill Ponds within the site to provide some flood storage and ecological enhancement.
(iv) Localised removal of hard watercourse boundary treatments and redundant bridges to improve ecological linkage along the watercourse, provide improved channel conveyance and some new flood storage areas.
(v) As and when opportunity arises, remove existing culverts and replace with open watercourses.
(vi) If the Garrison Works culvert is retained, consider how the existing flood relief channel could be maintained or improved whilst at the same time as minimising the risk of scour to the mill pond impoundment.

4.12 Central Area, Birch Vale Industrial Estate

4.12.1 Summary Statement

Birch Vale Industrial Estate is an existing Primary Employment Zone (PEZ). It is intended to introduce further development, including residential, into this PEZ that is located alongside the River Sett. The new

development is on brownfield land that appears to have been previously used for industrial purposes. The series of Plans supporting this site can be found in Appendix L.

The review has concluded that about 50% of the existing PEZ is in Flood Zones 3. The Flood Zone 1 areas are located at the western end of the site and along a strip of higher land along the southern border varying from 30m wide to 50m wide (at the eastern site boundary). Allocation of residential or other mixed use within the Flood Zone 1 area is appropriate in accordance with the NPPF and the associated TG and there is no requirement for the Exception Test to be demonstrated. New 'Less Vulnerable' infrastructure within the Flood Zone 3 areas, if sequentially preferred, would not require the Exception Test to be demonstrated, although in line with the NPPF, it would be necessary to demonstrate safety for the users. As the existing PEZ is brownfield, it is not functional flood plain (zone 3b). However, there is an area of wetland woodland, which, is to all intents and purposes functional flood plain, located alongside of the river and immediately downstream of the impounded water body at the north eastern corner of the site. This area of land has levels below the 167.0m AOD contour, as shown on the LIDAR maps.

A comparison of existing EA model data for the 1 in 100 year flood with site ground levels derived from LIDAR data has been undertaken. Model Data for the 1 in 1000 year event is not available. The 1 in 100 year data when plotted on the LIDAR data results in a wider flood zone 3 footprint than that shown on the EA flood maps for planning purposes. However an absence of a significant history of flooding indicates that the EA model of The River Sett may produce unrealistically high flood levels as the residential properties on Crescent Row (on the north bank of the River Sett) are shown as being subject to flood depths of around 1.0m and it would be expected that had such flood predictions been realised in practice there would be an established history of flooding. (See also Thornsett PEV review above).

Given the uncertainty associated with current EA model data, any new planning application being brought forward on land within the PEZ within the identified Flood Zone 3 areas of the site (as determined by the LIDAR river model comparison) should be supported by modelling of the River Sett to more accurately determine the 1 in 100 year flood levels. This would then enable any site specific flood plan measures required and allow due consideration of flood risk for the end users.

Such further analysis is not necessary for land within the Flood Zone 1 area (as determined by the LIDAR river model comparison).

4.12.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Sett, which is designated as a main river, which flows along the northern boundary of the PEZ.

The River Sett was a rich resource supporting industry development. As a result much of the site has been occupied by industrial buildings which harnessed the resource provided by the water. As a result the watercourse is identified as being heavily modified, being constrained by artificial walls. The road linking Thornsett and Birch Vale crosses the River Sett at the western and downstream end of the site. A consideration of the dimensions of the bridge arches with the upstream and downstream channels makes it clear that the bridge has a significantly lower capacity than the adjacent river channels. This could present a flood risk to parts of the site alongside of the river upstream of the bridge.

Upstream of the site there is a large Mill Pond that continues to impound water that is likely to be connected to the River Sett by mill races and goyts. Exactly how these operate is not known. Immediately downstream of the Mill Pond, is an area of wooded wetland, which is according to the LIDAR data below 167m AOD. This wooded wetland area is not suitable for development.

View of Birch Vale PEZ from Bridge over River Sett

Impounded Water on South Side of River Sett upstream of the Birch Vale PEZ

It should also be noted that the river model levels indicate that in an extreme event water could flood uncontrolled into the impounded water thereby exceeding the capacity of outlet structures. In extreme circumstances this could potentially threatening the integrity of the impoundment. As the crest of the impoundment is generally at approximately 169.0 mAOD, a breach would generally not threaten the land within Flood Zone 1 identified as appropriate for residential development. The size of the impounded water body (assumed in excess of 10,000m^3) would suggest that this will require assessment and management under amendments to the Reservoir Act introduced by the Flood and Water Management Act 2010.

The walls alongside the watercourse have not been assessed in respect of their ability to withstand hydrostatic pressure. Where buildings are present within the Flood Zone 3 footprints these are shown as hatched on the maps. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint. The Environment Agency has indicated that generally existing buildings in Flood Zone 2 and 3 areas can be retained or renovated using flood resilient construction techniques as part of further development within the site.

Flood depth maps have been developed based on the 1 in 100 year model information provided by the EA. However, the site inspection identified that residential properties adjacent to the road bridge on the north side of the River Sett are at greater risk of flooding from the River Sett than the PEV and since there is no

significant history of flooding of these properties and at the site, it would suggest that the model indicates unrealistically high flood levels on the River Sett.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank. Renovation of existing buildings would not normally be subject to this restriction.

The LIDAR data and site inspection has identified that an overland flood route exists at the western extremity of the site with water descending from the higher land to the south. Measures are in place to direct this flow away from existing buildings.

Surface water flood routes are identified on the EA surface water flood maps entering the site at its eastern end from the south.

Given that the site is 'brownfield' there are no areas that would be formally designated as Flood Zone 3b (functional flood plain). However, the area of wooded wetland, which is according to the LIDAR data below 167m AOD, immediately downstream of the Mill Pond, would appear to operate as flood plain.

4.12.3 Exception Test Issues

Allocation of residential or other mixed use within the Flood Zone 1 area is appropriate in accordance with the NPPF and the associated TG and there is no requirement for the Exception Test to be demonstrated. New 'Less Vulnerable' infrastructure within the Flood Zone 2 and 3 areas, if sequentially preferred, would not require the Exception Test to be demonstrated, although in line with the NPPF, it would be necessary to demonstrate safety for the users.

However, if it is proposed to locate residential development within the Flood Zone 3 area, as identified by the LIDAR river model comparison, and assuming the Sequential Test can be passed, it will be necessary to demonstrate that the Exception Test can also be passed. In undertaking the Exception Test for the Flood Zone 3 areas, it would be necessary to consider the breach risk in relation to the immediately adjacent upstream body of impounded water.

4.12.4 Additional Specification for Site Specific FRA

The Level 2 SFRA has identified that based on the existing model of the River Sett a significant part of the site is outside of Flood Zone 3. For development in these areas EA guidance on production of an FRA for a Flood Zone 1 site can be followed.

However, this review has also identified that there is a potential risk of flooding to those parts of the PEZ within the area designated as Flood Zone 3 (as determined by the LIDAR river model comparison). Therefore any new planning applications for proposals within this area should be supported by new modelling of the River Sett, that includes the bridge, to secure more reliable flood level data. Consideration should also be given as to how risks associated with a breach in the adjacent upstream impoundment can be managed.

As stated above, it seems likely that the river model data over-estimates fluvial flood risk at the site, but this needs to be demonstrated by new robust river modelling which may be combined with a review of the hydrology of the River Sett.

In the event that the modelling continues to show the development proposed as being within Flood Zone 3, and that there is therefore a significant flood risk to the proposals, measures to manage the identified risk should be set out in the FRA.

4.12.5 Opportunities (to reduce flood risks and enhance the water environment)

This site through which the River Sett flows offers a number of opportunities to enhance the water environment and reduce flood risks to adjacent properties. The following potential opportunities are identified which might be considered in conjunction with re-development of parts or this entire site:

(i) Considerable portions of the site are covered by impermeable surfaces. It would be reasonable to require redevelopment to reduce peak surface water run-off rates from the present day baseline to a percentage to be agreed with the Local Planning Authority by the use of SUDS or underground attenuation.
(ii) The use of SUDS could also include measures to improve the quality of surface water discharging from the site.
(iii) Localised removal of hard watercourse boundary treatments to improve ecological linkage along the watercourse, provide improved channel conveyance and some new flood storage areas.
(iv) Consideration could be given to enhancing and extending the area of wetland woodland immediately downstream of the Mill Pond at the western end of the site.
(v) The upstream mill pond appears to be at risk of uncontrolled inundation from the River Sett during an extreme event that could create a situation that would compromise the integrity of the impoundment potentially leading to a breach. The size of the impounded water body (assumed

in excess of 10,000m^3) would suggest that this will require assessment and management under amendments to the Reservoir Act introduced by the Flood and Water Management Act 2010.

4.13 Buxton Area, Station Road and Spring Gardens Regeneration Area (Northern Area)

4.13.1 Summary Statement

This site is part of the Station Road and Spring Gardens Regeneration Area. The review of flood risks has identified that the entirety of this site is in Flood Zone 1, and, therefore, from a flood risk perspective, is suitable for mixed use including residential. The series of Plans supporting this site can be found in Appendix M.

4.13.2 Identified Flood Risks and Constraints

The site is in an elevated position, much of it being a platform of land at a level of approximately 299.0 mAOD associated with former works and railway sidings.

EA surface water flood maps identify a surface water flood route along the retained railway line and a further route originating in the site and flowing eastwards.

Site inspection indicates that overland surface water flows could be expected on the strip of steeply sloping land to the north west of the retained railway line.

4.13.3 Exception Test Issues

Given the Flood Zone 1 designation of the site, the Exception Test is not relevant.

4.13.4 Additional Specification for Site Specific FRA

No additional guidance beyond that provided by the EA in FRA Guidance Note 1 is required other than to note that the FRA will need to address how overland flows from the retained railway and the elevated land to the north-west would be managed

4.13.5 Opportunities (to reduce flood risks and enhance the water environment)

Considerable portions of the site are covered by impermeable surfaces. It would be reasonable to require redevelopment to reduce peak surface water run-off rates from the present day baseline to a percentage to be agreed with the Local Planning Authority by the use of SUDS or underground attenuation. Such measures would reduce the likelihood of an overland surface water flow route being generated by the site (as is currently indicated on the EA surface water flood maps).

Infiltration may be a possible surface water drainage solution subject to confirmation of the suitability of the underlying deposits and confirmation that there are no contamination issues. The site is not in a Source Protection Zone, but given the rapidity of groundwater movements in the underlying limestone, direct discharge to underling rock would not be permissible.

The use of SUDS could also include measures to improve the quality of surface water discharging from the site.

4.14 Buxton Area, Station Road and Spring Gardens Regeneration Area (Southern Area)

4.14.1 Summary Statement

This site, which is already developed, is part of the Station Road and Spring Gardens Regeneration Area. It also forms the core of the central commercial area of Buxton Town centre, containing the Spring Gardens Shopping Centre. This site contains the natural valley of the River Wye (which is designated as a main river). The series of Plans supporting this site can be found in Appendix N.

The River Wye now runs in culvert through the upstream western section of this area, emerging briefly from culvert at two sections immediately to the east of the Spring Gardens Shopping Centre and between New Wye Street and Bridge Street.

The review of flood risks has identified that most of the site, which lies in the Wye Valley, is in Flood Zones 2 and 3, with only a relatively narrow strip of higher land on the northern boundary in Flood Zone 1. The EA have identified, that the flood zoning is on account of the incapacity of the culvert which would cause flood flows unable to enter the culvert at its upstream end (the eastern end of the Pavilion Gardens) to run down Spring Gardens.

However, as the site is already developed, and generally the intention is to retain retail and commercial uses which are categorised as 'Less Vulnerable' according to Table 2 of the NPPF TG, the Exception test is not an issue.

Although there is no history of recent major fluvial flooding, the risk clearly exists and as part of the regeneration options, reduction of this risk could be explored with the EA and DCC, in conjunction with measures to enhance, where possible, what remains of the former river corridor. Consideration should also be given to the introduction of ground floor flood resilience measures for new developments in the Flood Zone 2 and 3 areas.

4.14.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Wye, which is designated as a main river, and runs in a culvert from the eastern end of Pavillion Gardens, throughout the western end of the site to a point just to the east of the Spring Gardens Shopping Centre. It is culverted again for a substantial length under New Wye Street, re-emerges as open channel before entering culverts for its routing out of the site along Bridge St and Bakewell Road.

River Wye as it emerges from the Spring Gardens Shopping Centre Culvert

The River Wye is in the upper reaches of the Derbyshire Derwent river catchment division. Buxton, which is an elevated position in any case, is surrounded by higher land on almost every side, the River Wye running eastwards out of the town in a narrow valley. This location means that there is a convergence of watercourses having their origins on the surrounding high land which will drain rapidly into the town centre. This type of situation means that the River Wye and its tributaries are capable of producing very rapid responses to major rainfall events on the source catchments of the adjacent moors. The rapid response of this type of catchment means that flood warnings can give only very limited notice of a potential flood event. The steep gradients upstream also mean that these watercourses can have high sediment and debris loads which can result in rapid blockage of culverts, bridges and any other 'in channel' restrictions.

As noted above the Wye is at this location, in terms of the Water Framework Directive, heavily modified.

The EA have undertaken modelling of this section of watercourse and levels derived from the model grid have been compared with level information derived from Lidar to generate flood depth maps which are provided in the Appendices. These plans generally confirm the flood zoning as shown on the EA flood maps (for planning purposes) indicating that most of this site apart from a strip of higher land along the northern boundary with Station Road is in Flood Zones 2 and 3.

The flood risk is on account of the incapacity of the River Wye culverts to convey extreme event flows. This may be due to the culvert dimensions and gradients, but will also be severely exacerbated by the depth of sediment bed load and accumulations of debris. When the flow of water entering the culvert exceeds its capacity levels at the upstream entry will rise resulting in overtopping of river banks and a flow of water progressing downstream along Spring Gardens. In addition, any direct connections to the culvert will, if the culvert is operating under surcharge pressure, backwater with flood water emerging from gullies and manhole covers.

EA flood record maps, do not present evidence of recent major flooding in the town centre. The maps do record a small amount of recorded flooding in 1984 in the vicinity of New Wye Street and along the line of culvert over which the Spring Gardens Shopping Centre is now located.

This fluvial flood risk is exacerbated by potential surface water flooding, as given the significant extent of urbanised land around the town centre, exceedance water will under gravity flow towards the town centre. This potential source of flooding is identified on the EA Surface Water flood maps.

Currently the EA have no plans within the Flood Defence Grant in Aid programme to reduce the flood risk to this area, although the possibility of providing improved screening at the upstream entry to the Wye culvert has been considered in the past. Improved culvert entry screens would reduce the risk of flooding exacerbated by blockages due to uncontrolled entry of debris and sediment to the culvert.

The maps provided in the Appendices are based on the level data provided by the EA. Where buildings are present within the more accurately assessed flood footprint of the 1 in 100 year and 1 in 1000 year events, these are shown as hatched on the maps. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint which it would be practical to renovate. The Environment Agency has indicated that existing buildings could be renovated using flood resilient construction techniques as part of re-development within the site.

Adopting a Sequential Approach within the allocation all new development, and in particular more vulnerable uses, such as residential, should be located in the areas of lowest flood risk. The area of lowest risk is along the northern boundary of the site on the land this is currently used for car parking.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank, without express permission. Renovation of existing buildings in closer proximity to the watercourse would not normally be subject to this restriction.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted. Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.14.3 Exception Test Issues

Adopting a sequential approach, the strip of Flood Zone 1 land is sequentially preferential for all re-development and specifically for residential. However, progressively re-locating the focus of the main commercial area to the Flood Zone 1 land is not a viable option. However, adopting a Sequential Approach within the area all new development, and in particular more vulnerable uses, such as residential, should be located in the areas of lowest flood risk along the northern boundary of the site on the land this is currently used for car parking.

According to Table 3 of the NPPF TG, Exception Test evidence would not be required for 'Less vulnerable' development in Flood Zones 2 and 3.

If it is proposed to re-use, the existing buildings within the Flood Zone 3 area for 'more vulnerable' uses Exception Test issues could be addressed by restricting ground floor use to 'less vulnerable' usages and only permitting 'more vulnerable uses' at first floor level or by setting new floor levels above the 1 in 100 year flood level with an appropriate freeboard to account for uncertainty and climate change (typically taken as 600mm). However, given the interface with the existing footpaths and road levels, and consideration of disabled access provisions, this is unlikely to be possible without significant modification of the relationship between the footpath and roads in this area.

The layout of any development would need to consider how 'dry' (ie above the 1 in 100 year flood level) access/egress routes could be provided for 'more vulnerable' uses.

Either side of New Wye Street there is land available for development

4.14.4 Additional Specification for Site Specific FRA

The EA have a model of the River Wye in this location which provides data that would be suitable for incorporation into an FRA to cover applications for redevelopment of existing properties within this area.

However, for new development in the identified Flood Zone 2 and 3 areas, given the complexity of the flood issues in Buxton Town Centre, it would be advisable to support the FRA with modelling that takes account of the detail of both the upstream and downstream culverts and would need to provide sufficient

information to allow the depth and velocity of flooding to be assessed in both the pre-developed situation and subsequent to the implementation of the proposals.

In the event that an area wide study is to be implemented to support regeneration of the town centre, reduction of flood risk in the town centre and work towards some enhancement of the river corridor, then this would require detailed flood modelling supporting studies.

4.14.5 Opportunities (to reduce flood risks and enhance the water environment)

In that Buxton that has a history as a Spa town, with its origins based on the quality of its spring water, it is ironic that the aesthetic value of the town's river system has been lost within a network of culverts that convey waters through the town centre. As a result, within the town centre, there are only a few heavily modified sections of open channel remaining either side of New Wye Street. Given earlier development decisions reversal of this situation will be very difficult. The starting point would be to improve the remaining sections of open watercourse by setting back walls and shortening culverts where possible.

As indicated above there is an identified flood risk to the town centre and measures to reduce this risk, which could be coupled with some modest river enhancement measures as indicated above.

Previous work has identified that improved screens at the upstream entry to the culverts may be an option that could be supported by temporary containment and storage of flood water in Pavilion Park. This, however, would not deal with the identified surface water flood risk.

An alternative option would be to consider the gradual introduction of flood resilience measures, along with measures to increase awareness of the risk and identification (and creation of) dry access/egress routes.

The above would need to be informed by a detailed study of the existing fluvial and surface water flood risk and consideration of introduction of a scheme supported by Flood Defence Grant in Aid (in conjunction with the EA (main river aspects) and DCC (surface water flooding aspects) with contributions from a range of other sources which might be identified in conjunction with the wider regeneration strategy.

4.15 Buxton Area, Station Road and Spring Gardens Regeneration Area (Eastern Area)

4.15.1 Summary Statement

This site, which is already developed, is part of the Station Road and Spring Gardens Regeneration Area. The review of flood risks has identified that the majority of this site is in Flood Zone 1, and, therefore, from a flood risk perspective, is suitable for mixed use including residential. However, a small section of the site frontage to Bakewell Road and Bridge Street is in Flood Zone 2 and 3 due to fluvial flood risks from the River Wye. The series of Plans supporting this site can be found in Appendix O.

Hogshaw Brook (which is also designated as a main river) runs down the eastern side of the site and the EA indicate that this is provided with defences from which the site benefits.

4.15.2 Identified Flood Risks and Constraints

The primary flood risk to the site is on account of the River Wye, which is designated as a main river, and runs in a culvert within Bakewell Road and Bridge Street. The Wye enters this culvert when it reaches Bridge Street emerging from the culvert just to the east of the Bakewell Road/Fairfield Road junction as it flows into Ashwood Park. At the western end of Ashwood Park, the Wye is joined by Hogshaw Brook which runs along the eastern boundary of the site. The EA have provided information which indicates that there are defences on the Hogsahw Beck along the eastern boundary of the site.

EA model data, which takes account of defences, indicates that a strip of land within the site along its frontage to Bakewell Road and Bridge Street is vulnerable to flooding during a 1 in 100 year and 1 in 1000 year event. This flooding is possibly on account of inadequate culvert capacity of the culvert that conveys the Wye down Bridge St and Bakewell Road which would lead to water escaping from the upstream entry of the culvert and running downstream along the road to join the river again in Ashwood Park.

The River Wye is in the upper reaches of the Derbyshire Derwent river catchment division. Buxton, which is an elevated position in any case, is surrounded by higher land on almost every side, the River Wye running eastwards out of the town in a narrow valley. This location means that there is a convergence of watercourses having their origins on the surrounding high land which will drain rapidly into the town centre. This type of situation means that the River Wye and its tributaries are capable of producing very rapid responses to major rainfall events on the source catchments of the adjacent moors. The steep gradients

upstream also mean that these watercourses can have high sediment and debris loads which can result in rapid blockage of culverts, bridges and any other 'in channel' restrictions.

As noted above the Wye and Hogshaw Brook, are, in terms of the Water Framework Directive, heavily modified at this location.

The maps provided in the Appendices are based on the level data provided by the EA. Where buildings are present within the more accurately assessed flood footprint of the 1 in 100 year and 1 in 1000 year events, these are shown as hatched on the maps. The building footprints shown are indicative only and should be subject to further survey work to establish the precise footprint which it would be practical to renovate. The Environment Agency has indicated that existing buildings could be renovated using flood resilient construction techniques as part of re-development of the site.

Adopting a Sequential Approach within the allocation more vulnerable uses, such as residential, should be located in the areas of lowest flood risk.

In line with watercourse bye laws, it is generally not permissible to place new development within 8m of a watercourse bank, without express permission. Renovation of existing buildings would not normally be subject to this restriction.

Surface water flood routes are identified on the EA surface water flood maps (that generally correspond to the Flood Zones 2 and 3 areas (as identified on the EA flood map for planning). Reviewing the topography and road layout, it seems highly probable that exceeedance water will drain into this location from the sizeable surrounding urban areas. Such exceedance water will accumulate until such time as it can escape downstream into Ashwood Park.

The flood zones are shown on the plans in the appendices based on the information provided and the methodology adopted. Given that the site is 'brownfield' there are no areas that would be designated as Flood Zone 3b (functional flood plain).

4.15.3 Exception Test Issues

Whilst the parts of the site on the frontage of Bakewell Road and Bridge Street have areas of Flood Zones 2 and 3 associated with the Rive Wye culverts, the majority of the site lies within Flood Zone 1. Adopting a sequential approach, there is a significant area of land within Flood Zone 1 which is sequentially preferential for all re-development and specifically for residential.

Nonetheless, development pressures may justify development of 'more vulnerable' and 'less vulnerable' development within the Flood Zone 2 areas. According to Table 3 of the NPPF TG, Exception Test evidence would not be required in Flood Zone 2.

However, it can be seen from the plans within the Appendices that there is a narrow strip of Flood Zone 3 along the frontage of Bakewell Road and Bridge Street which is almost entirely occupied by existing buildings. If it is proposed to re-use, the existing buildings within the Flood Zone 3 strip, Exception Test issues could be addressed by restricting ground floor use to 'less vulnerable' usages and only permitting 'more vulnerable uses' at first floor level or by setting new floor levels above the 1 in 100 year flood level with an appropriate freeboard to account for uncertainty and climate change (typically taken as 600mm). However, given the interface with the existing footpath, and consideration of disabled access provisions, this is unlikely to be possible without significant modification of the relationship between the footpath and the road in this area.

The layout of the development for 'more vulnerable' uses would need to ensure that 'dry' (ie above the 1 in 100 year flood level) access/egress routes could be provided. In principle, this approach if supported by a site specific FRA, is deliverable.

4.15.4 Additional Specification for Site Specific FRA

The EA have a reasonable model of the River Wye in this location which provides data that would be suitable for incorporation into an FRA to cover application for most purposes on this site.

In the event that area enabling works are proposed, it would be advisable to consider this in conjunction with wider measures to reduce flood risks associated with both the River Wye and surface water flooding.

4.15.5 Opportunities (to reduce flood risks and enhance the water environment)

Whilst the site itself only has a boundary with Hogshaw Brook, it is possible that wider regeneration opportunities could be delivered in conjunction with measures to address flood risk issues more widely within the town centre.

An option that might be considered is to increase the capacity of the River Wye (any necessary culverts) between Bridge Street and Ashwood Park opening up as much of the river as possible. Increases in capacity are likely to reduce the flood risk alongside the river in both the central and eastern Spring Gardens

Regeneration Areas without causing significant downstream problems given the limited amount of riverside property immediately downstream.

Opening of the watercourse and setting back of training walls will increase the ecological and amenity value of the River Wye, which is currently a hindrance to redevelopment in the town centre rather than an asset to be enhanced and appreciated. It is recognised that constraints provided by the transport network (the road layout and the railway viaduct) coupled with the intensely urbanised nature of this location mean that an aspirational vision to enhance the river corridor whilst simultaneously reducing flood risk and releasing commercially attractive development opportunities would be challenging, it is nonetheless, an opportunity that merits consideration.

5.0

Appendices

Appendix A – Glossopdale: Woods Mill, Glossop

Appendix B – Glossopdale: Bank Street, Glosso

Appendix C – Glossopdale: Charlestown Works

Appendix D – Glossopdale: Adderley Place

Appendix E – Glossopdale: Waterside Hadfield

Appendix F – Central: Wharf Road, Whaley Bridge

Appendix G – Central Area: Brittania Mill, Buxworth

Appendix H – Central Area: Bingswood, Whaley Bridge

Appendix I – Central Area, Furness Vale Industrial Estate

Appendix J – Central Area: Torr Vale Mill, New Mills

Appendix K – Central Area: Thornsett Industrial Estate (PEZ)

Appendix L – Central Area: Birch Vale (PEZ)

Appendix M – Buxton Area, Station Road and Spring Gardens Regeneration Area (Northern Area)

Appendix N – Buxton Area: Station Rd and Spring Gardens Regeneration Area (Southern Area)

Appendix O – Buxton Area: Station Rd and Spring Gardens Regeneration Area (Southern Area)

APPENDIX P: Correspondence with (Flood) Risk Management Authorities

(i) Environment Agency

(ii) Derbyshire County Council

(iii) High Peak BC