Environment Agency

Calder Catchment Flood Management Plan

Summary Report December 2010

We are the Environment Agency. It's our job to look after your environment and make it a better place – for you, and for future generations.

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The Environment Agency. Out there, making your environment a better place.

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Introduction

I am pleased to introduce our summary of the Calder Catchment Flood Management Plan (CFMP). This CFMP gives an overview of the flood risk in the Calder catchment and sets out our preferred plan for sustainable flood risk management over the next 50 to 100 years.

The Calder CFMP is one of 77 CFMPs for England and Wales. Through the CFMPs, we have assessed inland flood risk across all of England and Wales for the first time. The CFMP considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding), which is covered by Shoreline Management Plans (SMPs). Our coverage of surface and ground water is however limited due to a lack of available information.

The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. This is essential if we are to make the right investment decisions for the future and to help prepare ourselves effectively for the impact of climate change. We will use CFMPs to help us target our limited resources where the risks are greatest.

This CFMP identifies flood risk management policies to assist all key decision makers in the catchment. It was produced through a wide consultation and appraisal process; however it is only the first step towards an integrated approach to Flood Risk Management. As we all work together to achieve our objectives, we must monitor and listen to each others progress, discuss what has been achieved and consider where we may need to review parts of the CFMP.

There is a long history of flooding within the Calder CFMP area. Flooding has been reported from rivers, canals, groundwater, surface water, mine water and sewers. Almost 21,000 properties have a one per cent chance of flooding each year if there were no defences in place.. Flooding from other sources such as groundwater, canals and mines, is not as closely monitored, mitigated or recorded, and so the risk posed from these sources is not fully evaluated.

We cannot reduce flood risk on our own, we will therefore work closely with all our partners to improve the co-ordination of flood risk activities and agree the most effective way to manage flood risk in the future. We have worked with others including Planning and Local Authorities, Yorkshire Water, British Waterways , Internal Drainage Boards (IDBs) and Natural England to develop this CFMP.

This is a summary of the main CFMP document, if you need to see the full document an electronic version can be obtained by emailing **necfmps@environment-agency.gov.uk** or alternatively paper copies can be viewed at our Yorkshire offices.

David Dangerfield
Yorkshire and North East Regional Director

Contents

The purpose of a CFMP in managing flood risk

CFMPs help us to understand the scale and extent of flooding now and in the future, and set policies for managing flood risk within the catchment. CFMPs should be used to inform planning and decision making by key stakeholders such as:

- the Environment Agency, who will use the plan to guide decisions on investment in further plans, projects or actions;
- regional planning bodies and local authorities who can use the plan to inform spatial planning activities and emergency planning;
- IDBs, water companies and other utilities to help plan their activities in the wider context of the catchment;
- transportation planners;
- landowners, farmers and land managers that manage and operate land for agriculture, conservation and amenity purposes;
- the public and businesses to enhance their understanding of flood risk and how it will be managed.

CFMPs aim to promote more sustainable approaches to managing flood risk. The policies identified in the CFMP will be delivered through a combination of different approaches. The following actions and their implementation will be subject to further appraisal and funding, and prioritised by their supporting evidence. The CFMP is a living document and actions will be updated as necessary to reflect changing responsibilities and delivery mechanisms.

Figure 1 shows the relationship between CFMPs, delivery plans, projects and actions

Note: Some plans may not be led by us – we may identify the need and encourage their development.

Catchment overview

The River Calder catchment covers just under 950 square kilometres. The River Calder flows for approximately 72 kilometres from its source, 400 metres above sea level at Heald Moor, near Todmorden to its confluence with the River Aire near Castleford. Nearly 770,000 people live within the CFMP area.

The headwaters of the catchment are characterised by swift-flowing upland streams which then flow through a series of former mill towns nestling in narrow valley bottoms. Below Wakefield, the River Calder follows through a gentle meandering course through a broad floodplain where it joins the River Aire. Within this low lying section of the River Calder, there is important agricultural land. The quality of the land rises to between Grade 2 and Grade 3 meaning the land quality is very good to moderate.

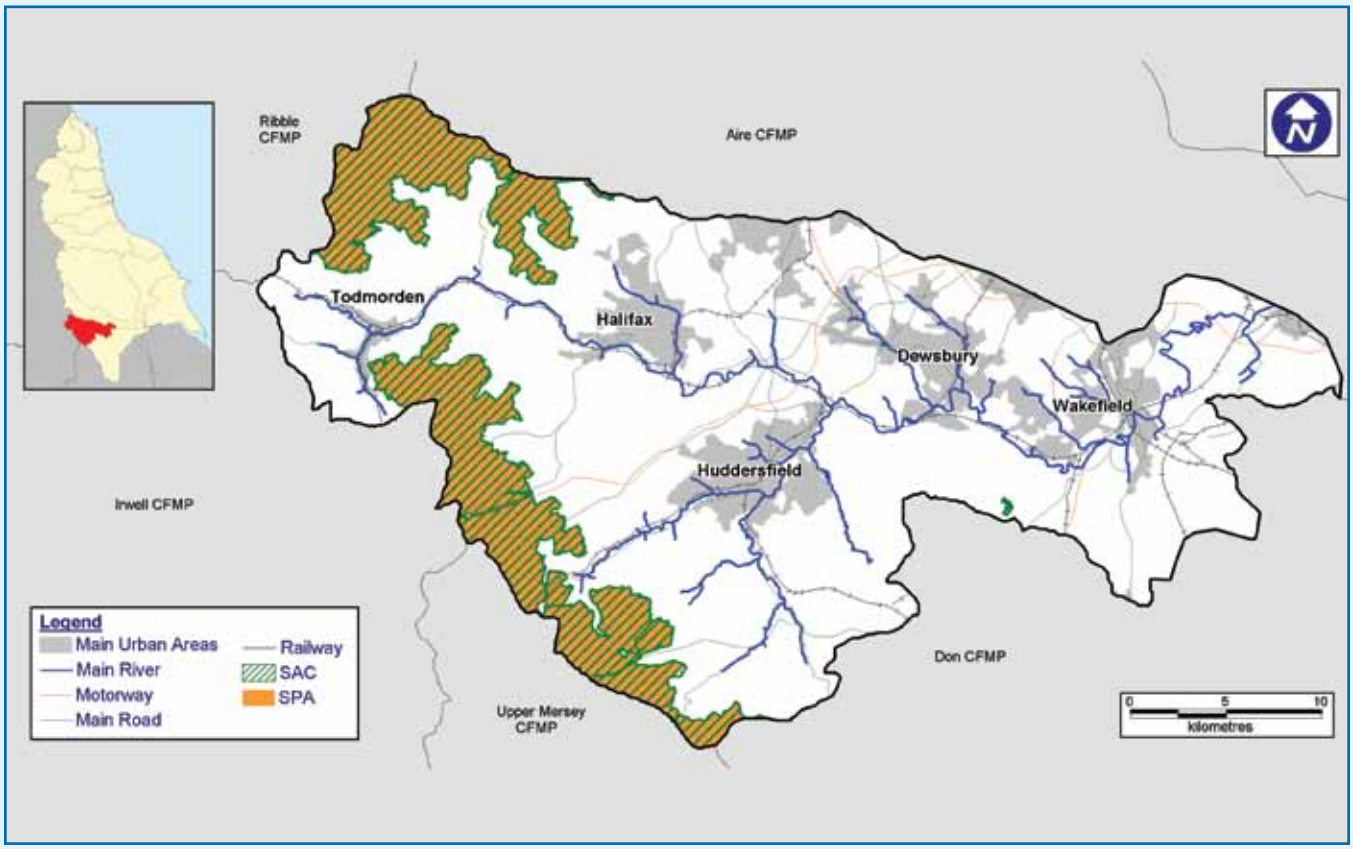
The Calder catchment is generally urbanised with the major concentrations of population within the city of Huddersfield and the towns of Dewsbury, Halifax, Todmorden and Wakefield. Because of this, the area contains many important transport routes and community assets such as hospitals, gas and electricity installations and emergency services.

The Calder catchment has a wealth of environmentally important sites. This includes part of the South Pennine Moors which includes two Special Protection Areas (SPA) and a Special Area for Conservation (SAC) designation. Additionally the Denby Grange Colliery Ponds SAC lies entirely within the Calder Catchment. There are also 11 Sites of Special Scientific Interest (SSSI) throughout the catchment. Many of the urban areas have an industrial past; this has left a legacy of historical sites including over 60 Scheduled Monuments and 10 registered parks and gardens.

Within the middle part of the catchment there are large urban areas. The upper reaches of the catchment are characterised by steep valley sides with development located within the restricted floodplain.

The Calder catchment is linked to the Sheffield and Leeds city region initiative. In the future there will be extensive economic growth targeted toward the area resulting in significant pressure for development and regeneration.

Map 1. The location and extent of the Calder CFMP area



River Calder flows through Wakefield

Current and future flood risk

Overview of the current flood risk

Flood risk has two components: the chance (probability) of a particular flood and the impact (or consequence) that the flood would have if it happened. The probability of a flood relates to the likelihood of a flood of that size occurring within a one year period, it is expressed as a percentage. For example, a one per cent flood has a one per cent chance or 0.01 probability of occurring in any one year.

The flood risks quoted in this report are the undefended one per cent flood figures. They are taken from broadscale mathematical models; they do not take into consideration the presence of defences and show the total risk of flooding within the catchment.

There has been a long history of flooding within the Calder CFMP area. The most damaging floods occurred in July 2007 when over 1,700 properties across the catchment flooded from surface water, sewers and rivers. And in June 2000 when over 700 properties flooded including properties in Todmorden and Hebdon Bridge from rivers and Marsden and Huddersfield from surface water.

Currently the main sources of flood risk for people, property, infrastructure and the land are:

- flooding from rivers, throughout the CFMP area, with concentration of risk in the urban communities of Hebden Bridge, Elland, Huddersfield, Dewsbury and Wakefield;
- surface water drainage and sewer flooding, which have been recorded in Mirfield, Wakefield, Todmorden, Hebden Bridge and in the Colne catchment.

What is at risk?

Within the Calder catchment there are just under 21,000 properties at risk from a one per cent flood, without taking into account current flood defences. There are approximately 52 kilometres of flood defences that reduce the probability of flooding throughout the catchment including at Todmorden, Copley, Brighouse and Wakefield.

There are also over 300 properties at significant risk of surface water flooding.

There are parts of two SPA, one SAC and three SSSI sites within the floodplain. However, less than one per cent of these sites lie in the one per cent flood outline. Therefore the impact of flooding on these sites is small as flooding will have little impact on the overall status of the sites.

Where is the risk?

Flood risk is spread throughout the Calder CFMP area. Table 1 below outlines some of the key communities with over 100 properties at risk of flooding, not taking into consideration defences. The areas with highest risk include Todmorden, Huddersfield and Wakefield.

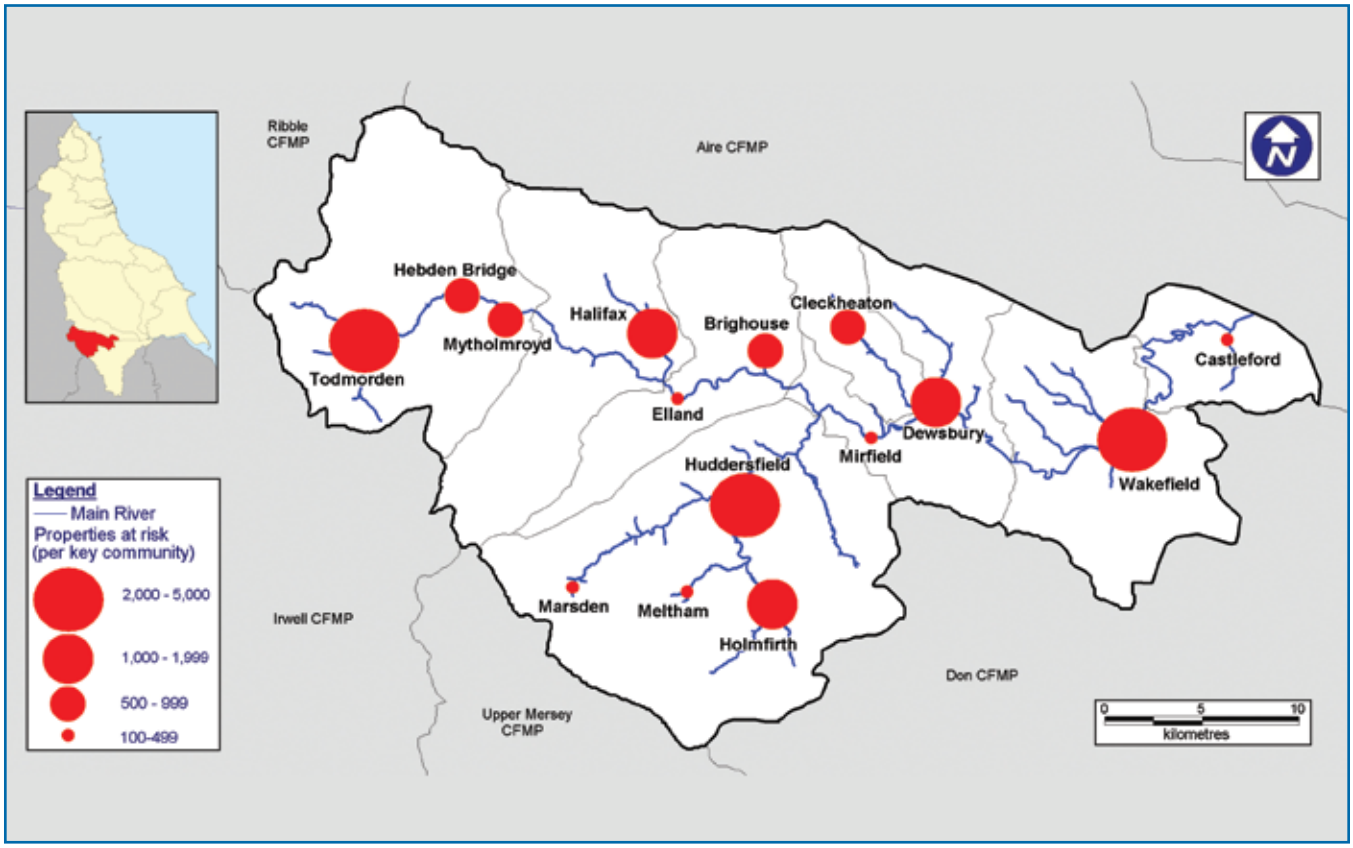
Table1. Locations of towns and villages with 100 or more properties at risk in a one per cent annual probability river flood if there were no defences in place

Number of properties at risk	Locations
2,000 to 5,000	Todmorden, Huddersfield, Wakefield
1,000 to 2,000	Halifax, Elland, Holmfirth/Honley, Dewsbury
500 to 1,000	Hebden Bridge, Mytholmroyd, Brighouse, Cleckheaton/Liversedge
100 to 500	Marsden,Meltham, Mirfield, Castleford

Table 2. Critical infrastructure at risk:

180 gas and electricity assets
22 educational facilities
37 health facilities
16 wastewater treatment works
5 emergency services

Map 2. Properties at risk of flooding in the Calder catchment



How we currently manage flood risk in the catchment

The catchment has a long history of flooding which has resulted in a number of engineering schemes being implemented to reduce the risk of flooding such as those in Todmorden. Our current flood risk management is focussed on those areas where risk is highest. Within the Calder catchment there are currently 246 defences which include just under 52 kilometres of raised defences. These defences offer various standards of protection but generally range from a 0.33 per cent to a 0.2 per cent standard.

In addition activities are carried out to reduce the probability of flooding.

- maintaining the above defences, including regular inspection to ensure condition is maintained;
- maintaining over 260 kilometres of river channels including removal of blockages likely to increase flood risk;
- working with local authorities to influence the location and layout of development, ensuring that inappropriate development is not allowed in the floodplain through the application of Planning Policy Statement 25: Development and Flood Risk (PPS25).

Further activities are carried out which reduce the consequences of flooding in the catchment including:

- understanding where flooding is likely by flood risk mapping including detailed modelling of the rivers and recording major flooding in the catchment;
- providing flood warnings via 95 separate flood warnings covering over 17500 properties across the Calder CFMP area;
- promoting awareness of flooding to organisations and members of the public so they are prepared in case they need to take action at times of flooding;
- promote resilience and resistance measures for those properties already in the floodplain.

The impact of climate change and future flood risk

The effect that flooding will have in the future is influenced by a range of issues such as climate change, changes in land use (e.g. development), and changes in how land is managed.

Within the Calder Catchment we carried out a catchment sensitivity analysis to a number of future flood risk drivers. These included:

Slowing runoff by large scale changes to agricultural practices;

- increased urbanisation;
- impact of climate change.

Of these circumstances the changes in agricultural land management had the potential to decrease flows by up to 25 per cent indicating that the catchment was sensitive to land management change. However, to gain this scale of benefit changes across the whole catchment would be required which is unfeasible.

The catchment was not sensitive to increased urban development as the total area of urban development is small compared to the total catchment area. The implementation of PPS25 reduced development within flood risk areas and controls the drainage from new development.

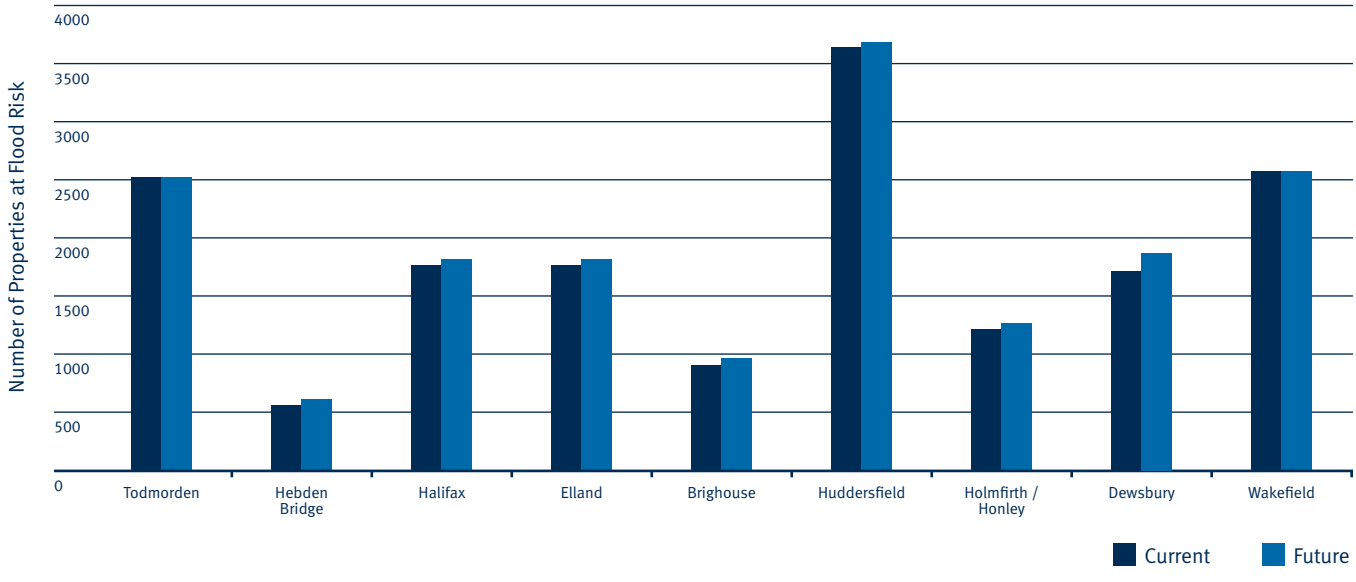
The Calder catchment is most sensitive to the impacts of climate change. The key predictions for the impact of climate change are:

- more frequent and intense storms causing more widespread and regular flooding from drainage systems and some rivers;
- increased winter rainfall increasing the likelihood of large-scale flood events.

In total the properties at risk of flooding rises from 20,904 currently to 21,864 in the future. This indicates that there will be limited increases in flood extent within the catchment and that the major changes in flood risk will be increased frequency of flooding and increased depth and speed of flood water flows in the existing at risk communities.

The increased intensity of rainfall will increase the occurrence of surface water and sewer flooding as existing drainage networks will be stretched to cope with the additional volumes of water

Figure 2. Current and future (2100) flood risk to property from a one per cent annual probability river flood, not taking into account current flood defences.



Future direction for flood risk management

Approaches in each sub-area

Flood risk is not the same in all of the catchment. We have divided the Calder catchment into eight sub areas which have similar physical characteristics, sources of flooding and level of risk. We have identified the most appropriate approach to managing flood risk for each of the sub-areas and allocated one of six generic flood risk management policies, shown in Table 3.

To select the most appropriate policy, the plan has considered how social, economic and environmental objectives are affected by flood risk management activities under each policy option.

In the following sections we outline the approach in each sub area by highlighting:

- key issues and messages for each sub area;
- our policy and vision for future management;
- key actions to deliver the policy.

Map 3. Catchment sub areas

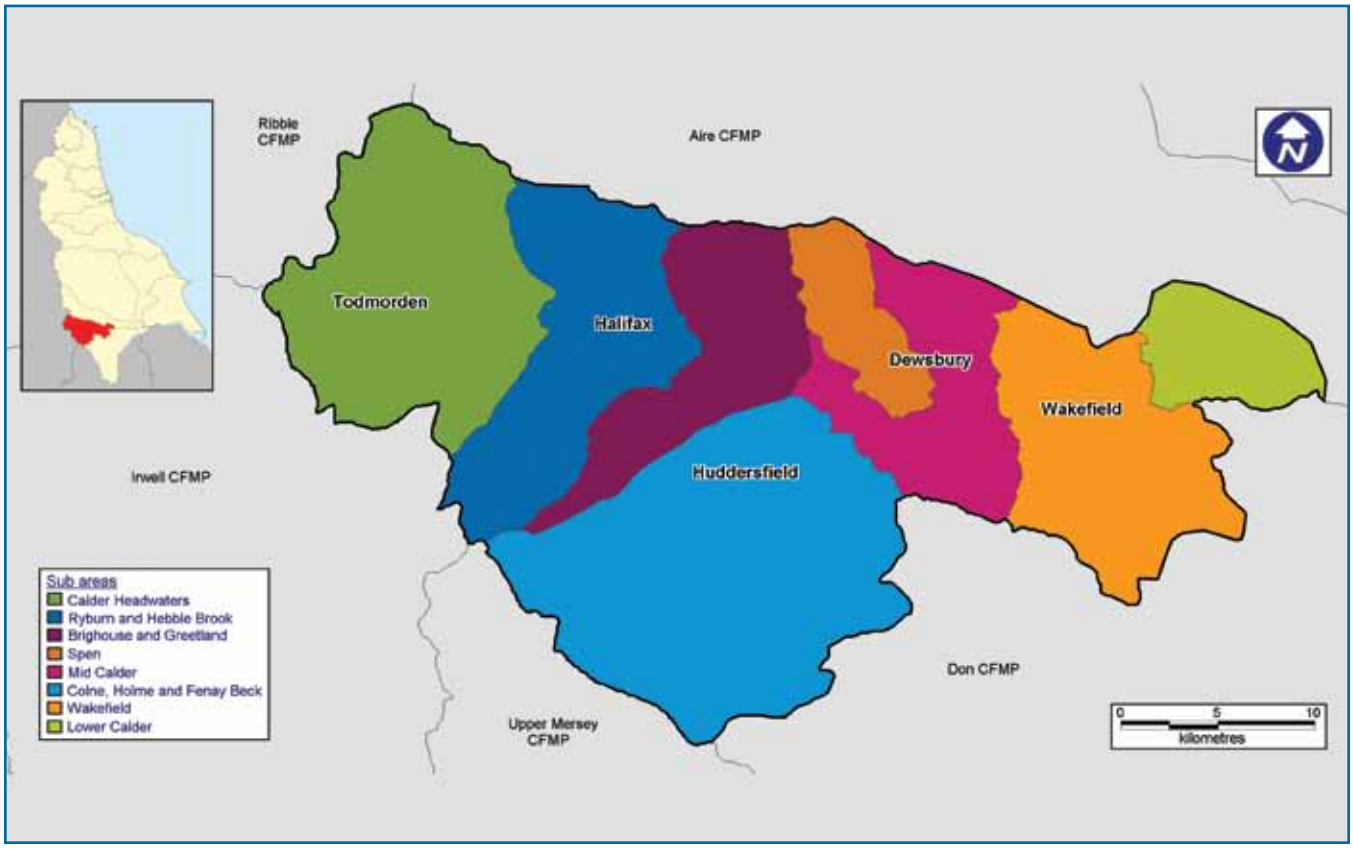


Table 3 Policy options

➜ Policy 1

Areas of little or no flood risk where we will continue to monitor and advise

This policy will tend to be applied in those areas where there are very few properties at risk of flooding. It reflects a commitment to work with the natural flood processes as far as possible.

➜ Policy 2

Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions

This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk.

➜ Policy 3

Areas of low to moderate flood risk where we are generally managing existing flood risk effectively

This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.

➜ Policy 4

Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change

This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

➜ Policy 5

Areas of moderate to high flood risk where we can generally take further action to reduce flood risk

This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

➜ Policy 6

Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits

This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists), but would only be implemented in specific locations within the area, after more detailed appraisal and consultation.

Sub-area 1

Calder Headwaters

Our key partners are:

Natural England

Local Authorities

Land Owners

British Waterways

Yorkshire Water

The issues in this sub-area

The River Calder, Hebden Water and Walsden Water cause river flooding. Flooding also comes from surface water and the Rochdale Canal. There are currently just under 3,800 properties at risk of river flooding during the one per cent flood, if undefended. Climate change will increase the risk of river flooding to just over 3880 properties. The risk of flooding from surface water and the Rochdale Canal will also increase.

The vision and policy

Proposed **Policy Option 5**. Our vision for the sub area is that we will continue developing a working in partnership approach to reduce the risk of flooding. Responsibility for flood risk management assets is shared between ourselves, the local authority and third parties. To ensure flood risk management is sustainable we need an integrated approach to managing risk. Of particular importance to this vision is the ability to improve the condition and function of the upland environment to reduce runoff and the high frequency of local floods. By developing this approach, we will contribute to wider economic, social and environmental benefits by working with partner organisations to maximise the range of benefits that can be achieved. The area and its character will become a safer location through greater appreciation of flood risk and the application of sustainable development and regeneration.

The key messages

- We will work in partnership to reduce the risk of flooding from all sources.
- The characteristics of the catchment mean that runoff rates are high and flooding can happen quickly. This gives little time to warn people. We need therefore to focus on resilience measures that are not dependent upon the actions of people at risk. flooding.
- Some communities are susceptible to rapid flooding from thunderstorms. Emergency response and flood awareness are particularly important.

Actions to implement the policy

- Produce a system asset management plan to determine the most sustainable approach to managing assets.
- Develop feasibility studies for flood alleviation schemes to reduce risk.
- Identify the implications of changing the flood regime on the South Pennine Moor SAC, SPA and SSSI.
- Ensure that emergency flood response plans are reviewed.
- Develop a role for a Sustainable Land Management Officer to promote sustainable land management practices.
- Investigate the interaction between Rochdale Canal, River Calder and Walsden Water.
- Produce and maintain a register of all culverts and outfalls.
- Increase the number of properties registered on our Floodline Warnings Direct service.
- Provide information to property owners and businesses on improving flood resilience and proofing.
- Carry out a washland optimisation study.

Sub-area 2

Ryburn and Hebble Brook

Our key partners are:

Local Authorities

Internal Drainage Boards

Yorkshire Water

Property owners and developers

The issues in this sub-area

This sub area covers a narrow strip of the Calder catchment and the uplands of the River Ryburn and Hebble Brook. This sub area stretches from Mytholmroyd to the confluence of the River Ryburn and River Calder in Halifax. Flooding comes from the River Calder, Hebble Brook and the River Ryburn and also from sewers, culverts and urban drainage infrastructure. The sub area responds rapidly to Pennine rainfall. There are currently 2,200 properties at risk of river flooding from the one per cent flood assuming no defences. However existing defences provide some protection within the sub area which reduces this risk. Climate change will increase the undefended risk of river flooding to 2249 properties. More flooding will also occur from sewers, culverts and urban drainage infrastructure due to the increase in rainfall intensity predicted under climate change.

The vision and policy

Under **Policy Option 4** our vision for the Ryburn and Hebble Brook sub area is that flood risk management will be increased to ensure that the implications of climate change will not result in further risk to people and property. This will ensure that communities within the sub area remain sustainable through the maintenance of flood defence assets, flood warning and response procedures.

A multi-agency approach to managing flood risk will ensure that further development will reduce the risk of flooding through the use of sustainable urban drainage techniques, developer contributions and robust implementation of PPS25.

The key messages

- Climate change is expected to increase the risk of flooding from all sources. Flood risk from urban sources, including surface water and drainage incapacity, are likely to increase over time.
- The location, layout and design of developments, are important factors in managing future flood risk. Regeneration and re-development of some areas offer an opportunity to reduce flood risk; for example re-establishing river corridors and more effective management of runoff.

Actions to implement the policy

- Produce and implement a system asset management plan to determine the best approach to sustaining the current level of flood risk.
- Ensure that emergency response plans are reviewed.
- Promote the use of SuDs for the management of runoff, as per the recommendations of PPS25.
- Carry out a flood warning feasibility study to address the potential to extend our flood warning service coverage for Hebble Brook.
- Increase the number of properties registered on our Floodline Warnings Direct service.
- Produce and maintain a register of all culverts and outfalls within the sub-area.

Sub-area 3

Brighouse and Greetland

Our key partners are:

- Local Authorities
- Property Owners
- English Heritage
- British Waterways
- Yorkshire Water

The issues in this sub-area

This sub area covers a narrow corridor of the Calder catchment from downstream of Copley to Clifton Wood. The main watercourses and sources of flooding are the River Calder, Red Beck and Clifton Beck. In the headwaters of the Red Beck lies Cupworth Reservoir. Flooding also comes from sewers, culverts and urban drainage infrastructure. Currently there are 1,329 properties at risk during the one per cent flood assuming no defences. However, all but 82 of these currently benefit from defences. In the future the undefended risk increases to 1,380 properties, 679 of these will benefit from current defences leaving 701 properties at risk with defences in place. Five areas of Brighouse have been identified as at risk of river flooding. Of particular concern is Armtage industrial estate where sandbagging to sections of defences is required.

The vision and policy

Under **Policy Option 4** our vision for the Brighouse and Greetland sub area is that flood risk management will be increased to ensure that the implications of climate change will not result in further risk to people and property. This will ensure that communities within the area remain sustainable through the maintenance of flood defence assets, flood warning and response procedures.

A multi-agency approach to managing flood risk will ensure that further development or regeneration will reduce the risk of flooding from all sources through the use of sustainable urban drainage techniques, developer contributions and robust implementation of PPS25.

The key messages

- A long term delivery plan for asset management is required. It should assess the existing assets and their role in delivering the flood risk management policy and approach throughout the sub area. This will enable us to plan for the most effective standard of protection to be maintained. This will be a major tool to inform partners, planning decisions and developers.
- The location, layout and design of development, are important factors in managing future flood risk so that past mistakes are not repeated. Regeneration and re-development of some areas offer an opportunity to reduce flood risk; for example re-establishing river corridors and more effective management of runoff.

Actions to implement the policy

- Produce a system asset management plan to determine the best approach to sustaining the current level of flood risk.
- Ensure emergency response plans are reviewed regularly.
- With the owners of the caravan parks at Brighouse, ensure that residual risks of flooding are understood. Ensure that public awareness is raised through the installation of information boards and emergency evacuation plans are in place.
- Undertaking a surface water management plan for Brighouse.
- With English Heritage, identify flood risk and establish a management plan for Shibden Hall.
- Investigate the interaction between the Calder and Hebble Navigation and the River Calder and the risk of canal flooding.
- Produce and maintain a register of all culverts and outfalls and identify capacity and other issues.
- Investigate the implications of climate change scenarios on flood embankments at Armtage industrial estate in Brighouse.
- Improve public awareness of the risk of flooding from all sources.

↑ There are 1329 properties at risk in the Brighouse and Greetland sub area

Spen

Our key partners are:

Local Authorities

Yorkshire Water

The issues in this sub-area

This sub area covers the River Spen sub-catchment from its headwaters, north of Cleckheaton, to its confluence with the River Calder at Ravensthorpe. There are little changes in flow along the River Spen with significant areas of floodplain being developed. As well as this the river responds rapidly to localised rainfull, which averages around 600-1,000 millimetres per year, this is due to the river generally flowing through a relatively steep confined river channel.

During a one per cent probability flood from rivers, there are currently 2,577 properties at risk taking into account the defences. Under climate change scenarios the number of properties at risk is expected to increase to 1,620.

The vision and policy

Under **Policy Option 5** our vision for the sub-area is that we will develop a working in partnership approach to reduce the risk of flooding. Responsibility for flood risk management assets within the sub area is shared between ourselves and third parties. To ensure flood risk management is sustainable we need an integrated approach to managing risk. Of particular importance is the need to further understand the risk from all sources of flooding so that a management strategy can be developed for the sub area. This strategy will consider a number of elements including the potential for new raised defences, flood warning, increased awareness and improvements to drainage infrastructure. A new scheme in the area is being developed and should be completed by 2013. By developing this approach the area and its character will become a safer location through greater appreciation of flood risk and the application of sustainable development and regeneration.

The key messages

- Climate change is expected to increase the risk of flooding from all sources. Flood risk from other sources, including surface water are likely to increase over time.
- We need to review our management of the watercourses and structural assets to ensure that these are contributing towards delivering this approach. In some cases we may be able to develop further schemes to reduce the risk of flooding however, we need to work together to develop an approach that reduces the risk of flooding from all sources.

Actions to implement the policy

- Produce and implement a system asset management plan to determine the most sustainable approach to managing assets.
- Ensure that the emergency response plans are reviewed.
- Develop a flood risk strategy for the River Spen. This should consider all sources of flooding to develop the most sustainable approach to managing flood risk.
- Produce and maintain a register of all culverts and outfalls and identify capacity and other issues.
- Improve public awareness of the risk of flooding from all sources.

↑ The River Spen

Sub-area 5

Mid Calder

Our key partners are:

Local Authorities

Network Rail

Highways Agency

Yorkshire Electricity Distribution PLC

Yorkshire Water

The issues in this sub-area

This sub area covers the mid section of the River Calder from Clifton Woods to Horbury. There are a number of watercourses, including the River Calder, Batley Beck and Chickenley Beck. The Calder and Hebble Navigation is present through the southern part of the area, running parallel to the River Calder. The sub area is generally urbanised with the main communities including Mirfield, Dewsbury and Batley.

Flooding comes from the River Calder, Batley Beck and Chickenley Beck and also from surface water and sewers. There are 2,452 properties at risk of river flooding assuming no defences. As a result of climate change the risk of river flooding to properties will increase to 2667. Currently the flood defences in the sub-area reduce the number of properties at risk to 128. Without improvements and with the effects of climate change 855 properties will be at risk in the future.

The vision and policy

Under **Policy Option 4** our vision for this sub-area is that flood risk management will be increased to ensure that the implications of climate change will not result in further risk to people and property. This will ensure that communities within the sub area will remain sustainable through the maintenance of flood defence assets and the improved application of urban design principles (including PPS25 recommendations), flood warning and response procedures. The risk of flooding comes from a number of sources and the current approach to managing flood risk is shared between organisations. As this is the case, we believe that a joint approach to managing these multiple sources is required. This will ensure that our understanding of the risk flooding poses to communities within this sub-area is fully understood. Our approach to managing this risk will be risk based and co-ordinated.

The key messages

- We want rivers to be part of the urban landscape. At present they are often culverted and hidden away. Previous modifications to these watercourses now cause some flooding.
- Redevelopment and regeneration offer a crucial opportunity to reduce flood risk. We want resilient buildings; and more flood compatible site layout's following redevelopment.
- Master planning, PPS25, strategic flood risk assessments and the right policies in local plans provide the tools to achieve this.

Actions to implement the policy

- Produce and implement a system asset management plan to determine the best approach to sustaining the current level of flood risk.
- Ensure that all emergency response plans are reviewed.
- Determine the risk of flooding to the transport network. Where possible ensure that key routes remain operational during flood events. Following the identification of flood risk to these facilities, ensure alternative routes and emergency plans are developed and reviewed.
- Determine the risk of flooding to gas and electricity assets. Where possible ensure that the site remains operational during flood events.
- Determine the risk of flooding to healthcare facilities. Where possible ensure that the site remains operational during flood events.
- Produce and maintain a register of all culverts and outfalls and identify capacity and other issues.
- Improve public awareness of the risk of flooding from all sources.
- Increase the number of properties registered to receive our Floodline Warnings Direct service.

↑ Aerial photo of Dewsbury

Sub-area 6

Colne, Holme and Fenay Beck

Our key partners are:

Local Authority

British Waterways

Yorkshire Water

Natural England

landowners

The issues in this sub-area

This sub area covers the Colne, Holme and Fenay Beck sub-catchments. The headwaters of the Colne and Holme start in the South Pennine Moors and contain a number of reservoirs. Here both rivers are confined to narrow river valleys. The River Colne travels through Marsden and Slaithwaite before joining the River Holme at Huddersfield. The River Holme passes through Holmfirth and Brockholes.

Flooding comes from the rivers mentioned and also from sewers, surface water and Huddersfield Broad Canal. There are currently 5,278 properties at risk of flooding during the one per cent undefended flood and this will rise to 5,355 in the future. There are currently 3.86km of raised man-made defences within the sub-area. Climate change will also increase the risk of flooding from sewers, culvert blockages, surface water and Huddersfield Broad Canal.

The vision and policy

Through **Policy Option 5** our vision for the sub area is that we develop a partnership approach to reduce the risk of flooding from all sources. Responsibility for flood risk management is shared between ourselves and third parties. To ensure management is sustainable we need an integrated approach and must explore multiple approaches to managing risk through the development of a management strategy. Of particular importance is the ability to improve the condition and function of the upland environment to reduce runoff rates and the frequency of local floods. By developing this approach, we will contribute to wider economic, social and environmental benefits, working with partner organisations to maximise the range of benefits that can be achieved. The area and its character will become a safer location through greater appreciation of flood risk and the application of sustainable development and regeneration.

The key messages

- We need to review our management of the watercourses and structural assets to ensure that these are contributing towards delivering this approach. In some cases we may be able to develop further schemes to reduce the risk of flooding. We need to work together to develop an approach that reduces the risk of flooding from all sources.
- Generally the existing river corridors provide an opportunity to adapt to the impacts of climate change and we are seeking to safeguard them from inappropriate development.
- We want the rivers to be part of the urban landscape– at present they are often culverted and hidden away. Previous modifications to these watercourses now cause some flooding. We want to learn from previous decisions.

Actions to implement the policy

- Produce and implement a system asset management plan to determine the most sustainable approach to managing assets.
- Ensure that all flood response plans are reviewed.
- In accordance with the Reservoir Act 1975, produce a reservoir flood plan.
- Develop a flood risk management strategy for the Colne, Holme and Fenay Beck.
- Investigate the interaction between Huddersfield Broad Canal and the River Colne and identify the risk of canal flooding.
- Develop a role for a Sustainable Land Management Officer to promote sustainable land management.
- Determine in greater detail the risk of flooding to gas and electricity assets and the consequences of flooding.
- Determine the risk of flooding to healthcare and educational facilities and the consequences of flooding.
- Produce a register of culverts and outfalls to identify capacity and other issues.
- Increase the number of properties registered to receive our Floodline Warnings Direct service.

↑ Huddersfield Broad Canal runs through this sub area

Sub-area 7

Wakefield

Our key partners are:

Local Authorities

British Waterways

Natural England

Individual land owners

Yorkshire Water

The issues in this sub-area

The main watercourse is the River Calder, with a large number of smaller becks draining into the Calder, including Ings Beck. The area starts at Horbury and finishes at Wakefield. Communities include Wakefield, Ossett, Horbury and Crofton.

Flooding comes from the River Calder, Ings Beck, sewers, surface water, urban drainage infrastructure and groundwater. In total, there are 3,041 properties at risk of flooding during a one per cent flood assuming no defences. Future flood risk is expected to be 3,035 properties. There are currently 9.3km of raised man-made defences within the Wakefield sub-area. Climate change will also increase the frequency of flooding.

The vision and policy

With **Policy Option 5** our vision is that we will develop a working in partnership approach to reduce the risk of flooding. Responsibility for flood risk management is shared between ourselves and third parties. We will explore multiple approaches to managing risk. We need to understand the risk of flooding from all sources so that flood risk is managed effectively. This will incorporate a number of elements including new raised man-made defences in Wakefield (phase 3), Ings Beck and Oakenshaw Beck, increased awareness and improvements to drainage infrastructure. By taking this approach the area will become a safer location through greater appreciation of flood risk and sustainable development and regeneration.

The key messages

- The potential for mixed source flooding means that we need to work together to reduce the risk of flooding from all sources.
- Redevelopment and regeneration offer opportunities to reduce flood risk such as re-creating undeveloped river corridors. Policies need to be in place in local plans to ensure that all opportunities to set back development from watercourses are taken and that the use of water compatible and innovative open space is encouraged.

Actions to implement the policy

- Produce and implement a system asset management plan.
- Implement Phase 3 of the Wakefield flood alleviation scheme.
- Ensure that emergency response plans are reviewed.
- Investigate the interaction between the Leeds and Liverpool Canal and the River Calder to identify the risk of canal flooding.
- Undertake a surface water management plan.
- Determine in detail the risk of flooding to gas and electricity assets and the consequences of loss of the site during flooding.
- Develop a role of Sustainable Land Management Officer to promote sustainable agricultural land management.
- Produce a register of culverts and outfalls and identify capacity and other issues.
- Develop a detailed scheme design for both Horbury and Horbury Junction.
- Increase the number of properties registered to receive Floodline Warnings Direct service.

Sub-area 8

Lower Calder

Our key partners are:

Local Authorities

Network Rail

Highways Agency

Natural England

Individual landowners, farmers and developers

The issues in this sub-area

The sub area contains a large stretch of the River Calder from east of Wakefield to Methley Junction, as well as the Waindyke-Sewerbridge watercourse which helps to drain Normanton into the Calder. The main source of flooding is the River Calder and Waindyke-Sewerbridge Beck, although flooding can also occur from mine water and subsidence as well as local sewers.

Currently there are 290 properties at risk during the one per cent undefended flood which could rise to 314 in the future. However, there are a large number of flood storage areas within the Lower Calder sub area. These help reduce the risk of flooding to properties within the immediate area but also to those in the Lower Aire.

The vision and policy

Utilising **Policy Option 6** our vision for the sub-area is that washlands and floodplain will work more efficiently to reduce the risk of flooding. We will work with others to provide flood storage areas and recreational facilities for communities within the sub area and beyond including those in the River Aire CFMP. The area will become a key example of how flood risk and development can co-exist in order to sustain the economic stability of communities whilst minimising the risk to life.

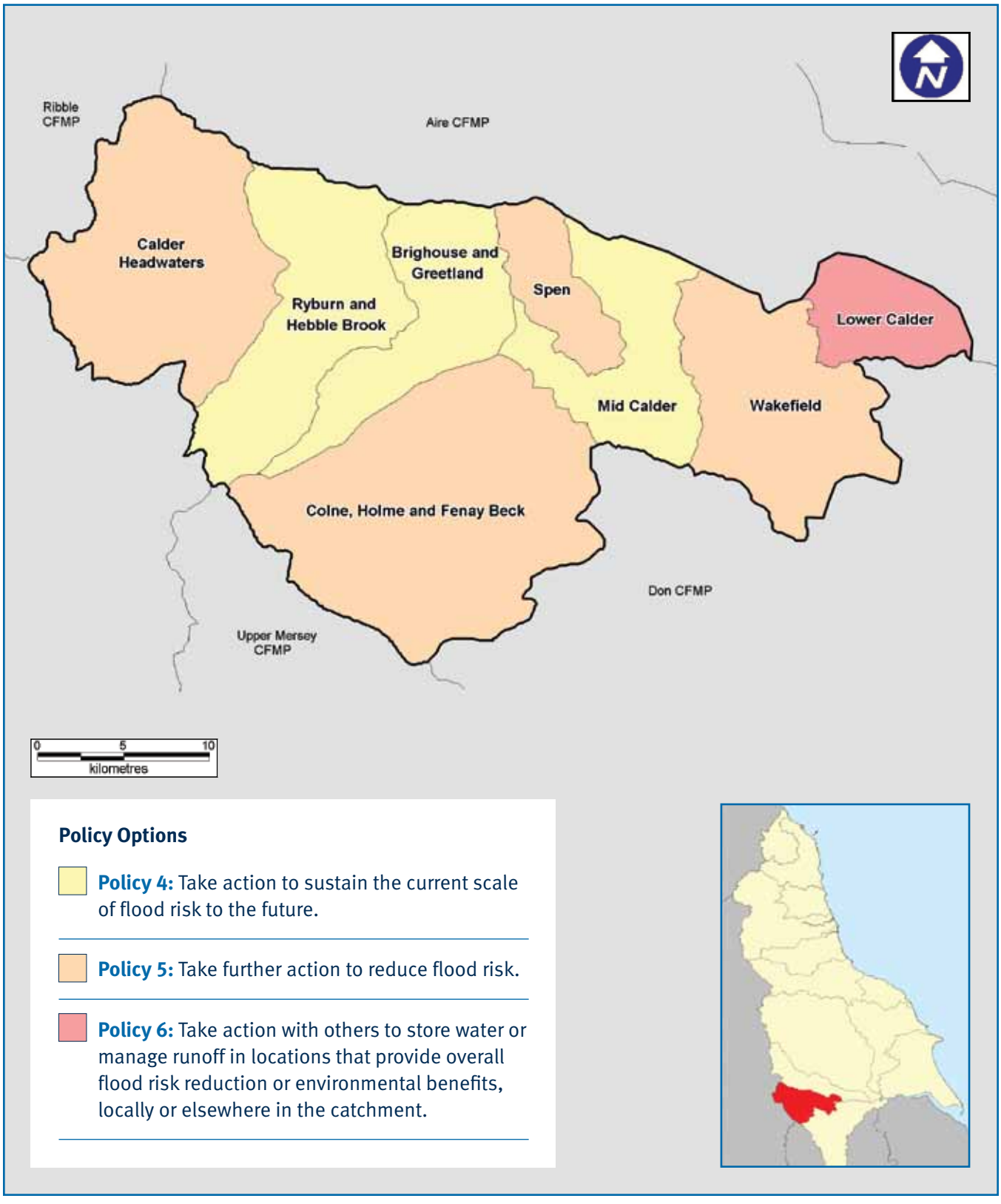
The key messages

- For the storage of water to reduce the probability of flooding to people and property, we need to ensure that our current flood storage areas are effectively managed. We are currently reviewing the role of washlands on the Lower Aire and we need to ensure that the contribution of the River Calder to this heavily modified system is fully understood.
- The actions of individuals will play an increasingly important role in this area. Our expenditure will be focused on our washland system so we need to ensure that flood resilience is incorporated into all new builds. And where possible flood awareness is improved.

Actions to implement the policy

- Produce a system asset management plan to determine the requirements for maintaining current infrastructure and channel structure.
- Ensure the integration of policies and actions between this sub area and the River Aire.
- Provide information and advice to property owners and businesses on improving flood resilience and proofing.
- Improve public awareness of the risk of flooding from all sources.
- Determine the risk of flooding to the transport network and the consequences of closures during flooding. Where possible ensure that key routes remain operational during flood events. Where not possible, ensure alternative routes and emergency plans are developed.
- Develop a role for a Sustainable Land Management Officer to promote sustainable land management.
- Carry out a washland optimisation study to identify future maintenance requirements and identify the optimum level of storage to reduce the risk of flooding.

Map of CFMP policies



Policy Options

Policy 4: Take action to sustain the current scale of flood risk to the future.

Policy 5: Take further action to reduce flood risk.

Policy 6: Take action with others to store water or manage runoff in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

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