Environment Agency

Ribble Catchment Flood Management Plan

Summary Report December 2009

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Introduction

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

The Ribble 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, groundwater, 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 groundwater is however limited due to a lack of available information.

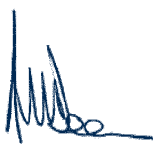
The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. This is essential if we are to make the right investment decisions for the future and to help prepare ourselves effectively for the impact of climate change. We will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

In the Ribble catchment the main sources of flood risk are from rivers, surface water flooding, and sewer flooding from the drainage system. The lower reaches of the catchment at locations such as Lytham St Annes and parts of Preston are also at risk of tidal flooding. We estimate 6400 properties in the catchment have a 1% annual probability of flooding from rivers or a 0.5% annual probability of flooding from the tide. We estimate that by 2100 approximately 12,400 properties will be at risk of flooding (fluvial and tidal). This is a 94% increase compared to the current number of properties at fluvial flood risk across the catchment.

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 management flood risk in the future. To develop this plan and ensure social, economic and environmental issues were taken into account we worked with, and consulted many organisations. These include local authorities, Lancashire and North Yorkshire County Councils, Defra, United Utilities, Natural England and English Heritage.

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 **enquiries@environment-agency.gov.uk** or alternatively paper copies can be viewed at any of our offices in North West Region.



Tony Dean
Regional Director

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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.
- Internal Drainage Board, water companies and other utilities to help plan their activities in the wider context of the catchment.
- Transportation planners.
- Landowners, farmers and land managers who 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. Together with our partners, we will implement these approaches through a range of delivery plans, projects and actions.

The relationship between the CFMP, delivery plans, strategies, projects and actions is shown in figure 1.

Figure 1 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 Ribble CFMP area is made up of the catchments of the River Ribble, along with its major tributaries which include the Hodder, Calder, and Darwen, together with the streams draining the Fylde Peninsula. The catchment contains extensive areas of rural land containing numerous villages, together with some major urban areas including Burnley, Blackburn, Preston, and South Blackpool. There are also areas of high quality agricultural land, particularly in the west of the CFMP area, where there is a history of agricultural drainage.

Whilst the majority of the lower catchment is flat low-lying river floodplain, elevated areas are present in the West Pennine Moors near to the urban settlements of East Lancashire, as well as in the Bowland Fell area. This leads to faster responses to rainfall in those parts, whereas the lower lying areas tend to have a slower and more gradual response time to rainfall.

The key urban areas within the catchment lie in the industrialised areas of East Lancashire adjacent to the River Calder and Darwen, such as Burnley, Nelson and Blackburn; and also in the lower reaches of the River Ribble at Preston and Walton-le-Dale. There are also numerous dispersed villages in the upper catchment, with some larger towns such as Settle, Clitheroe and Ribchester located in the middle to upper catchment. The industrial legacy of the Ribble catchment is evident in areas of East Lancashire where industrial buildings such as mills and factories were built over rivers, creating numerous culverted watercourses.

Approximately 6,400 properties across the catchment have a 1% chance of flooding from rivers or a 0.5% chance of flooding from the tide in any one year. Around 70% of these properties are in the urban areas of East Lancashire and Preston. Our approach to management in these high risk locations is focused around sustainable re-development, flood warning, resilience, making space for water either locally or upstream, and the improvement or installation of flood defences where they are economically justifiable and environmentally acceptable.

The CFMP area is important for nature conservation. A number of nationally and internationally protected sites are within the CFMP area. These range from the Bowland Fell Special Protection Area (SPA) and Long Preston Site of Special Scientific Interest (SSSI) in the upper catchment, to the Ribble Estuary SPA where the Ribble enters the Irish Sea. Depending on the location and nature of the designation, flooding can have a mixture of effects, although within the Ribble catchment these effects are expected to be beneficial.

↑ River Calder at Burnley

Map 1 Location Of The Ribble CFMP Area

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 1% flood has a 1% chance or probability of occurring in any one year, and a 0.5% flood has a 0.5% chance or probability of occurring in any one year. The numbers of people at risk of flooding quoted in this report do not take account of flood defences already in place.

The Ribble catchment has a history of flooding; 40 significant events having been recorded since 1600. The most significant was in 1866 when flooding occurred on the Ribble, Calder and the Darwen, when newspapers recorded widespread flooding of businesses and properties. More recently in 1995, 38 properties were flooded in Preston, Walton le Dale and Ribchester and a similar event in 2000 also flooded Padiham, Barrowford and Blackburn affecting 33 properties. In 2002 the Calder and Darwen flooded affecting 18 residential and 40 commercial properties around Blackburn and Burnley.

The main sources of flooding in the Ribble catchment are:

- River flooding mainly affects Preston, Ribchester and Walton-le-Dale from the Ribble. The urban areas of East Lancashire are mainly affected by the Calder and Darwen. There is useful attenuation capacity on the Ribble due to floodplain near Long Preston and further down the Ribble Valley. This is largely responsible for the delay in peak flows further downstream. Elsewhere in the catchment there are limited amounts of floodplain that can attenuate the flows. There are a number of locations in the catchment where local restrictions in the flow such as a culvert or bridge may contribute to flooding.
- Tidal flooding is caused by storm surge and wave action in times of high astronomical tides. The three main urban areas influenced by direct tidal flooding are Lytham St Annes, Preston (Penwortham) and Walton-le-Dale. The rivers in the catchment are tidally influenced as far as Brockhole Bridge on the Ribble and High Walton Bridge on the Darwen. Immediately upstream of these points storm surges, waves and tides have the potential to increase flooding caused by rainfall by preventing inland fluvial rivers from draining freely (Tidelocking). Liggard Brook, Dow Brook and Savick Brook are affected in this way. Tidal flooding and coastal processes will be assessed in the next Shoreline Management Plan (SMP) expected in 2010.
- Surface water flooding is caused by water collecting or flowing over the surface before soaking into the ground or entering a watercourse. This type of flooding can occur throughout the catchment. Our consultation showed that some of the urban areas of Blackpool and Preston have high surface water flood risk as does Clitheroe, Whalley and Higher Walton.
- Sewer flooding is usually caused by an inadequate sewer capacity or blockages within the network. Isolated sewer flooding affects various locations across the catchment to some extent, but Blackpool and Blackburn-Oswaldtwistle experience a higher incidence of internal sewer flooding problems. United Utilities have undertaken work to improve and maintain public sewers in this area.
- Even though the Ribble CFMP area contains areas of permeable bedrock at or near the land surface and some underlying aquifers, (both major and minor in terms of water resources) groundwater flooding is not seen as a major issue in the area. Any groundwater rebound, associated with the end of historical water pumping, is thought to be negligible.

What is at risk?

Using a broad-scale model and flood maps we estimate 6,400 properties across the catchment have a 1% chance of flooding from rivers or a 0.5% chance of flooding from the tide in any one year. There are 10 SSSIs, 1 SPA, 2 national nature reserves and 10 scheduled ancient monuments within the 1% annual probability flood event some of which could be adversely affected by flooding.

Where is the risk?

The main flood risk to people, communities and businesses, in terms of disruption and proportion of the community affected, are located in the urban areas of Preston and Walton-le-Dale, and the urban towns of East Lancashire. Parts of the Ribble catchment (for example, Northern and Eastern areas) are quite steep and most flooding is directly from rivers which can be fast flowing and pose a risk to life. The number of properties at risk and the cost of damage in the built up areas is much larger than in the rest of the catchment, but there are rural properties at flood risk. The flow modelling used in the creation of the CFMP indicates that Barrowford, Ribchester, Burnley and Higher Walton could experience flood depths of in excess of 1m for the 1% annual exceedance probability (AEP) fluvial flood event. The map overleaf illustrates where the properties are at risk of flooding in a 1% annual probability event.

Table 1. Locations of Towns and Villages with 100 or more properties at risk in a 1% annual probability river flood

Number of properties at risk	Locations
>1000	Lytham St. Annes, Preston, Burnley
500-1000	Blackpool, Clitheroe, Nelson
100-500	Settle, Blackburn, Darwen, Accrington, Oswaltwistle

Table 2. Critical infrastructure at risk:

In addition to properties being at risk of flooding, a range of infrastructure is also at risk within the catchment in a 1% flood event. This includes three water treatment works, 19 sewage treatment works, 23 schools, 16 health care facilities, and four community centres.

↑ River Ribble, Preston

Map 2 Risk to property across catchment for the 1% and 0.1% annual probability fluvial events

How we currently manage the risk in the catchment

The Ribble catchment has benefited from engineering schemes put in place over the last 50 years or more. These include:

- The recent construction of the Lomeshaye and Walton le Dale Flood Alleviation Schemes that now provide protection for a 1.3% annual probability event.
- Construction of the Highgate Park Flood Basin and Defences in Fulwood, Preston.

In addition to these engineering schemes, other flood risk management activities are carried out in the catchment. These include activities that help to reduce the probability of flooding, and activities that address the consequences of flooding.

Activities that reduce the probability of flooding include:

- Maintaining and improving existing flood defences, structures and watercourses. The catchment has over 85 km of raised defences, with more than 50% of these maintained by the Environment Agency.

- Enforcement and maintenance where riparian owners and others carry out unconsented work or neglect duties which could increase flood risk.
- Building on the recommendations of previous Environment Agency flood risk strategies, such as those covering Burnley, Nelson and Colne, and the Darwen area, to manage flood risk more effectively.
- Working with local authorities to influence the location, layout and design of new and redeveloped property to ensure that only appropriate development is allowed on the floodplain through the application of Planning Policy Statement 25 (PPS25).

Activities that reduce the consequences of flooding include:

- Flood risk mapping, understanding where flooding is likely to occur.
- Operation of Floodline and Flood Warning Services to 19 areas in the Ribble Catchment.
- Providing flood incident management.
- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are prepared in case they need to take action in time of flood.
- Promoting resilience and resistance measures for those properties already in the floodplain.

The impact of climate change and future flood risk

In the future, flooding will be influenced by climate change, changes in land use (for example urban development), and rural land management. In the Ribble catchment, sensitivity testing revealed that climate change has the greatest impact on flood risk, with land management change having a significant effect in the upper catchment from large scale change and urbanisation having a very small effect. Whilst we do not know exactly what will happen in the future the key trends are:

- More frequent and intense storms causing more widespread flooding from drainage systems and some rivers.
- Wetter winters increasing the likelihood of large-scale flooding.

The future scenarios used in the Ribble CFMP were:

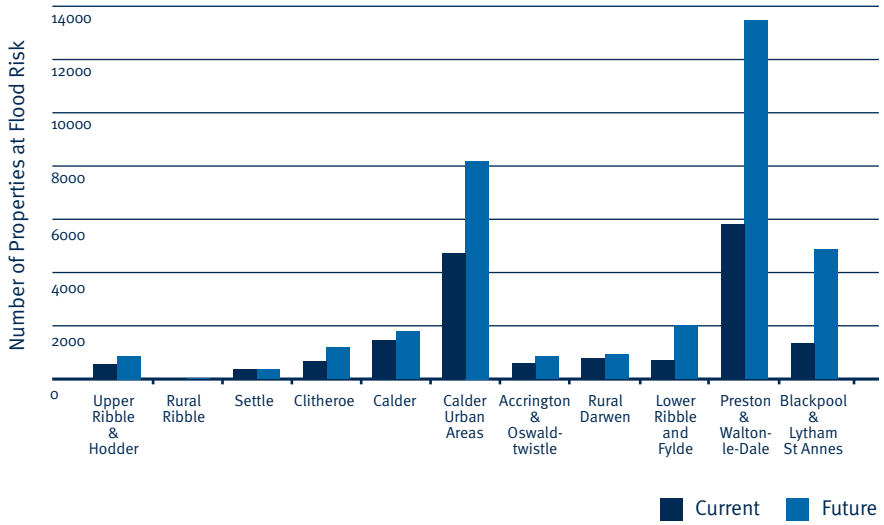
- A 20% increase in peak flow in all watercourses. The predicted increase in flow can affect the frequency, timing, scale of flooding and the flood levels.
- A total sea level rise of 841 mm by the year 2100.
- Increased urbanisation (up to 10%).

We estimate that by 2100 approximately 12,400 properties will be at risk of flooding (fluvial and tidal). This is a 94% increase compared to the current number of properties at flood risk across the catchment. Flood depth is expected to increase by 0.3m in Burnley, Colne, and Walton-le-Dale; by 0.2m in Preston, Blackburn, and Nelson; and 0.1m in Darwen; by 2100.

No additional environmental or heritage sites are in the future 1% annual probability flood extent but the flood depth and extent of flooding is expected to increase slightly.

Figure 2 shows the difference between current and future flood risk for a 1% annual probability event at key areas in the catchment.

Figure 2 Current and future (2100) flood risk to property from a 1% annual probability river flood, taking into account current flood defences.



Future direction for flood risk management

Approaches in each sub-area

We have divided the Ribble CFMP area into ten distinct sub-areas that have similar physical characteristics, sources of flooding, and levels of risk. These sub areas will allow us and key stakeholders to promote flood risk management approaches, policies and actions that are most appropriate in that area to deliver the various Government and regional strategies, in particular "Making Space for Water". In the face of increasing risk, it often is not sustainable to keep building and raising defences. This is why we have to look catchment-wide at how we direct effort and resources to ensure sustainable solutions. We have assessed what will be the most sustainable approach to managing flood risk in each sub area. This is presented in the following sections and they outline:

- The key issues in that area.
- The vision and preferred policy.
- The proposed actions to implement the policy.

This document does set out our policies for managing flood risk, recognising the constraints that do exist. Our future direction for managing flood risk is expressed by applying one of our six standard policy options to that sub area. 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. The six policy options are explained on page 11.

Map 3 Sub-areas

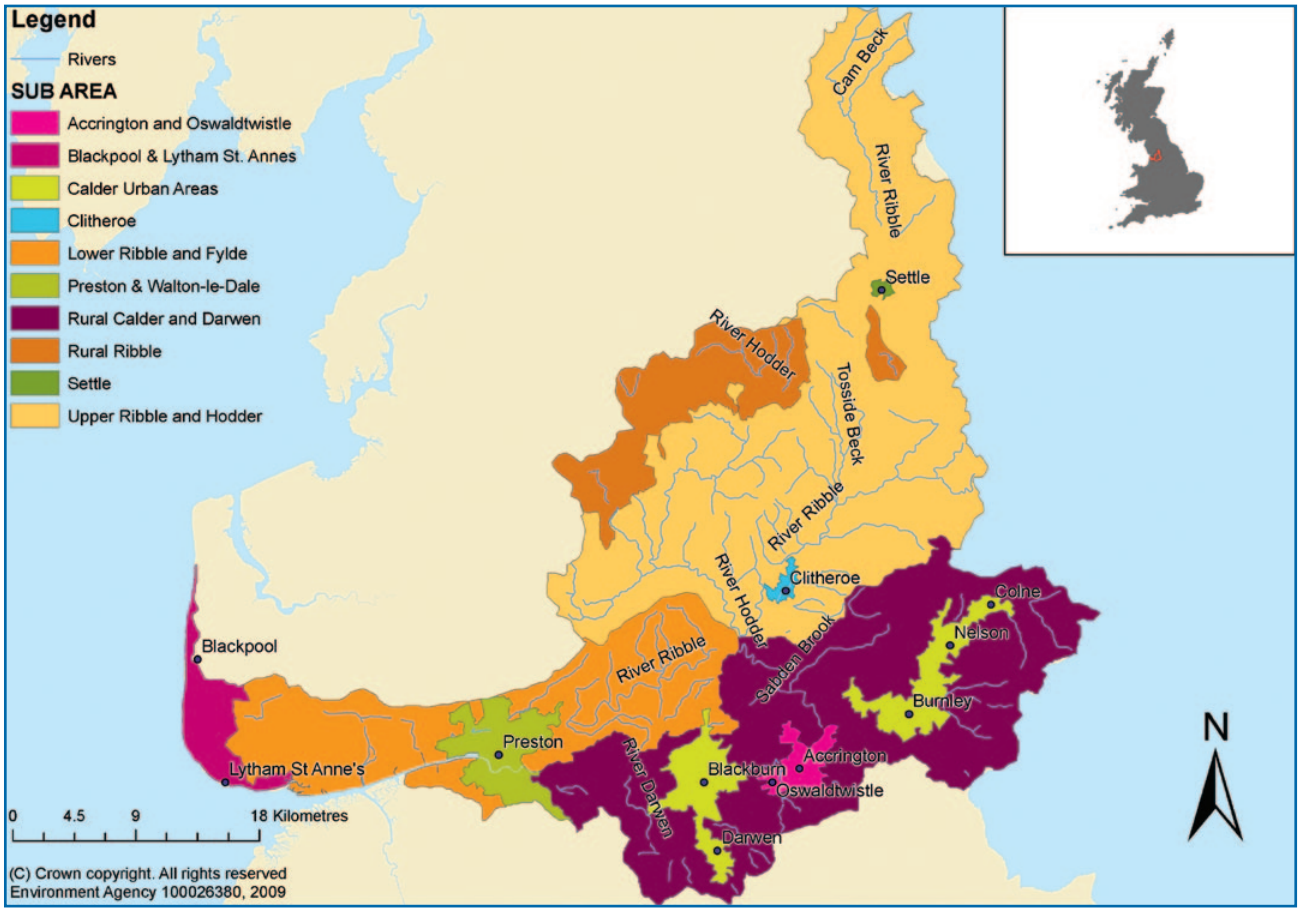


Table 3 Policy options

➜ 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.

Upper Ribble & Hodder

Our key partners are:

- Craven District Council
- Ribble Valley Borough Council
- Pendle Borough Council
- Lancashire County Council
- Landowners
- Natural England
- RSPB

The issues in this sub-area

This sparsely populated area has a generally low risk of flooding considering its very large size. Any properties that are at risk of flooding are dispersed in nature. The sub-area is very rural and the rivers tend to be natural channels without flood defences. We estimate there are 230 properties at risk of flooding in a 1% annual probability event (APE) and this could rise to 350 due to the effects of climate change by 2100.

The vision and preferred policy

Policy option 1: Areas of little or no flood risk where we will continue to monitor and advise.

Because of the generally low flood risk throughout this sub-area, significant engineering works are unlikely to be economically justifiable to the isolated properties which are at risk of flooding. Flood resilience measures within these properties are the preferred method of managing flood risk. Due to the sub-area's rural nature, there are possibilities for targeted natural flood storage and associated creation of new habitats. Our current flood risk management activities in this sub-area are minimal, and any increase in flood risk as a result of climate change is unlikely to be significant enough to change this approach.

The key messages

- Flood risk is low and the sub-area is sparsely populated. There are some flood risk problems in isolated villages.
- Flood defence engineering works in this area are very unlikely to be justifiable due to the isolated nature of the properties at risk of flooding.
- Opportunities exist to provide flood storage and create habitat, which could also reduce downstream flood risk.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Promote the application and use of flood resilience measures to those properties in the sub-area currently at risk of flooding.
- Promote land use/land management projects by landowners via Higher Level Stewardship (HLS).

↑ Tosside, Forest Of Bowland

Sub-area 2

Rural Ribble

Our key partners are:

- Ribble Valley Borough Council
- Craven District Council
- Lancashire County Council
- United Utilities
- Landowners
- Natural England
- RSPB

The issues in this sub-area

This sub-area is almost entirely rural and contains the designated Bowland Fell SPA and the Long Preston Deeps Site of Special Scientific Interest (SSSI) and so has high nature conservation value. Only four properties are currently at risk of flooding, and the effects of climate change are unlikely to increase this number. In the Bowland Fell area a significant amount of work has been carried out in the sub-area by United Utilities' Sustainable Catchment Management Programme (SCaMP) project to improve the quality of habitats, which could also benefit downstream flood risk.

The vision and preferred policy

Policy option 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 sub-area consists of elevated moorland habitat in the upper part of the River Hodder catchment, and an upland flat meandering floodplain at Long Preston that provides the upland habitat limit for a number of bird species in England.

Whilst there are isolated farms, the sub-area is almost entirely rural and unpopulated and there are very low numbers at risk of flooding.

The SCaMP project being carried out by United Utilities includes measures such as the blocking of moorland 'grip' drainage channels, and the creation of small wetland areas which will help to increase flow storage in this sub-area. Due to its rural nature, some parts of this sub-area have good potential for the storage of water during flood events, with the added opportunity for enhancement of natural habitats. The reconnection of the Ribble to its floodplain at Long Preston Deeps through land management changes steered by a river restoration plan should contribute to future reduction in flood risk downstream and have important conservation benefits. Our current flood risk management activities in this sub-area are minimal, and any increase in flood risk as a result of climate change is unlikely to be significant enough to change this approach.

The key messages

- Flood risk is very low and is not forecast to increase significantly in the future.
- Any proposed works should look to conserve and enhance the nature of the SSSI site.
- Flood defence engineering works in this area are unlikely to be justifiable to the few isolated properties at risk of flooding.
- The sub-area is suitable for floodplain storage and the creation of new habitats involving the increased storage of flows to benefit downstream flood risk.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Implement the SCaMP project by United Utilities and its partners, to improve habitats within Bowland Fell.
- Promote land use/land management projects by landowners in selected areas to benefit flood risk, via Higher Level Stewardship (HLS).
- Promote the application and use of flood resilience measures to those properties in the sub-area currently at risk of flooding, where flood defences are not economically viable.

↑ Langden Brook, Dunsop Bridge

Settle

Our key partners are:

Craven District Council

Lancashire County Council

United Utilities

The issues in this sub-area

Flood risk in Settle is mainly from the River Ribble due to the catchment immediately upstream responding quickly to rainfall events. A total of 90 properties are currently at risk of flooding which is forecast to double over the next 100 years due to the effects of climate change, although no critical infrastructure is at risk now or in the future. Due to the rapidly responding catchment, problems exist with flows entering the sewers in the town possibly leading to flooding. The town contains a number of walls acting as flood defences, as well as bridges and channelised stretches that may restrict river flows. Because of the flood risk in the town, a flood warning service is provided to parts of Settle to inform residents of potential flooding to their properties.

The vision and preferred policy

Policy option 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.

Whilst flood risk in Settle is not as high as other towns downstream in the Ribble catchment, future flood risk is forecast to increase to a high level due to the effects of climate change. Despite this, major engineering works in the form of flood defences are unlikely to be economic due to the current standard of protection. Alternative approaches to managing flood risk should therefore be adopted, such as the implementation of sustainable drainage systems (SUDS) in new and existing developments. In addition, the local authority has a responsibility to discourage inappropriate development in floodplain areas, and the effects of sewer flood risk need to be better understood to look at the impacts on flood risk from all sources.

The key messages

- Flood risk will rise to a high level in the future due to the impacts of climate change.
- Major engineering works are unlikely to be justifiable.
- We need to work with our partners from United Utilities and Craven District Council to investigate other ways of managing flood risk, such as using the planning system to discourage floodplain development, and investigating flood risk from the sewer network.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Resist inappropriate development on the floodplains in and around Settle using the principles of PPS25 and encourage the implementation of sustainable drainage systems (SUDS).
- Carry out a feasibility study to consider the justification for maintaining the current level of flood risk into the future in Settle, accepting that major works are unlikely to be a priority.
- Investigate the causes of surface water flooding and sewer flooding in Settle and carry out remedial actions.
- Identify structures which cause flow restrictions or flow obstructions in Settle, and prioritise structures for replacement / redesigning / removal according to their flood risk.

↑ River Ribble at Giggleswick Bridge, Settle

Clitheroe

Our key partners are:

Ribble Valley Borough Council

United Utilities

Lancashire County Council

The issues in this sub-area

The town of Clitheroe is at risk of flooding from Mearley Brook, stretches of which are culverted (ie, built over to form an underground river) through the town. The under-capacity or blockage of these culverted stretches present the most significant flood risk to the town. In addition, the Low Moor area is at risk of flooding from the River Ribble. There are 260 properties in Clitheroe at risk of flooding in a 1% flood event as well as three schools and one health care facility, due to climate change it is expected to rise to 490 by the year 2100. There are some problems related to sewer and surface water flooding although this is not as severe as in other parts of the catchment. Within Clitheroe, there are 37 properties at risk of flooding in a higher frequency 10% flood event, which requires more urgent action. Residents in Clitheroe and Low Moor are eligible to receive a flood warning service due to the high flood risk.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

Flood risk within Clitheroe is high and will rise significantly in the future if action is not taken. The culverted stretches of Mearley Brook need to be addressed to ensure that they are of a sufficient capacity, and the flood risk associated with the open stretches of Mearley Brook and the River Ribble requires further investigation. In addition, aspects such as sewer flooding and highways drainage flooding need to be considered, and we need to work with our partners to more fully understand and manage these aspects.

The key messages

- Flood risk is high and is forecast to increase in the future due to the effects of climate change.
- Clitheroe is at risk of flooding from culverted and open watercourses in the town.
- We need to work with our partners to investigate all sources of flood risk within Clitheroe, and use the planning system to discourage floodplain development.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Investigate flood risk within Clitheroe, identifying those areas at most risk and propose measures that are economically and environmentally viable.
- Promote the application of rigorous planning control for any new development in and around Clitheroe using the principles in PPS25 and encourage the implementation of SUDS.
- Produce a Strategic Flood Risk Assessment (SFRA) for Clitheroe to help minimise flood risk to future development in the town from all sources of flooding.
- Investigate the causes of surface and sewer flooding in Clitheroe and carry out remedial actions with our partners.

↑ Mearley Brook at Clitheroe

Rural Calder and Darwen

Our key partners are:

- Ribble Valley Borough Council
- Pendle Borough Council
- Burnley Borough Council
- Hyndburn Borough Council
- Blackburn with Darwen Borough Council
- South Ribble Borough Council
- Landowners
- Natural England
- RSPB

The issues in this sub-area

This large, predominantly rural sub-area has a generally low flood risk which will not rise significantly due to climate change. There are a few isolated flood risk problems in villages such as Trawden, Whalley and Higher Walton.

In these villages approximately 720 properties are at risk in a 1% event, as well as two schools, one health care facility and a community centre. Whalley is at risk of flooding from the River Calder, whilst Trawden is at risk from Trawden Brook. Higher Walton is at risk of flooding from the River Darwen.

The rest of the sub-area is sparsely populated, with a small number of dispersed properties at risk of flooding. Due to the flood risk residents in parts of Higher Walton and Whalley are eligible to receive a flood warning service. In the future by 2100 we estimate 840 properties will be at risk due to the effects of climate change.

The vision and preferred policy

Policy option 3: Areas of low to moderate flood risk where we are generally managing existing flood risk effectively.

Flood risk within much of this large sub-area is relatively low, and is not forecast to increase significantly. It is unlikely that flood risk management measures could be justified in this sub-area as other areas have much greater flood risk. However; the risk of flooding to villages such as Whalley and Higher Walton needs further investigation to determine if any further works can be justified.

Current activities in the sub-area are mainly general maintenance to watercourses, such as the removal of blockages and management of vegetation.

Within this sub-area, numerous opportunities exist for habitat creation schemes that could benefit flood risk in the downstream stretches of the catchment. This includes the upland moorland areas where the blocking of moorland 'grip' drainage channels and creation of wetland habitat could have flood risk management benefits. There are sites adjacent to the River Darwen where floodplain areas could be used for flood storage.

The key messages

- Flood risk is generally low although villages such as Whalley, Trawden and Higher Walton are at risk of flooding.
- Opportunities exist in the sub-area for habitat creation schemes to benefit flood risk in downstream areas.
- Flood risk is currently being managed at the correct level, and as the effects of climate change are not expected to be significant, this level of flood risk management should continue in the future.

↑ River Darwen, Salmesbury at Bottoms

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aims are listed below:

- Promote the flood warning service to eligible residents within Higher Walton and Whalley.
- Promote land use / land management projects by landowners to benefit flood risk, via HLS.
- Consider the justification for further measures to manage flood risk in Whalley, accepting that major works are unlikely to be a priority for funding due to the existing standard of protection.

↑ River Calder at Cock Bridge, near Whalley

Sub-area 6

Calder Urban Areas

Our key partners are:

Burnley Borough Council

Pendle Borough Council

Blackburn with Darwen Borough Council

United Utilities

Lancashire County Council

The issues in this sub-area

This entirely urban area is at high risk of flooding. This is due to a variety of factors; heavily culverted watercourses in the sub-area, rapidly reacting upland catchment upstream, and the flood risk posed by open rivers. Around 4700 properties are at risk of flooding in the sub-area, which is forecast to rise to 8200 over the next 100 years due to the effects of climate change. There are eight schools and seven health care facilities currently at risk in a 1% event, with an extra three health care facilities at risk in by 2100 due to climate change. Burnley is at risk of flooding from the River Calder and Brun, Nelson is at risk from Walverden Water, and Colne is at risk from Colne Water. In addition, Barrowford and Lomeshaye are at risk from Pendle Water, whilst Padiham is at risk from the River Calder. Blackburn is at risk from the River Blakewater and River Darwen, Darwen is at risk from the River Darwen.

There is also a risk of sewer and surface water flooding. Parts of Blackburn have a more pronounced sewer flooding problem than other parts of the catchment, although the exact theoretical flood risk from this source is currently unknown.

This sub-area contains seven areas where residents are offered a flood warning service, illustrating the high flood risk.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

Flood risk is already high and is forecast to increase in the future due to climate change, and therefore significant action is required. This will involve work by the Environment Agency to follow up previous studies in investigating the feasibility of flood risk management measures. The restriction to flows presented by the culverted stretches of rivers in the sub-area also requires investigation, as does the flood risk posed by all potential sources of flooding. We will work with our key partners to more fully understand the risks posed by sewer and surface water flooding.

Local authorities covering the sub-area need to apply appropriate planning control for developments within flood risk areas and promote the use of Sustainable Drainage Systems (SUDS) within current and future developments. The authorities should complete Strategic Flood Risk Assessments (SFRAs) for their respective areas to minimise the risk of flooding.

The further promotion of the flood warning service in the sub-area is also important.

The key messages

- Flood risk is high and will increase in the future due to climate change.
- The high flood risk in the sub-area is due to the heavy culverting of watercourses, as well as the rapidly reacting catchment upstream of the sub-area.
- Significant work is required with our partners to address flood risk.
- Our previous studies in the area will form the basis of our planned strategy in the future.
- Sewer flooding in some parts of the sub-area is more pronounced than in other parts of the catchment.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Implement the recommendations of our previous studies to reduce flood risk, by carrying out works such as the installation of defences or the opening up of culverts where it is economically justifiable.
- Local authorities to produce SFRAs to cover their areas, to help minimise flood risk to future development from all sources.
- Promote the application of rigorous planning control for any new developments in the sub-area using the principles in Planning Policy Statement 25 (PPS25) and encourage the implementation of SUDS.
- Investigate the causes of surface water flooding and sewer flooding in the sub-area, defining the theoretical risk from these sources and carry out remedial actions.

↑ River Darwen at Blackburn

Sub-area 7

Accrington & Oswaldtwistle

Our key partners are:

Hyndburn Borough Council

United Utilities

Lancashire County Council

The issues in this sub-area

This small, entirely urban area has a relatively high risk of flooding. This is mainly due to the numerous culverted watercourses in the sub-area. Around 230 properties are at risk of flooding, rising to 330 taking into account climate change. One school, one health care facility, and one community centre are also at risk in a 1% event. Accrington is at risk of flooding from the River Hyndburn, Broad Oak Water, and Antley Syke, whilst Oswaldtwistle is at risk from Tinker Brook. There is also a risk of sewer and surface water flooding. Residents within parts of Accrington can register for a flood warning service.

The vision and preferred policy

Policy option 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 area has a relatively high flood risk, especially bearing in mind the effects of climate change, and action is required to manage the risk. The flow through the numerous culverts within this sub-area requires further investigation, and the feasibility of carrying out measures to manage the associated flood risk needs to be pursued. The local authority also needs to assist in managing flood risk by effective control of the planning system to discourage inappropriate development on floodplains. Finally, the impact of all sources of flooding needs consideration, and we will work with our partners to investigate surface water and sewer flooding.

The key messages

- Flood risk is relatively high and will increase in the future due to climate change.
- The high flood risk in the sub-area is due to heavy culverting of watercourses.
- Major engineering works are unlikely to be a priority in this sub-area, although other works and actions are likely.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Consider options to manage flood risk in the sub-area, accepting that major works are unlikely to be a priority.
- Promote the application of rigorous planning control for any new development in Accrington and Oswaldtwistle using the principles in PPS25 and encourage the implementation of SUDS.
- Local authority to produce a SFRA to cover their areas, to help minimise flood risk to future development from all sources of flooding.
- Investigate the causes of surface water flooding and sewer flooding in the sub-area.

↑ Broad Oak Water, Accrington

Sub-area 8

Lower Ribble and Fylde Streams

Our key partners are:

Ribble Valley Borough Council

Preston City Council

Lancashire County Council

Fylde Borough Council

The issues in this sub-area

This large and mainly rural sub-area has a relatively low risk of flooding, with 275 properties currently at risk and two schools. This number is expected to rise to 775 properties due to the effects of climate change.

In the East of the sub-area, the main areas of flood risk are at Ribchester and Salmesbury, which are both Flood Warning Areas. These locations are at risk from the River Ribble, which flows through a flat, meandering floodplain in this sub-area. In the west of the area parts of Warton are at flood risk from Wrea Brook, and isolated properties along the floodplain of Main Drain. This risk is associated with rivers that discharge into the Ribble Estuary, and the effect that rising sea levels will have on the ability of these watercourses to fully discharge during storm events. A small area just west of Preston is tidally influenced from the Ribble Estuary, although very few properties are at risk in these locations.

The vision and preferred policy

Policy option 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.

In the future there is increased flood risk due to climate change. Action is required to maintain the current level of flood risk. Areas such as Ribchester and Salmesbury are at risk of flooding, studies are required to investigate various flood risk management options and propose a sustainable risk based solution. We need to work in conjunction with our partners to ensure that the planning system discourages inappropriate development on the floodplain, and that the relevant local authority produces a SFRA to minimise the risk of flooding to developments. Effective maintenance of existing defences, flood resilience measures, and the development of the flood warning service in Ribchester and Salmesbury will help to reduce the flood risk in the sub-area.

The impact of the Hesketh Outmarsh managed realignment scheme on tidal flood risk in the sub-area should be examined to determine if similar projects along the Ribble Estuary could have flood risk benefits. Finally, numerous opportunities exist for habitat creation schemes in this sub-area with areas of land adjacent to the River Ribble and its estuary, offering opportunities to develop wetlands that could yield some flood risk management benefits.

The key messages

- Flood risk is relatively low but will increase in the future due to the effects of climate change.
- Any major works are unlikely to be financially viable.
- Opportunities exist to carry out land management projects, create habitat and reconnect the river to the floodplain with potential flood risk benefits.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Investigate ways to maintain the level of flood risk in Ribchester in future, accepting that major works are unlikely to be economically viable.
- Promote land use/land management projects by landowners to benefit flood risk, via HLS.
- Complete a feasibility study of suitable sites in the policy unit for floodplain / river restoration and habitat creation, providing possible flood risk benefits.
- Promote the application and use of flood resilience measures to properties currently at risk of flooding.
- Schedule maintenance of existing flood defences in the sub-area to ensure that they retain their standard of protection.

↑ Main Drain at Eastham Bridge

Preston & Walton-le-Dale

Our key partners are:

Preston City Council

South Ribble Borough Council

Lancashire County Council

United Utilities

Lancashire County Council

The issues in this sub-area

This relatively large sub-area has a very high risk of flooding, with 2,300 properties currently at risk as well as five schools, five health care facilities and one community centre. This rises to 5,300 properties in the future due to the effects of climate change, with two more schools and five more community centres also at risk. The sources of flood risk vary, from the risk of direct flooding from the River Ribble in areas of Preston and Walton-le-Dale, to the flood risk associated with culverts in Preston such as Moor Brook, Swill Brook, and Eaves Brook. In addition, the influence of the tidal Ribble estuary, into which many of the rivers in this area drain, can lead to rivers 'backing up' during high tide conditions, which can increase flood risk as flows start to build up at tidal outlets.

The heavily urbanised nature of the area means that surface run-off rates are high. When combined with the number of sewer overflows in the area and discharges from the highway drainage system, this means that intense rainfall events can also lead to localised flooding. There are four areas in this sub-area where residents can register for the flood warning service.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

The very high flood risk both now and in the future means that significant work is required to reduce flood risk. We will take the lead by investigating areas of flood risk and highlighting areas where major works are economically justifiable. The SFRA produced by Preston City Council should help to reduce flood risk to developments, whilst the planning system should be used to encourage the implementation of SUDS and discourages inappropriate development in floodplain areas. The culverted watercourses in the sub-area require attention, and maintenance of existing defences is also vital in ensuring they remain fit for purpose. Finally, the risk of flooding from all sources needs consideration, and so we will work with our partners to more fully understand the risk of flooding from the sewer network and the highways drainage system.

The key messages

- Flood risk is very high and will increase significantly in the future due to climate change.
- Numerous sources of flood risk exist in the sub-area, including culverted watercourses, direct flooding from rivers, and the risk of flooding from the highways drainage system and sewer network.
- The influence of the Ribble Estuary can have a significant impact on watercourses that drain into it during high tide events.

Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Investigate flood risk within Preston and Walton-le-Dale, identifying those areas most at risk and highlighting major works and other measures that are economically viable.
- Promote the application of rigorous planning control for any new development in Preston using the principles in PPS25 and encourage the implementation of SUDS.
- Investigate the causes of surface water flooding and sewer flooding in the sub-area to understand their theoretical risk and carry out remedial actions.
- Identify structures such as culverts that cause flow restrictions and prioritise structures for replacement/ redesigning/removal according to their flood risk.

↑ River Ribble at Penwortham Old Bridge, Preston

Sub-area 10

Blackpool & Lytham St Annes

Our key partners are:

Fylde Borough Council

Blackpool Borough Council

United Utilities

Lancashire County Council

The issues in this sub-area

This predominantly urban sub-area contains the large town of Blackpool and the smaller town of Lytham St Annes. Given its size, flood risk is relatively high with 540 properties currently at risk, rising significantly to 1940 in the future due to the effects of climate change, with an extra three schools, two health care facilities and two community centres are expected to be at risk. Flood risk is predominantly in Lytham St Annes and is due to the impact of sea level rise on the ability of Liggard Brook to discharge into the Ribble estuary. The risk of flooding from rivers in Blackpool is very low, with the main risk in the town associated with coastal flooding from the sea. This aspect is not considered as part this plan and is instead addressed in the SMP.

The vision and preferred policy

Policy option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk.

Flood risk is already high, and is projected to significantly increase in the future. Work is required to reduce this risk. Whilst Liggard Brook already contains flood defences along its lower stretches, investigations are required to determine the feasibility of other flood risk management options. In addition, the local authorities in this sub area will play a key role in using their powers to control development in flood risk areas. Other sources of flooding such as from the from the sewer network and the highways drainage system need to be better understood; with partners working together on these risks.

The key messages

- Flood risk in Lytham St Annes is high and will rise significantly in the future due to the effects of climate change.
- Liggard Brook presents the biggest risk of flooding, which will increase as levels rise in the Ribble estuary.
- We need to work with our partners to reduce flood risk.

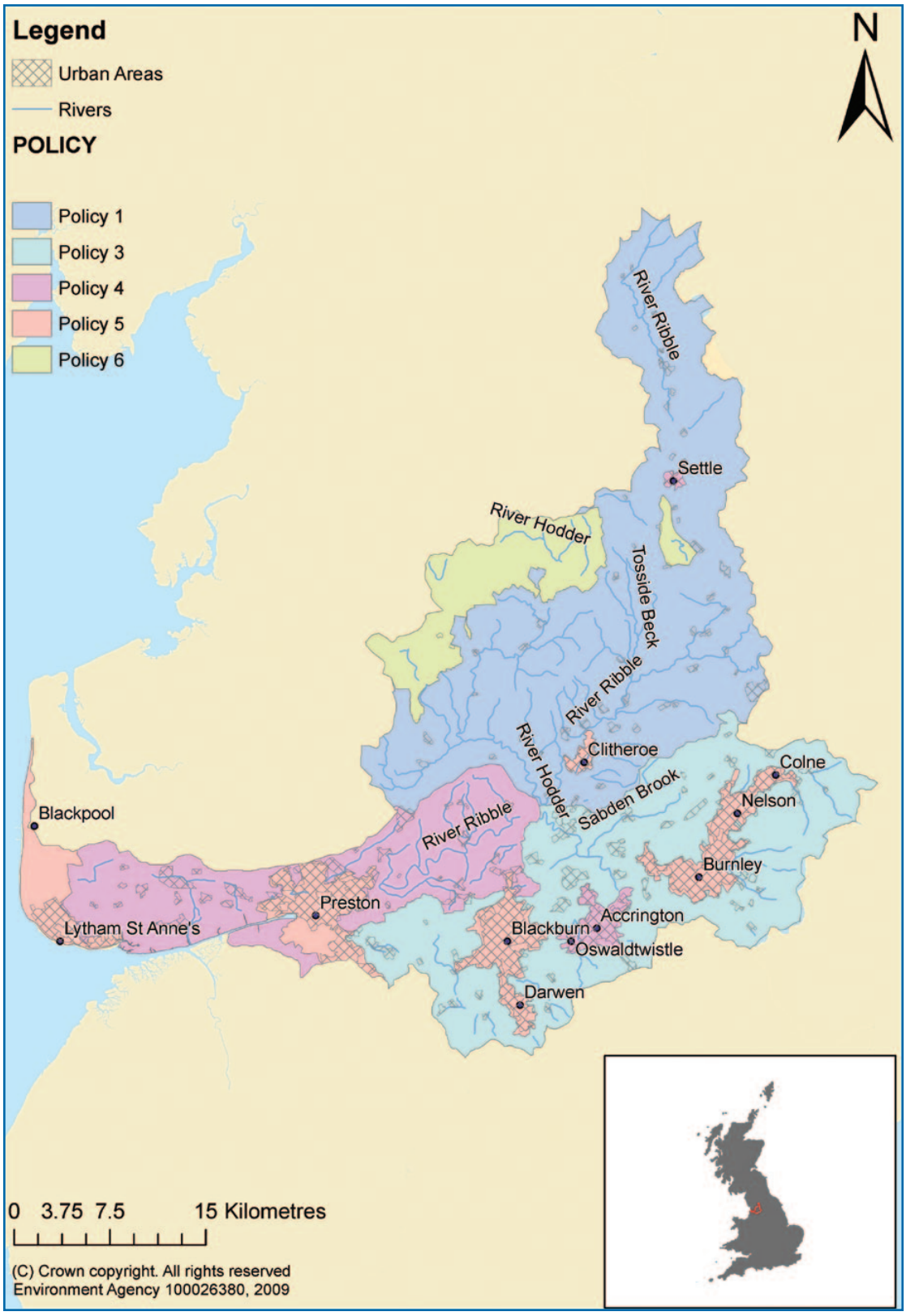
Proposed actions to implement the preferred policy

The essential actions to achieve our policy aim are listed below:

- Investigate the causes of flooding in the Lytham St Annes/Fylde area, and highlight feasible works to reduce flood risk.
- The local authorities in the sub area need to produce Strategic Flood Risk Assessments (SFRAs) and utilise the planning system to discourage inappropriate development on the floodplain. Local authorities need to encourage the implementation of SUDS in new and existing developments.
- Investigate the causes of surface and sewer flooding in Blackpool and Lytham St Annes and carry out remedial actions.

↑ Liggard Brook at Lytham

Map of CFMP policies



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