

# Eden Catchment Flood Management Plan

Summary Report December 2009



managing  
flood risk

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# Introduction

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

The Eden 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 more 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 Eden catchment there is flood risk from its rivers, surface water and sewers. No significant areas within the catchment are at risk of tidal flooding. There are 4500 residential and 1000 commercial properties at a 1% annual risk of flooding from rivers. The most

significant flood event in recent years occurred in January 2005, when flooding affected approximately 2700 residential properties across the catchment, Carlisle being badly affected. In the future it is estimated climate change could increase the number of properties at risk to 4800 residential and 1060 commercial across the Eden 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 manage 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 all local authorities, United Utilities, DEFRA, Eden Rivers Trust, Lake District National Park, Natural England and the Forestry Commission.

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

A handwritten signature in black ink, appearing to read 'Tony Dean'.

**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:

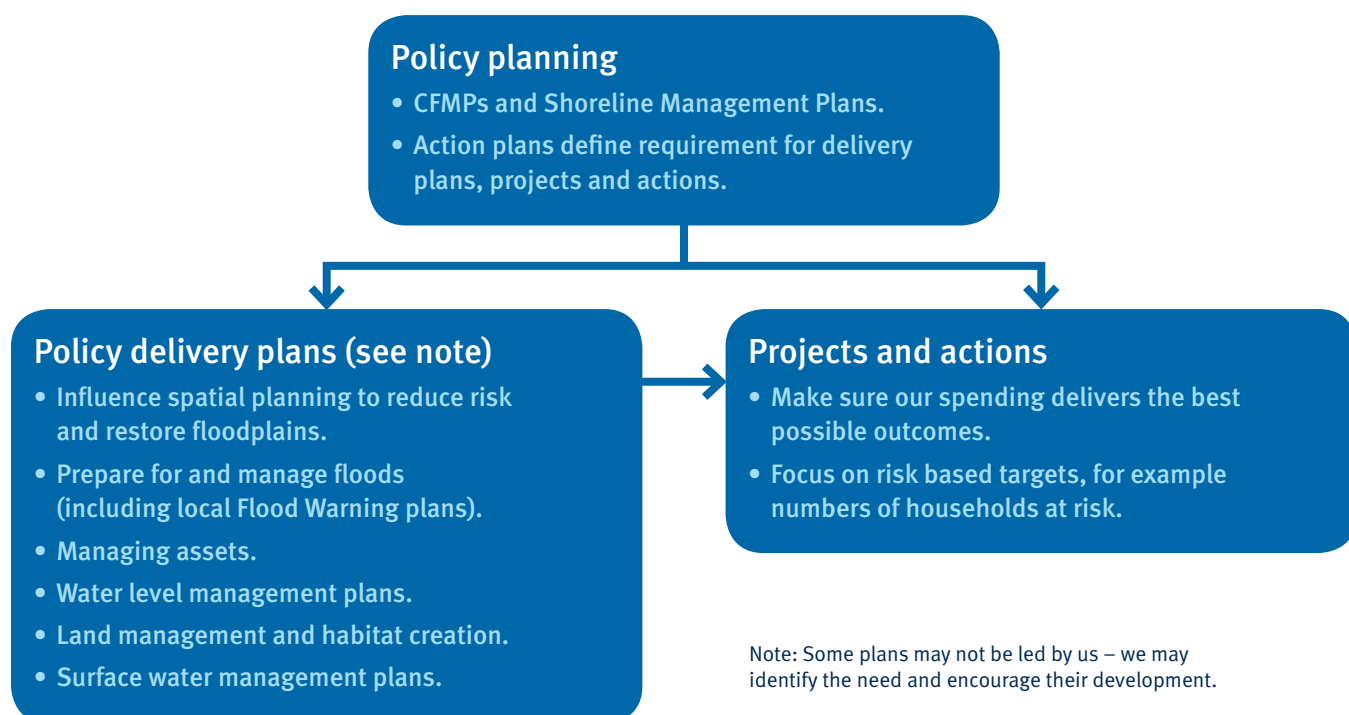
- The Environment Agency, who will use the plan to guide decisions on investment in further plans, projects or actions.
- Regional planning bodies and local authorities who can use the plan to inform spatial planning activities and emergency planning.

- 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



# Catchment overview

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It is useful to draw out some general characteristics that are most important in our management of flood risk. The principal watercourses are the Eden, Eamont, Irthing, Petteril and the Caldew, with a total catchment area of approximately 2400 km<sup>2</sup>. The catchment is predominately rural with only 1% classified as urban. Around 244,000 people live in the catchment, the principal population centres are Carlisle, Penrith and Appleby.

The upper catchment is dominated by the steep gradients of Skiddaw, Helvellyn and surrounding fells. Below Kirkby Stephen, the Eden's valley widens. The Lower Eden is characterised by wide floodplains and washlands. These areas are important in providing storage capacity during high water levels. The catchment is subjected to some of the highest rainfalls in England. Upstream of Penrith, average annual rainfall exceeds 2800mm compared to 920mm across England and Wales. In the upper catchment, high rainfall and the steep terrain make the Eden a 'fast-responding' catchment where high river levels occur soon after heavy rainfall, and it can reduce the time available to provide advanced warning of flooding.

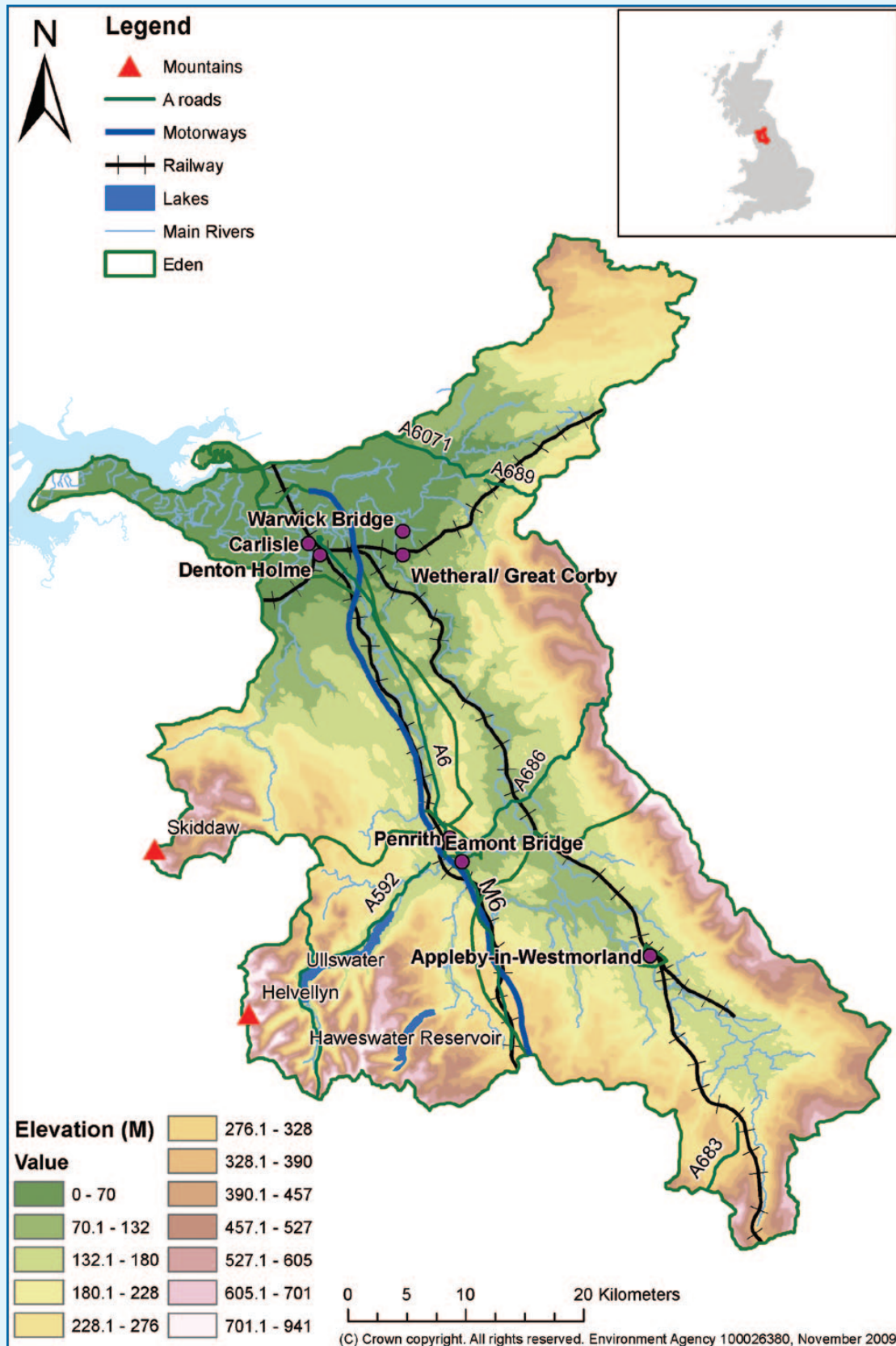
The Eden Valley contains areas of high quality farmland in the low lying areas, and less intensive farming in the foothills of the North Pennines. There are also some areas of intensively managed pasture on the Solway Plain. However, the main land use is livestock with grazing pasture. Agriculture forms an important part of the local and regional economy, with tourism growing in importance. The rural nature of the catchment provides an opportunity to manage land use to reduce run-off and increase the time between rainfall and peak flows. However, holding water for longer periods of time on agricultural land can lead to increased crop damage and adversely affect rural economies.

The Eden Catchment is highly significant for landscape, cultural heritage and nature conservation. Thirty percent of the area lies within Areas of Outstanding Natural Beauty (AONB) with a further 30% designated as landscape of county importance. A large part of the study area lies within the Lake District National Park. The catchment has over 550 Scheduled Ancient Monuments. Hadrian's Wall is designated as a World Heritage Site. There are several Special Areas of Conservation (SACs), the

most significant being the River Eden itself and the Upper Solway Flats & Marshes SAC; these lie at the confluence of the Eden with the Solway Firth.

Development pressure in Cumbria is not perhaps as great as in other parts of the country. However Carlisle, Penrith and Appleby are identified for growth as part of the Regional Spatial Strategy (RSS) and are locations at flood risk.

Map 1 Main features



# Current and future flood risk

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## 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 flood risks quoted in this report are those that take account of flood defences already in place.

The Eden catchment has been subject to several historical severe flooding events mainly affecting Carlisle, Penrith and Appleby. The most significant recent event was in 2005 where 2700 properties were flooded, 75% of which were in Carlisle, and there were two fatalities. The flow rates and flood water levels for this event were the highest on record.

The main sources of flooding in the Eden catchment are as follows:

- River flooding from the River Eden occurs in its steeper middle course in the semi-rural communities of Appleby, Warwick Bridge and Wetheral. Further downstream, the river changes character into a wide floodplain where at Carlisle it is influenced by tributary inflows. Penrith and Eamont Bridge are also vulnerable to river flooding and the tributaries they are on, eventually flow into Carlisle. The response times are short in the upper reaches of this catchment.
- Tidal flood risk is not significant in this catchment. Although the Eden flows out into the Solway Firth, only a few isolated locations have been identified that are at risk from a 0.5% tidal event. Analysis has shown that tide levels in excess of those in January 2005 would have no effect on the river levels in Carlisle.
- Groundwater flooding is not a significant issue in this catchment in its own right, due to the nature of the catchment geology. However, it may contribute to flooding in association with river and rainfall events.
- Surface water flooding does occur in the Eden catchment. At present, there are relatively few records of property flooding due to surface water alone. Based on information available, it is thought to be high in frequency but low in consequence. There are complex interactions between ordinary watercourses, sewers and surface water and the graph in figure 2 gives an indication of the sources of flooding from the January 2005 event.
- Sewer flooding has been recorded in some of the urban areas of Carlisle. It is likely that the flooding was caused by hydraulic overload of the sewer system. In January 2005, foul and surface water sewers became locked by the high level of the Eden and prevented discharging which resulted in overflowing of the sewers.

## What is at risk?

Using models for the main rivers and flood maps on the less significant tributaries we estimate, there are 4500 residential and 1000 commercial properties at a 1% annual risk of flooding from rivers. There are significant areas of agricultural land at risk from river flooding, potentially leading to livestock and crop damage. The most significant flood event in recent years occurred in January 2005, when flooding affected approximately 2700 residential properties across the catchment. In Carlisle, the cost of the January 2005 flood has been estimated at over £400 million. There are 12 environmental sites and seven scheduled ancient monuments in the 1% flood zone. Some of these sites may not be adversely affected by a flood, but further work needs to be done in this area to assess the risk.



## Where is the risk?

The Eden catchment has been subject to several historical severe flood events. Carlisle, Penrith and Appleby are at greatest flood risk in terms of the number of individual properties affected. There are other smaller settlements particularly in the Eden Valley (Low Crosby, Warwick Bridge and Wetheral) and close to Penrith (Eamont Bridge) that are vulnerable to flooding. The main locations at flood risk across the catchment are illustrated in table 1.

We recognise the potential risk from surface water and sewer flooding. However, further studies, following on from the CFMP, will be undertaken to quantify this potential risk.

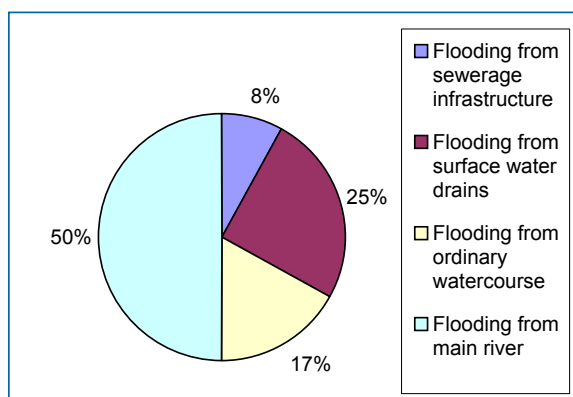
**Table 1. The areas with the highest concentration of properties currently at risk from a 1% annual probability fluvial flood:**

Number of properties at risk	Locations
Over 500	Carlisle
151 to 500	Appleby, Penrith; Eden Valley (Low Crosby, Warwick Bridge and Wetheral)
51 to 150	Eamont Bridge
25 to 50	Kirkby Stephen, River Roe catchment (Stockdalewath and Thistlewood).

**Table 2. Critical infrastructure at risk:**

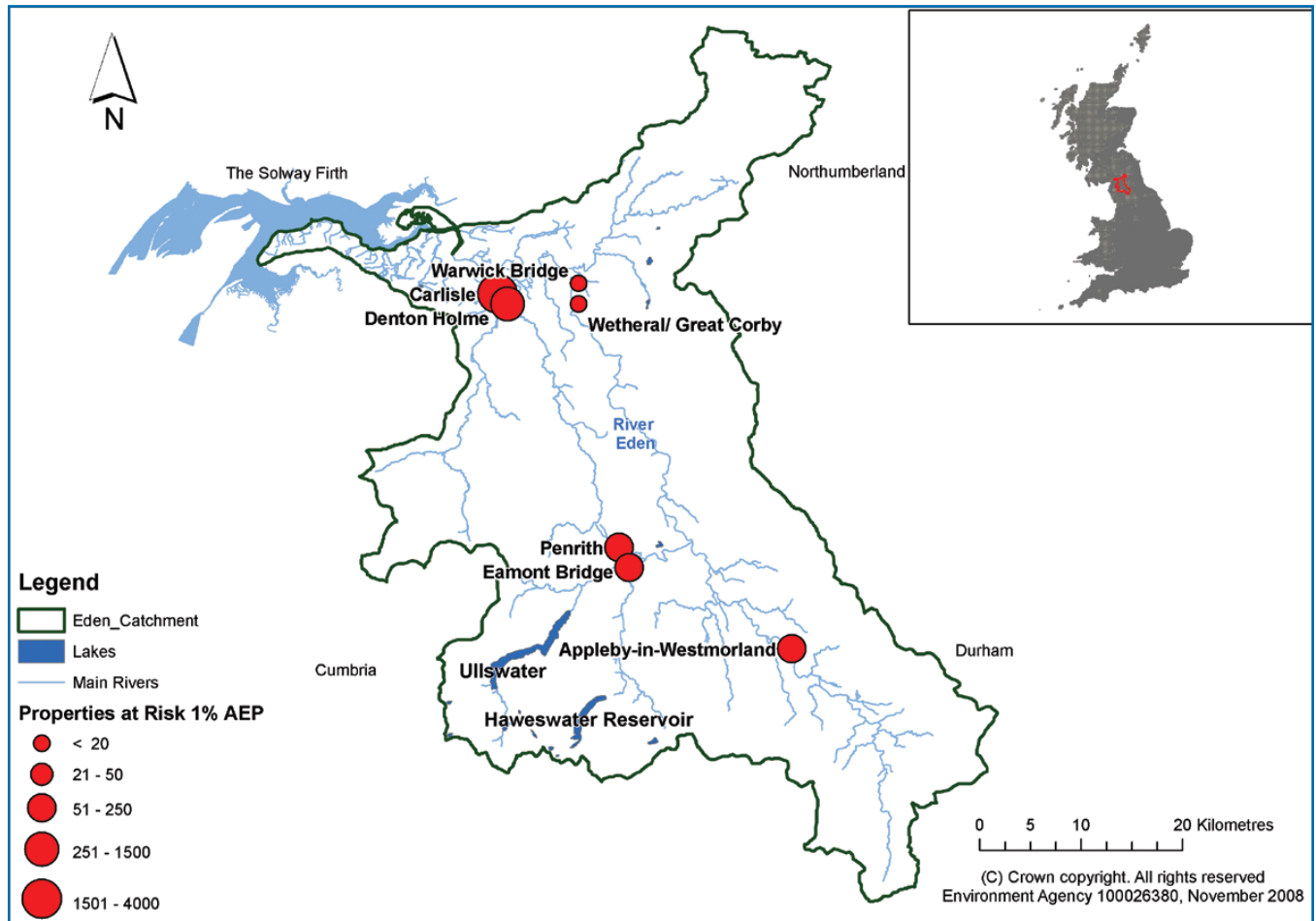
14 Electricity sub stations, 8 Medical centres, 10 Schools and 9 Waste water treatment works

**Figure 2 Source of flooding from Jan. 2005 event**



↑ Demountable defences at Carlisle

Map 2 Where are the areas at flood risk



## How we currently manage the risk in the catchment

Almost 90% of the properties at risk in the Eden catchment are in Carlisle. Carlisle has benefited together with other towns, from engineering schemes put in place over the last 50 years or more. Including:

- The construction of a two-phase flood defence scheme in Carlisle. The first phase has been completed, and phase 2 should be completed during 2010. The scheme is designed to provide a 0.5% standard of protection.
- Raised defences that were built early in the 1990s along the River Eden at Appleby provide a Standard of Protection (SOP) of

1%. Further studies are being undertaken to improve the standard of protection in the undefended Sands area of the town.

- Detailed design is currently underway for new defences to protect Penrith and construction work is planned to start in 2010.

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

Activities that reduce the probability of flooding include:

- Identifying and promoting new flood alleviation schemes where appropriate. Recent studies have been undertaken in Appleby and Penrith.
- Maintaining and improving existing flood defences, structures and watercourses. The Eden has over 60km of river defences.
- Enforcement and maintenance where riparian owners carry out work detrimental to flood risk.

## The impact of climate change and future flood risk

- Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring 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 warning services to over 2,000 properties.
- 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. Many properties on the Sands at Appleby have benefited from flood resistance and resilience measures in a trial project funded by Defra.

In the future, flooding will be influenced by climate change, changes in land use (for example urban development) and rural land management. In the River Eden catchment, sensitivity testing revealed that climate change has the greatest impact on flood risk, with land management change, and urbanisation having a much smaller effect. A typical catchment requires a 10% covering of forest to produce a 2% reduction in outflow. 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 River Eden CFMP concentrated on climate change only and assumed 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.

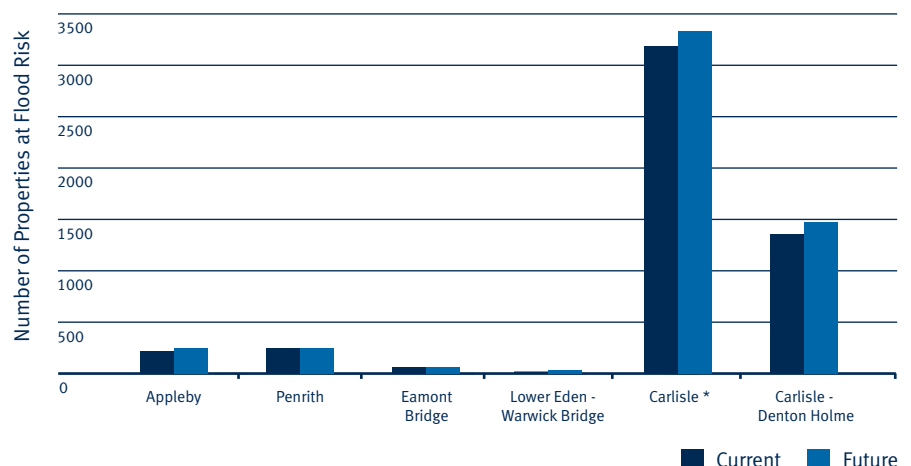
The greatest impact is predicted in the main urban areas. In Carlisle,

the onset of flooding is predicted to occur earlier, possibly reducing the time to provide flood warnings. Without further flood alleviation, the number of properties suffering flood depth of between 0.5 and 1.0m would double in Carlisle city centre during a 1% annual probability event (APE). Peak flows in Penrith and Appleby are also predicted to increase by 15-20%, and will likely affect the depth and frequency of flooding. At Warwick Bridge, Lower Eden Valley, climate change is predicted to increase the number of properties at risk of flooding. Eamont Bridge is also at increased risk of flooding because of climate change.

The graph below shows the difference between current and future flood risks from a 1% event at key locations across the catchment. Following on from the CFMP, organisations need to work together to investigate flood risk from other sources (eg surface water and sewer flooding) in more detail.

The extent of flooding on all environmental sites will increase as a result of climate change and two further sites are potentially at risk.

**Figure 3 Current and future (2100) flood risk to property from a 1% annual probability river flood, taking into account current flood defences.**



\* On completion of defences (Jan 2010) in Carlisle approximately 3,000 properties will be protected from river flooding to a 0.5% standard of protection.

# Future direction for flood risk management

## Approaches in each sub-area

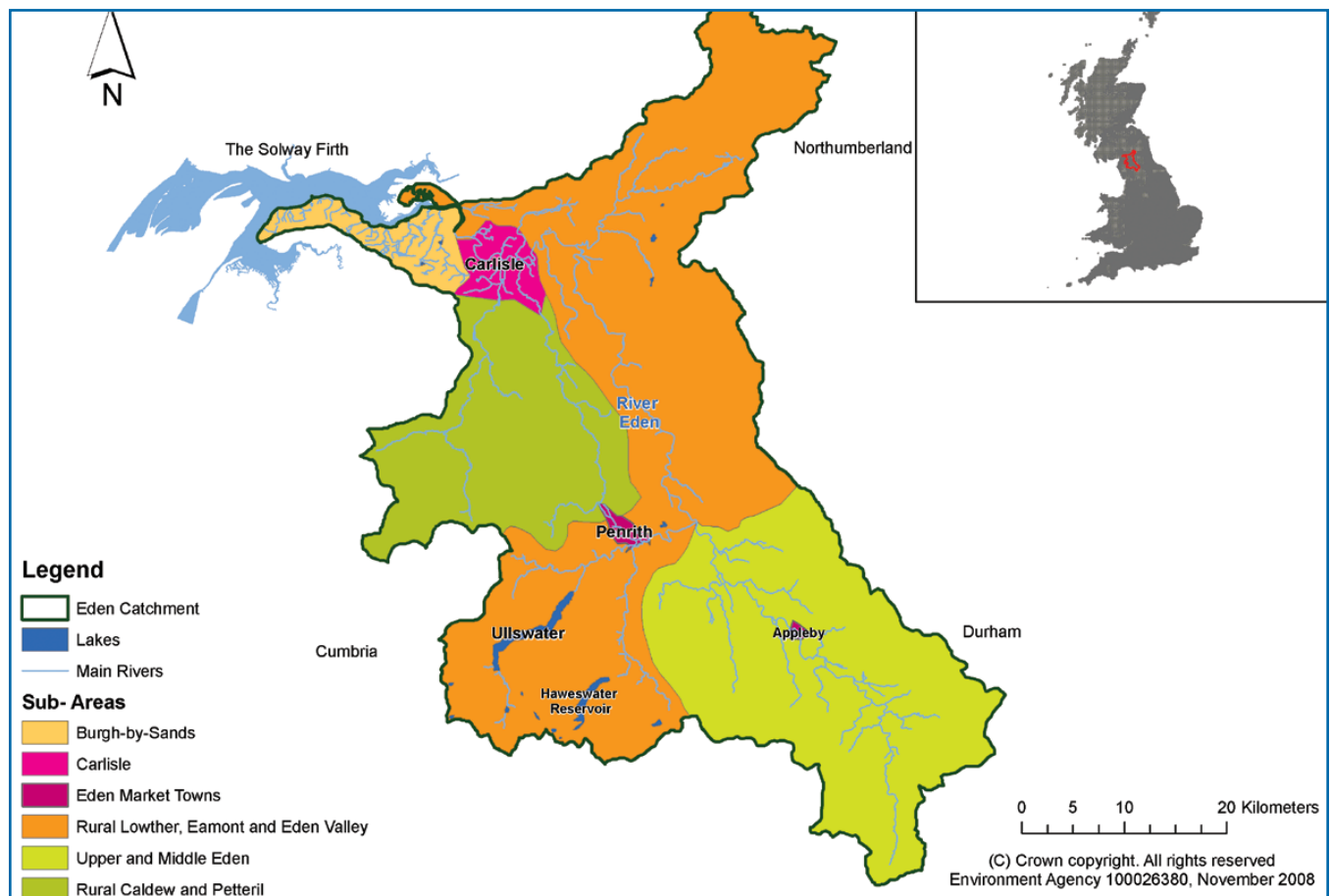
We have divided the Eden CFMP area into six distinct sub-areas based on their physical characteristics, sources of flooding and levels of risk. These sub-areas will allow us and the key stakeholders to promote flood risk management approaches, policies and actions that are most appropriate to deliver the various Government and regional strategies, in particular the Making Space for Water strategy. When facing increasing risk, it is often not sustainable to keep

building and raising defences. This is why we have to look at the whole catchment and 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 that 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.

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### → 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.

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### → 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.

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### → 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.

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### → 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.

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### → 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.

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# Upper and Middle Eden

## Our key partners are:

Cumbria County Council

Eden District Council

Landowners

English Nature

## The issues in this sub-area

This sub-area is characterised by scattered small settlements. Flood risk to property is low, with around 20 properties at risk. Climate change is estimated to have a small effect on the number of properties at risk. This part of the catchment reacts rapidly to rainfall, with flood events occurring soon after heavy rain. However, these locations are in the upper catchment where opportunities to store or hold flood waters are limited. Storage of flood waters would provide limited benefit to reducing flood risk across the catchment.

## The vision and preferred policy

**Policy option 2:** Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.

Based on the flood risk in this area, we are unlikely to be able to justify increasing our expenditure. We need to consider more efficient and cost-effective ways of managing the risk in this policy unit. We will review our System Asset Management Plans (SAMPs) so that we are able to maximise the benefits from the existing defences over their design life. In the long term, we may decide not to maintain certain defences. These plans need to consider how future management of our defences can contribute to an improvement in the condition of the Sites of Special Scientific Interest (SSSI), where practical.

We will provide advice to the community on managing the effects of flooding and support the local authority in the development of appropriate emergency response plans. As a means of making more efficient use of our resources, we will investigate if our flood warning service can be extended in this area. We will work with the planning authority and other land managers to encourage changes in land use to reduce surface water flows.

## The key messages

- On new developments, proactive measures to mitigate for climate change such as improved defences, flood resistance, resilience and improved site layout will be needed.
- Encourage land management measures that make a positive contribution to reducing surface run-off which may help to keep water on the land for an increased period which may help to reduce river flows. This could provide benefits elsewhere in the catchment and help to reduce localised flooding.
- Changes in future management / maintenance of flood risk management assets need to consider the impact on the Eden SAC.

## Proposed actions to implement the preferred policy

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

- Investigate the feasibility of a flood warning service that could provide landowners with suitable advanced warning to enable the movement of livestock from areas at risk to higher ground. Maintain the flood warning area (FWA) at Bolton and review its coverage.
- Encourage take-up of environmental stewardship schemes through catchment sensitive farming officers, to help contribute to reducing flood risk.
- Maintenance work to rural watercourses and raised defences will be reduced through a process of SAMPs.



↑ Kirkby Stephen (Frank's Bridge)



# Rural Lowther, Eamont and Eden Valley

## Our key partners are:

Cumbria County Council

Carlisle City Council

Eden District Council

Lake District National Park Authority

Northumberland National Park Authority

Land managers

United Utilities

Developers

catchment demonstrates sensitivity to land-use change and we encourage the take-up of environmental stewardship schemes to contribute to flood risk management.

## The vision and preferred policy

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

The preferred policy option is to continue with existing actions, however there are specific locations where we need to review the current standard of protection offered by our defences. There are approximately 180 properties at risk of flooding during a 1% APE (Warwick Bridge, Wetheral, Crosby on Eden, Brampton and Great Corby) in the Eden Valley, and a further 50 properties at Eamont Bridge on the River Eamont. Flood depths are predicted to increase by as much as half a metre and warning times may decrease. There are a further 20 properties at risk of flooding in this sub-area as a consequence of climate change.

Our current flood risk management activities, including maintenance of raised defences for areas at risk in

the Lower Eden and channel maintenance at Eamont Bridge, should continue to maintain the current level of flood risk. Development pressure in this sub-area is considered to be low. However, Eamont Bridge is an attractive and highly convenient village close to Penrith. Development needs to be strictly managed to ensure that it does not increase flood risk.

## The key messages

- Minimise risk at the most flood prone places by influencing planning to ensure developments take account of the level of flood risk.
- Encourage flood resistance and resilience to properties at risk of flooding.
- We will continue with existing and alternative flood risk measures accepting that in some places risk may increase with time.

## The issues in this sub-area

This is the largest of the sub-areas and predominantly a rural landscape, with a number of key smaller settlements at flood risk. The combined number of properties at risk is less than 250. However, given the nature of the flood risk (deep and fast flowing water and/or limited warning) the impact of the individual communities has been considered in setting our policy. The Lowther sub-catchment lies in the Lake District National Park and small pockets on the boundary of the catchment in the Eden Valley are located within Northumberland National Park. This part of the





## Proposed actions to implement the preferred policy

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

- Undertake a feasibility study to investigate the flood risk management opportunities at Low Crosby.
- Encourage the use of sustainable drainage systems (SUDS) in new development proposals to control run-off at source.
- Continue current asset management programme for the river channel at Eamont bridge. Continue with existing policy of no maintenance to the majority of the raised defences in the Lowther valley, accepting further deterioration from present condition of poor and very poor.



↑ Eamont Bridge (above and left)

# Eden Market Towns

## Our key partners are:

Cumbria County Council

Eden District Council

Developers

## The issues in this sub-area

This sub-area comprises the two Cumbrian market towns of Penrith and Appleby. Both towns have high significance to the local economy and community as centres for shopping, housing and employment, and are also identified as Key Service Centres under the North West RSS. There are approximately 320 properties in Penrith and 220 properties in Appleby at the 1% APE risk of flooding. A further 20 properties are at risk as a consequence of climate change taking the total to 560 by 2100. We maintain raised defences and a pumping station in Appleby. Parts of Appleby town centre are not protected by the existing defence and are at risk of frequent flooding. Surface water also contributes to flood risk in these towns. Four medical centres, two electricity sub-stations and one waste water treatment works are at risk within this sub-area.

## 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.

Our vision for this sub-area is to undertake further appropriate actions that will reduce the high flood risk in both Penrith and Appleby. We aim to ensure that the most vulnerable properties are made flood resistant and resilient and encourage sustainable re-development when opportunities arise. There is high demand for industrial and commercial land in Penrith, and large areas of the Gillwilly Industrial Estate are classed within Flood Zone 3 (High Risk). Penrith is the principal town in Eden District and therefore subject to the greatest development pressures. The RSS has set a target of 170 new houses to be built annually within Eden and it is estimated that 75% of these will be in Penrith. Further improvements to the existing flood defences and beneficial land management change outside this sub-area would also help to reduce flood risk. There are storage opportunities upstream on Thacka Beck that may help to reduce flooding in Penrith.

To achieve this, our preferred approach is policy option 5.

## The key messages

- Appleby and Penrith are the second and third highest flood risk locations in terms of people and property within the Eden Catchment.
- The Eden Strategic Flood Risk Assessment (SFRA) identifies that land currently being considered for residential allocation in Penrith is located out of recognised flood risk areas, and is classified as Zone 1 (Low Probability). There are numerous small watercourses which have the potential to cause localised flooding problems if appropriate surface water management is not undertaken.
- All defences in Appleby and Penrith protect property (residential or non-residential). Failure of these defences would increase risk to life and damage to property.
- Flood risk to people in Penrith is high due to the rapid rise of flood water, depth and predicted velocity. No flood warning service is provided for Penrith as a consequence of the short response time. A flood warning service is provided in Appleby, with 223 properties registered.



## Proposed actions to implement the preferred policy

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

- A major capital scheme for Thacka Beck, Penrith is at an advanced stage. The project appraisal report has been accepted and detailed design has begun for the upstream storage and culvert repair option.
- Influence the planning system to ensure that inappropriate development is guided away from flood risk areas and, where development is permitted, the risks are adequately mitigated.
- Residents and businesses are encouraged to take positive steps to reduce the consequences of flooding by improving flood resilience. Residents and businesses in Appleby to take appropriate self-help measures to reduce the damage caused by flood events, taking advantage of the Defra pilot flood resilience grants.
- Further study to be undertaken to investigate viability of providing flood warnings to Penrith despite the very short lead-time.



↑ Appleby

# Carlisle

## Our key partners are:

Cumbria County Council

Carlisle City Council

United Utilities

Developers

## The issues in this sub-area

Carlisle is the county capital of Cumbria and a major centre for employment, housing and the local and regional economy. In Carlisle, the January 2005 event affected 1,800 properties and resulted in the evacuation of 3,000 people. In parts of Carlisle flood risk is high, with 6,500 people considered at risk on the Eden given a 1% APE. Depths of flooding up to 3.5m, with velocities of 0.5 to 2.9 m/s are predicted. Flooding from surface water and sewers contributes to overall flood risk. Without intervention, 6,750 properties could be at risk as a consequence of climate change. The provision of a greater security from flooding and a higher standard of protection in key locations are essential to the regeneration of Carlisle. Two medical centres, eight electricity sub-stations, one school and one waste water treatment works are at risk within this sub-area.

## 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.

Management of flood risk is to be maintained as a key factor in the Carlisle Renaissance Masterplan to ensure that development takes account of flooding issues. Development in areas at risk of flooding (brownfield and undeveloped) will only be permitted where a flood risk assessment has been submitted, with planning applications in line with appropriate policies within the Carlisle City Council development plan and PPS25. Further improvements to the existing flood defences throughout the city are required to reduce flood risk. Carlisle accounts for 60% of total potential damages within this catchment. This is estimated to rise with climate change.

## The key messages

- Where development must take place in areas of flood risk, flood resilience is incorporated into buildings.
- The Eden and Patteril Scheme was completed in May 2008 and designed to give protection against a 0.5% APE. There are existing flood defences along the River Caldew, constructed following flooding in 1963 and 1984. The Caldew and Carlisle City Centre Scheme commenced in May 2008 and should be completed in 2010, and aims to increase the SoP of these defences.



## Proposed actions to implement the preferred policy

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

- Continue the prioritised programme of works to improve the SOP through Carlisle by completing the Carlisle City and Caldew Scheme.
- SUDS to be encouraged as a means of reducing overall flood risk and controlling pollution from urban run-off. We need to work with United Utilities and Carlisle City Council to identify areas at risk of flooding from complex sources (eg, sewer and surface water).
- Jointly investigate and resolve complex flooding from different sources through combined improvement projects.
- Maintain and review the flood warning service to the 4500 properties that are included in the various flood warning areas throughout Carlisle.



↑ Old Eden

# Burgh-by-Sands

## Our key partners are:

Cumbria County Council

Allerdale Borough Council

Carlisle City Council

Land Managers

concerns raised by the farming industry over the impact on the viability of land holdings.

understanding of this policy and its implications.

## The issues in this sub-area

This coastal policy unit is downstream of Carlisle. Several small rural settlements are located within this policy unit, the largest of which is Burgh-by-Sands. Flood risk within this policy unit is small in comparison to risk elsewhere within the catchment. There are around 50 properties at risk from tidal flooding, there are no properties at risk from river flooding. Levels of maintenance of land drainage systems in this sub-area have been reduced over recent years, with

## The vision and preferred policy

**Policy option 2:** Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.

The historic practice of maintaining the agricultural drainage systems in this Policy Unit is no longer sustainable. It is proposed to reduce our current level of management and encourage a more natural drainage system, targeting our asset management activities on areas where flooding poses a greater risk to people and property. Our preferred approach is policy option 2. To achieve this, we must engage key stakeholders to encourage awareness and

## The key messages

- Continue to adopt a risk-based approach to flood risk management.
- Engagement with stakeholders.

## Proposed actions to implement the preferred policy

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

- Review the SAMPs to ensure that the maintenance programme is risk-based. As the flood risk increases due to climate change, the SAMP should identify opportunities to sustain the current level of flood risk.



↑ Embankments



# Rural Caldew and Petteril

## Our key partners are:

Cumbria County Council

Allerdale Borough Council

Carlisle City Council

Eden District Council

Lake District National Park Authority

Landowners

Our current flood risk management activities are limited. We maintain areas of raised defences that protect small rural communities. Our works in this sub-area concentrate on channel maintenance and the removal of obstructions. Large scale storage within this Policy Unit has shown not to be economically viable as part of the Carlisle and City / Caldew Scheme. Modelling has shown that attenuation has some benefit.

catchment and help to reduce localised flooding.

## Proposed actions to implement the preferred policy

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

- Encourage take-up of environmental stewardship schemes through catchment sensitive farming officers to contribute to reducing flood risk.
- Continue with existing policy of no maintenance of the raised rural defences in the Caldew Valley accepting further deterioration from present condition of poor and very poor.
- Continue to maintain the standard of protection of the isolated raised defences that protect the small communities at Plumpton and Newton Reigney.

## The issues in this sub-area

This sub-area covers the upper and middle sections of the Caldew and Petteril sub-catchments. There are no flood warning areas but a flood watch is issued by the Environment Agency for the Caldew/Petteril catchments. Flood risk to people and property is low. Approximately 50 properties are at risk in a 1% APE from the main rivers but a number of properties are considered to be at risk on the River Roe at Stockdalewath and at Roe Beck at Thistlewood (29 properties flooded in these areas in January 2005).

## 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.

## The key messages

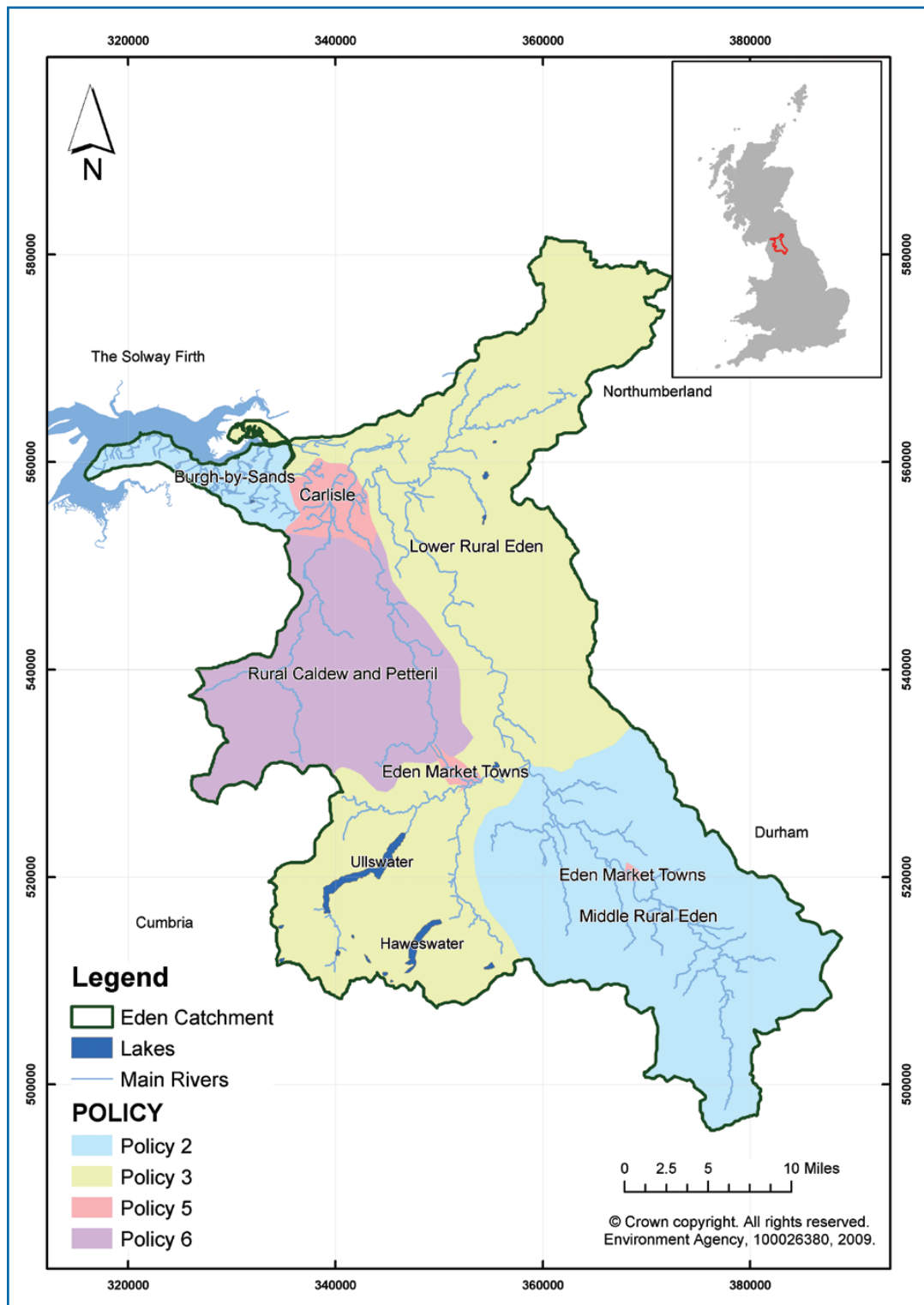
- Large-scale storage is not considered to be viable in this sub-area.
- Land management in this sub-area to reduce surface run-off and, help to keep water on the land for an increased period in a managed fashion, may help to reduce river flows. This could provide benefits elsewhere in the



↑ Highbridge

# Map of CFMP policies

Map 4 Summary of Policies







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