

Wear Catchment Flood Management Plan

Summary Report December 2009



managing
flood risk

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Published by:

Environment Agency
Rivers House,
21 Park Square South,
Leeds, LS1 2QG
Tel: 0870 8506506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

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ISBN: GENE1109BRCN-E-P December 2009

Introduction



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

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

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

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

The Wear catchment has a long history of flooding with reported flooding dating back over 700 years.

Over the years a number of engineering schemes have been implemented to reduce the risk of flooding in the catchment. At present over 4,700 properties including some key infrastructure buildings are at risk of flooding (not taking into account defences) during the one per cent flood scenario. In the future due to climate change this number is expected to rise to almost 5,000.

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. In developing this plan we have worked with Durham County Council and City of Sunderland Council along with Natural England. We also consulted all the local authorities on the draft plans and incorporated their comments in the final plan.

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 the North East.

A handwritten signature in black ink, appearing to read 'D. Dangerfield', with a long horizontal stroke extending to the right.

**David Dangerfield,
Director – Yorkshire and North East**

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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:

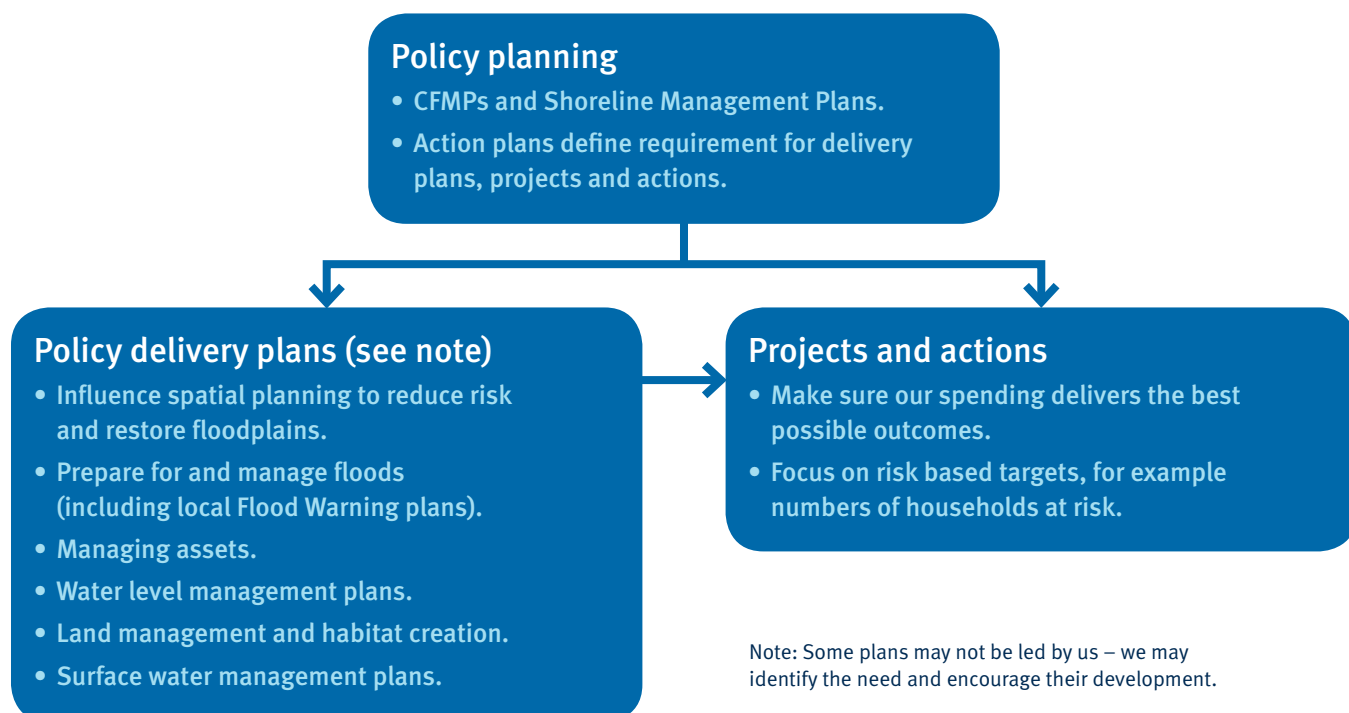
- The Environment Agency, who will use the plan to guide decisions on investment in further plans, projects or actions;
- Regional planning authorities and local authorities who can use the plan to inform spatial planning activities and emergency planning;

- IDBs, water companies and other utilities to help plan their activities in the wider context of the catchment;
- Transportation planners;
- Land owners, farmers and land managers that manage and operate land for agriculture, conservation and amenity purposes;
- The public and businesses to enhance their understanding of flood risk and how it will be managed.

CFMPs aim to promote more sustainable approaches to managing flood risk. The policies identified in the CFMP will be delivered through a combination of different approaches. 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

The River Wear drains the North Pennine Moors between Killhope Law and Burnhope Seat. There are many streams in this area that eventually come together to form the start of the River Wear at Wearhead in County Durham. Two other major rivers also begin within 20 miles of this small area of uplands. These are the River Tees to the south and the River Tyne to the north.

The upper part of the catchment is almost entirely within the North Pennines Area of Outstanding Natural Beauty (AONB). This is characterised by upland heather and peat moors. River valleys are steep and narrow with small market towns spread along the valley bottoms.

Within the uplands are the North Pennines Moors and the North Pennines Dales, both of which are designated as important environmental sites under the Habitats Directive. Numerous Sites of Special Scientific Interest (SSSI) can be found in the headwaters and throughout the catchment.

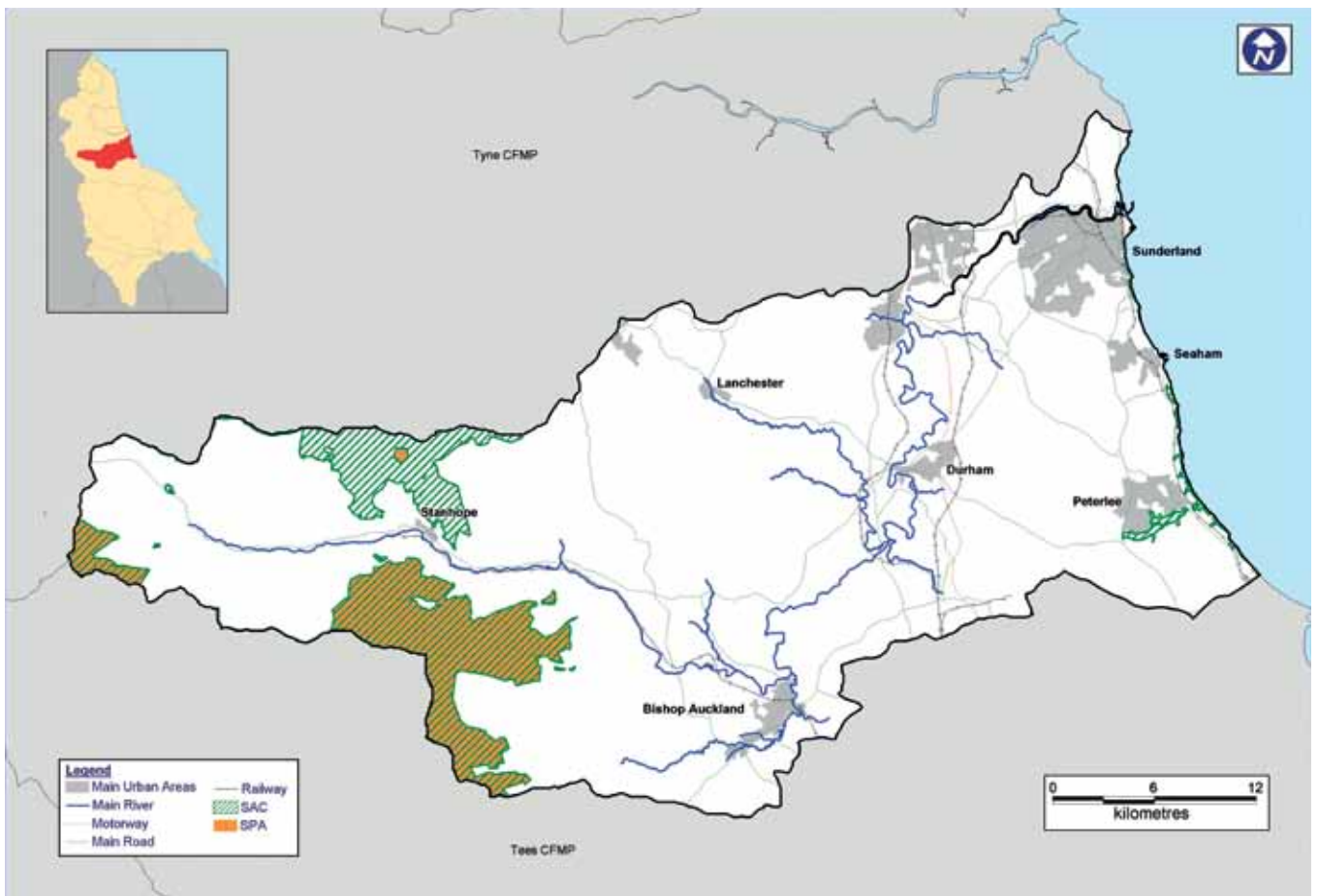
As the river flows through the catchment it passes through a gentler agricultural landscape of wider valleys and more open floodplains. The river is joined by the tributaries of the River Gaunless and River Browney in this middle section.

In the lower reaches of the catchment the landscape becomes more heavily urbanised. Major urban areas of Durham, Chester-le-Street and Sunderland have built up to the banks of the Wear. Important national transport links such as the East Coast Main Line railway and the A1 run through the catchment.

The Wear eventually flows out to the North Sea through Wearmouth at Sunderland where the CFMP meets the boundary of the North East Coastal Authority Groups Shoreline Management Plan.

More than 620,000 people live within the CFMP area, the majority of residents live within the urban areas in the east of the catchment.

Map 1 Location and extent of the Wear CFMP area



Current and future flood risk

Overview of the current flood risk

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

The flood risks quoted in this report, unless stated otherwise, are the undefended one per cent flood figures, produced by broadscale modelling, they do not take into consideration the presence of defences to demonstrate the total risk of flooding within the catchment.

The main source of flooding in the catchment is from the rivers, there are no known groundwater flooding problems. Given the large urban areas in the east of the catchment there are some instances of surface water flooding where intense rainfall can exceed the capacity of the urban drainage systems.

The River Wear has a long and varied flood history with reports as early as 1316 with regular floods recorded from the 1700s onwards in the Durham area. Due to the differences in the catchments between the main river Wear and the tributary rivers catchment, wide scale floods are rare and flooding generally occurs on either the Wear, or the tributaries, but rarely on both at the same time. Extensive flooding occurred on the Wear in 1967 with property flooding recorded along all the riverside towns and villages.

In 2000 a large flood on the River Gaunless resulted in over 400 properties flooding in South Church and West Auckland.

What is at risk?

Within the Wear catchment there are over 4,700 properties at risk of flooding in the one per cent flood. This is less than 1.5 per cent of the catchment population. There are over 40 essential infrastructure assets at risk including power installations and three health care buildings.

Flooding has a neutral impact on 0.15 kilometre squared of SSSI, 0.69 kilometre squared of SAC and 0.45 kilometre squared of SPA and a positive impact on 0.11 kilometre squared of SSSI in the CFMP area. Additionally there are 10 Scheduled Ancient Monuments, three are bridges which are not at risk of flooding or erosion, two are old railway structures in areas with no known erosion problems and five are structures relating to coal and ore extraction within the river. The risk to these individual sites has not been addressed within the CFMP.

Table 1 Locations of towns and villages with 25 or more properties at risk in a one per cent annual probability river flood

Number of properties at risk	Locations
100 to 500	West Auckland, South Church, Lanchester, Durham, Houghton-le-Spring, Chester-le-Street
50 to 100	Stanhope, Crook
25 to 50	Wolsingham

Table 2 Critical infrastructure at risk:

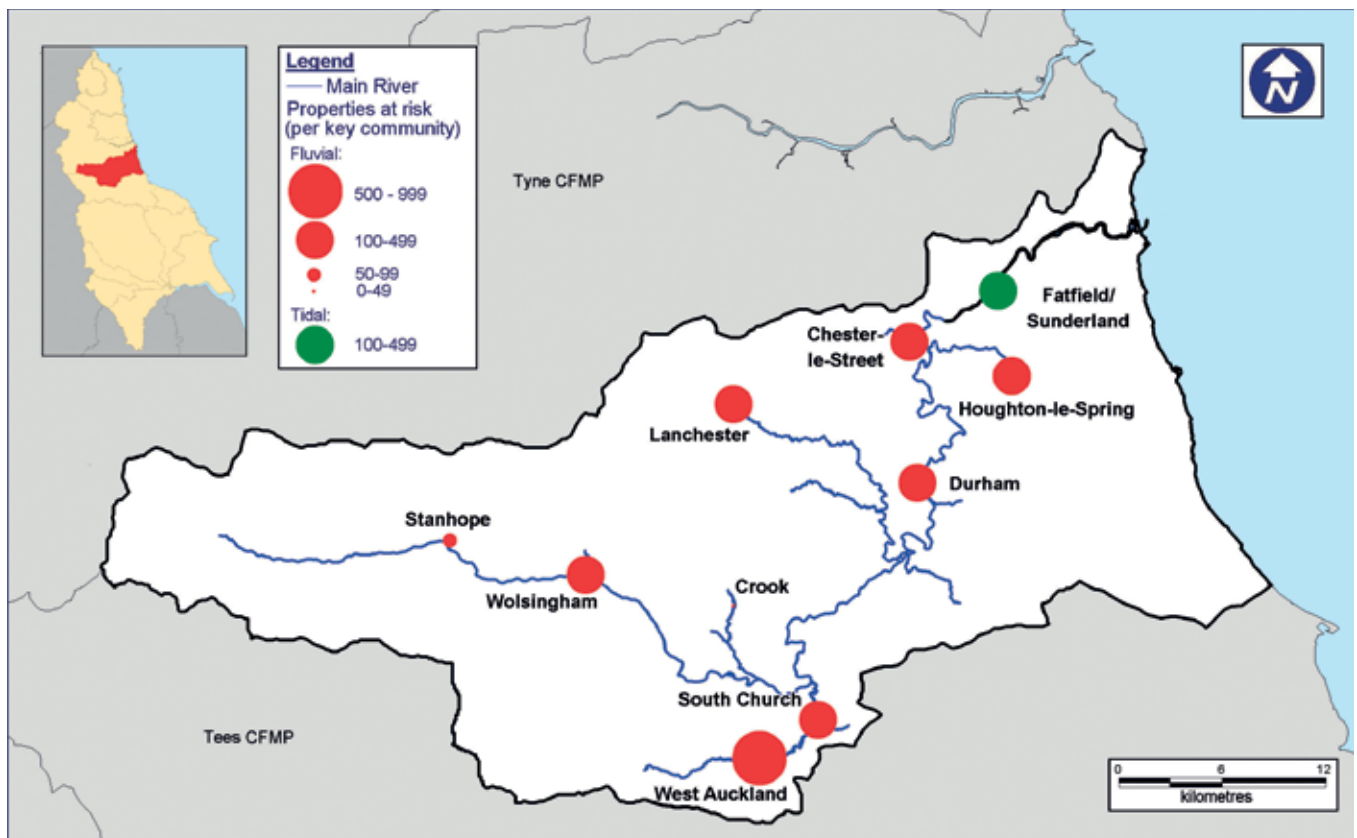
25 gas and electricity assets
2 wastewater treatment works
3 health care facilities
12 Educational facilities

Where is the risk?

Flooding in the Wear catchment is scattered along the main river and some of the major tributaries. The main risk in the catchment is located in the towns and villages listed in Table 1. In recent years flooding has occurred in Chester-le-Street, Durham, Stanhope, South Church, West Auckland and Houghton-le-Spring. Many of these communities have flooded historically although many of them now benefit from defences which reduce the frequency of flooding.

In the tidal stretches of the River Wear the main risk is in areas such as Fatfield although this is from a combination of tidal and river flows and as such is rare as the events have to coincide for flooding to occur.

Map 2 Properties at risk of flooding in the Wear catchment



How we currently manage the risk in the catchment

- Flood risk mapping** to gain a more detailed understanding of flood risk in localised areas. This includes recording the extents of large floods in the catchment and then mapping these on GIS systems. Where more detail on flood risk is required this team will commission detailed computer modelling of the river systems.
- Maintenance of existing defences and structures** prioritised on a risk basis to ensure the effectiveness of our assets. Within the Wear catchment there are over 26 kilometres of maintained raised defences, including defences at Stanhope, Chester-le-Street, Houghton-le-Spring, West Auckland and South Church and almost 350 kilometres of maintained river channel. The Environment Agency carries out regular maintenance activities within the catchment which includes inspections of defences and watercourses, regular grass cutting and vermin control on defences and regular clearing of blockages within the river channels.
- Capital schemes** to create new flood defences and replace existing ones where flood risk is identified as being high and where a cost effective solution can be installed. The recently completed Gaunless scheme is an example of the work carried out by this team.
- Flood forecasting and warning** to make the emergency responders and the public aware of predicted river and coastal flooding. Within the catchment there are more than 25 specific locations including Durham, Stanhope and the River Gaunless where we offer a focused flood warning service.

The impact of climate change and future flood risk

- **Development control** to prevent inappropriate development in flood risk areas such as Durham and Sunderland and regulate the work of others to ensure that flood risk and environmental issues are not detrimentally effected.
- **Strategic planning** to plan sustainable long term investment on a risk basis including the development of Catchment Flood Management Plans.

The effect that flooding will have in the future is influenced by a range of issues such as climate change, changes in land use (e.g. development), and changes in how land is managed. Within the Wear Catchment we considered land use management changes, urbanisation and the impact of climate change in assessing future catchment scenarios. We assessed the sensitivity of the catchment to these catchment changes. However, there is little development pressure in the catchment as a whole and the scope to apply land use change to the whole catchment is limited so the models showed little change as a result of these scenarios. Therefore for our future scenario development we have concentrated on the impacts of climate change. The key trends are:

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

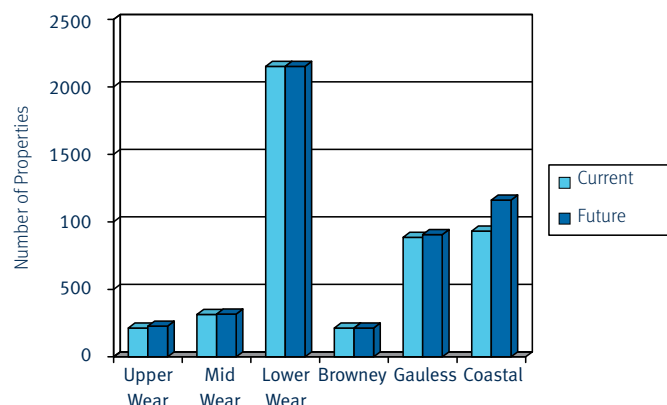
The government recommendations for considering climate change is to increase flows in rivers by 20 per cent for all flood scenarios. We have

used this for assessing the future flood risk in the Wear catchment. The catchment is most sensitive to the increase in the longer winter rainfall scenarios as catchment wide flooding requires rainfall over the majority of the catchment.

The impacts of this future flooding scenario for the Wear catchment plan area is limited with an increase in properties at risk of 267 from 4,712 currently to 4,969 at risk during a future one per cent probability flood as shown in Figure 2. However, the frequency of flooding to the existing properties is expected to increase in the future when 4,781 properties will be at risk at the future 1.3 per cent flood. The main risk areas will remain as existing with small increases noted in all areas including Durham, Chester-le-Street and Fatfield.

The predicted increase and frequency of rainfall storms will likely increase the frequency of surface water drainage flooding in the catchment although the detail is not fully explored within this CFMP. This aspect of flooding will need further investigation and we will work with local authorities and the water company to gather more detailed understanding of this potentially significant future flood risk.

Figure 2 Current and future flood risk to properties from a one per flood



Future direction for flood risk management

Approaches in each sub-area

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

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

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

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

Map 3 Catchment policy decisions

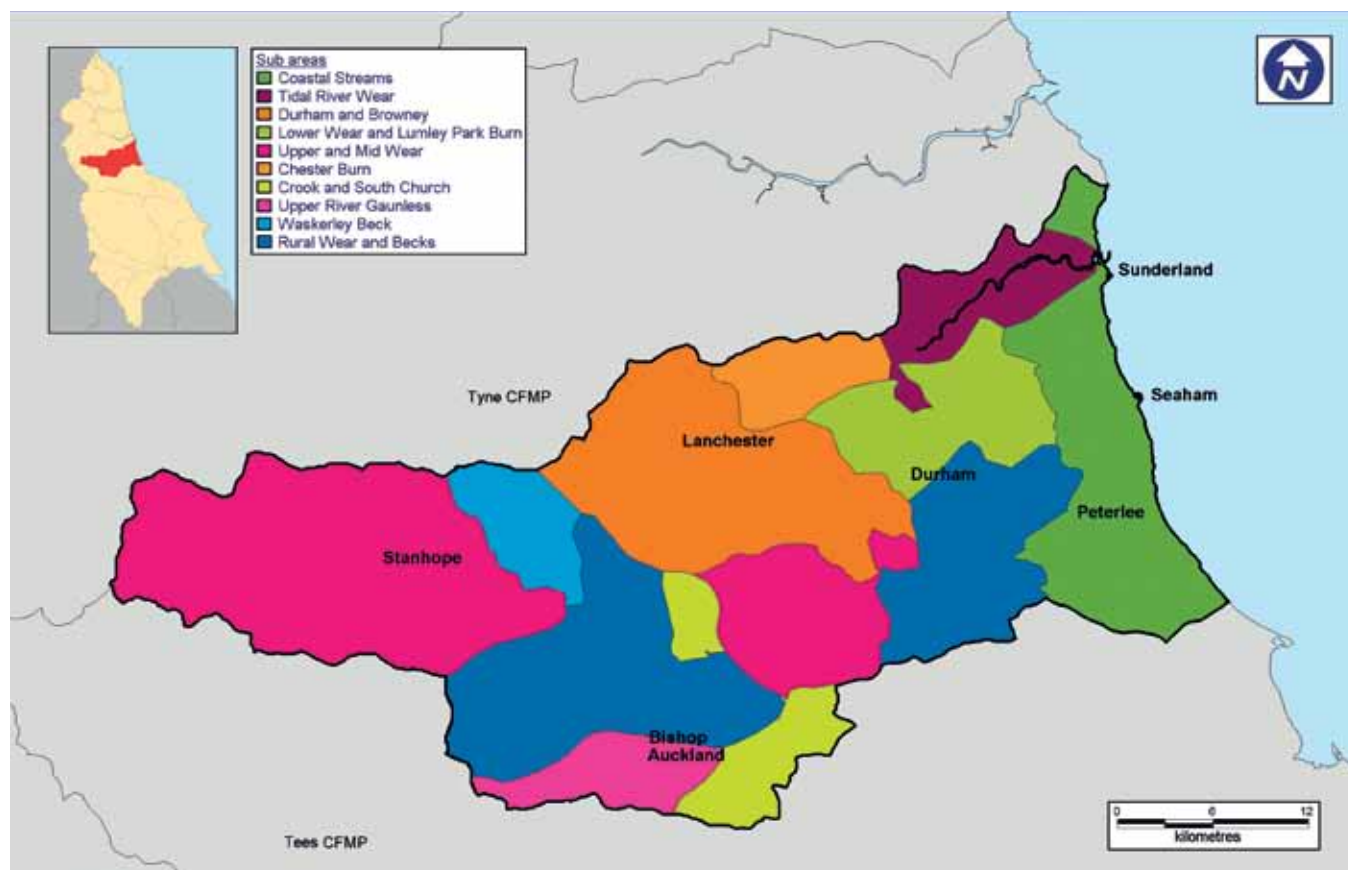


Table 3 Policy options

→ 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.

Coastal Streams

Our key partners are:

City of Sunderland Council

Durham County Council

The issues in this sub-area

Several short watercourses pass through urban areas along the length of coastline from Seaburn to Crimdon Park. The risk of flooding is caused by channel obstructions, surface water flooding and high tides. However, the river channels are capable of carrying high flows,

so while the broadscale modelling has identified up to 69 properties at risk of flooding assuming that the channels are only capable of passing the 50 per cent flow, there are no reported instances of flooding in the sub-area. In future this could rise to 75 properties.

The vision and policy

Policy Option 1 is appropriate for this area. There is no reported flooding and it is believed that the watercourses are capable of passing sufficient flow in their current condition. However, further investigation into the risk of flooding in the sub-area will be done, with that information we will review our policy option.

The key messages

- We will not take any action in this area to manage the risk of flooding.
- We will work with others to develop a better understanding of risks from a number of sources. We will review our approach if necessary based on the improved information.

Actions to implement the policy

- Local authorities should consider the need for more detailed mapping of the risks of flooding along the coastal streams. This needs to be carried out in time for actions that may occur as a result of climate change.

Tidal River Wear

Our key partners are:

City of Sunderland Council

Northumbrian Water

The issues in this sub-area

The main risk of flooding comes from the North Sea rather than flows coming down the river. There are also a number of small urban watercourses in channels that have the potential to become blocked or overflow, particularly when there is extreme rainfall. When tides are high these channels are unable

flow into the River Wear. There is a risk of flooding to a large number of people and property, our broad scale modelling indicates 473 properties at risk currently rising to potentially 638 in the future due to sea level rise and rainfall intensity increases.

The vision and policy

Under **Policy Option 5**, we will take further action in this area to reduce the current known flood risks in areas like Fatfield. We will also work with other organisations to manage risks from urban watercourses and urban drainage systems more effectively. All sources of flooding must be considered together and we will work with other organisations to achieve this.

The key messages

- The risk of flooding in the future will increase as a result of sea level rise, increased river flows and increased rainfall intensity.
- Development planning can help prevent future increases in risk by ensuring the development along the water front is set back from the river.

Actions to implement the policy

- We will investigate further flood risk management actions in the Fatfield area where there is a risk of flooding.
- We will identify what actions are needed to ensure that sea level rise does not result in an increased risk of flooding. By doing this we will also look at what changes to the flood warning service may be necessary in the future.
- New techniques to map the risk of flooding from all sources will be used to assess the risk to Sunderland. This will help plan effective approaches to managing the risk from all sources.

Durham and Browney

Our key partners are:

Durham County Council

Northumbrian Water

Land owners

Natural England

The issues in this sub-area

This sub-area includes Durham City and the Browney Catchment. In the Browney Catchment, the risk of flooding in the area comes from Smallhope Burn as it passes through Lanchester where frequent flooding can occur.

In Durham there is the potential for a large number of people and businesses to be affected by flooding. Areas at risk within the city include a number of vulnerable members of the community. Flooding can cause a great amount of economic damage to properties in the city.

Further flooding is spread throughout the sub-area. In total there are 473 properties at risk from the one per cent flood, this may rise to 504 in future scenarios. Current flood risk management activities and defences in parts of the sub-area reduce this risk.

We currently carry out a number of flood risk management activities in the sub-area, including regular inspection and clearance on channels and offer a flood warning service throughout the sub-area.



The vision and policy

We will follow a **Policy Option 5** approach throughout the sub-area, currently we carry out flood risk management activities along the main rivers such as the Browney and Smallhope Burn. Risk exists outside of these areas and needs to be addressed by doing more work in the sub-area. We will investigate what further action can be taken to reduce the risk of flooding. This approach will also be used to develop flood awareness and knowledge of self help measures that residents can take to reduce the effects of flooding on themselves and their property.

Within Durham we will take further action to reduce risk. Managing risk in the city will reduce the likelihood of flooding and limit the impact on people and damage caused by flood waters.

The key messages

- A strategic partnership approach between many different organisations working together is needed to reduce the effects of flooding.
- Actions in other parts of the river catchment can reduce the risk of flooding in the towns. Not all measures to reduce the risk will be visible to people living and working in the city itself.
- The development planning process has a vital role to play in managing future risk of flooding. It should ensure that floodplain areas remain free of development so they can absorb the increasing amounts of flood waters.
- Properties at risk of flooding are widely spread across a number of watercourses in the area. This means that building structural responses is not the best action to take in reducing the risk of flooding.
- Individuals need to be more prepared and aware of the risks of flooding.

Actions to implement the policy

- We will investigate the feasibility of providing flood defences through the sub-area.
- We will investigate the need for expansion and improvement of the flood warning service across the area.
- Businesses should develop flood resilience plans. This will help reduce the effects of flooding that could result in loss of income and community disruption through loss of services.
- We will investigate the potential for small scale wetland creation upstream of Lanchester. This may help reduce flood flow through the town whilst providing environmental enhancements.
- Flood response plans need to be maintained.
- We will develop a strategic approach in reducing the risk of flooding. We will investigate the most effective use of storage on the floodplain in this and other parts of the river catchment. Our approach will include different measures that can be taken in the town.
- Development plans should ensure that undeveloped floodplain areas in the towns remain free of development.

Lower Wear and Lumley Park Burn

Our key partners are:

Durham County Council

National Farmers Union

Natural England

Land owners

Northumbrian Water

City of Sunderland

The issues in this sub-area

This stretch of the River Wear has a low risk of flooding. The floodplain acts as a natural store of flood waters which results in a reduction in the flood levels at Chester-le-Street. There are flood defences along parts of the river bank which prevent all of the floodplain being used. Climate change will mean the defences are less effective in the future. The Lumley Park Burn flows through the urban area of Houghton-le-Spring. The river

channel is heavily modified and has several obstructions that could restrict flow if blockages occur. In total modelling indicates there are 243 properties currently at risk. However, a recent detailed mapping study of the area has shown there is a lower risk of flooding than initially thought. Additionally defences around Chester-le-Street reduce the risk to 57 properties. Surface water flooding in the urban areas of the sub-area are not fully understood.



The vision and policy

Utilising **Policy Option 3** we will continue with our current activities. By taking this approach we will continue to maintain flood defences where there is benefit of doing so. We will also work with others to ensure that the floodplain can continue to act as a natural flood storage area. We will take an approach that involves considering the opportunities to enhance the natural storage areas downstream. We will review the need for alternative approaches as we update this CFMP in the future.

The key messages

- Climate change could result in an increased risk of surface water flooding from more intense rainfall. Further research and development work is needed to be able to map these risks.
- We can reduce the overall risk of flooding in the catchment by linking together flood risk measures in other sub-areas. Using and enhancing the natural flood storage that occurs along the floodplain will reduce the risk of flooding across the catchment.
- Increasing uptake of our flood warning service and raising awareness of how to be prepared is an important part of managing the risk of flooding. This is important where properties are isolated and spread throughout the sub-area.

Actions to implement the policy

- We will continue the long term maintenance of the flood defences at Chester-le-Street. In some areas there are other flood defences that prevent the river from connecting with the floodplain. We will investigate the benefits of realigning these defences to encourage waters to be stored in the floodplain. This will reduce flood levels at Chester-le-Street.
- We will provide advice to residents in isolated properties on how they can prepare and protect their home from flooding. We will also actively encourage the owners of these properties to sign up to the flood warning service.
- We will work with partners to improve our understanding of the risks from surface water flooding.

Upper and Mid Wear

Our key partners are:

Durham County Council

National Farmers Union

Natural England

Land owners

The issues in this sub-area

This sub-area includes the headwaters and also the mid-reaches of the River Wear. In the uplands flooding can happen quickly but normally only for short periods of time. Run off from these upland areas is rapid and the rivers react quickly to rainfall providing little attenuation downstream.

The Mid section of the Wear provides a natural storage area for flood waters in the catchment. This floodplain area acts as a

natural store of flood waters and currently has an effect on reducing the risk of flooding to downstream areas. There are a few properties also at risk spread throughout the Wear floodplain. In total there are currently 215 properties at risk, mainly in the upland catchment, rising to 244 due to climate change. There are defences in the area which do reduce the risk of flooding in parts of the sub-area.



The vision and policy

Policy Option 6 is appropriate for this sub-area as the reduction of runoff and storage of water in the sub-area will have benefits locally and further downstream. In the upland areas we will seek to reduce runoff by land management changes including the restoration of peat bogs in the uplands. We will discuss with other organisations the creation of habitats which will have a beneficial effect on the rate and volume of runoff into the river system.

In the lower sections of the sub-area we will look to opportunities to maximise the natural floodplain storage to reduce downstream flows in the river and thus manage the risk of flooding further downstream.

The key messages

- By allowing the floodplain to act as a natural store of flood waters, we can help reduce the risk of flooding further downstream.
- To bring about a sustainable approach to managing the risk of flooding we need to work with many partner organisations and landowners in the area.
- In the upper Wear flood water will become more hazardous in the future as the speed of flood waters and the rate at which flooding occurs increases. Residents and local businesses need to be aware of the risks of flooding and be prepared.
- There is an opportunity to improve the upland environment which will also reduce runoff.
- Any new development needs to be set back from the river. This will be more sustainable than building defences to protect development sites.

Actions to implement the policy

- We will continue to maintain the existing defences to ensure that properties continue to be protected in the future.
- We will work with partners to encourage changes to the way we manage land. This will improve the upland environment and reduce runoff from the land so reducing the effects of frequent flood flows.
- We will undertake a gravel monitoring study to develop a strategy for managing gravel within the River Wear. This will help in managing the risk of flooding from the river.
- We will develop a detailed flood risk management strategy to look at the most effective way to use the natural floodplain. This strategy will consider how actions in this sub-area can be complimented by actions in higher risk areas upstream to reduce the flood risk over a wider area.
- We will work with the owners of important infrastructure to make sure that their assets are flood resilient and can be operated during flooding.

Chester Burn

Our key partners are:

Natural England

National Farmers Union

Durham County Council

The issues in this sub-area

The Chester Burn flows through a long length of culvert under Chester-le-Street before joining with the River Wear. High flood levels on the Wear can result in the Chester Burn backing up causing flooding to occur within the town. In total around 96 properties are at risk of flooding. However work has been

done to reduce the effects of this in recent years and 84 properties are protected to the one per cent flood level, but a risk remains. In future the total properties at risk rises to 110, although the current defences will continue to provide some risk reduction to the majority of these properties.

The vision and policy

Policy Option 6 will be used to reduce the risk of flooding from the Chester Burn catchment, we will work with other organisations to reduce the runoff within the area. The risk comes from urban areas and agricultural land. This policy will help control the flood flows of the Chester Burn and so reduce the effects of the water backing up in the catchment. Using long term development planning the length of the burn should be opened up. By doing this the burn will be less restricted during high flows and the effect of water backing up will be reduced. While aiming to reduce runoff in the catchment we will continue to carry out routine maintenance in and around Chester-le-Street.

The key messages

- Sustainable Urban Drainage Systems (SuDS) should form part of any new development or redevelopment plans to manage increases in the risk of flooding in urban areas.
- Long term development plans should work towards opening up the length of the Chester Burn. This could provide for a less restricted watercourse reducing the effect of backing up flood flows.

Actions to implement the policy

- Put in place long term development targets to look at how the culverted length of the Chester Burn can be opened up in line with long term re development plans.
- Development planning should ensure that all new development incorporates SuDS to ensure there is no increase in runoff from new urban areas. Using these techniques to reduce runoff from all urban areas in the sub-area should also be considered.
- We need to adopt a partnership approach with key organisations and work with landowners to reduce the runoff from agricultural land.

Upper River Gaunless

Our key partners are:

Durham County Council

The issues in this sub-area

The risk of flooding is greatest where communities are located near smaller tributary streams joining the River Gaunless. Flooding in this area can happen quickly but would not last for long. In total there are around 31 properties at risk at a 0.5

per cent flood although most of the properties are defended to a lower level. In the future this may increase to 44 properties.

There are seven defences in the sub-area which reduce the risk to some of these properties.

The vision and policy

By applying **Policy Option 4** we will take action to minimise the expected increase in risk of flooding in the future. We will do this mainly through improving the condition of the watercourses. This will allow them to flow more freely at the junctions between small watercourses and the River Gaunless. We will encourage isolated properties to be prepared and better protected for flooding. If possible, we will also expand the flood warning service to cover more properties at risk in the future. We will continue to maintain the Spring Gardens dam and wildlife area. This will help keep the risk of widespread flooding in the urban areas in the downstream valley low, with the added benefit of providing local amenity and wildlife benefits.

The key messages

- Encouraging residents to be prepared and protected for flooding will be an effective option for reducing flood damage to properties in the area. This is because there is a low number of properties at risk spread throughout the sub-area.

Actions to implement the policy

- We will develop a sustainable maintenance programme for the watercourses that focuses on the junction between smaller watercourses and the River Gaunless.
- We will investigate the expansion of the flood warning service. We will promote the benefits of the service and work to increase sign up in low take up areas.
- Offer advice to residents at risk of flooding about how they prepare for flooding and reduce the possible effects.
- The long term maintenance of the Spring Gardens dam will continue to provide great benefit to the community downstream.

Crook and South Church

Our key partners are:

Durham County Council

The issues in this sub-area

Properties at risk are those within a narrow strip of land along the length of the Beachburn Beck through Crook and riverside properties at Howden-le-Wear and along the Gaunless and Oakley Cross Beck at West Auckland and South Church.

In total there are 828 properties within the one per cent flood outline not considering defences. However,

over 600 of these properties are defended by a defence scheme on the Gaunless and by channel works on the Howden and Beachburn Beck.

Future flood risk is not expected to increase due to the steep floodplains in the area. There are only an additional four properties at risk due to climate change.



The vision and policy

We will utilise **Policy Option 3** for future management in this sub-area. On the Beachburn and Howden Becks there are limited ways in which we can manage the risk of flooding in the area. This is because of the nature of the landscape and location of properties at risk of flooding. Risk can be managed through continuing to maintain the channel and the flood defences for this sub-area.

Managing the risk of flooding on the Gaunless relies on the continued use of the Spring Gardens dam in the upstream area.

By keeping future developments set back slightly from the river banks we can sustain the current low risk of flooding. The required area between the bank and the development would not be large but will help manage the risk of flooding in the future.

The key messages

- The risk of flooding on the Gaunless has been greatly reduced in recent years.
- There will continue to be a low risk of flooding from surface water and rivers in the area.
- The area of land at risk of flooding through Crook is limited to a narrow strip following the watercourse.
- Setting back development slightly from the river banks would greatly reduce the risk of flooding in the future.

Actions to implement the policy

- We will carry out regular maintenance of the river channel to ensure that no damage has been caused and there is no build up of debris.
- Offer advice to residents at risk of flooding about how they can reduce the possible effects of flooding and how they can prepare. This is particularly important to owners of infrastructure and emergency services to ensure that they can still respond effectively in a flood event.
- We will work with planning authorities to make sure that any future development is set back from the river front.
- We will investigate to see if there are any changes that could be made in managing the land. By doing this we can see if there is an opportunity to reduce the volume and speed of runoff water. This would reduce the effects of flooding.

Waskerley Beck

Our key partners are:

Durham County Council

The issues in this sub-area

This largely rural area is dominated by Waskerley and Tunstall reservoirs which control the flow of the Waskerley Beck. The main risk of flooding to people within this sub-area comes from the River Wear in Wolsingham. In total there are currently 32 properties at risk of flooding during the 1.3 per cent

flood. In the future it is estimated that the number of properties at risk could increase to 121. The cost of flood damage is expected to rise in the future. The topography around Wolsingham means it could be vulnerable to surface water flooding which is currently not fully understood.

The vision and policy

Because of the expected increase in damage caused by flooding in the future, we will sustain the current low level of risk by taking further action as outlined in **Policy Option 4**. The risk of flooding in this sub-area is sensitive to the gravel movement within the River Wear. We will manage this in order to keep the risk of flooding low. This would involve putting in place actions upstream of this area so flood risk management works may not be visible in the local area. By protecting floodplain areas from inappropriate development we can prevent an increase in future flood risk.

The key messages

- Flow for the Waskerley Beck is artificially controlled by the reservoirs. The risk of flooding to the area comes from the River Wear.
- By restricting the inappropriate development in the future we can use the floodplain to help manage the risk of flooding to property.

Actions to implement the policy

- We will undertake a gravel monitoring study to help us manage the gravel within the River Wear. This will help manage the risk of flooding from the river.
- We will work with planning authorities to make sure that inappropriate development does not take place within the floodplain.
- Mapping the risks of surface water flooding will allow an understanding of the risk so risk can be managed by using the best approach.
- We will investigate the need to extend our flood warning service in the future to any additional properties that may be at risk.

Rural Wear and Becks

Our key partners are:

Durham County Council

Natural England

Northumbrian Water

The issues in this sub-area

There are a small number of properties at risk spread throughout the wide area on a number of different watercourses. The risk of flooding is limited through the sub-area with only 27 properties currently at risk and this only rises to 32 under future flooding

scenarios. There are some small lengths of the road and railway network which could be affected by flooding which would disrupt transport. Climate change increases in river flow will not increase the risk of flooding in this part of the catchment.

The vision and policy

Under **Policy Option 2** we will reduce our actions over time by withdrawing maintenance in places where it is viable to do so, such as the short lengths of floodbank which do not provide an effective flood defence benefit. We will not replace these banks when they come to the end of their life. In doing this the river will be allowed to reclaim its floodplain over time and improve the river environment. We can make sure it stays at low risk by using planning processes to prevent inappropriate development in high risk areas.

We will continue to monitor the level of flood risk in the sub-area.

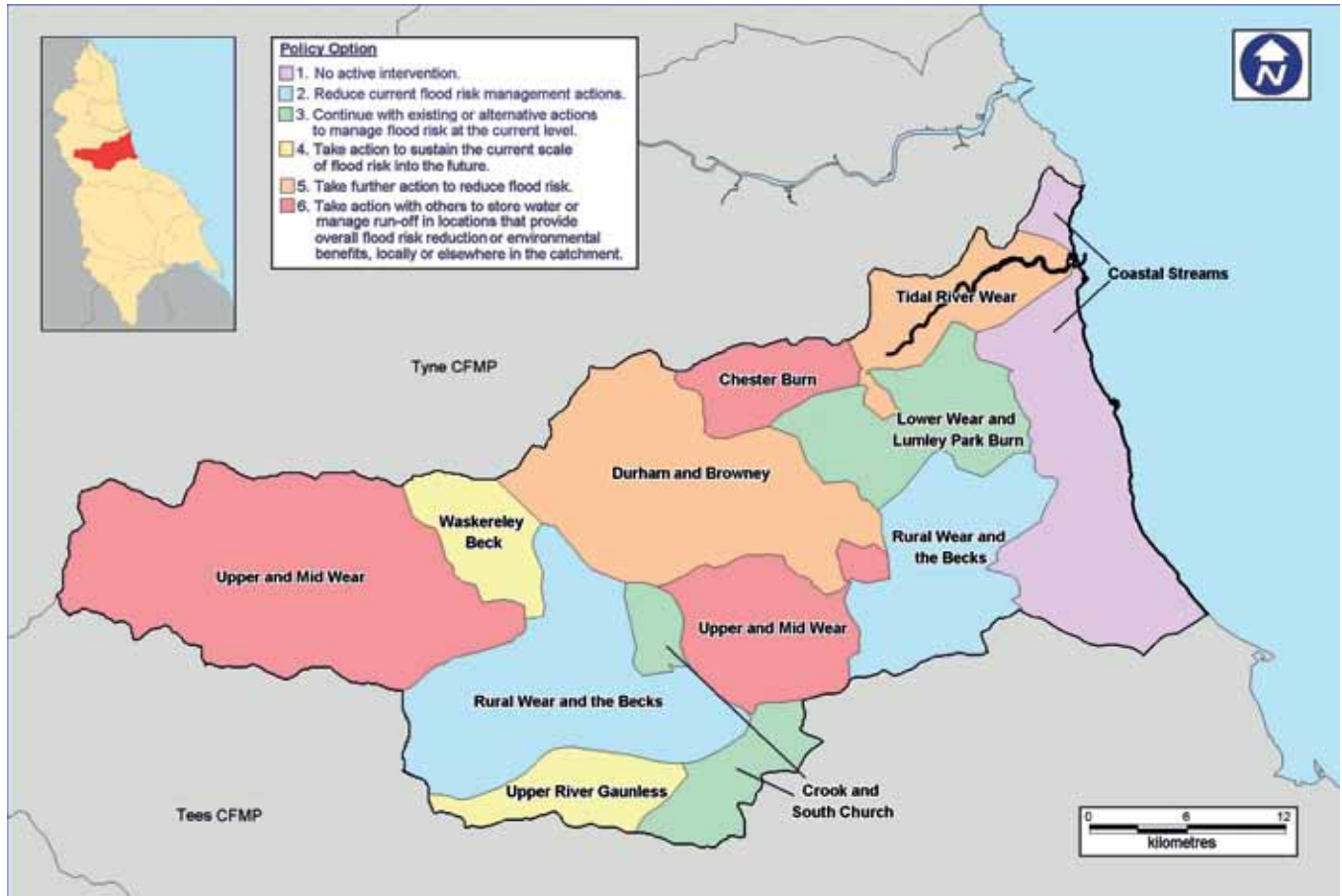
The key messages

- This sub-area is at low flood risk and will continue to be low risk in the future.
- Infrastructure at risk can be made resilient at a site specific location. As the sub-area has a low flood risk this is the most appropriate action.

Actions to implement the policy

- We will develop a plan to withdraw maintenance from defences that do not provide long term flood risk management benefits. This will allow us to reinvest money and resources into areas with a higher risk of flooding.
- Risk assessments for infrastructure at risk of flooding needs to be carried out. This will identify the most suitable measures that can be put in place locally to reduce the impact of flooding in the area.
- Offer advice to residents at risk of flooding about how they prepare for flooding and reduce the possible effects.

Map of CFMP policies



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