

River Nene Catchment Flood Management Plan

Summary Report December 2009



managing
flood risk

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Introduction



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

The River Nene 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). This is covered by Shoreline Management Plans (SMPs). Our coverage of surface and groundwater flooding is however limited due to a lack of available information.

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

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

There are different sources of flooding in the catchment. Areas of Northampton, Wellingborough, Kettering and Corby are at risk of flooding from the River Nene and its tributaries. The Fens are at risk of

flooding if the embankments overtop in the tidal reach of the River Nene downstream of Peterborough. There is the risk of surface water and sewer flooding in the large urban centres. Incidents are recorded in Corby, Wellingborough and Kettering. Groundwater flooding could occur in the catchment, although few incidents of such flooding are recorded.

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. For example, in parts of the catchment Internal Drainage Boards (IDBs) have an important role in managing flood risk. We will work in partnership with the IDBs to agree the most effective way to manage flood risk in the future. We also work with many other organisations, groups and individuals with an interest in how flood risk is managed. This includes local authorities, water companies, conservation bodies such as Natural England and the public.

This is a summary of the main CFMP document. If you would like to see the full document an electronic version can be obtained by **emailing enquiries@environment-agency.gov.uk** or telephoning 08708 506 506. Alternatively, paper copies can be viewed at any of our offices in Anglian Region.

A handwritten signature in black ink that reads "Paul Woodcock". The signature is written in a cursive style with a horizontal line underneath the name.

Paul Woodcock
Regional Director Anglian Region

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↑ Dog in a Doublet Sluice

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:

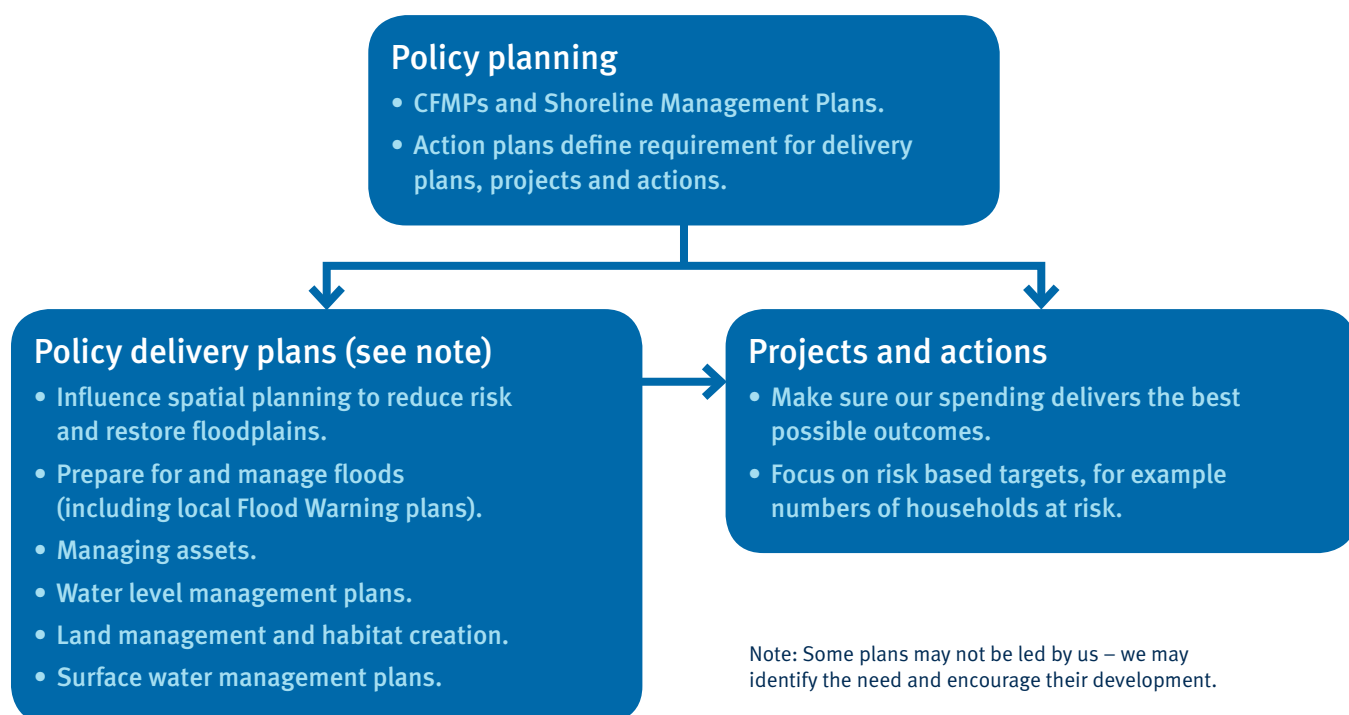
- the Environment Agency, who will use the plan to guide decisions on investment in further plans, projects or actions;
- regional planning bodies and local authorities who can use the plan to inform spatial planning activities and emergency planning;

- Internal Drainage Boards (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 catchment of the River Nene is located in the east of England. It extends from around Daventry eastwards through Northampton, Wellingborough and Peterborough to its outfall into The Wash. Map 1 shows the location and extent of the River Nene CFMP area. It includes the major tributaries of the Kislingbury Branch, Brampton Branch, Wootton Brook, River Ise, Willow Brook and Harpers Brook. The downstream limit of the CFMP catchment is located at Guy's Head which is The Wash Shoreline Management Plan (SMP) boundary. The Wash SMP deals with coastal flood risk management issues from The Wash. The CFMP considers tidal flood risk along the River Nene upstream of Guy's Head to the tidal limit at Dog in-a-Doublet sluice.

The overall catchment area is about 2,270 km² and has a population of around 750,000. Although there are large centres of population such as Northampton, Wellingborough, Kettering, Corby and the southern parts of Peterborough (which includes the areas of Fengate, Longthorpe, Orton Goldhay, Orton Longueville, Stanground and Woodston), the catchment to Peterborough is largely rural.

Nearly 60% of the agricultural land in the River Nene CFMP area is grade three, with grades one and two making up a further 32%. The higher quality grade one agricultural

land is found mainly in The Fens, where arable crop production means this area is intensively farmed. High quality grade two agricultural land is found to the east of Peterborough and similarly extensively farmed from growing crops. Grade three agricultural land tends to be found to the west of Peterborough.

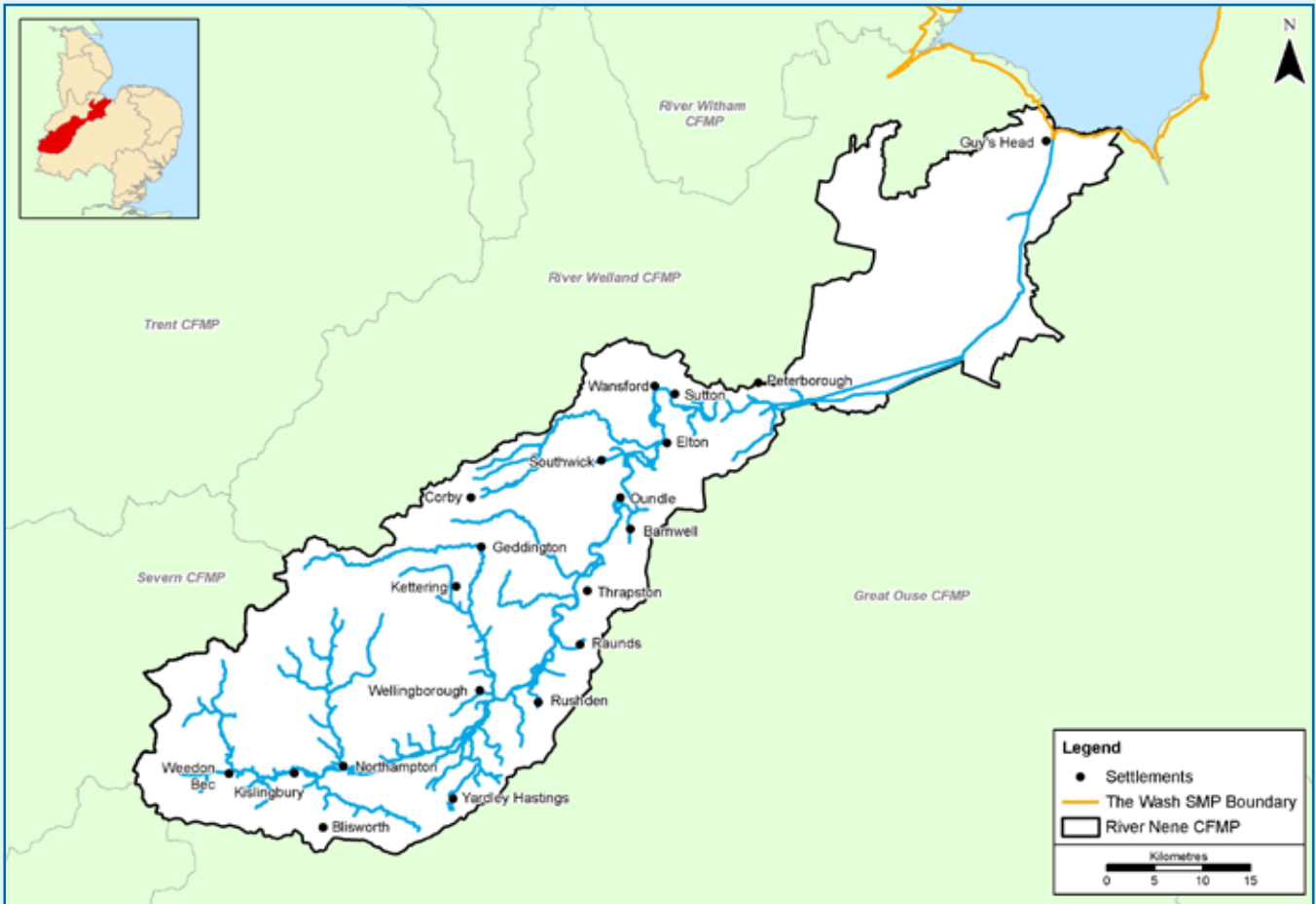
The River Nene and its tributaries: the Kislingbury Branch, the Brampton Branch and Wootton Brook, rise in the Northampton uplands to the west of the catchment. These headwaters meet in Northampton and from here the River Nene flows across gently undulating rural country to the flat plains around Peterborough, before entering the embanked tidal reach across the Fens. Much of the Fens lies below sea level relying on pumping stations for drainage. Internal Drainage Boards (IDBs) play an important role in managing land drainage and flood defences within these low-lying areas.

The underlying geology of the catchment broadly comprises mudstones to the west of Northampton, limestones between Northampton and Peterborough, and clays to the east of Peterborough. Where the underlying rock is non-porous mudstones, there are higher rates of rainfall runoff, and runoff flows directly into the watercourses.

In the areas where there is limestone or sandstone bedrock, runoff may infiltrate the rock delaying the response of rivers to rainfall and reducing peak flood flows. There is also a risk from groundwater flooding in these areas. In the lower fenland areas downstream of Peterborough the predominance of peat soils and the low gradients means that water moves slowly to the river channels.

Within the River Nene catchment there are a number of sites designated for their environmental importance including Ramsar sites, Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Sites of Special Scientific Interest (SSSIs). Important environmental sites in the catchment include: the Nene Washes (SPA, SAC, Ramsar), the Upper Nene Valley Gravel Pits (SPA) and Orton Pit (SAC). The Wash (Ramsar, SPA, SAC) is located downstream of the CFMP area boundary, however the River Nene and flood risk management activities can have an effect on this area. Throughout the catchment there are 60 SSSIs. The historic and cultural value of the catchment is recognised by a number of Scheduled Monuments (SMs) and listed buildings.

Map 1 Location and extent of the River Nene CFMP area



↑ River Ise

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% annual probability flood has a 1% chance or 0.01 probability of occurring in any one year, and a 0.5% annual probability flood has a 0.5% chance or 0.005 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 catchment has a history of flooding. The most significant events in recent years occurred in 1998 and 2000 in Northampton, due to heavy rainfall causing flooding from the River Nene. The impact was felt as far downstream as Peterborough.

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

- river flooding from the River Nene, Brampton Branch and Kislingbury Branch in the outer areas of Northampton, from the River Ise and Slade Brook in Kettering, from the River Ise and the River Nene in Wellingborough, from Willow

Brook in Corby, from the River Nene in Oundle, and the River Nene and Stanground Lode in Peterborough;

- tidal flooding from the River Nene downstream of Peterborough, where tidal water could rise over the top of embankments;
- flooding from lowland drains and riparian owned watercourses;
- breaching/failure of embankments, which could be a problem along rivers across the fenland area of the catchment. This type of flooding is difficult to predict but could cause rapid flooding of areas immediately behind the embankments, which could result in a loss of life to people living within the immediate vicinity;
- surface water and sewer flooding, which has occurred in Corby, Wellingborough, Kettering, Geddington and Oundle;
- groundwater flooding which has occurred in Glapthorn, Oundle and parts of Kettering and Northampton, when there are high groundwater levels within the underlying limestone or sandstone rock. Although, few incidents of such flooding are recorded.

What is at risk?

At present there are around 4,200 people and 2,100 commercial and residential properties at risk from the 1% annual probability river flood, taking into account current flood defences. This means that 0.6% of the total population living in the catchment are currently at risk from flooding. Of all the agricultural land in the catchment, 4% is at risk of flooding in the current 1% annual probability river flood.

It is difficult to assess the impact of flooding on environmental features, but the Nene Washes (SSSI, SPA, SAC, Ramsar site), Upper Nene Valley Gravel Pits (SSSI, potential SPA) and Orton Pit (SSSI, SAC) may be at some risk from the 1% annual probability river flood. The Nene Washes is sensitive to changes in water levels, however increased flooding would be beneficial if additional wet grassland habitat was created. Flooding of the reedbeds in the Upper Nene Valley Gravel Pits could be detrimental to wintering bittern, but could improve the quality of wetland habitat. Orton Pit is not expected to be affected by increases in flooding. There are 15 other SSSIs and 48 SMs that may also be at some flood risk in the 1% annual probability river flood.

Where is the risk?

Around 20% of the people and properties that are at risk within the catchment from a 1% annual probability river flood (taking into account current flood defences) are located in Corby and Weldon. A further 10% are located in the outer areas of Northampton. There is currently no risk from the 1% annual probability river flood in central Northampton due to the presence of flood defences.

The distribution of properties at risk from a 1% annual probability river flood, taking into account current flood defences, is illustrated in Figure 3. Table 1 summarises where there is flood risk to more than 25 properties. Table 2 summarises the critical infrastructure that is at risk from a 1% annual probability river flood. We recognise that there is also a potential risk from surface water and groundwater flooding. However, further studies following on from the CFMP are needed by us and our partners to quantify this potential risk.

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

No. of properties at risk	Locations
100 to 500	Outer Northampton, Kettering, Wellingborough, South Peterborough, Raunds, Corby and Weldon
50 to 100	Wansford, Stibbington and Water Newton, Oundle, Bilsworth, Yardley Hastings, Bozeat and Grendon, Wootton
25 to 50	Barnwell, Weedon and Bugbrooke, Rushden, Elton, Cotterstock and Tansor, Bigstock and Sudborough, Southwick and Kings Cliffe

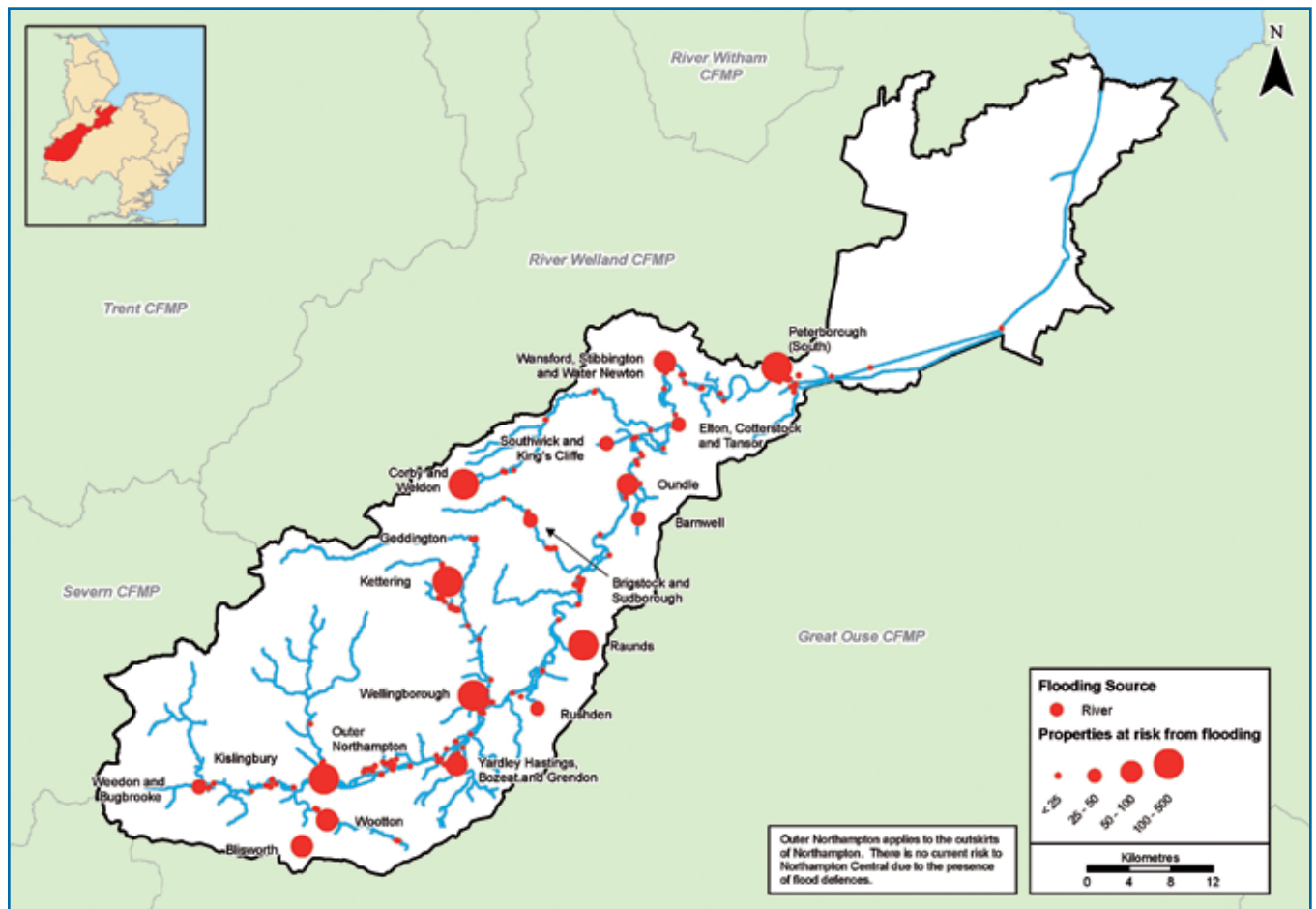
Table 2 Critical infrastructure at risk

Twenty-two electricity sub-stations, ten Sewage Treatment Works (STW), five waste management sites, Flour Mill Integrated Pollution Prevention Control (IPPC) site in Wellingborough, a hospital, a care home, a police station and sections of motorway, A road and railway



↑ River Nene, Thrapston Bridge

Map 2 Flood risk to property in a 1% annual probability river flood, taking into account current flood defences



How we currently manage the risk in the catchment

The catchment has a history of flood risk, generally due to the high rainfall which has led to watercourses and drains being overwhelmed, flood defences overtopped or raised embankments breached. However, in recent times, especially the last 80 years, numerous engineering schemes have been implemented to reduce flood risk in the catchment including:

- a number of Flood Storage Reservoirs (FSRs) throughout the catchment that provide a standard of protection between a 1% and 10% annual probability river flood.
- construction of flood walls and embankments. Flood walls and banks in Thrapston, Kislingbury, Central Northampton and along Dallington Brook provide protection up to a 0.5% annual probability river flood.
- construction of tidal gates. Tidal gates in Wisbech provide protection up to a 0.5% annual probability tidal flood;
- construction of relief channels. Geddington Relief Channel provides protection up to a 1% annual probability river flood.

These measures have all reduced flood risk and around 6% of the total catchment population currently live in areas that benefit from flood risk management schemes.

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 probability of flooding and those that address the consequences of flooding.

Activities that reduce the probability of flooding include:

- maintaining and improving existing flood defences and structures;

- maintaining river channels;
- maintenance of drainage networks by IDBs and landowners;
- maintenance of road drainage and sewer systems.

Activities that reduce the consequences of flooding include:

- 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);

- understanding where flooding is likely by using flood risk mapping;
- providing flood forecasting and warning services;
- 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.



↑ Yarwell

The impact of climate change and future flood risk

In the future, flooding can be influenced by climate change, changes in land use (for example urban development) and rural land management. Using river models we tested the sensitivity of the rivers in the CFMP area to these drivers.

For urbanisation, we tested the sensitivity of the rivers in the catchment to urban growth, based on the number of houses in the catchment being doubled by 2100. Increasing urbanisation had an impact on flood risk.

For climate change we tested the following changes up to 2100:

- 15% increase in peak flow in all watercourses. This will increase the probability of large-scale flood risk;

- a total sea level rise of 800 mm by the year 2100. This will increase the probability of tidal flooding and increase the length of time watercourses will not be able to flow freely to the sea at high tide (tide-locked). Climate change was shown to have a significant impact on flood risk.

For rural land management, we adjusted the river models to represent the effect of reducing and increasing intensive farming practices. At a catchment scale this had a limited impact on flood risk. Therefore, changes in rural land management were not taken forward into the final future scenario.

In the River Nene catchment, climate change and urbanisation were shown to have the greatest impact on flood risk. Therefore, the scenario used to model future flood risk was based on urbanisation and climate change as described.

Using river models we estimate that by 2100, about 9,000 people and 4,300 properties across the catchment may be at risk from the 1% annual probability river flood. These figures take account of current flood defences. Flood risk from rivers increases mainly in Corby, Kettering, Northampton outer, Wellingborough and the southern parts of Peterborough.

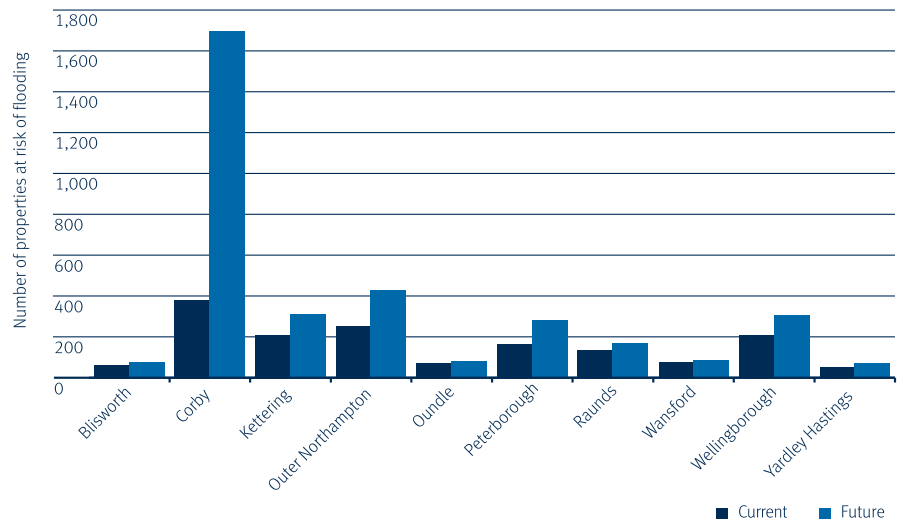


↑ River Nene, Lilford Road Bridge

Figure 2 shows the difference between current and future flood risks from a 1% annual probability river flood at key locations in the catchment. Following on from the CFMP, organisations need to work together to investigate flood risk from other sources in more detail (for example, surface water and ground water flooding).

Flood risk to infrastructure and transport services is expected to increase in the future. Generally, it is unlikely that the impact of flooding on environmental sites will change significantly in the future, although the extent of flooding is likely to increase.

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



↑ Wootton Brook, Horton

Future direction for flood risk management

Approaches in each sub-area

We have divided the River Nene catchment into eight distinct 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 considered how social, economic and environmental objectives are affected by flood risk management activities under each policy option.

Map 3 Sub-areas and flood risk management policies

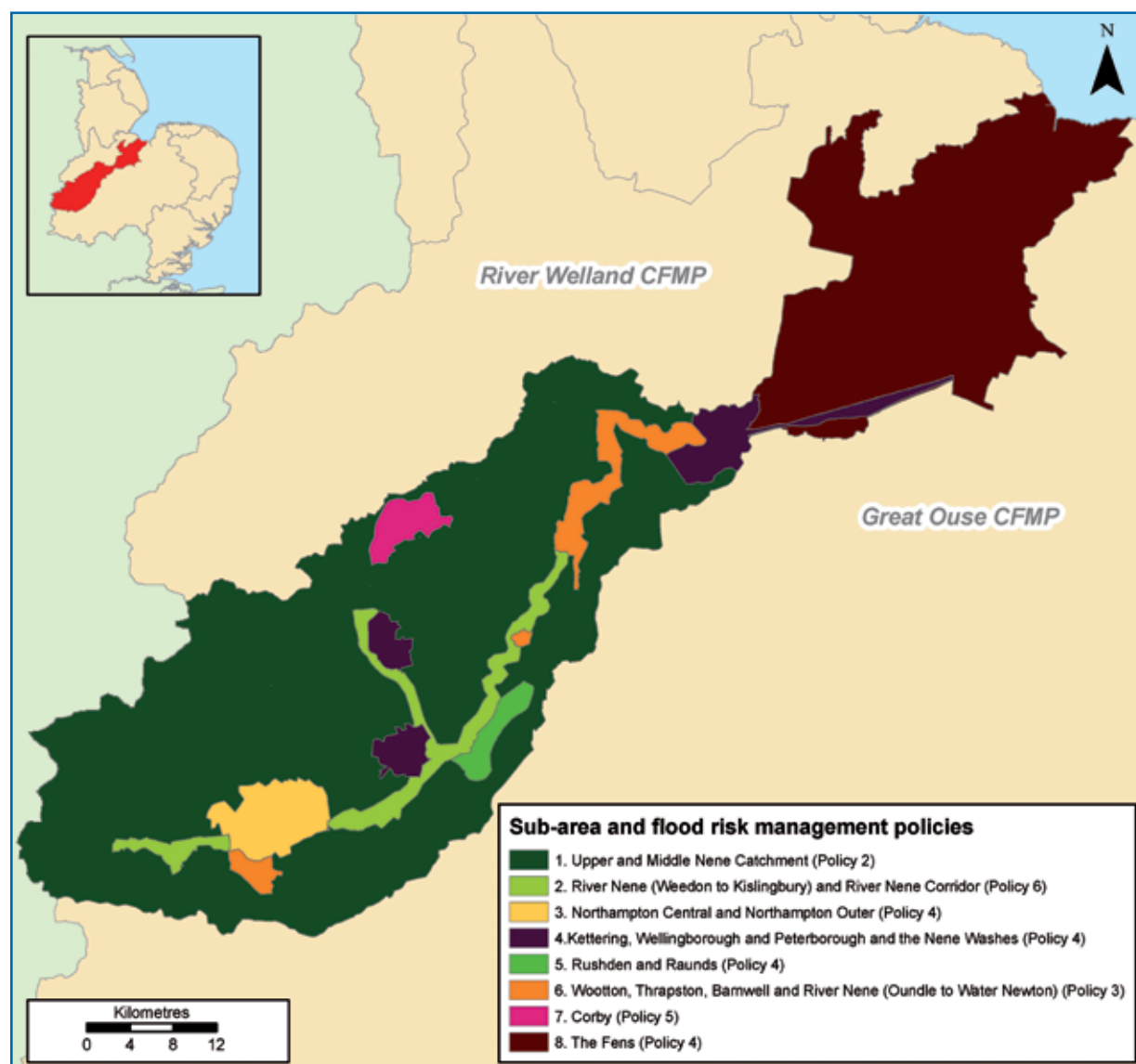


Table 3 Flood risk management policy options

→ 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 and Middle Nene

Our key partners are:

Corby Borough Council

Daventry District Council

East Northamptonshire Council

Huntingdonshire District Council

Kettering Borough Council

Northampton Borough Council

Peterborough City Council

South Northamptonshire Council

Wellingborough Borough Council

The issues in this sub-area

Within this large sub-area there is low risk to people and property located in villages, or in isolated areas scattered throughout the rural region. Currently 283 properties within this sub-area are at risk from the 1% annual probability river flood.

There is approximately 1% of grade two agricultural land at risk of flooding within this sub-area. Five STW and one electricity sub-station are at risk in the current 1% annual probability river flood. A number of A-roads, some sections of the M1 and West Coast Mainline are at risk in the current 1% annual probability river flood. There may also be risk from groundwater flooding due to the underlying limestone geology. Table 4 details flood risk to people and property in this sub-area.

Table 4 Risk to people and property within the Upper and Middle Nene Catchment sub-area during a 1% annual probability river flood. This includes protection from the Great Oakley flood storage reservoir, Geddington flood relief channel and Clipston flood storage reservoir

	Current	Future (2100)
Number of people	578	874
Number of properties	283	407

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.

In these rural reaches the current activity to manage flooding is out of proportion with the level of flood risk, or is not effective. In general, overall flood risk management activities will be reduced within the sub-area. Where flood risk is more concentrated (for example in towns and villages) existing actions to manage flooding will be continued. The preferred policy is to reduce bank and channel maintenance in some locations. This will enable limited resources to be targeted to other areas of the catchment where the risks are greater, to ensure value for money. The preferred policy will also help improve the flow between the river and its floodplain and so improve wetland and aquatic habitats.

Flood warning is an important way of managing the consequences of flooding throughout the catchment. Therefore, the local flood warning infrastructure (such as river flow gauging stations) needs to be maintained.

The key messages

- Where feasible, flood risk management activities will be reduced as the current activity to manage flooding is out of proportion with the level of flood risk.
- Reducing bank and channel maintenance will help naturalise rivers and improve the flow between the river and its floodplain.
- Maintain flood warning infrastructure (such as river flow gauging stations) to ensure that an effective flood warning service can be provided throughout the catchment.

Proposed actions to implement the preferred policy

- Investigate options to cease or reduce current bank and channel maintenance and flood defence maintenance. In addition, changes in land use, development of sustainable farming practices and environmental enhancement should be investigated to mitigate an increase in flooding in the future.

- Continue with the flood warning service including the maintenance of flood warning infrastructure (such as river flow gauging stations) and public awareness plans.
- Continue maintenance and inspection of Grendon Brook Villages, Great Oakley and Clipston flood storage reservoirs and Geddington flood relief channel.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.
- Encourage planners to develop policies to prevent inappropriate development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25). Any new development should be targeted to areas with lowest flood risk.
- Encourage planners to develop policies for regeneration and redevelopment of commercial sites to incorporate resilience measures so that the location, layout and design of development can help to mitigate residual flood risk. Regeneration and redevelopment should also provide opportunities to improve the environment and make space for water.



↑ River Nene, Old Road Bridge, Irthlingborough

River Nene (Weedon to Kislingbury) and River Nene Corridor

Our key partners are:

East Northamptonshire Council

Huntingdonshire District Council

Peterborough City Council

South Northamptonshire Council

Borough Council of Wellingborough

Kettering Borough Council

Daventry District Council

Northampton Borough Council

The issues in this sub-area

Within this large sub-area there is low risk to people and property, located in villages or in isolated areas scattered throughout the rural region. Currently there are 106 properties at risk from the 1% annual probability river flood.

There is approximately 1% of grade two agricultural land at risk from flooding within this sub-area. One STW and one electricity sub-station are at risk in the current 1% annual probability river flood. A number of A-roads, some sections of the M1 and West Coast Mainline are at risk in the current 1% annual probability river flood. Tables 5 and 6 detail flood risk to people and property in this sub-area.

Table 5 Risk to people and property within River Nene (Weedon to Kislingbury) during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	105	178
Number of properties	57	90

Table 6 Risk to people and property within River Nene Corridor during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	68	75
Number of properties	49	52

The floodplain in this sub-area can provide areas to store water during flood events. The storage of floodwaters can reduce the impact of flooding to people and property both locally and in urbanised areas downstream. For example, the storage of floodwater in this sub-area may reduce future risk to people and property in the Northampton Outer, Wellingborough and Peterborough and the Nene Washes, Kettering and southern parts of Peterborough sub-areas. Currently there is low risk to people and property in this sub-area and the storage of floodwaters will not increase this 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.

In this largely rural area the aim is to manage flood risk by maximising the potential of the floodplain to retain water to benefit locations elsewhere in the catchment. Storing water on these floodplains can reduce flood risk to settlements downstream. This policy may involve:

- restoring river channels, water meadows and the natural floodplain;
- reducing runoff from agricultural land;
- structural measures to control water levels and retain more water on the floodplains;
- engineered schemes to store floodwater. Locally, the floodplain storage areas may provide long-term benefits for the river environment and wetland habitats.

Within this sub-area reducing bank and channel maintenance will increase the ability of the floodplain to store water by improving the flow between the river and its floodplain. However, where flood risk maybe more concentrated, such as in towns and villages, existing actions to manage flooding may be continued.

To be able to use the floodplain for flood risk management, planners must prevent development that affects the ability of the floodplain to retain water.

The key messages

- Storing water on the floodplain in these areas can reduce flood risk to settlements downstream.
- Development that affects the ability of the floodplain to retain water should be prevented.
- Maintenance work on rivers should aim to increase the capacity of the floodplain to retain water.
- Storing water on the floodplain could provide long-term benefits for the river environment and wetland habitats.

Proposed actions to implement the preferred policy

General actions across the sub-area:

- Produce flood storage studies for this sub-area to investigate the most appropriate storage options and locations for floodplain storage. The studies should also consider opportunities to enhance the environment by improving the natural state of the river and its habitat.
- Continue with the flood warning service including the maintenance of flood warning infrastructure (such as river flow gauging stations) and flood awareness plans.

Actions specific to River Nene (Weedon to Kislingbury):

- Continue with the current flood risk management activities throughout this sub-area.
- Encourage planners to develop policies to prevent inappropriate new development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25). Any new development should be targeted to areas with lowest flood risk and must not increase risk to existing development.
- Work with partners to investigate the impact of flooding to critical infrastructure at risk.

Actions specific to River Nene Corridor:

- Identify opportunities where bank and channel maintenance can be reduced to improve the flow between the river and its floodplain to increase water storage on the natural floodplain.
- Encourage planners to prevent new development within the floodplain. The floodplain should be maintained as an asset to make space for water.
- Encourage planners to develop policies for regeneration and redevelopment of commercial sites to incorporate resilience measures so that the location, layout and design of development can help to mitigate residual flood risk. Regeneration and redevelopment should also provide opportunities to improve the environment and make space for water.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.

Northampton Central and Northampton Outer

Our key partners are:

Northampton Borough Council

South Northamptonshire Council

Daventry District Council

The issues in this sub-area

This sub-area is largely urban and has a high population density. It contains little open land apart from the downstream washland and other storage reservoirs.

Northampton is located at the joining point of the three main upper tributaries of the Nene. The flows from these three rivers combine in Northampton, before being controlled just downstream of the town at the Northampton Washlands. In the centre of Northampton there are flood walls and flood banks, as well as upstream flood storage, that provide protection from the current and future 0.5% annual probability river flood.

The main flood risk is from the River Nene, in Northampton Outer. In Northampton Outer there are currently 251 properties at risk from the 1% annual probability river flood. There are no people and property at risk in Northampton Central, due to the presence of the defences. There is approximately 20% of grade two agricultural land at risk of flooding in Northampton Outer. There are parts of the West Coast Mainline, A45 and A3 at risk in the current 1% annual probability river flood. There are also 10 electricity sub-stations and one waste management site at risk in the current 1% annual probability river flood. High concentrations of impermeable surfaces within this sub-area also increase the risk of surface water and sewer flooding. The following tables 7 and 8 detail flood risk to people and property in this sub-area.

Table 7 Risk to people and property within Northampton Central during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	0	0
Number of properties	0	0

Table 8 Risk to people and property within Northampton Outer during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	363	740
Number of properties	251	428

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.

Historically, defences have been constructed to reduce the probability of flooding. However, flood defences can fail or be overwhelmed and may become less effective in the future. Different approaches are required for different sources of flooding, as river defences do not reduce the risk from urban drainage issues and surface water flooding. For Northampton the most sustainable option to manage future flood risk would be by storing water on the floodplain upstream along the River Nene (Weedon to Kislingbury).

Within the settlements the urban environment needs to be adapted to make it more resilient to flooding. For example, as commercial sites are redeveloped, the location and layout of buildings could be designed to help reduce flood risk. The risk of flooding cannot be reduced entirely, therefore flood awareness must continue to be promoted amongst these communities.

The key messages

- Where possible, future flood risk should be managed by storing water on the floodplain upstream of settlements at risk.
- Any redevelopment of floodplain areas is an opportunity to increase their flood resilience.
- Organisations must work together to provide an integrated approach to urban drainage issues and surface water flooding.
- Flood awareness plans will be used to manage the consequences of flooding.

Proposed actions to implement the preferred policy

General actions across the sub-area:

- Develop a flood storage study to investigate the feasibility of creating storage areas, natural or engineered, along the river corridor upstream of the town to manage future flood risk within Northampton.

- Continue with the current flood risk management activities through Northampton.
- Encourage planners to develop policies for new development and regeneration (including commercial sites) to incorporate resilience measures so that the location, layout and design of development can help to reduce flood risk. Planners should prevent inappropriate development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25), and ensure that any new development does not increase the risk to existing development. Any new development or regeneration should provide opportunities to improve the river environment and make space for water.
- Reduce the consequences of flooding by: improving public awareness of flooding; encouraging people to sign up to, and respond to, flood warnings.
- Work with partners to investigate the options for managing urban drainage issues and surface water flooding. Where strategies, including water cycle strategies, have been developed, organisations need to work together to implement the recommendations made.

Actions specific to Northampton Central:

- Work with partners to develop an emergency response plan to manage flood risk from the defences failing or being overwhelmed.

Actions specific to Northampton Outer:

- Work with partners to investigate the impact of flooding to critical infrastructure at risk.



↑ River Nene, Northampton

Peterborough and the Nene Washes

Our key partners are:

Kettering Borough Council

Borough Council of Wellingborough

Peterborough City Council

Nene Washlands Commissioners

East Northamptonshire Council

North Northamptonshire Development Company

Anglian Water

The issues in this sub-area

The settlements within this sub-area are located in and around river floodplains, which are at risk from river flooding. This is a largely urban sub-area with a high population density and contains little open space. The main source of flooding is from the River Nene, River Ise and Slade Brook, together with some smaller watercourses.

There are some informal/private flood defences within all three of these settlements. There are also a number of flood storage reservoirs which manage flood risk in each of these settlements.

Currently 579 properties are at risk from the 1% annual probability river flood. There is approximately 35% of grade two agricultural land at risk of flooding within this sub-area (none of this is located in Wellingborough).

There is approximately 83% of grade one agricultural land at risk in Peterborough and the Nene Washes. There are parts of the Midland Mainline and some A-roads at risk of flooding in the current 1% annual probability river flood. There is a metal recycling site and an IPPC site (Flour Mill, Wellingborough) and 10 electricity sub-stations at risk in the current 1% annual probability river flood. High concentrations of impermeable surfaces within this sub-area also increases the risk of surface water and sewer flooding. Tables 9 to 11 detail flood risk to people and property in this sub-area.

Table 9 Risk to people and property within Kettering during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	485	688
Number of properties	208	311

Table 10 Risk to people and property within Wellingborough during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	308	530
Number of properties	206	306

Table 11 Risk to people and property within Peterborough and the Nene Washes during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	396	639
Number of properties	165	280

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.

Historically these settlements are protected using upstream storage. The most sustainable approach to manage future flood risk within these settlements would be to increase this flood storage capacity. There are opportunities to develop further storage areas within the River Nene (Weedon to Kislingbury) and River Nene corridor sub-area.

Within the settlements the urban environment needs to be adapted to make it more resilient to flooding, for example as commercial sites are redeveloped, the location and layout of buildings could be designed to help reduce flood risk. The risk of flooding cannot be reduced entirely, therefore flood awareness must continue to be promoted amongst these communities.

The key messages

- Where possible, future flood risk should be managed by storing water on the floodplain upstream of settlements at risk.
- Any redevelopment of floodplain areas is an opportunity to increase their flood resilience.
- Organisations must work together to provide an integrated approach to urban drainage issues and surface water flooding.
- Flood awareness plans will be used to manage the consequences of flooding.

Proposed actions to implement the preferred policy

General actions across the sub-area:

- Encourage planners to develop policies for new development and regeneration (including commercial sites) to incorporate resilience measures so that the location, layout and design of development can help to reduce flood risk. Planners should prevent inappropriate development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25), and ensure that any new development does not increase the risk to existing development. Any new development or regeneration should provide opportunities to improve the river environment and make space for water.
- Reduce the consequences of flooding by: improving public awareness of flooding; encouraging people to sign up to, and respond to, flood warnings; and by improving local emergency planning for critical infrastructure at risk.
- Work with partners to investigate the options for managing urban drainage issues and surface water flooding. Where strategies, including water cycle strategies, have been developed, organisations need to work together to implement the recommendations made.
- Develop a flood storage study to investigate the feasibility of creating storage areas, natural or engineered, within the River Nene (Weedon to Kislingbury) and River Nene corridor sub-area to manage future flood risk within these settlements.
- Continue with the current flood risk management activities through these settlements.

Actions specific to Peterborough and the Nene Washes:

- Continue with the Nene Washes Water Level Management Plan.

Rushden and Raunds

Our key partners are:

East Northamptonshire Council

Northampton Borough Council

South Northamptonshire Council

Anglian Water

The issues in this sub-area

This mostly urban policy unit has a relatively high population density, containing little open land apart from some active floodplain through the towns and some open rural land each side of Stanwick.

Impermeable surfaces in this sub-area can lead to rapid runoff and as a result, flooding from the Raunds Hog Dyke and Skew Bridge Dyke. In general there are only a small number of informal/private defences within the towns. Currently there are 178 properties at risk from the 1% annual probability river flood. There is no agricultural land at risk of flooding within this sub-area. Some parts of the A45, an electricity sub-station, Rushden hospital and Raunds ambulance station are at risk from the 1% annual probability river flood. High concentrations of impermeable surfaces within this sub-area also increases the risk of surface water and sewer flooding. Table 12 details flood risk to people and property in this sub-area.

Table 12 Risk to people and property within the Rushden and Raunds sub-area during a 1% annual probability river flood, taking into account current flood defences

	Current	Future
Number of people	342	508
Number of properties	178	242

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 this densely populated urban sub-area the most sustainable approach to manage future flood risk would be to open up river channels and re-create river corridors, so that there is more space for rivers to flow through the towns. To achieve this a combination of improvements to the channel capacity by increasing the size of culverts and active land use planning should be considered.

Flood risk management planning needs to be linked closely with regeneration and redevelopment of these towns so that policies can be put in place to create green corridors, and to incorporate flood resilience measures into the location, layout and design of development.

Organisations need to work together to manage all flood sources as flooding from surface water and sewer flooding could increase in the future due to more frequent and intense storms.

The risk of flooding cannot be reduced entirely, therefore flood awareness must continue to be promoted amongst these communities.

The key messages

- Future flood risk should be managed by opening up river channels and re-creating river corridors so there is more space for rivers to flow.
- Flood risk management planning needs to be linked closely with regeneration and redevelopment so that the location and layout of development can help to reduce flood risk.

- Organisations must work together to provide an integrated approach to urban drainage issues and surface water flooding.
- Flood awareness plans will be used to manage the consequences of flooding.

Proposed actions to implement the preferred policy

- In the short term, continue with the current flood risk management activities.
- Investigate the feasibility of increasing the passage of water along Skew Bridge Dyke and Hog Dyke to manage future flood risk.
- Encourage planners to develop policies for new development and regeneration (including commercial sites) to incorporate resilience measures so that the location, layout and design of development can help to reduce flood risk. Planners

should prevent inappropriate development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25), and ensure that any new development does not increase the risk to existing development.

- Encourage planners to develop policies for new development and regeneration to provide opportunities to recreate a river corridor and make space for water.
- Reduce the consequences of flooding by: improving public awareness of flooding; encouraging people to sign up to, and respond to, flood warnings; and by improving local emergency planning for critical infrastructure at risk.
- Work with partners to investigate the options for managing urban drainage issues and surface water flooding. Where strategies, including water cycle strategies, have been developed, organisations need to work together to implement the recommendations made.



↑ Hog Dyke, Raunds

Wootton, Thrapston, Barnwell, River Nene (Oundle to Water Newton)

Our key partners are:

Northampton Borough Council

South Northamptonshire Council

East Northamptonshire Council

Anglian Water

The issues in this sub-area

The settlements within this sub-area are located in and around river floodplains, which are at risk from river flooding. The probability of river flooding has been reduced in Thrapston and Barnwell. However, flood defences can fail or be overwhelmed which could have serious consequences within these sub-areas. Currently 265 properties within this sub-area are at risk from the 1% annual probability river flood.

There is approximately 27% of grade two agricultural land at risk of flooding in the River Nene (Oundle to Water Newton) and Wootton. There is no critical infrastructure at risk in Thrapston and Barnwell in the current 1% annual probability river flood. There are some sections of the West Coast Mainline, some A-roads and 1 STW at risk in Wootton and River Nene (Oundle to Water Newton) in the current 1% annual probability river flood. Groundwater is also a potential source of flooding in Wootton, Barnwell and the River Nene (Oundle to Water Newton) due to the underlying geology. Surface water flooding may also occur in the River Nene (Oundle to Water Newton). Tables 13 to 16 detail flood risk to people and property in this sub-area.

Table 13 Risk to people and property within Wootton during a 1% annual probability river flood, taking into account current flood defences

	Current	Future
Number of people	178	200
Number of properties	74	83

Table 14 Risk to people and property within Thrapston during a 1% annual probability river flood, taking into account current flood defences

	Current	Future
Number of people	0	0
Number of properties	0	0

Table 15 Risk to people and property within Barnwell during a 1% annual probability river flood, taking into account current flood defences

	Current	Future
Number of people	0	153
Number of properties	0	64

Table 16 Risk to people and property within the River Nene (Oundle to Water Newton) during a 1% annual probability river flood, taking into account current flood defences

	Current	Future
Number of people	400	445
Number of properties	191	213

The vision and preferred policy

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

These settlements have been built in the floodplain and as a result have a history of flooding. In the past flood defences have been constructed and maintenance work carried out on the rivers to reduce flood risk. Although flood risk is not expected to increase significantly in the future, as there is a concentration of people and property within the floodplain, it is still feasible and effective to continue with the current level of flood risk management. For the majority of these sub-areas this will be achieved by continuing existing flood risk management activities. However, for some settlements there may be alternative, more appropriate ways to manage flood risk at the current level.

Alternative measures may include reducing flood risk maintenance in some parts of the settlements where there is a low flood risk, or where benefits may arise in the future from upstream flood storage. Reducing the need for continued maintenance could bring opportunities to improve the environmental quality of local watercourses.

The key messages

- The current level of flood risk management should be continued in these settlements.
- In some areas there may be alternative, more appropriate ways to manage flood risk at the current level.
- Any new development or re-development should be resilient to all sources of flooding.

Proposed actions to implement the preferred policy

General actions across the sub-area:

- Continue with the flood warning service including the maintenance of flood warning infrastructure (such as river flow gauging stations) and public awareness plans.

- Work with planners to influence the location, layout and design of new and redeveloped property. Ensure that only appropriate development is allowed on the floodplain through the application of Planning Policy Statement 25 (PPS25).

Actions specific to Wootton:

- Continue with the current flood risk management activities.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.
- Work with partners to develop a Surface Water Management Plan for Wootton.

Actions specific to Thrapston:

- In the short term, continue with the current flood risk management activities.
- In the longer term, consider alternative, more appropriate ways to manage flood risk at the current level by taking into account potential benefits from future upstream storage areas.
- Work with partners to develop an emergency response plan to manage flood risk from the defences failing or being overwhelmed.

Actions specific to Barnwell:

- Continue with the current flood risk management activities.

Actions specific to River Nene (Oundle to Water Newton):

- In the short term, continue with the current flood risk management activities.
- In the longer term, consider alternative, more appropriate ways to manage flood risk at the current level by taking into account potential benefits from future upstream storage areas.
- Work with partners to develop emergency response plans for critical infrastructure and transport links at risk from flooding.

Corby

Our key partners are:

Corby Borough Council

North Northamptonshire Development Company

The issues in this sub-area

This sub-area is largely urban. The main source of flooding is from Harpers Brook and Willow Brook. Currently there are 381 properties at risk from the 1% annual probability river flood. There is no agricultural land at risk of flooding in this sub-area. Some sections of A-road, one electricity sub-station and Corby STW are at risk in the current 1% annual probability river flood. High concentrations of impermeable surfaces within this sub-area also increases the risk of surface water and sewer flooding. Table 17 details flood risk to people and property in this sub-area.

Table 17 Risk to people and property within Corby during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	835	3,828
Number of properties	381	1,694

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.

This mostly urban sub-area has a high population density and contains little open land. Corby is at flood risk from high flows in Harpers Brook and Willow Brook, together with a large number of minor, tributary

watercourses. Impermeable surfaces in this sub-area can lead to rapid run-off and this poses surface water and sewer flood risk to people and properties. Corby is expected to double in population between now and 2031 and climate change is expected to increase the flood risk in the future.

The preferred approach to manage the food risk in Corby, is to do a flood risk study. This study should look at how we can reduce the flood risk in Corby and investigate the possibility of building new flood defences in the town.

The risk of flooding cannot be completely removed and other measures need to be taken to reduce the flood risk. In the long term, flood risk management planning needs to be linked closely with regeneration and redevelopment, so that policies can be put in place to create green corridors, and to incorporate flood resilience measures into the location, layout and design of development. As Corby is at risk from several sources of flooding and targeted for large scale urban expansion, a water cycle strategy has been developed. The recommendations from this strategy associated with future development, should be integrated with the measures to manage flood risk to existing development within the town. Organisations need to work together to manage all sources of flooding, as surface water and sewer flooding could increase in the future due to more frequent and intense storms. Flood awareness must continue to be promoted amongst the community.

The key messages

- A study for Corby will investigate how flood risk in the town should be managed.
- Flood risk management planning needs to be linked closely with regeneration and redevelopment so that the location and layout of development can help to reduce flood risk.

- Organisations must work together to provide an integrated approach to urban drainage issues and surface water flooding.
- Flood awareness plans will be used to manage the consequences of flooding.

Proposed actions to implement the preferred policy

- Develop a study for Corby to investigate how flood risk in the town should be managed. The study should investigate the possibility of building new flood defences through the town.
- Continue with the flood warning service including the maintenance of flood warning infrastructure for example, river flow gauging stations.
- Develop a flood awareness plan to encourage people to sign up to, and respond to flood warnings. The flood awareness plan will inform people about actions they can take to protect themselves and their property.
- Encourage planners to develop policies for new development and regeneration (including commercial sites) to incorporate resilience measures so that the location, layout and design of development can help to reduce flood risk. Planners should prevent inappropriate development in the floodplain using measures set out in Planning Policy Statement 25 (PPS25), and ensure that any new development does not increase the risk to existing development. Any new development or regeneration should provide opportunities to improve the river environment and make space for water.
- Work with partners to develop an emergency response plan for critical infrastructure and transport links at risk of flooding.
- Work with our partners to put in place the recommendations from the Corby Water Cycle Study to ensure that water resources and flood risk management issues can be addressed in a sustainable way to accommodate future planned growth.



↑ Willow Brook, Corby

The Fens

Our key partners are:

Peterborough City Council

South Holland District Council

Fenland District Council

King's Lynn and West Norfolk Borough Council

North Level IDB

South Holland IDB

Waldersley IDB

Hundred of Wisbech IDB

King's Lynn IDB and Westside Marshes IDB

The issues in this sub-area

This lowland area is mainly rural, where historically much of the land has been drained for agriculture. Embanked watercourses carry water from upstream across these areas to outfall along the coast. The probability of flooding has been significantly reduced in this area through various engineering works including those for land drainage purposes. There is a perception of little or no risk. However, flood defences can fail or be overwhelmed which means that there can be significant residual risk with potentially serious consequences of flooding. Currently five properties within this sub-area are at risk from the 1% annual probability river flood. There is less than 1% of grade two agricultural land at risk of flooding in this sub-area. There is no critical infrastructure at risk in the current at risk from the 1% annual probability river flood. Table 18 details flood risk to people and property in this sub-area.

Table 18 Risk to people and property within the Fens sub-area during a 1% annual probability river flood, taking into account current flood defences

	Current	Future (2100)
Number of people	10	20
Number of properties	5	11

There is a high standard of protection offered by the defences within this sub-area. In the long term these defences will become increasingly ineffective against storms which are expected to become more frequent and intense in the future.

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.

Historically, The Fens have been heavily managed by a number of organisations to reduce the probability of river and tidal flooding. Flood risk is expected to increase in the future to people, property and the environment. In the short term it will be feasible and effective to maintain the existing flood defences at the current level of flood risk management. However, in the future the protection given by these defences may decline as future flooding is expected to become more intense. It may be difficult to maintain the current level of flood risk management into the future for all low-lying areas. Where it is technically, environmentally and economically viable, the policy is to undertake further activities to maintain the current level of flood risk management into the future.

Within The Fens sub-area, the preferred approach is to produce a flood risk management strategy to develop a sustainable, integrated and long term flood risk management approach. The strategy should investigate how flood risk varies across The Fens and the best approach to manage this risk, which may include making space for water. The strategy may highlight the need to carry out further work in some areas, while in others we may be able to continue with or reduce our flood risk management activities. As part of this strategy, flood risk from breaching of the existing defences should be considered. To develop a sustainable flood risk management approach the strategy must bring together organisations and other plans and projects across The Fens. This included considering flood risk from the Rivers Witham, Welland, Nene, Great Ouse along with tidal risk and the policies set within The Wash SMP.

The key messages

- In the short term, it is still feasible and effective to maintain the existing flood defences at the current level of flood risk management.
- Produce a strategy to develop a sustainable, integrated and long term flood risk management approach for The Fens.

Proposed actions to implement the preferred policy

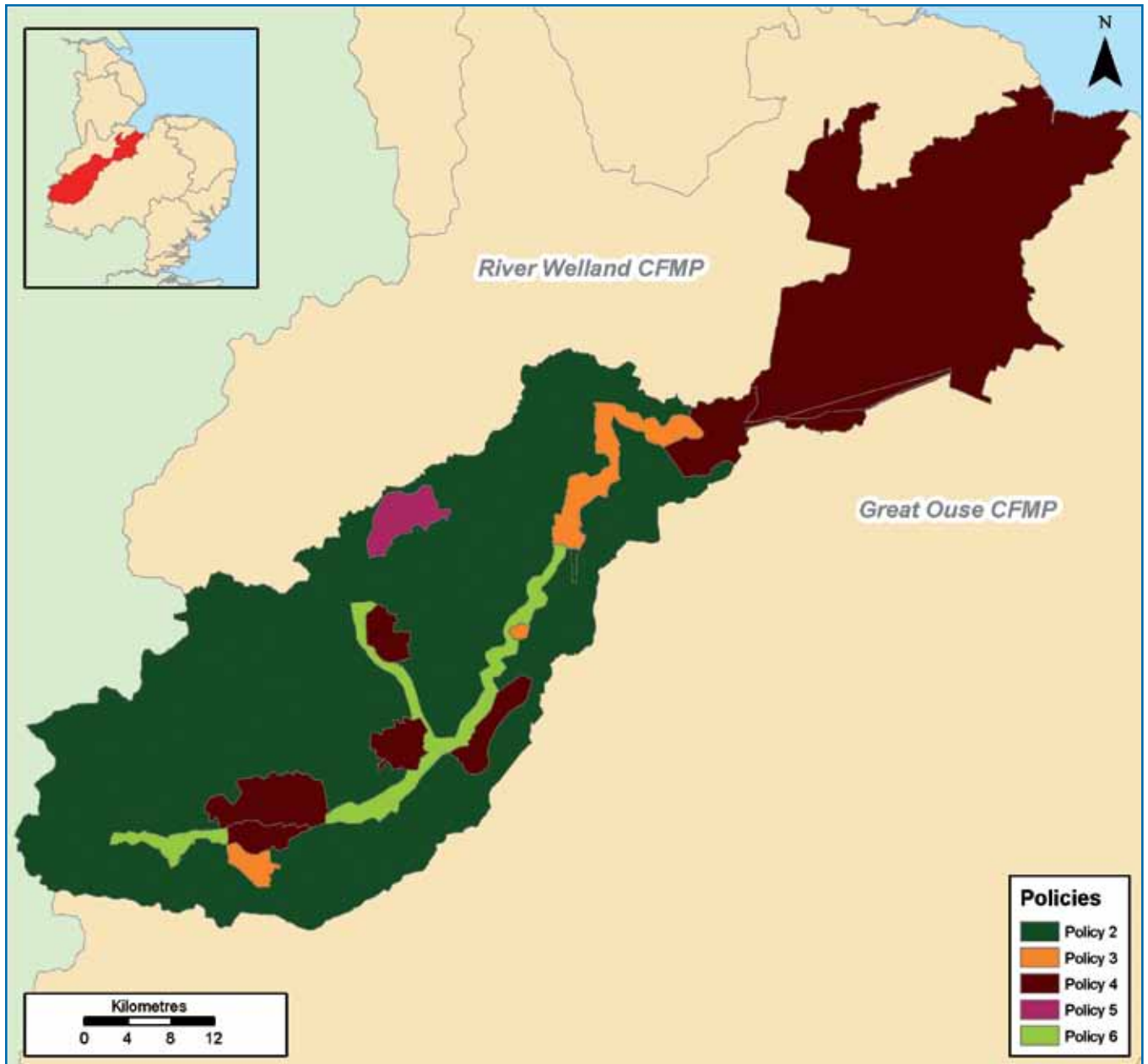
- Produce a flood risk management strategy for The Fens to investigate how flood risk varies across the area and the best approach to manage this risk.



↑ Tidal River Nene, Mouth Lane, Guyhirn

Map of CFMP policies

Map 4 The flood risk management policies for the River Nene CFMP area



Notes

Notes

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