



**Flood Risk Management Strategy**  
**Tay Estuary and Montrose Basin**



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## Foreword

Flooding can affect us all. The risk of flooding and its impacts can't be removed entirely from our lives but it can be managed. This strategy takes our knowledge and understanding of flooding and turns it into a set of actions that are planned, prioritised and co-ordinated to tackle flooding in the areas where it affects us the most.

Approximately 3,800 residential and 1,400 non-residential properties are at risk of flooding in the Tay Estuary and Montrose Basin Local Plan District. Dundee, Arbroath and Cupar are just some of the areas where the greatest impacts of flooding can be found. The annual damages across the region are estimated to be £16 million, largely from river flooding. Across Scotland we now estimate 108,000 properties to be at risk, with the expected annual flood damage being in the region of £252 million.

We can expect these numbers to increase. Changes to the climate, how we live and how we use the land bring more and more people and property into flood risk.

Although the risk of flooding will never be removed entirely, this strategy describes the ambition for managing flooding and the priorities for action. A Local Flood Risk Management Plan co-ordinated by Angus Council provides additional detail on the responsibility for delivery, funding and coordination of actions across the Local Plan District. Taken together, these documents describe the commitment of public bodies to address flooding.

This Flood Risk Management Strategy is published by SEPA and has been approved by Scottish Ministers. It has been produced with the support and collaboration of Angus Council, Aberdeenshire Council, Dundee City Council, Fife Council, Perth and Kinross Council, Scottish Water and others with an interest in flood management. SEPA took account of the views received through two public consultations carried out during the development of the strategy and its supporting information.

How we plan for and manage our flood risk has far reaching consequences for Scotland's communities. As well as targeting action and resources in the areas where they can achieve most, the strategies also help to increase awareness of flood risk and improve understanding of how it can affect us.



Terry A'Hearn

Chief Executive Officer  
SEPA



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# Flood Risk Management Strategy

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# Tay Estuary and Montrose Basin Local Plan District

## 1 Flood risk management in Scotland

### 1.1 What is a Flood Risk Management Strategy?

Flood Risk Management Strategies have been developed to reduce the devastating and costly impact of flooding in Scotland. They coordinate the efforts of all organisations that tackle flooding, be it in our cities or rural areas and be it from rivers, the sea or from surface water. The strategies concentrate the work of these organisations to where the risk of flooding and benefits of investment are greatest.

By publishing these strategies, we are giving individuals, communities and businesses the information to better manage their own responsibilities. Everyone can take action with the confidence of knowing what others are doing and when they are doing it.

Flood Risk Management Strategies set out the short to long term ambition for flood risk management in Scotland. The strategies state the objectives, as agreed by responsible authorities, for tackling floods in high risk areas. Actions that will then deliver these objectives are described and prioritised in six-year planning cycles. The decisions are based on the best evidence available on the causes and consequences of flooding. Through this risk-based and plan-led approach, flood management will improve for individuals, communities and businesses at risk in Scotland.

Each strategy should be read alongside its Local Flood Risk Management Plan. The Local Flood Risk Management Plans have been developed by local authorities and provide additional local detail on the funding and delivery timetable for actions between 2016 and 2021. The publication date of the Local Flood Risk Management Plans is June 2016. Both the Flood Risk Management Strategy and Local Flood Risk Management Plan will be updated every six years.

These Flood Risk Management Strategies are approved by Scottish Ministers and published by SEPA, Scotland's strategic flood risk management authority. They have been prepared in collaboration with all 32 local authorities, Scottish Water and other organisations with a responsibility or interest in managing flooding. They are required under the Flood Risk Management (Scotland) Act 2009 and the European Commission's Floods Directive. The actions proposed to manage flood risk in high risk areas have been developed using the best available information at the time. The number of actions that are actually delivered over the six years set out in the strategy will depend on a number of factors including funding availability, and community engagement issues such as potential objections to a particular flood protection scheme.

### 1.2 How to read this Strategy

Each Flood Risk Management Strategy has three sections:

Section 1 contains background information on the approach taken in Scotland to manage flooding. It explains the duties and aims of organisations involved in tackling flooding, including how they work together and how flood risk management planning is linked to other government policies and initiatives.



Section 2 is the most important section for those individuals and communities seeking to understand their flood risk and its management. For priority areas (called Potentially Vulnerable Areas) there is a short description of the causes and consequences of flooding. The agreed objectives are clearly set out. And, most importantly, the actions that will deliver these objectives are prioritised and described.

Section 3 includes supporting information on the sources of flooding in wider river catchments and coastal areas. A glossary is also provided.

### 1.3 Managing flooding in Scotland

Flood risk management in Scotland aims to manage flooding in a sustainable way. Sustainable flood risk management considers where floods are likely to occur in the future and takes action to reduce their impact without moving the problem elsewhere. It considers all sources of flooding, whether from rivers, the sea or from surface water. It delivers actions that will meet the needs of present and future generations whilst also protecting and enhancing the environment.

The sustainable approach to managing flood risk works on a six year planning cycle, progressing through the key stages outlined below.

#### Identifying priority areas at significant flood risk

The first step to delivering a risk-based, sustainable and plan-led approach to flood risk management was SEPA's **National Flood Risk Assessment**, which was published in 2011. The assessment considered the likelihood of flooding from rivers, groundwater and the sea, as well as flooding caused when heavy rainfall is unable to enter drainage systems or the river network. The likelihood of flooding was examined alongside the estimated impact on people, the economy, cultural heritage and the environment. It significantly improved our understanding of the causes and consequences of flooding, and identified areas most vulnerable to floods.

Based on the National Flood Risk Assessment, SEPA identified areas where flooding was considered to be nationally significant. These areas are based on catchment units as it is within the context of the wider catchment that flooding can be best understood and managed. These nationally significant catchments are referred to as **Potentially Vulnerable Areas**. In Scotland, 243 Potentially Vulnerable Areas were identified. They are estimated to contain 92% of the total number of properties at risk.

A small number of Candidate Potentially Vulnerable Areas were identified after the National Flood Risk Assessment in light of new information that warranted further assessment and appraisal. They are included in the flood risk management planning process. The National Flood Risk Assessment will be updated to inform each subsequent planning cycle.

#### Improving the understanding of flooding

SEPA developed **flood hazard and flood risk maps** between 2012 and 2014. These maps improved our understanding of flooding and helped inform the subsequent selection of actions to manage flood risk in Potentially Vulnerable Areas. The flood hazard maps show information such as the extent of flooding, water level, as well as depth and velocity where appropriate. The flood risk maps provide detail on the impacts on people, the economy, cultural heritage and the environment.

In 2012 SEPA also developed an **assessment of the potential for natural flood management**. The assessment produced the first national source of information on where natural flood management actions would be most effective within Scotland.

Flood hazard and flood risk maps and the assessment of the potential for natural flood management can be viewed on the SEPA website [www.sepa.org.uk](http://www.sepa.org.uk).

## Identifying objectives and selecting actions

The objectives and actions to manage flooding will provide the long-term vision and practical steps for delivering flood risk management in Scotland.

Working collaboratively with local partnerships, SEPA has agreed the objectives for addressing the main flooding impacts. Actions that could deliver these agreed objectives have been appraised for their costs and benefits to ensure the right combinations are identified and prioritised. The actions considered in the development of this strategy include structural actions (such as building floodwalls, restoring flood plains, or clearance and repair works to rivers) and non-structural actions (such as flood warning, land use planning or improving our emergency response). Structural and non-structural actions should be used together to manage flood risk effectively.

An assessment of the potential for natural flood management was used to help identify opportunities for using the land and coast to slow down and store water. Natural flood management actions were recommended in areas where they could contribute to the management of flood risk. In such instances these actions were put forward as part of flood protection or natural flood management studies.

## Climate change and future flood risk

The UK Climate Projections (UKCP09) report predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall events. The predicted increase in rainfall is expected to variably increase the potential for river and surface water flooding, and similarly, there is expected to be a rise in sea levels that will vary around the coastline.

The predicted increases in flood risk described in Section 3 are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Flood Risk Management Strategies and Local Flood Risk Management Plans

For flood risk management purposes, Scotland has been divided into 14 **Local Plan Districts**. Each Local Plan District will have a set of complementary plans: Flood Risk Management Strategies produced by SEPA, and Local Flood Risk Management Plans produced by a lead local authority. Flood Risk Management Strategies and Local Flood Risk Management Plans aim to make a strong and lasting contribution to sustainable flood risk management, and will be at the heart of efforts to tackle flooding in Scotland. They will help to target and maximise the benefit of public investment.

### 1.4 How the Flood Risk Management Strategy was developed

#### Partnership working

Many organisations and individuals are involved in helping to improve flood management in Scotland. A piecemeal approach to tackle flooding does not work.

Flooding is too complex, and the causes and impacts too complicated for any single organisation to address alone. Flooding disregards local authority boundaries and cuts across the responsibilities of organisations such as SEPA, Scottish Water and emergency responders. To be successful, flood management requires coordination among organisations as set out in this strategy. A willingness to collaborate by those responsible for flood management is essential.

This strategy has been developed in partnership by:

- Angus Council (lead local authority), Aberdeenshire Council, Dundee City Council, Fife Council and Perth and Kinross Council;
- Scottish Water; and,
- SEPA.

These organisations are working more closely together than ever before. In local partnerships, here and throughout Scotland, SEPA has provided the technical analysis and ensured a consistent national approach is taken. It has provided the evidence upon which to make sensible, informed decisions. Local authorities and Scottish Water have made sure that local knowledge and expertise has informed the decision-making.

### **Consultation, engagement and advice**

SEPA has been keen to hear from the people and communities that live under the threat of flooding to ensure that our technical analysis of the risks is accurate and that efforts to manage flooding are targeted to where most can be achieved. SEPA held two public consultations during the development of the Flood Risk Management Strategies. The first was on the general approach to flood risk management planning and the identification of priority areas (2011); the second, held jointly with local authorities, was on the understanding of flooding in these priority areas and on the objectives and actions to manage flooding (2015).

Further advice has been sought from relevant organisations at key stages. The strategies have benefited from Local Advisory Groups, providing important community and area-based knowledge on both the causes and consequences of flooding and on the appropriate actions for future management. Local Advisory Groups have been especially helpful in considering flood risk management planning in the context of wider plans and initiatives. The Tay Local Advisory Group includes representatives from a range of sectors, including government agencies, National Park Authorities, local authorities, non-government organisations, utility companies and land and asset managers.

In producing the Flood Risk Management Strategy, SEPA has also taken advice from a National Flood Management Advisory Group. Over 50 member organisations, reflecting the national importance and impact of flooding on our communities, economy, environment and cultural heritage, have been invited at key stages to provide comment and input.

Some of the work carried out by SEPA has been complex and technical in nature for which we have sought professional advice. Through membership of the Scottish Advisory and Implementation Forum for Flooding (SAIFF), we have received assistance from local authorities, Scottish Water, Forestry Commission Scotland, the National Park Authorities and other key interested organisations. We have also developed some of our methods by working with other organisations with similar responsibilities within the UK and Europe. We have specifically worked with the Environment Agency and English local authorities in the cross border areas.

SEPA's chief statutory function in flood risk management planning is to prioritise future actions across Scotland. To do this, SEPA made a technical, risk-based assessment of the costs and impacts of actions. This independent assessment was used alongside information from partner organisations to jointly agree priorities and identify indicative delivery dates for actions. A National Prioritisation Advisory Group, with representatives from the Scottish Government, COSLA, Scottish Water and local authorities, was established to provide guidance to SEPA on the priority of flood risk management actions, having considered both the technical ranking prepared by SEPA and issues of local priority.

### **Strategic Environmental Assessment and Habitats Regulation Appraisal**

SEPA undertook a strategic environmental assessment to assess the significant environmental effects of the Flood Risk Management Strategies. Our assessment was published in an environmental report, and we consulted the public on our findings. We have published a post-adoption statement, which describes how we have taken account of the environmental assessment and the consultation responses, and how we will monitor any significant environmental effects of the Flood Risk Management Strategies.

We also undertook a Habitats Regulations Appraisal to ensure that the Flood Risk Management Strategies will not adversely affect the integrity of Special Areas of Conservation and Special Protection Areas. We consulted Scottish Natural Heritage and Natural England on our appraisal method and took their views into account. We have applied mitigation measures where required.

## **1.5 Roles and responsibilities for flood risk management planning**

Individuals have a personal responsibility to protect themselves and their property from flooding. However, public bodies have responsibilities too and are working together to reduce the impacts of flooding in Scotland. Responsibility for flood risk management planning falls primarily to SEPA, local authorities and Scottish Water. Some of the key roles are outlined below and more information is available from the SEPA website.

### **Your responsibilities**

Organisations and individuals have responsibilities to protect themselves from flooding. Being prepared by knowing what to do and who to contact if flooding happens can help you reduce the damage and disruption flooding can have on your life.

The first step to being prepared is signing up to Floodline so you can receive messages to let you know where and when flooding is likely to happen. Other useful tools and advice on how to be prepared are available on the Floodline website, including a quick guide to who to contact in the event of a flood. For more information visit: [www.floodlinescotland.org.uk](http://www.floodlinescotland.org.uk). You can also check how your area could be affected by flooding by looking at SEPA's flood maps.

### **SEPA**

SEPA is Scotland's national flood forecasting, flood warning and strategic flood risk management authority. We have a statutory duty to produce Scotland's Flood Risk Management Strategies. As described above, we work closely with other organisations responsible for managing flood risk through a network of partnerships

and stakeholder groups to ensure that a nationally consistent approach to flood risk management is adopted.

SEPA also has a responsibility to identify where in Scotland there is the potential for natural flood management techniques to be introduced. Natural flood management uses the natural features of the land to store and slow down the flow of water.

In running Floodline, we provide direct warnings, live flooding information and advice on how to prepare for or cope with the impacts of flooding 24 hours a day, seven days a week. To help us forecast for flooding we work in partnership with the Met Office through the Scottish Flood Forecasting Service. SEPA has piloted surface water flood forecasting to help urban areas improve their resilience to and preparedness for flooding. The development and wider roll-out of this service is being considered alongside the technical, resource and communication challenges associated with providing surface water flooding guidance.

To raise awareness of flooding at a national level SEPA runs education initiatives, community engagement programmes and an annual campaign to promote the useful advice and information available through Floodline. We work in partnership with local authorities, Neighbourhood Watch Scotland, Ready Scotland and others to share our resources and help to promote preparedness and understanding of how flood risk is managed.

### **Local authorities and lead local authorities**

Local authorities work together for flood risk management planning purposes through a lead local authority. The lead local authority must perform several important functions over and above the general flood-related duties and powers given to local authorities. Most significantly, the lead local authority, having contributed with other local authorities to the production of the Flood Risk Management Strategy, must prepare a Local Flood Risk Management Plan. Although the lead local authority is responsible for the production of the plan, its content will be drawn from and agreed by all relevant local authorities, other responsible authorities and SEPA. Local authorities have been working collaboratively in the manner described above to develop these Local Flood Risk Management Plans.

It is the responsibility of your local authority to implement its flood protection actions agreed within the Flood Risk Management Strategy, including new schemes or engineering works and their statutory requirements to monitor, clear and maintain watercourses. You can help your local authority to manage flooding by letting them know if debris is blocking watercourses or if flood defences have been tampered with.

During severe flooding, local authorities will work with the emergency services and coordinate shelter for people evacuated from their homes.

### **Scottish Water**

Scottish Water is a responsible authority for flood risk management and is working closely with SEPA, local authorities and others to coordinate plans to manage flood risk.

Scottish Water has the public drainage duty and is responsible for foul drainage and the drainage of rainwater run-off from roofs and any paved ground surface from the boundary of properties. Additionally, Scottish Water helps to protect homes from

flooding caused by sewers either overflowing or becoming blocked. Scottish Water is not responsible for private pipework or guttering within the property boundary.

## National parks

The two National Park Authorities, Loch Lomond and Trossachs National Park and Cairngorms National Park, were designated as responsible authorities for flood risk management purposes in 2012. Both have worked with SEPA, local authorities and Scottish Water to help develop Flood Risk Management Strategies and Local Flood Risk Management Plans. They also fulfil an important role in land use planning, carrying out or granting permission for activities that can play a key role in managing and reducing flood risk.

## Other organisations

- The **Scottish Government** oversees the implementation of the Flood Risk Management (Scotland) Act 2009, which requires the production of Flood Risk Management Strategies and Local Flood Risk Management Plans. Scottish Ministers are responsible for setting the policy framework for how organisations collectively manage flooding in Scotland. Scottish Ministers have also approved this Flood Risk Management Strategy.
- **Scottish Natural Heritage** has provided general and local advice in the development of this Flood Risk Management Strategy. Flooding is seen as natural process that can maintain the features of interest at many designated environmental sites, so Scottish Natural Heritage helps to ensure that any changes to patterns of flooding do not adversely affect the natural environment. Scottish Natural Heritage also provides advice on the impacts of Flood Protection Schemes and other land use development on designated sites and species.
- **Forestry Commission Scotland** was designated in 2012 as a responsible authority for flood risk management planning purposes and has engaged in the development of the Flood Risk Management Strategies through national and Local Advisory Groups. This reflects the widely held view that forestry can play a significant role in managing flooding.
- During the preparation of the flood risk management plans **Network Rail** and **Transport Scotland** have undertaken works to address flooding at a number of frequently flooded sites. Further engagement is planned with SEPA and local authorities to identify areas of future work. There is the opportunity for further works to be undertaken during the first flood risk management planning cycle although locations for these works are yet to be confirmed.
- **Utility companies** have undertaken site specific flood risk studies for their primary assets and have management plans in place to mitigate the effects of flooding to their assets and also minimise the impacts on customers.
- The **Met Office** provides a wide range of scientific support, forecasts and weather warnings. SEPA and the Met Office work together through our partnership the Scottish Flood Forecasting Service.
- The **emergency services** provide emergency support when flooding occurs and can coordinate evacuations. You should call the emergency services on 999 if you are concerned about your safety or the safety of others and act immediately on any advice provided.

- **Historic Environment Scotland** considers flooding as part of its regular assessments of historic sites. As such, flooding is considered as one of the many factors which inform the development and delivery of its management and maintenance programmes.

## 1.6 Links with other plans and policies

### River basin management planning

River basin management aims to protect and improve the condition of our rivers, lochs, estuaries and coastal waters. Taking action to reduce flood risk in Scotland provides an opportunity to connect with plans to improve the quality of Scotland's water environment at the same time. For example, coordination between river basin management and flood risk management can reduce flood risk, whilst improving water quality and biodiversity.

SEPA is leading the delivery of River Basin Management Plans and Flood Risk Management Strategies and has worked to ensure that there is integration and coordination between them. This coordination, particularly in regard to consultation and engagement, will be important for stakeholders many of whom have an interest in the objectives of both plans.

### Land use and spatial planning

Land use planning decisions are one of the most powerful tools available to manage flood risk. The alignment of flood risk management and land use planning policy is pivotal to achieving sustainable flood risk management. Decisions relating to flood risk management can have significant implications for the location of development and, likewise, decisions relating to the location of development can impact on flood risk. Land use planning has the potential to contribute to sustainable flood risk management through the location, use and design of new development and the redevelopment of existing areas. Actions that deliver national level land use planning policies are summarised in Annex 2.

SEPA is a statutory consultee providing advice on planning applications with regards to flood risk. Guidance aims to minimise flood risk to development and ensure no adverse effects occur elsewhere.

Land use planning objectives and actions have been agreed with responsible authorities, which will ensure that flood risk is adequately taken into account throughout the planning process.

### Emergency planning and response

Emergency plans are prepared under the Civil Contingencies Act 2004. They are in place across Scotland and are prepared by Category 1 and 2 Responders, such as Police Scotland and the Scottish Ambulance Service. Emergency plans ensure the effective management of response to emergencies. Emergency plans can either be generic and deal with all emergencies or specific to deal with, for example, flooding. The information contained in the Flood Risk Management Strategies can be used to inform wider emergency response plans for flooding.

Many organisations have specific roles and responsibilities during an emergency response to a flood for example, local authorities, the Scottish Fire and Rescue Services, Police Scotland and SEPA. In many cases, this response is augmented by the work of voluntary organisations, communities and individuals. During an

emergency, the response by these agencies will be co-ordinated through regional and local resilience partnerships.

## Scottish Water investment plans

There is a close relationship between Flood Risk Management Strategies and Scottish Water's investment plans. Sewer flooding is not considered in detail in this strategy although it remains a high priority for Scottish Water and its customers. Scottish Water's close involvement in flood risk management planning aims to ensure that there is strong coordination between the management of sewer and surface water flooding and the actions to be taken forward by local authorities.

## 1.7 Supporting information

### Sources of flooding described in this strategy

The Flood Risk Management Strategy addresses the risk of flooding from rivers, the coast and surface water. The risk of flooding from rivers is usually due to rainfall causing a river to rise above bank level spreading out and inundating adjacent areas. Coastal flooding is where the risk is from the sea. Sea levels can change in response to tidal cycles or atmospheric conditions. Over the longer term sea levels and coastal flood risk may change due to climate change. Surface water flooding happens when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. There can be interactions between these sources of flooding, but for the purposes of this strategy they are dealt with independently.

The following aspects of flooding have not been incorporated into this strategy:

- **Groundwater** is generally a contributing factor to flooding rather than the primary source. It is caused by water rising up from underlying rocks or flowing from springs.
- **Reservoir breaches** have been assessed under separate legislation (Reservoirs (Scotland) Act 2011). Further information and maps can be found on SEPA's website.
- The Flood Risk Management (Scotland) Act 2009 does not require SEPA or responsible authorities to assess or manage **coastal erosion**. However, SEPA has included consideration of erosion in the Flood Risk Management Strategies by identifying areas that are likely to be susceptible to erosion and where erosion can exacerbate flood risk. As part of considering where actions might deliver multiple benefits, we have looked to see where the focus of coastal flood risk management studies coincides with areas of high susceptibility to coastal erosion. Subsequent detailed studies and scheme design will need to consider coastal erosion in these areas.
- **Coastal flood modelling.** The information on coastal flooding used to set objectives and identify actions is based on SEPA modelling using simplified coastal processes and flooding mechanisms at work during a storm. Wave overtopping cannot be accurately modelled at a national scale due to the importance of local factors such as prevailing wind conditions, the depth and profile of the near-shore sea bed or the influence of any existing defences or management structures. As a result, coastal flood risk may be underestimated in some areas. Conversely, in locations with wide and flat floodplains, the modelling may overestimate flood risk. To address this, in a number of locations where



more detailed local models were available they have been incorporated into the development of the Flood Risk Management Strategies. Where wave overtopping has been specifically identified as a concern – but where no further detailed modelling is available – particular compensation has been made in the selecting actions to address coastal flood risk.

### Commonly used terms

Below are explanatory notes for commonly used terms in this strategy. A glossary of terms is also available.

- Reference to flood risk.** During the development of this strategy flood risk has been assessed over a range of likelihoods. For consistency in reporting information within the strategies, unless otherwise stated, all references to properties or other receptors being ‘at risk of flooding’ refer to a medium likelihood flood (up to a 1 in 200 chance of flooding in any given year). By exception, references will be made to high or low risk flooding, which should be taken to mean a 1 in 10 chance/likelihood or 1 in 1000 chance/likelihood of flooding in any given year respectively.

Chance / likelihood of flooding	
High	1 in 10 year
Medium	1 in 200 year
Low	1 in 1000 year

- Annual Average Damages** have been used to assess the potential economic impact of flooding within an area. Depending on its size or severity each flood will cause a different amount of damage to a given area. Annual Average Damages are the theoretical average economic damages caused by flooding when considered over a very long period of time. It does not mean that damage will occur every year: in many years there will be no damages, in some years minor damages and in a few years major damages may occur. High likelihood events, which occur more regularly, contribute proportionally more to Annual Average Damages than rarer events. Within the Flood Risk Management Strategies Annual Average Damages incorporate economic damages to the following receptors: residential properties, non-residential properties, vehicles, emergency services, agriculture and roads. They have been calculated based on the principles set out in the Flood Hazard Research Centre Multi-Coloured Handbook (2010).
- History of flooding.** The history of flooding sections of this document report floods that have occurred up to July 2015.

## 1.8 Next steps and monitoring progress

Flood risk management planning has progressed significantly in recent years. Scotland now has the most advanced nationally consistent and locally informed understanding of the causes and consequences of flooding that it has ever had. SEPA is committed to improving this knowledge and understanding during subsequent planning cycles, accepting that these first Flood Risk Management Strategies are based on the best available current knowledge and data.

SEPA has prioritised actions based on funding assumptions provided by Scottish Government and the capacity of local authorities to deliver within the next six years. Lead local authorities will provide an interim report on the progress of delivering all

actions in the Local Flood Risk Management Plan not earlier than two years and not later than three years from its publication. A final report will also be prepared at the end of the first planning cycle.

A second set of Flood Risk Management Strategies and Local Flood Risk Management Plans will be published in December 2021 and June 2022 respectively.

### **Licensing acknowledgements**

Full data licensing acknowledgements can be found in Annex 3 of this strategy.

# Flood Risk Management Strategy

## Tay Estuary and Montrose Basin Local Plan District

This section is the most relevant for individuals, communities and businesses seeking to understand their local flood risk and its management. There is an overview of the Local Plan District, as well as further detail for every Potentially Vulnerable Area. For each Potentially Vulnerable Area, there is a short description of the causes and consequences of flooding. The agreed objectives are clearly set out and, most importantly, the actions that will deliver these objectives are prioritised and described.

## Section 2: Understanding and managing flooding

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• Lucklawhill (07/15) .....	181
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• St Andrew (Denhead and Strathkinnness) (07/17) .....	203
• Cupar (07/18).....	216
• Auchtermuchty and Pleasance (07/19).....	230

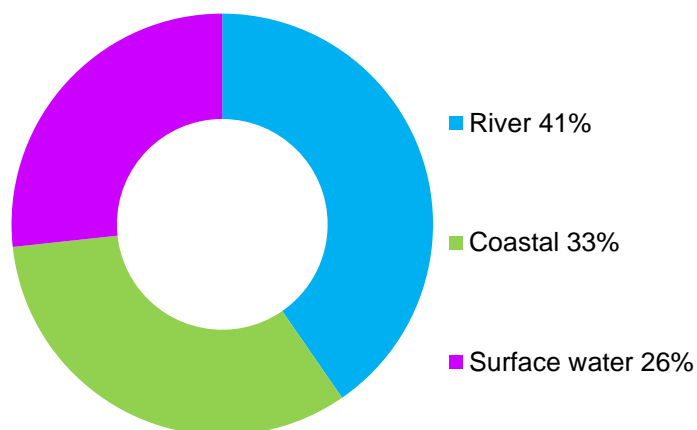
## 2.1 Summary of flooding in the Tay Estuary and Montrose Basin Local Plan District

The Tay Estuary and Montrose Basin Local Plan District covers an area of 2,712km<sup>2</sup> with a population of approximately 340,000. The area contains five local authorities and 19 Potentially Vulnerable Areas.

### Flood risk in the Tay Estuary and Montrose Basin

There are approximately 3,800 residential and 1,400 non-residential properties at risk of flooding within the Local Plan District. This equates to approximately 5% of all properties at risk of flooding nationally. Within the Local Plan District, approximately 2.5% of all residential and 9% of all non-residential properties are at risk and it is estimated that 89% of these properties are located within Potentially Vulnerable Areas. The Annual Average Damages from flooding (see glossary) are approximately £16 million.

River flooding is the main source of flood risk, followed by surface water flooding. The Annual Average Damages caused by river flooding are £6.5 million, those caused by coastal flooding are £5.3 million and those caused by surface water flooding are £4.3 million (Figure 1).



**Figure 1:** Annual Average Damages by flood source

Table 1 and Figure 3 show the number of properties at risk and the Annual Average Damages caused by flooding in the main towns and cities within the Local Plan District. This includes damages to residential properties, non-residential properties, transport and agriculture. Please note that economic damages to airports and rail infrastructure were not assessed, as information on damages at this scale is not available.

	Residential and non-residential properties at risk of flooding	Annual Average Damages
Dundee (inc. Invergowrie and Broughty Ferry)	1,900	£5.1 million
Arbroath	410	£1.5 million
Cupar	280	£740,000
Monifieth	280	£680,000
Carnoustie/Barry	200	£410,000
St Andrews	200	£380,000
Montrose	190	£540,000
Brechin	160	£600,000
Newburgh	130	£450,000
Auchtermuchty	60	£200,000

**Table 1:** Main areas at risk of flooding<sup>1</sup>

## Background information on the Tay Estuary and Montrose Basin Local Plan District

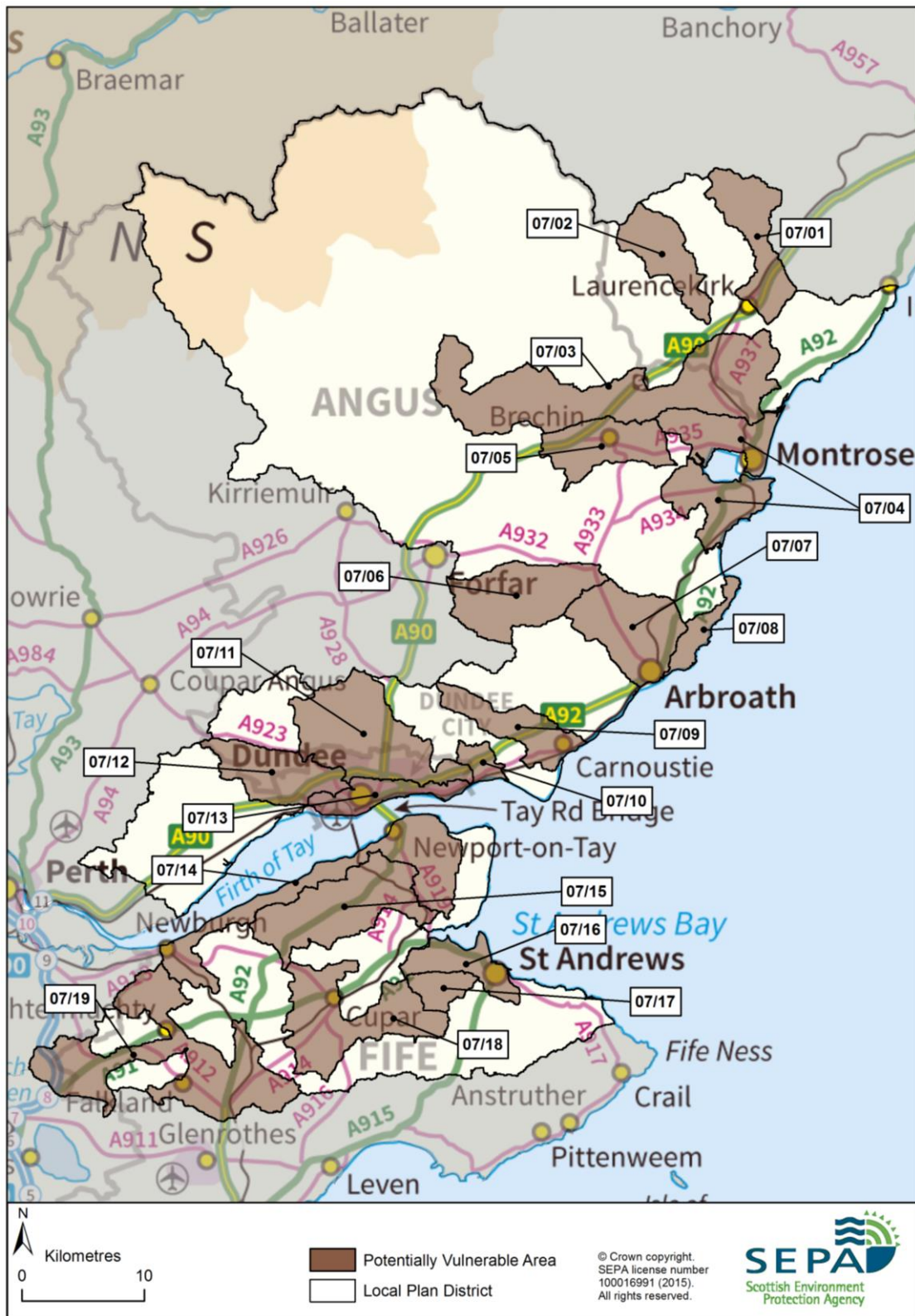
The extent of the Tay Estuary and Montrose Basin Local Plan District and the location of the Potentially Vulnerable Areas are shown in Figure 2.

It is a relatively urbanised area (approximately 4% of land cover) with a number of large cities and towns including Dundee, Arbroath, St Andrews, Leuchars, Forfar, Carnoustie and Montrose. Across the area the main types of land cover include heather and grassland (40%), arable and horticultural land (38%), and coniferous and broadleaved woodland (9%).

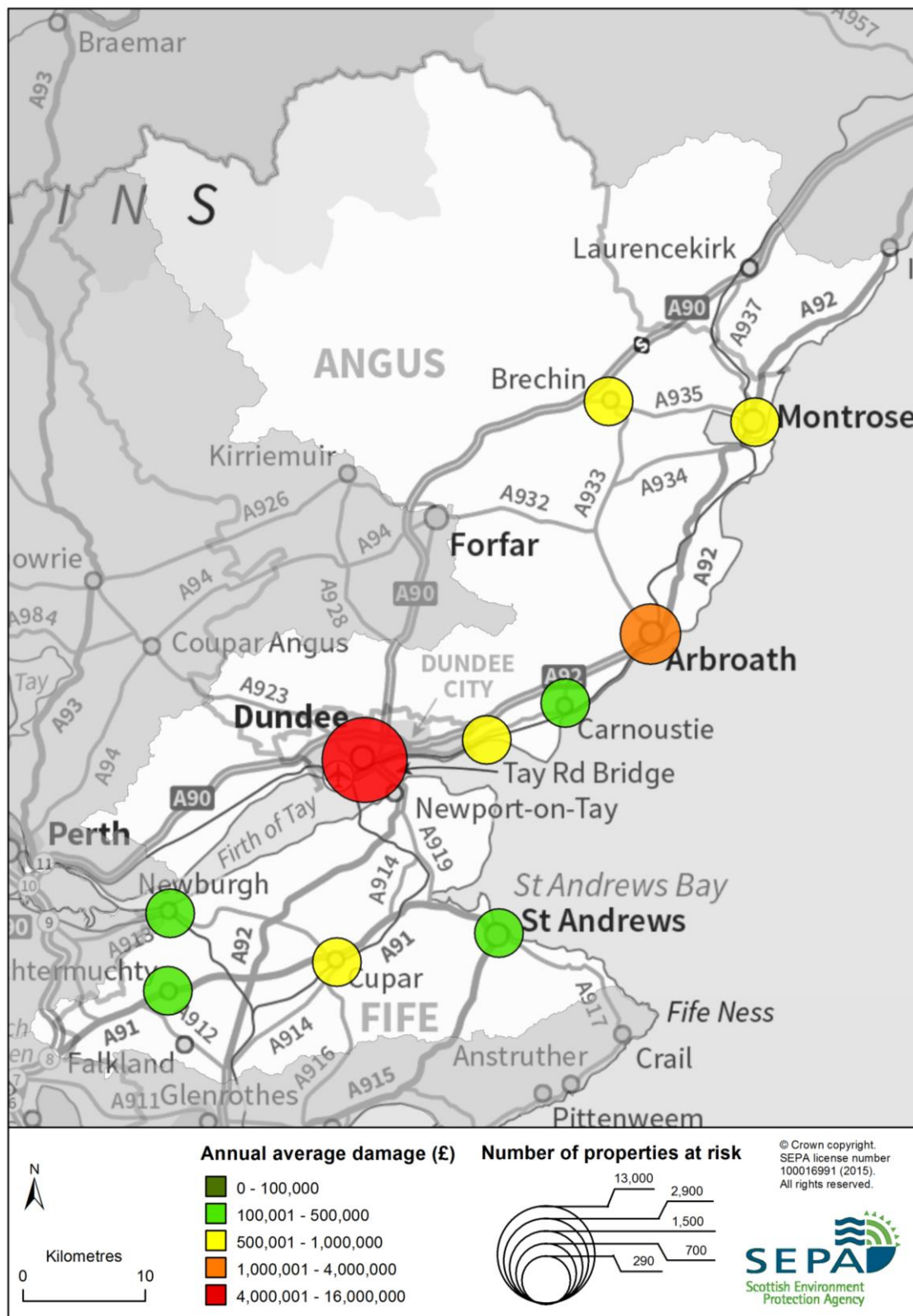
The main river catchments are the Rivers North Esk and South Esk, Lunan Water, Dighty Water and the River Eden. The Local Plan District also has 233km of coastline stretching from Inverbervie in the north to Fife Ness in the south. The coastline includes the Montrose Basin, the Firth of Tay, and the Angus and Fife coastlines that are exposed to the North Sea.

Further details of flood risk from distinct sources can be found in the river, coastal and surface water sections of this report.

<sup>1</sup> Table 1 does not show properties at risk if they are protected by a flood protection scheme



**Figure 2:** The Tay Estuary and Montrose Basin Local Plan District with Potentially Vulnerable Areas identified



**Figure 3:** The Tay Estuary and Montrose Basin Local Plan District showing areas with most properties at risk of flooding and associated damages

## Objectives and actions in the Tay Estuary and Montrose Basin Local Plan District

The objectives are the shared aims for managing flooding. Actions describe where and how flood risk will be managed. Objectives and actions have been set by SEPA and agreed by flood risk management responsible authorities following consultation.

Some flood risk management objectives and actions apply to all areas, whether designated as a Potentially Vulnerable Area or not. For example, flood risk can be managed through national planning policy or as part of ongoing statutory duties for local authorities. The focus of this Flood Risk Management Strategy is to manage flood risk in Potentially Vulnerable Areas where specific actions apply in addition to the generic actions listed below. Further detail on specific actions can be found in the relevant Potentially Vulnerable Area chapter. Local authorities may have further information on how they manage flooding across their area.

Target area	Objective(s)	ID	Indicators
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 3,800 residential properties</li> <li>• 1,400 non-residential properties</li> <li>• 8,400 people</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 3,800 residential properties</li> <li>• 1,400 non-residential properties</li> <li>• 8,400 people</li> </ul>

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk (7054)</b>		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk (7054)</b>		
<b>Delivery lead:</b>	–		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and the Resilient Communities Initiative, and ensuring that properties and businesses are insured against flood damage.		



<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk (7054)</b>		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plans.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk (7054)</b>		
<b>Delivery lead:</b>	Local authority, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. The local authorities produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

<b>Action (ID):</b>	<b>EMERGENCY PLANS / RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	<b>Reduce overall flood risk (7054)</b>		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	<b>Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)</b>		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## 2.2 Potentially Vulnerable Areas

The table below summarises the actions to manage flood risk in the Potentially Vulnerable Areas of this Local Plan District. Further detail is provided in each Potentially Vulnerable Area.

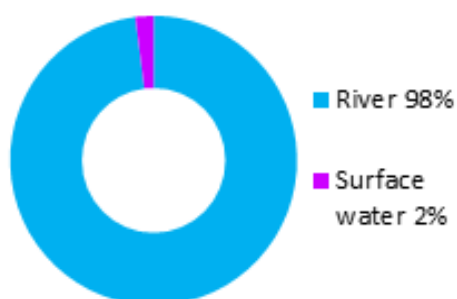
PVA	Flood protection scheme/ works	Natural flood management works	New flood warning	Flood protection study	Natural flood management study	Surface water plan/study	Strategic mapping and modelling	Maintain flood protection scheme*	Maintain flood warning*	Flood forecasting	Property level protection scheme	Community flood action groups	Self help	Awareness raising	Maintenance	Site protection plans	Emergency plans/ response	Planning policies
07/01							✓	N/A	N/A	✓			✓	✓	✓		✓	✓
07/02				✓			✓	✓	N/A	✓		✓	✓	✓	✓		✓	✓
07/03							✓	N/A	✓	✓			✓	✓	✓		✓	✓
07/04			✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓
07/05		✓			✓	✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
07/06							✓	N/A	N/A	✓			✓	✓	✓		✓	✓
07/07	✓					✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
07/08						✓	✓	N/A	N/A	✓			✓	✓	✓		✓	✓
07/09				✓		✓	✓	✓	N/A	✓			✓	✓	✓		✓	✓
07/10			✓	✓		✓	✓	✓	N/A	✓			✓	✓	✓		✓	✓
07/11			✓	✓		✓	✓	N/A	N/A	✓		✓	✓	✓	✓		✓	✓
07/12					✓	✓	✓	N/A	N/A	✓			✓	✓	✓		✓	✓
07/13	✓					✓	✓	✓	✓	✓			✓	✓	✓		✓	✓
07/14				✓			✓	N/A	✓	✓			✓	✓	✓		✓	✓
07/15							✓	N/A	N/A	✓			✓	✓	✓		✓	✓
07/16	✓		✓	✓		✓	✓	N/A	✓	✓			✓	✓	✓		✓	✓
07/17	✓		✓	✓		✓	✓	N/A	N/A	✓			✓	✓	✓		✓	✓
07/18			✓	✓		✓	✓	✓	N/A	✓			✓	✓	✓		✓	✓
07/19			✓	✓	✓		✓	✓	N/A	✓		✓	✓	✓	✓		✓	✓

\*Note: N/A is used where there is no formal Flood Protection Scheme or flood warning scheme present.

## Laurencekirk (Potentially Vulnerable Area 07/01)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Aberdeenshire Council	River North Esk (Tayside)

### Summary of flooding impacts



#### At risk of flooding

- 20 residential properties
- <10 non-residential properties
- £110,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

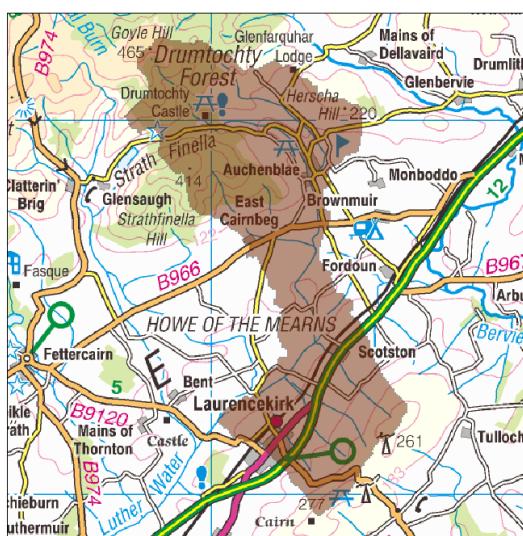
Actions

## Laurencekirk (Potentially Vulnerable Area 07/01)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Aberdeenshire Council	River North Esk (Tayside)

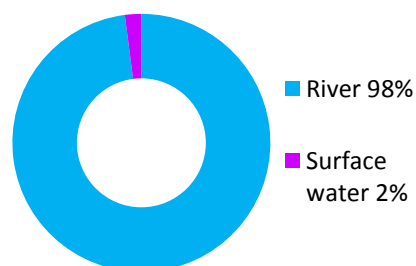
### Background

This Potentially Vulnerable Area is 40km<sup>2</sup> (shown below). It is situated in the north east of the River North Esk catchment and includes Laurencekirk and Auchenblae. The main source of flooding is the Luther Water.



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There are approximately 20 residential properties at risk of flooding. The Annual Average Damages are approximately £110,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The main risk of flooding in this area is to Auchenblae from the Luther Water. The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

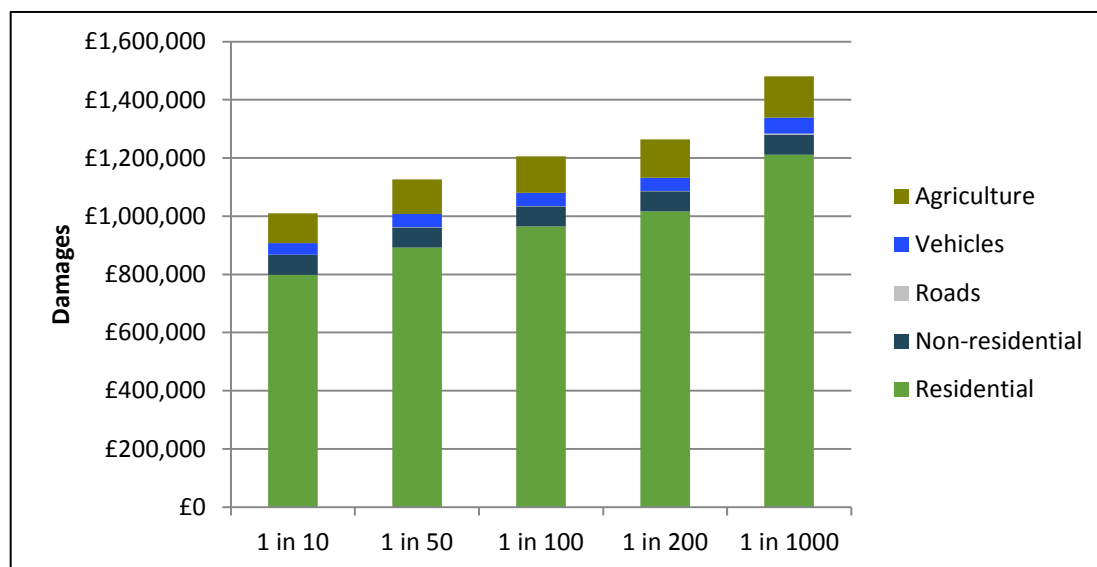
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to agricultural land. The Dundee to Aberdeen railway line is also notably impacted. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

It has been confirmed with Aberdeenshire Council that a small number of non-residential properties identified as being at flood risk in this area are no longer functioning as commercial properties.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,000)	10	20	20
Non-residential properties (total 180)	<10	<10	<10
People	30	40	40
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links (excluding minor roads)	1 B road at 1 location  1 Railway route at 7 locations: Dundee to Aberdeen	1 B road at 1 location  1 Railway route at 7 locations: Dundee to Aberdeen	1 B road at 1 location  1 Railway route at 7 locations: Dundee to Aberdeen
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	0	0	1
Agricultural land (km <sup>2</sup> )	1.3	1.7	1.8

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

### History of flooding

No significant river, coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

## Objectives to manage flooding in Potentially Vulnerable Area 07/01

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Laurencekirk Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £110,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £110,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		



## Actions to manage flooding in Potentially Vulnerable Area 07/01

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Laurencekirk Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Aberdeenshire Council provides a range of flood protection products at cost price with free delivery across Aberdeenshire. The products are available for all types of flooding.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline. This will be achieved through property level protection events delivered by the Scottish Flood Forum and SEPA-led education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Aberdeenshire Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Fettercairn (Potentially Vulnerable Area 07/02)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Aberdeenshire Council	River North Esk (Tayside)

### Summary of flooding impacts



#### At risk of flooding

- 50 residential properties
- 10 non-residential properties
- £140,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

Actions

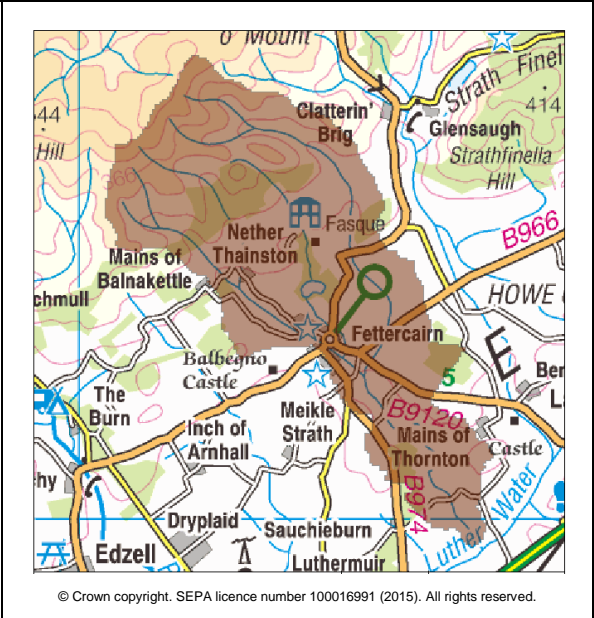
## Fettercairn (Potentially Vulnerable Area 07/02)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Aberdeenshire Council	River North Esk (Tayside)

### Background

This Potentially Vulnerable Area is 32km<sup>2</sup> and is situated in the River North Esk catchment (shown to the right). It includes Fettercairn and the main watercourses are the Dowrie Burn and its tributaries, the Burn of Cauldcotts, the Crichtie Burn and the Craigmoston Burn.

There are approximately 50 residential properties and 10 non-residential properties at risk of flooding. The Annual Average Damages are approximately £140,000. All damages are derived from river flooding.



### Summary of flooding impacts

The highest risk of flooding is in Fettercairn and Craigmoston from the Burn of Cauldcotts and Craigmoston Burn.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

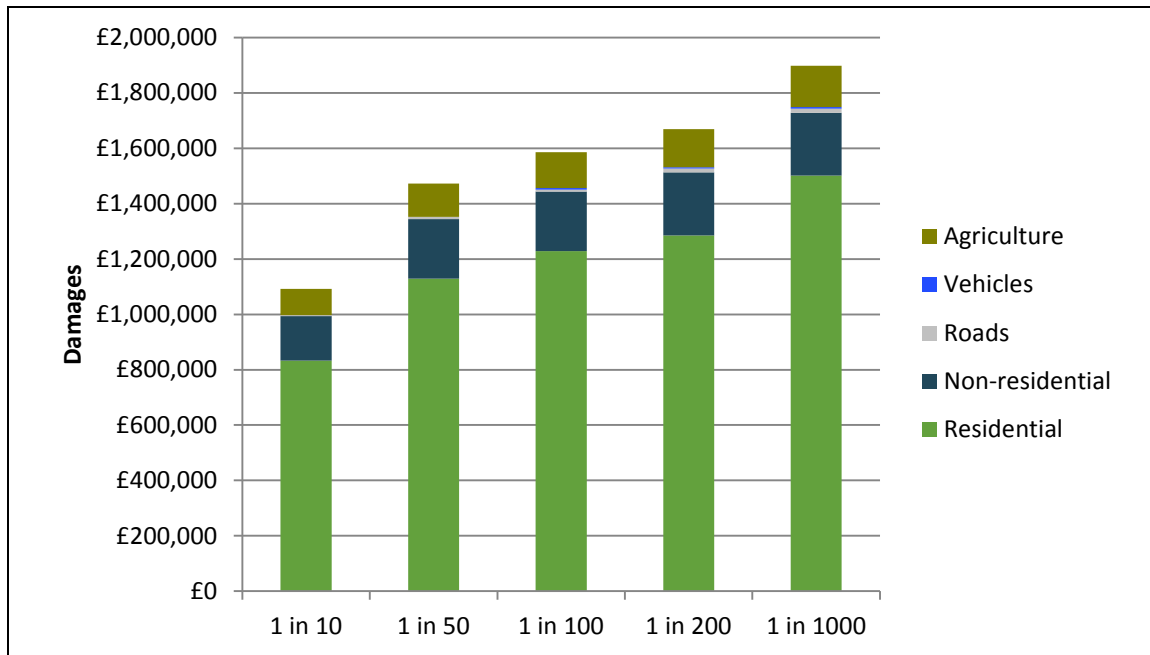
The damages associated with floods of different likelihood are shown in Figure 1.

For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. The location of the impacts of flooding is shown in Figure 2.

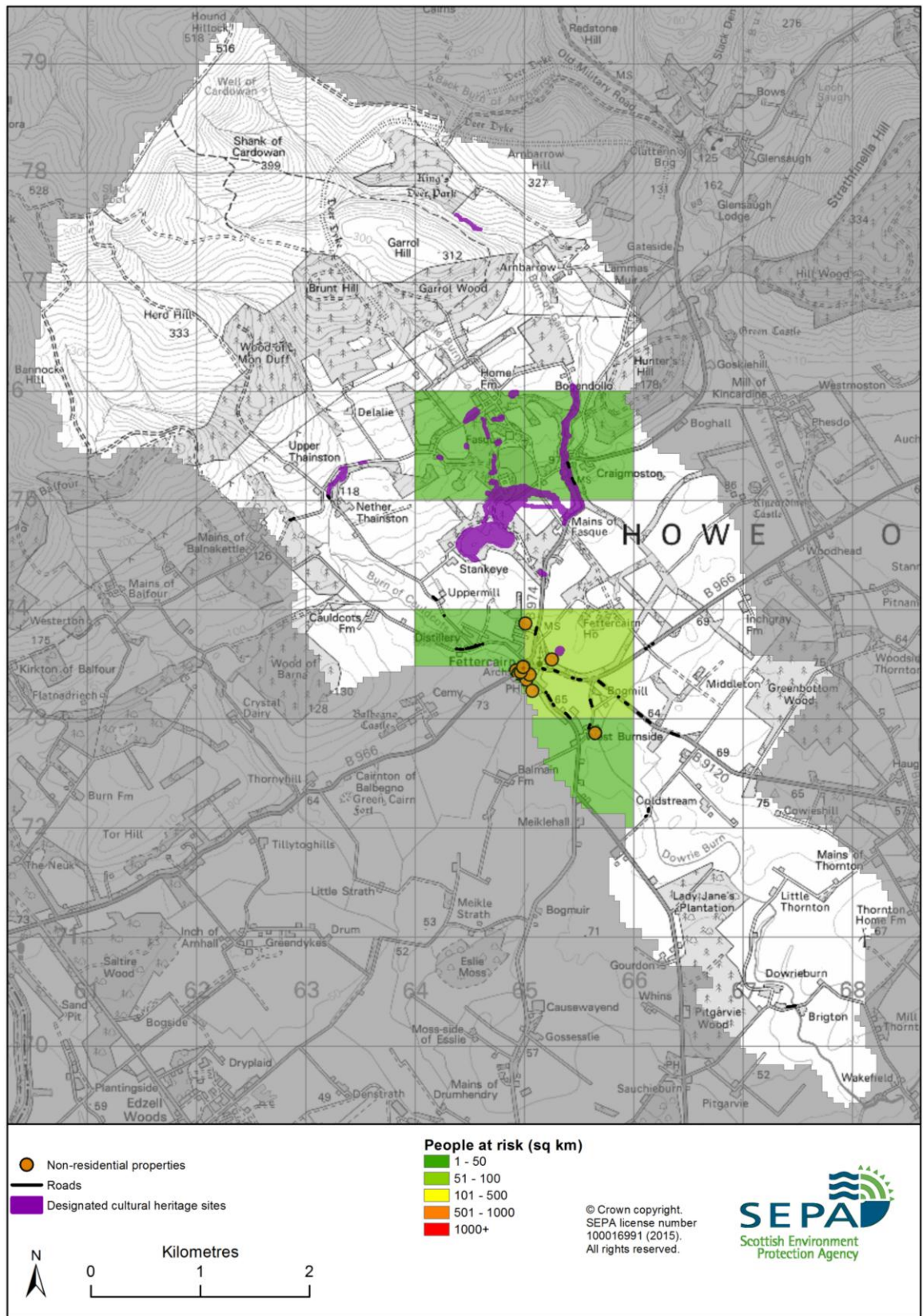
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 280)	40	50	50
Non-residential properties (total 70)	<10	10	10
People	80	100	110
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links (excluding minor roads)	3 B roads at 9 locations	3 B roads at 11 locations	3 B roads at 12 locations
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	3	3	3
Agricultural land (km <sup>2</sup> )	1.2	1.7	1.8

**Table 1:** Summary of flooding impacts



**Figure 1:** Damages by flood likelihood



**Figure 2: Impacts of flooding**

## History of flooding

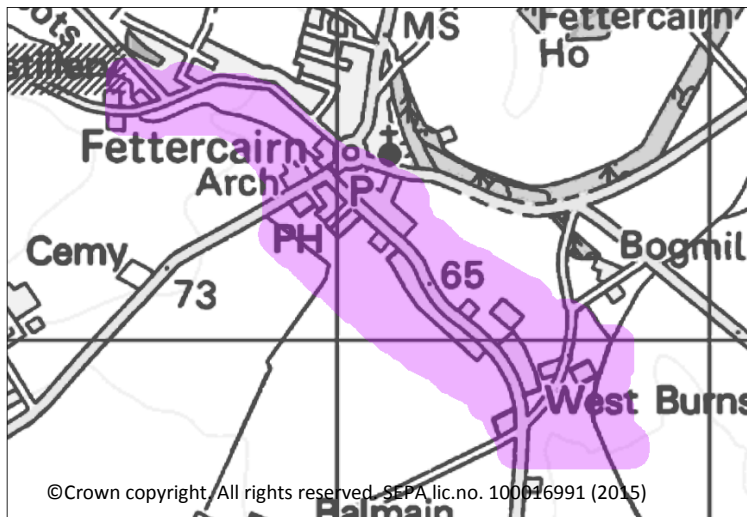
The following floods have been recorded in this area:

- December 2012: A small number of properties were flooded in Fettercairn after the Cauldcotts Burn overtopped flood defences.
- October 2009: Fettercairn hit by flood water when the Cauldcotts Burn burst its banks near the distillery. The water flowed down a field and flooded a number of properties.



## Objectives to manage flooding in Potentially Vulnerable Area 07/02

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA’s flood map. The objectives below have been set for Fettercairn Potentially Vulnerable Area.

Reduce economic damages to residential and non-residential properties in Fettercairn caused by river flooding	
Indicators:	Target area:
<ul style="list-style-type: none"> <li>£96,000 Annual Average Damages from residential properties</li> <li>£17,000 Annual Average Damages from non-residential properties</li> </ul>	 <p style="font-size: small; text-align: center;">© Crown copyright. All rights reserved. SEPA, lic.no. 100016991 (2015)</p>
Objective ID: 7003	

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>50 residential properties</li> <li>£140,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>50 residential properties</li> <li>£140,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 07/02

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Fettercairn Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70030005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Fettercairn caused by river flooding (7003)		
<b>Delivery lead:</b>	Aberdeenshire Council		
<b>Priority:</b>	National:		Within local authority:
	<b>102 of 168</b>		<b>6 of 12</b>
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	A flood protection study has been recommended for Fettercairn to further assess options to manage flood risk. The study should build on existing studies and should include natural flood management, focusing on the assessment of runoff control and sediment management. The study should also consider the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. The study has a lower national priority and is to be carried out in the second flood risk management cycle.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 39 residential properties and 10 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £2.6 million. Thirty-four of these properties are at risk from high likelihood floods and could benefit from natural flood management actions.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. The study could also benefit two roads located within the study area. Natural		

<b>Social:</b>	flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought. In this location designated sites include conservation areas and listed buildings.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2022-2027</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Black Burn and Luther Water areas to improve understanding of flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. As this work coincides with a proposed local authority study in Fettercairn, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70030017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Fettercairn caused by river flooding (7003)		
<b>Delivery lead:</b>	Aberdeenshire Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain existing flood protection schemes that provide protection to Fettercairn from river flooding. These include the Fettercairn Flood Protection Scheme constructed in 1982 and an informal flood storage area on the Burn of Cauldcotts constructed in 2011.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.</p> <p>In this area Aberdeenshire Council also owns and operates two river level gauges on telemetry for Fettercairn.</p>		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (70030012)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Fettercairn caused by river flooding (7003)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Fettercairn Flood Resilience Group operates in this area. This is a community-run group set up in spring 2013. When possible it is supported by Aberdeenshire Council.</p>		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Aberdeenshire Council provides a range of flood protection products at cost price with free delivery across Aberdeenshire, available for all types of flooding.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>SEPA will engage with the community and promote Floodline. This will be achieved through property level protection events delivered by the Scottish Flood Forum and SEPA-led education events.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Aberdeenshire Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

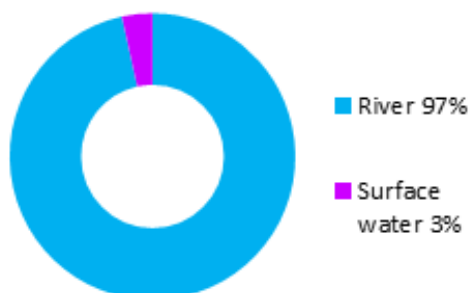
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## North of Brechin (Potentially Vulnerable Area 07/03)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Aberdeenshire Council, Angus Council	River North Esk (Tayside)

### Summary of flooding impacts



#### At risk of flooding

- 20 residential properties
- 20 non-residential properties
- £110,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

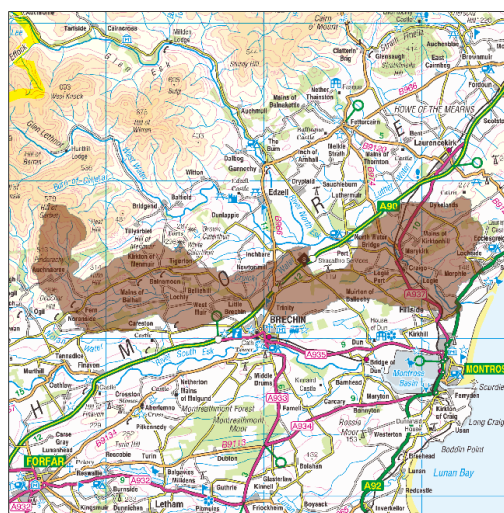
Actions

## North of Brechin (Potentially Vulnerable Area 07/03)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Aberdeenshire Council, Angus Council	River North Esk (Tayside)

### Background

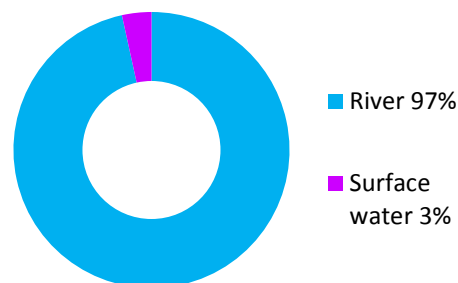
This Potentially Vulnerable Area is 124km<sup>2</sup>. It is situated at the mouth of the River North Esk catchment where it meets the North Sea (shown below). It includes Marykirk and the main watercourses are the River North Esk and its tributaries the Cruick Water and Keithock Burn.



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There is a risk of river flooding and surface water flooding, with the majority of damages caused by river flooding.

There are approximately 20 residential properties and 20 non-residential properties at risk of flooding. The Annual Average Damages are approximately £110,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

Flood risk is spread out across the Potentially Vulnerable Area and flooding occurs to small pockets of land adjacent to the River North Esk and its tributaries.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

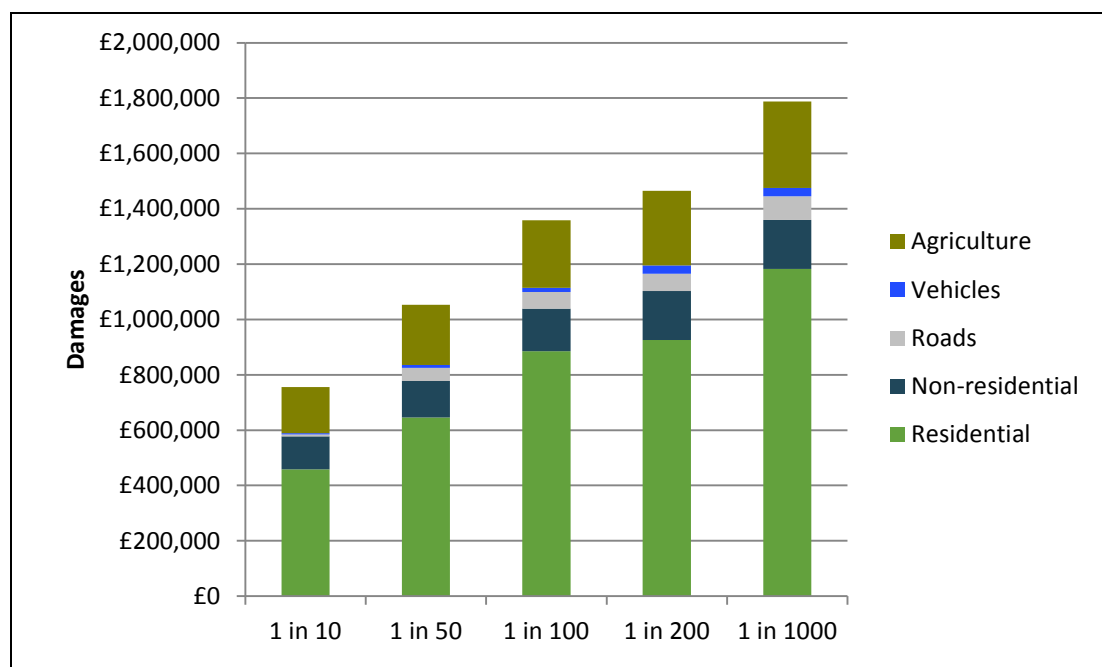
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. The Dundee to Aberdeen railway line is also notably impacted. The location of the impacts of flooding is shown in Figure 3.



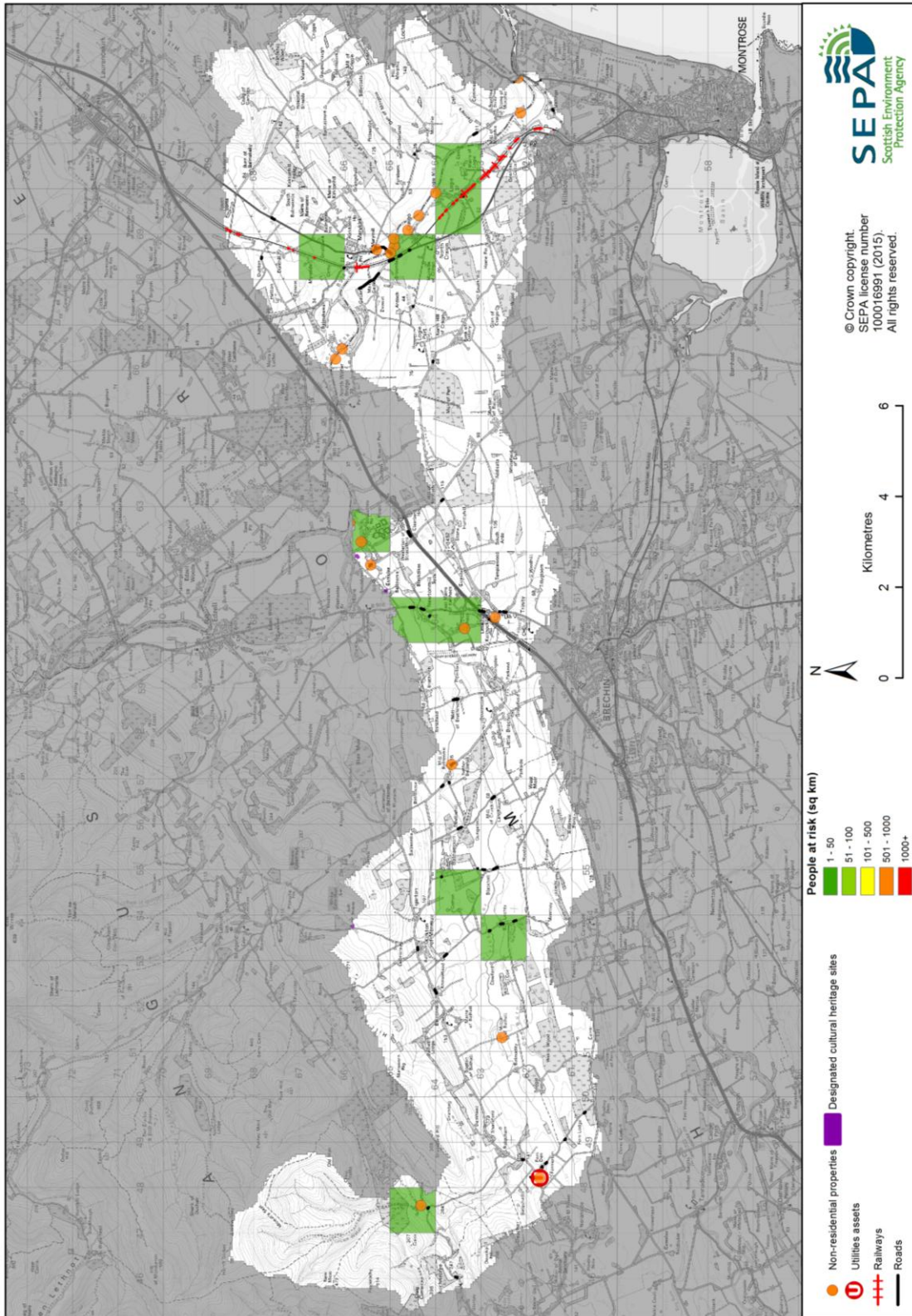
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 910)	10	20	20
Non-residential properties (total 160)	10	20	20
People	20	40	50
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	3 A roads, 1 B road at 13 locations  1 Railway route at 18 locations: Dundee to Aberdeen	3 A roads, 1 B road at 16 locations  1 Railway route at 18 locations: Dundee to Aberdeen	3 A roads, 1 B road at 17 locations  1 Railway route at 18 locations: Dundee to Aberdeen
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	7	7	7
Agricultural land (km <sup>2</sup> )	2.5	4.1	4.8

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

One significant flood has been recorded in this Potentially Vulnerable Area, which occurred on 2 November 2002. The highest river level recorded at the SEPA gauging station on the North Esk at Logie Mill was 4.225m above normal level. The peak flow of 636 m<sup>3</sup>/s recorded at this time is the highest flow at this gauging station since the start of recording in 1983. People were evacuated in Marykirk and Logie by the emergency services.

## Objectives to manage flooding in Potentially Vulnerable Area 07/03

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for the North of Brechin Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £110,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £110,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 07/03

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for the North of Brechin Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Cruick Water and Lower North Esk areas to improve understanding of flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Inchbare, Marykirk and the Logie Mill and Craigo flood warning areas which are part of the North Esk river flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.</p> <p>In this area Aberdeenshire Council also owns and operates two river level gauges on telemetry for Marykirk.</p>		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.</p> <p>Aberdeenshire Council provides a range of flood protection products at cost price with free delivery across Aberdeenshire, available for all types of flooding.</p>		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Aberdeenshire Council and Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Angus Council operates an emergency response plan in areas of high flood risk.</p>		

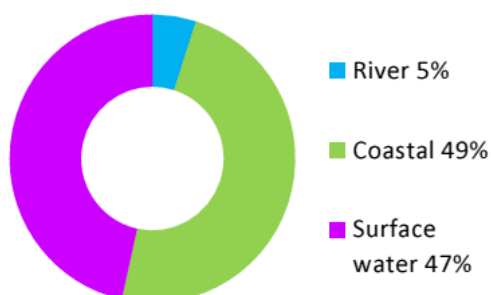
<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		



## Montrose Basin (Potentially Vulnerable Area 07/04)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Kincardine and Angus coastal

### Summary of flooding impacts



#### At risk of flooding

- 130 residential properties
- 90 non-residential properties
- £700,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	New flood warning	Community flood action groups	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

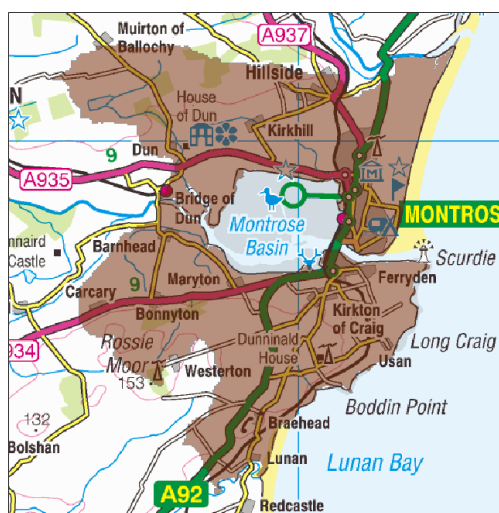
Actions

# Montrose Basin (Potentially Vulnerable Area 07/04)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Kincardine and Angus coastal

## Background

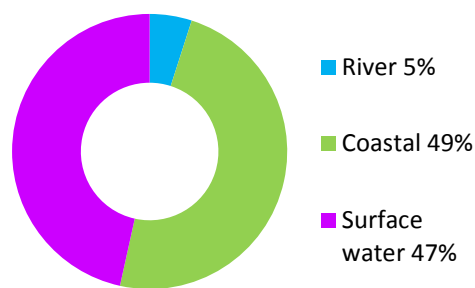
This Potentially Vulnerable Area is 63km<sup>2</sup> and is made up of small coastal watercourses that flow into the Montrose Basin and Montrose Bay (shown below). It includes the towns of Montrose and Ferryden.



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The area has a risk of river, coastal and surface water flooding with the majority of damages caused by coastal and surface water flooding.

There are approximately 130 residential properties and 90 non-residential properties at risk of flooding. The Annual Average Damages are approximately £700,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

The highest risk of coastal flooding is from the North Sea and Montrose Basin to Montrose, Ferryden and Bridge of Dun. The highest risk of surface water flooding is in Montrose and Ferryden.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties and roads. The Dundee to Aberdeen railway line is also notably impacted. The location of the impacts of flooding is shown in Figure 3.

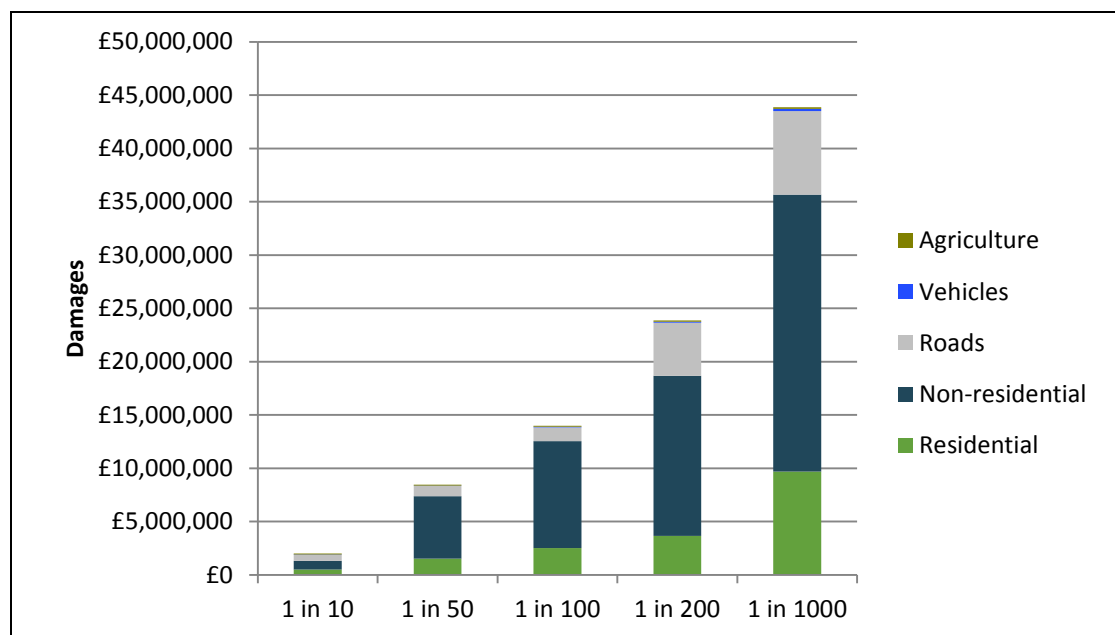
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works

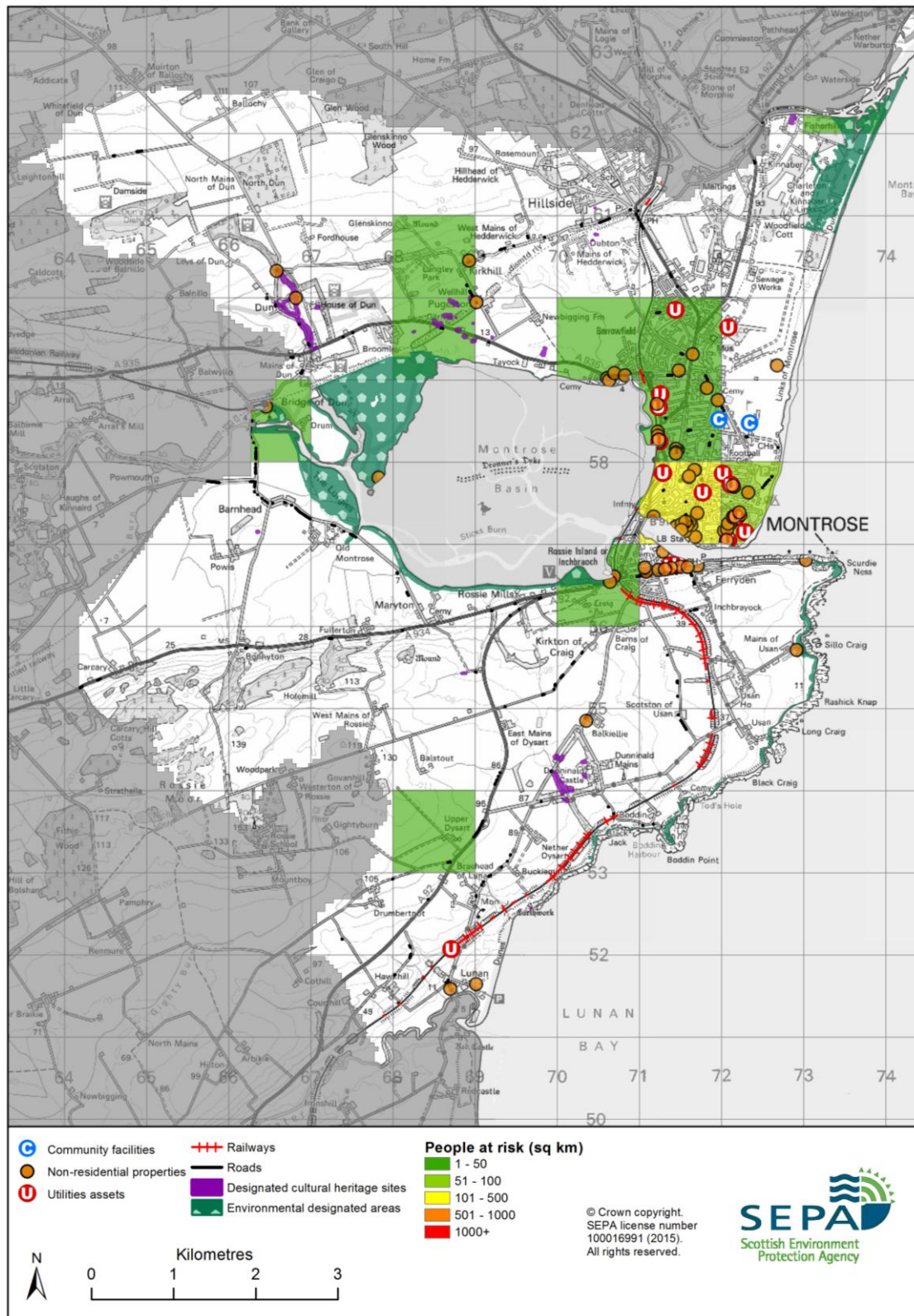
and pumping stations). Within this Potentially Vulnerable Area there is one asset identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
<b>Residential properties (total 7,800)</b>	10	130	440
<b>Non-residential properties (total 970)</b>	20	90	120
<b>People</b>	30	290	960
<b>Community facilities</b>	0	<10 Includes: educational buildings and emergency services	<10 Includes: educational buildings and emergency services
<b>Utilities assets</b>	<10	10	20
<b>Transport links (excluding minor roads)</b>	4 A roads at 24 locations  1 Railway route at 18 locations: Dundee to Aberdeen	4 A roads, 2 B roads at 39 locations  1 Railway route at 26 locations: Dundee to Aberdeen	4 A roads, 2 B roads at 45 locations  1 Railway route at 32 locations: Dundee to Aberdeen
<b>Environmental designated areas (km<sup>2</sup>)</b>	4.6	5.0	5.3
<b>Designated cultural heritage sites</b>	9	14	14
<b>Agricultural land (km<sup>2</sup>)</b>	2.4	3.3	4.7

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

One coastal flood has been recorded in this Potentially Vulnerable Area. On 12 January 2005 Montrose experienced property level flooding alongside the Tayock Burn due to high tide levels within the Montrose Basin.

## Objectives to manage flooding in Potentially Vulnerable Area 07/04

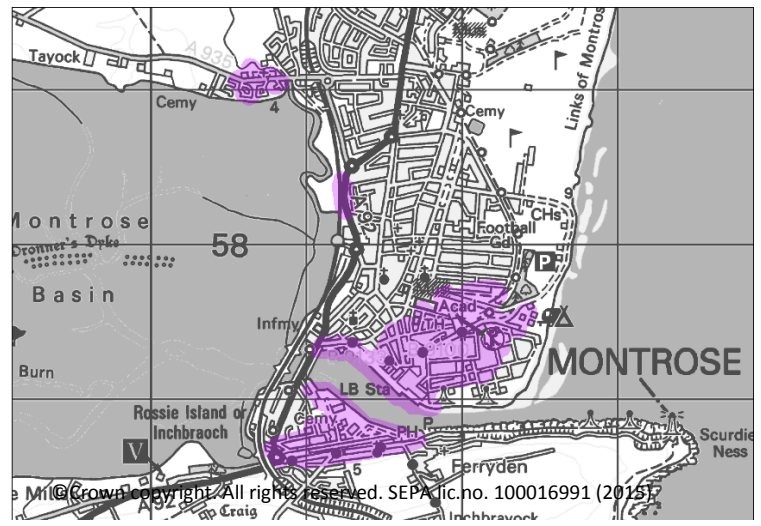
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Montrose Basin Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties and risk to people in Montrose caused by coastal flooding

Indicators:

- 250 people
- £130,000 Annual Average Damages from residential properties
- £140,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7007, 7008

Target area	Objective	ID	Indicators within PVA
Montrose and Ferryden	Reduce economic damages and number of residential properties at risk of surface water flooding in Montrose and Ferryden where practical	7005	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 130 residential properties</li> <li>• £700,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 130 residential properties</li> <li>• £700,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/04 there are 20 residential properties at risk and Annual Average Damages of £330,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/04

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Montrose Basin Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	New flood warning	Community flood action groups	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Flood warning is required for communities at risk of coastal flooding along the Aberdeenshire coast from Peterhead to Montrose. A flood forecasting system will be required before the flood warning scheme can be developed.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70070005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Montrose caused by coastal flooding (7007, 7008)		
<b>Delivery lead:</b>	Angus Council		
<b>Priority:</b>	National: <b>57 of 168</b>	Within local authority: <b>4 of 6</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Montrose to assess whether flood defences and natural flood management could reduce flood risk. Natural flood management options that should be considered include wave and surge attenuation. The study should also consider the viability of property level protection. The study should take a sustainable approach and consider the interaction		



	between actions and potential effects on coastal processes along the shoreline.
Potential impacts	
<b>Economic:</b>	The study could benefit 104 residential properties and 43 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £5.2 million.
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the study area. The study could also benefit three utilities and three roads located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and on designated sites. Where possible opportunities to enhance and restore the environment should be sought. To be in accord with the FRM Strategy, the responsible authority should seek to ensure as part of the study that the proposed actions will not have an adverse effect on the integrity of the Montrose Basin Special Protection Area. In addition, nationally and locally designated sites are present in the study area and could be positively or negatively impacted. These include conservation areas, listed buildings, Sites of Special Scientific Interest and Ramsar sites.

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70050018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Montrose and Ferryden where practical (7005)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Montrose area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. As a local authority study is proposed in this area, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70070017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Montrose caused by coastal flooding (7007, 7008)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing sea walls, gabions, embankments and revetments around Montrose Basin.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Kinnaird/Bridge of Dun flood warning area which is part of the South Esk river flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (70070012)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Ferryden Flood Action Group operates in this area. The group was formed in late 2014 after advice given by Angus Council at a public meeting.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

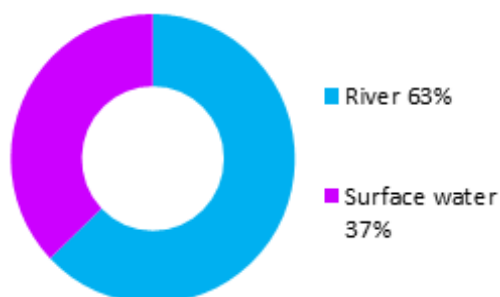
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Angus Council operates an emergency response plan in areas of high flood risk.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Brechin (Potentially Vulnerable Area 07/05)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	River South Esk (Tayside)

### Summary of flooding impacts



#### At risk of flooding

- 100 residential properties
- 70 non-residential properties
- £670,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	Natural flood management works	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

## Brechin (Potentially Vulnerable Area 07/05)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	River South Esk (Tayside)

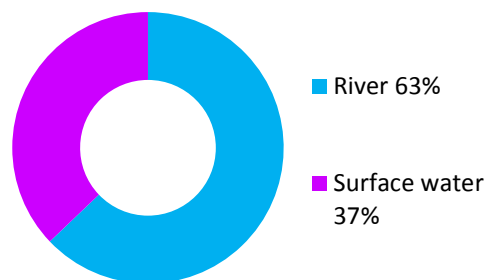
### Background

This Potentially Vulnerable Area is 36km<sup>2</sup> and includes Brechin (shown below). It is situated near the mouth of the River South Esk where it flows into the Montrose Basin. The main sources of flooding are river and surface water.

There are approximately 100 residential properties and 70 non-residential properties at risk of flooding. The Annual Average Damages are approximately £670,000.



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**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The highest risk of flooding is in Brechin from the River South Esk. Brechin is also notably impacted by surface water flooding.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

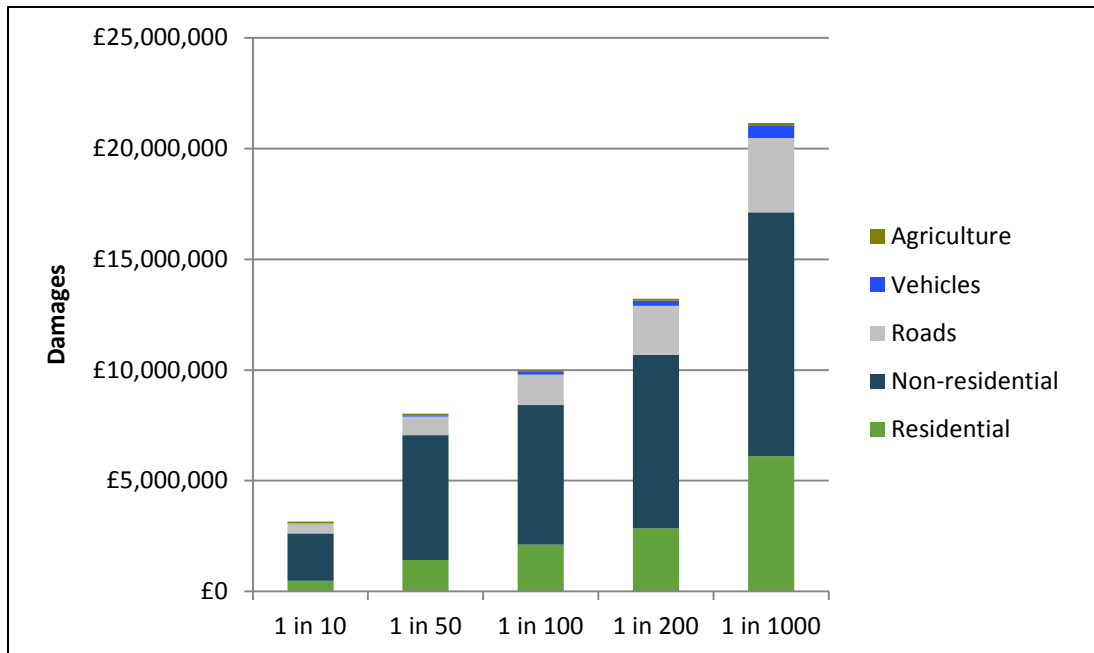
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

In Brechin, Angus Council has undertaken detailed studies for the design and build of the Brechin Flood Protection Scheme. The information in this report uses SEPA data which may be different from the flooding information held by the local authority.

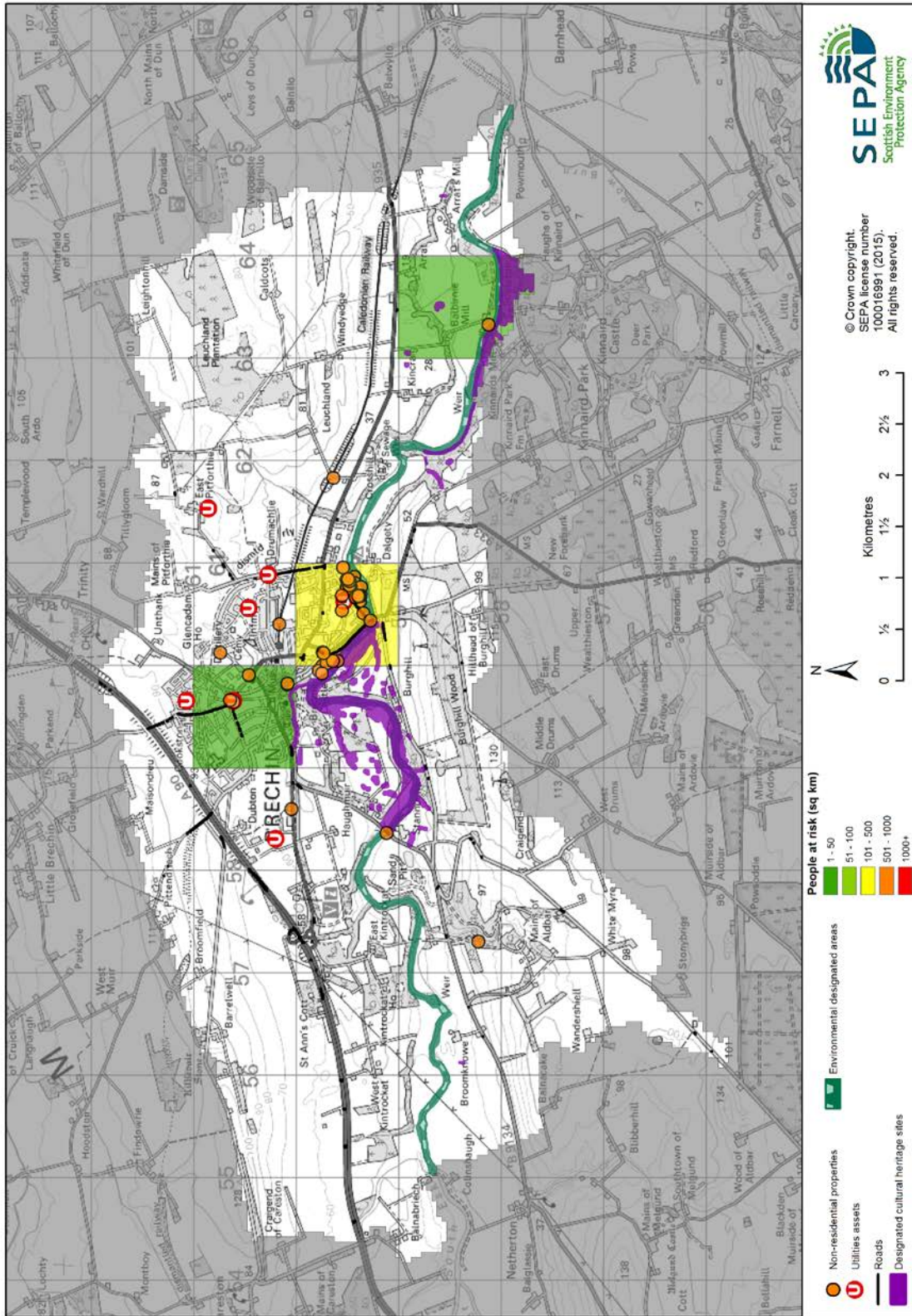
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 4,100)	10	100	220
Non-residential properties (total 460)	50	70	80
People	20	210	480
Community facilities	0	0	<10 Healthcare facilities
Utilities assets	<10	<10	10
Transport links (excluding minor roads)	3 A roads, 1 B road at 35 locations	3 A roads, 1 B road at 51 locations	4 A roads, 1 B road at 59 locations
Environmental designated areas (km <sup>2</sup> )	0.7	0.8	0.8
Designated cultural heritage sites	8	11	12
Agricultural land (km <sup>2</sup> )	1.8	2.2	2.4

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood





**Figure 3: Impacts of flooding**

## History of flooding

This area has a long history of flooding. All the floods described below occurred in and around the town of Brechin:

- 21 November 2002: Evacuation and temporary relocation of families after defences were overtopped on the River South Esk. Thirty properties flooded and roads were closed.
- October 1982: Flooding to a property on River Street.
- 1960: River flooded to 18 inches.
- 13 December 1957: Houses flooded for first time since 1951. Up to 1.5 feet along River Street.
- November 1951: Flood event similar to that in 1921 with flooding to the top of railings.
- October 1939: Bottom flats inundated through doors and windows.
- 1921: Flood level to the height of the railings situated along the walkway adjacent to the river.
- 5 October 1920: River level 8-9 feet above normal levels. River Street flooded from Fordmouth to the bridge and up to a depth of 5 inches. Not as prolific as the 1913 flood but waters extended up to Nursery Lane. There were 58 houses inundated up to a depth of 3 feet.
- 9 May 1913: River levels reached approximately 0.8m above the current road level on River Street.
- 21 November 1891: Reports quote that approximately 4.6 inches of rain fell over the course of two days causing very serious flooding.
- 25 February 1872: Flood levels exceeded that of the 1829 and 1860 floods with levels rising to several feet. Paper Mill and Inch completely inundated.
- 1860: Great flood recorded. Cottages on River Street inundated by floodwaters up to a level of 3 feet.
- December 1853: Inch inundated by flood water and property beside the river flooded up to a level of 4.5 feet.
- 1829: River Street flooded up to levels of between 2-3 feet.
- 1774: House inundated by flood water on River Street.

## Objectives to manage flooding in Potentially Vulnerable Area 07/05

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Brechin Potentially Vulnerable Area.

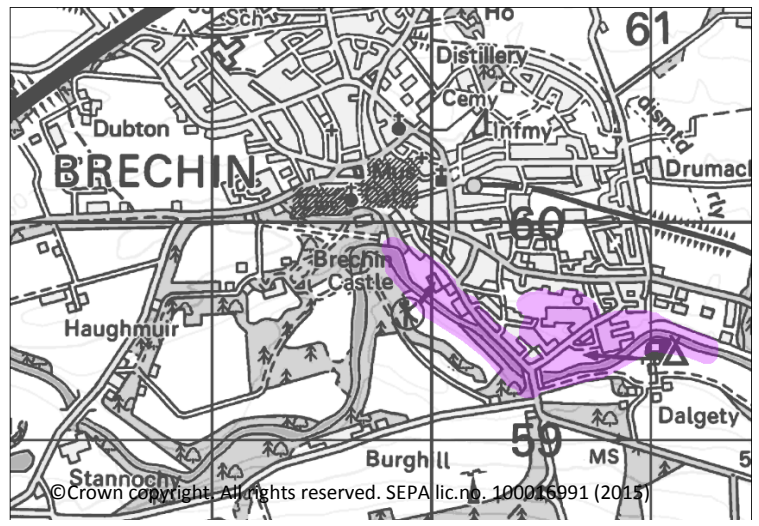
### Reduce economic damages to residential and non-residential properties and risk to people in Brechin caused by flooding from the River South Esk

Indicators:

Target area:

- 190 people
- £98,000 Annual Average Damages from residential properties
- £260,000 Annual Average Damages from non-residential properties

Objective ID: 7011, 7012



Target area	Objective	ID	Indicators within PVA
Brechin	Reduce economic damages and number of residential properties at risk of surface water flooding in Brechin where practical	7009	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 100 residential properties</li> <li>• £670,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 100 residential properties</li> <li>• £670,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/05 there are 10 residential properties at risk and Annual Average Damages of £250,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/05

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Brechin Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	Natural flood management works	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT WORKS (70110004)</b>				
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Brechin caused by flooding from the River South Esk (7011, 7012)				
<b>Delivery lead:</b>	Angus Council				
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	Natural flood management works are continuing following completion of the Brechin Flood Protection Scheme. The works include upland reforestation.				
<b>Potential impacts</b>					
<b>Economic:</b>	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. Eighty-four residential and non-residential properties could potentially benefit from natural flood management actions in this location.				
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the natural flood management works area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.				
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats.				

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (70120003)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Brechin caused by flooding from the River South Esk (7011, 7012)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The South Esk pilot catchment project aims to identify and prioritise opportunities for delivering improvements to river habitats whilst helping to reduce flood risk. Phase 1 of the study has been completed and SEPA is currently in discussion with landowners with regard to taking forward some sites to options appraisal and outline design.		
<b>Potential impacts</b>			
<b>Economic:</b>	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. The following rivers in the study area are identified by SEPA to be at less than good status for their physical condition: Melgund Burn and Lemno Burn (Water body IDs 5804 and 5806). Opportunities to improve the condition of this river should be considered by coordinated with river basin management planning.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70090018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Brechin where practical (7009)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70110017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Brechin caused by flooding from the River South Esk (7011, 7012)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Maintain the Brechin Flood Protection Scheme once completed in January 2016. The Brechin Flood Protection Scheme is an integrated urban drainage and river flood protection scheme and has been designed to provide a current-day standard of protection of 1 in 200 years.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Brechin, Kinnaird/Bridge of Dun and the Finavon and Tannadice flood warning areas which are part of the South Esk river flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage. Angus Council has provided door guards and air brick covers for locations in Brechin.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community and promote Floodline participation in education partnership events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		



<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

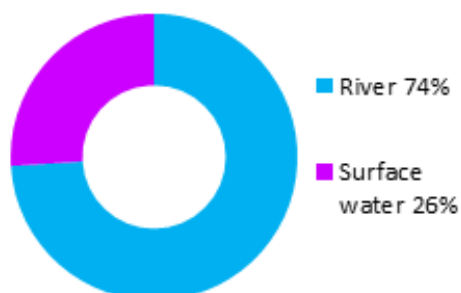
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Angus Council operates an emergency response plan in areas of high flood risk.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Lunan Water (Potentially Vulnerable Area 07/06)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Lunan Water

### Summary of flooding impacts



#### At risk of flooding

- 20 residential properties
- <10 non-residential properties
- £60,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

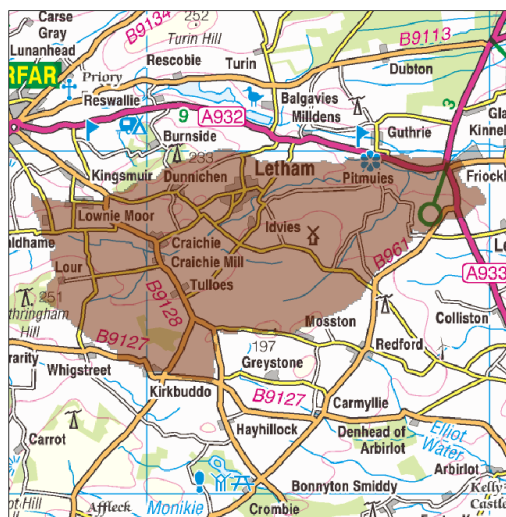
Actions

# Lunan Water (Potentially Vulnerable Area 07/06)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Lunan Water

## Background

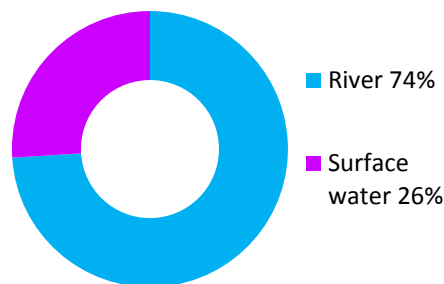
This Potentially Vulnerable Area is 53km<sup>2</sup> and situated in the upper reaches of the Lunan Water catchment (shown below).



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This area includes Letham and the main watercourse is the Vinny Water, a tributary of the Lunan Water. The majority of damages in this area are caused by river flooding with a lower risk of surface water flooding.

There are approximately 20 residential properties at risk of flooding. The Annual Average Damages are approximately £60,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The main risk of flooding in this area is to Letham from the Vinny Water.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

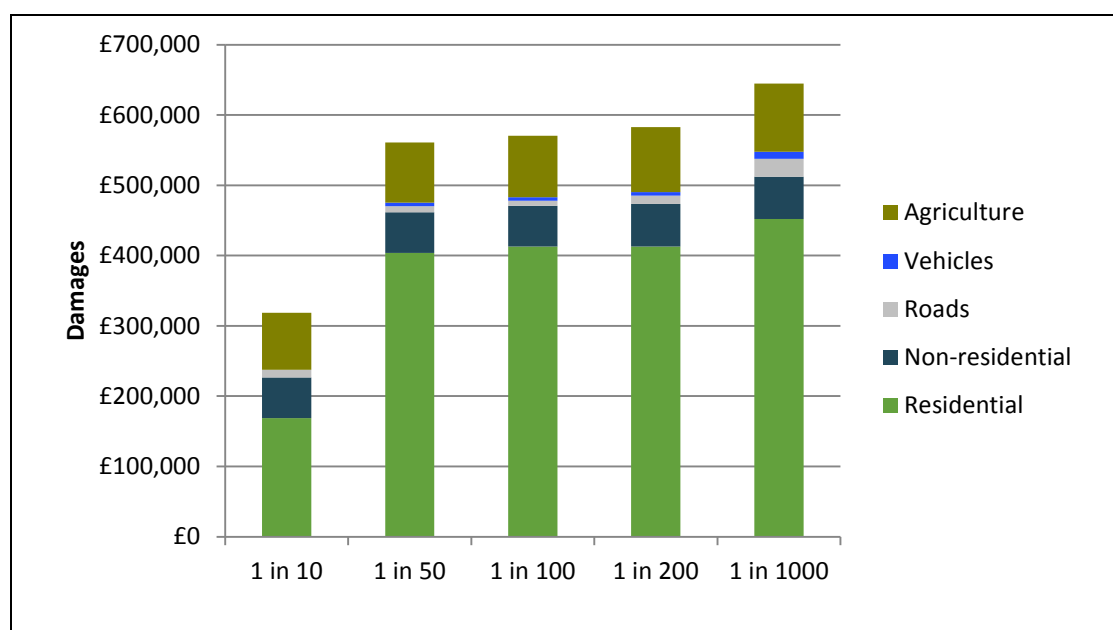
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to agricultural land. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

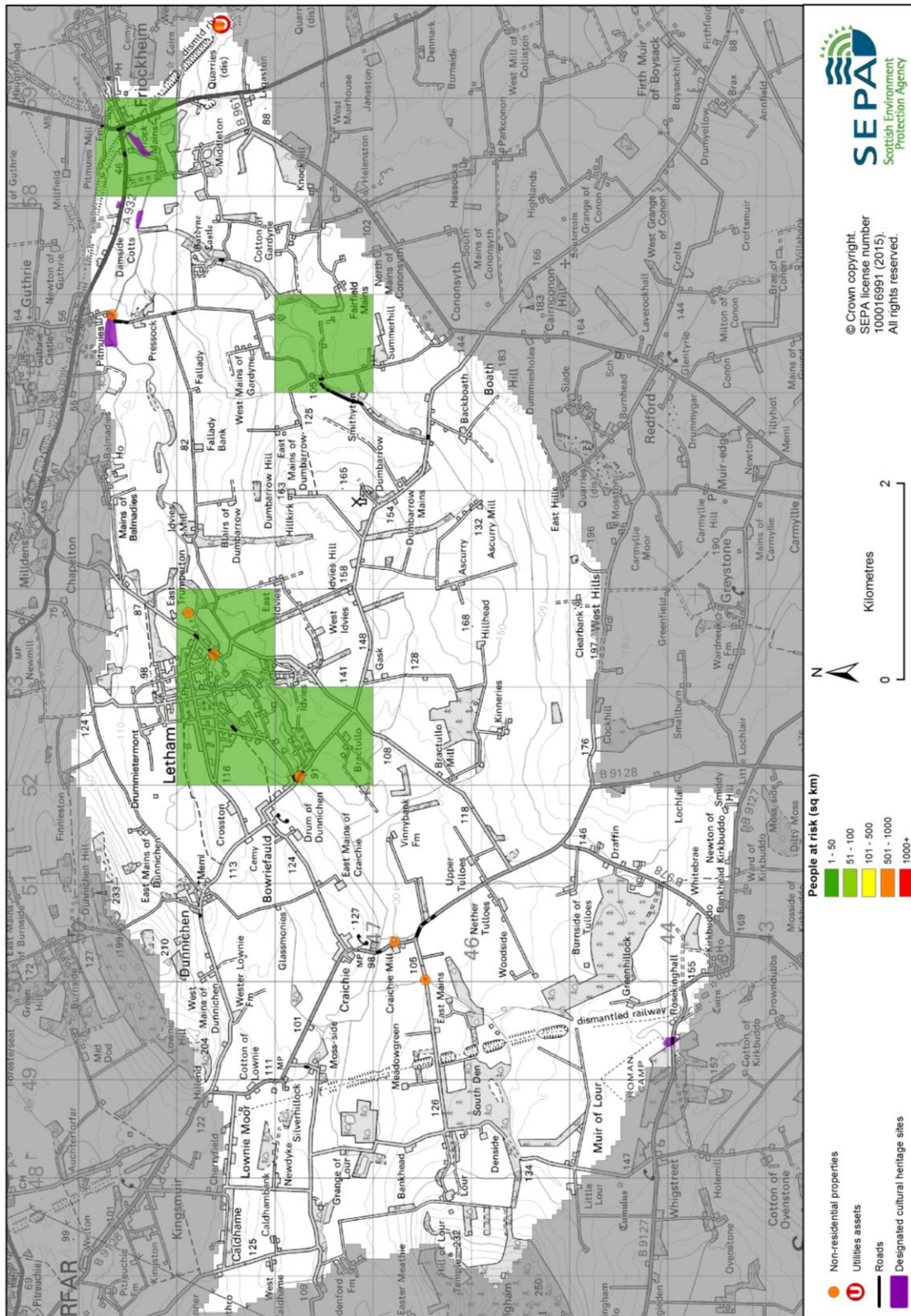
The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and pumping stations). Within this Potentially Vulnerable Area there is one asset identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,100)	<10	20	20
Non-residential properties (total 110)	<10	<10	<10
People	10	30	40
Community facilities	0	0	0
Utilities assets	0	<10	<10
Transport links (excluding minor roads)	2 A roads, 2 B roads at 12 locations	2 A roads, 2 B roads at 12 locations	2 A roads, 2 B roads at 12 locations
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	5	5	5
Agricultural land (km <sup>2</sup> )	1.4	1.6	1.6

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

### History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

## Objectives to manage flooding in Potentially Vulnerable Area 07/06

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Lunan Water Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £60,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £60,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 07/06

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Lunan Water Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water Integrated Catchment Studies will be considered as these projects are completed.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		



<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

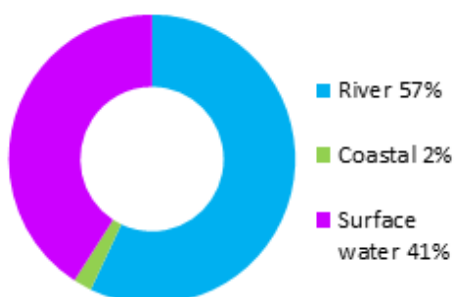
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Angus Council operates an emergency response plan in areas of high flood risk.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Arbroath (Potentially Vulnerable Area 07/07)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Brothock Water

### Summary of flooding impacts



#### At risk of flooding

- 250 residential properties
- 140 non-residential properties
- £1.6 million Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

## Arbroath (Potentially Vulnerable Area 07/07)

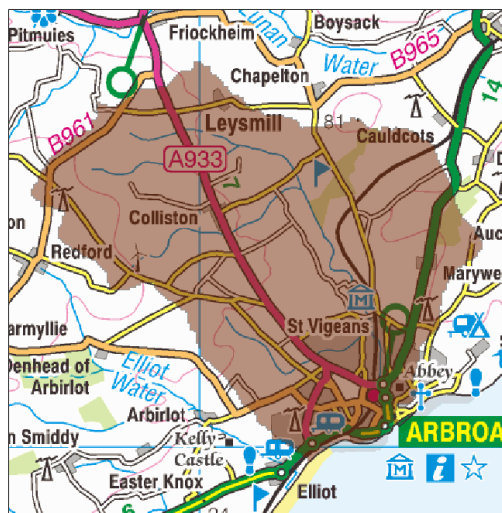
Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Brothock Water

### Background

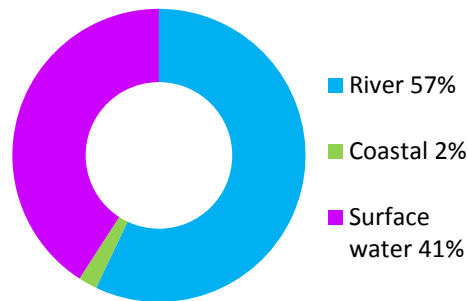
This Potentially Vulnerable Area is 50km<sup>2</sup> and includes the whole Brothock Water catchment. It contains Arbroath and the main watercourses are the Brothock Water and its tributaries including the Magungie Burn, Denside Burn, Coliston Burn and Hercules Den Burn.

There are approximately 250 residential properties and 140 non-residential properties at risk of flooding. The Annual Average Damages from flooding are approximately £1.6 million.

The main sources of flood damages are river and surface water flooding.



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**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

The highest risk of flooding is in Arbroath from the Brothock Water. Arbroath is also notably impacted by surface water flooding.

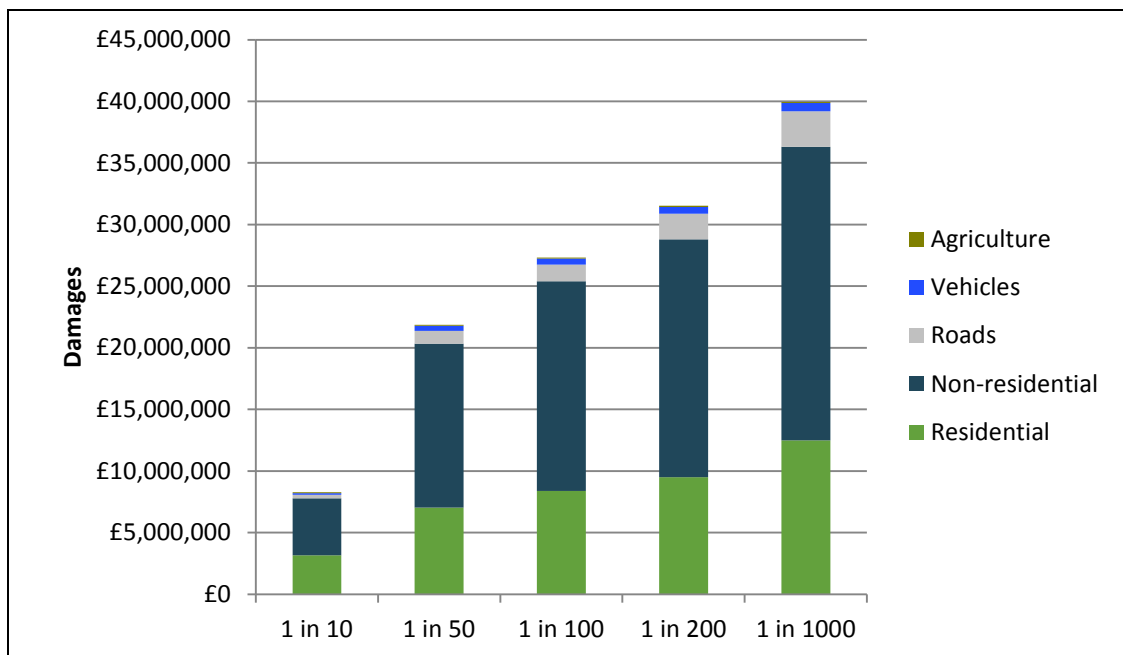
The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties. The Dundee to Aberdeen railway line is also notably impacted. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 10,500)	130	250	330
Non-residential properties (total 1,000)	60	140	170
People	280	550	720
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	2 A roads, 3 B roads at 46 locations  1 Railway route at 16 locations: Dundee to Aberdeen	2 A roads, 4 B roads at 109 locations  1 Railway route at 30 locations: Dundee to Aberdeen	2 A roads, 5 B roads at 124 locations  1 Railway route at 32 locations: Dundee to Aberdeen
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	3	4	4
Agricultural land (km <sup>2</sup> )	1.1	1.2	1.2

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood

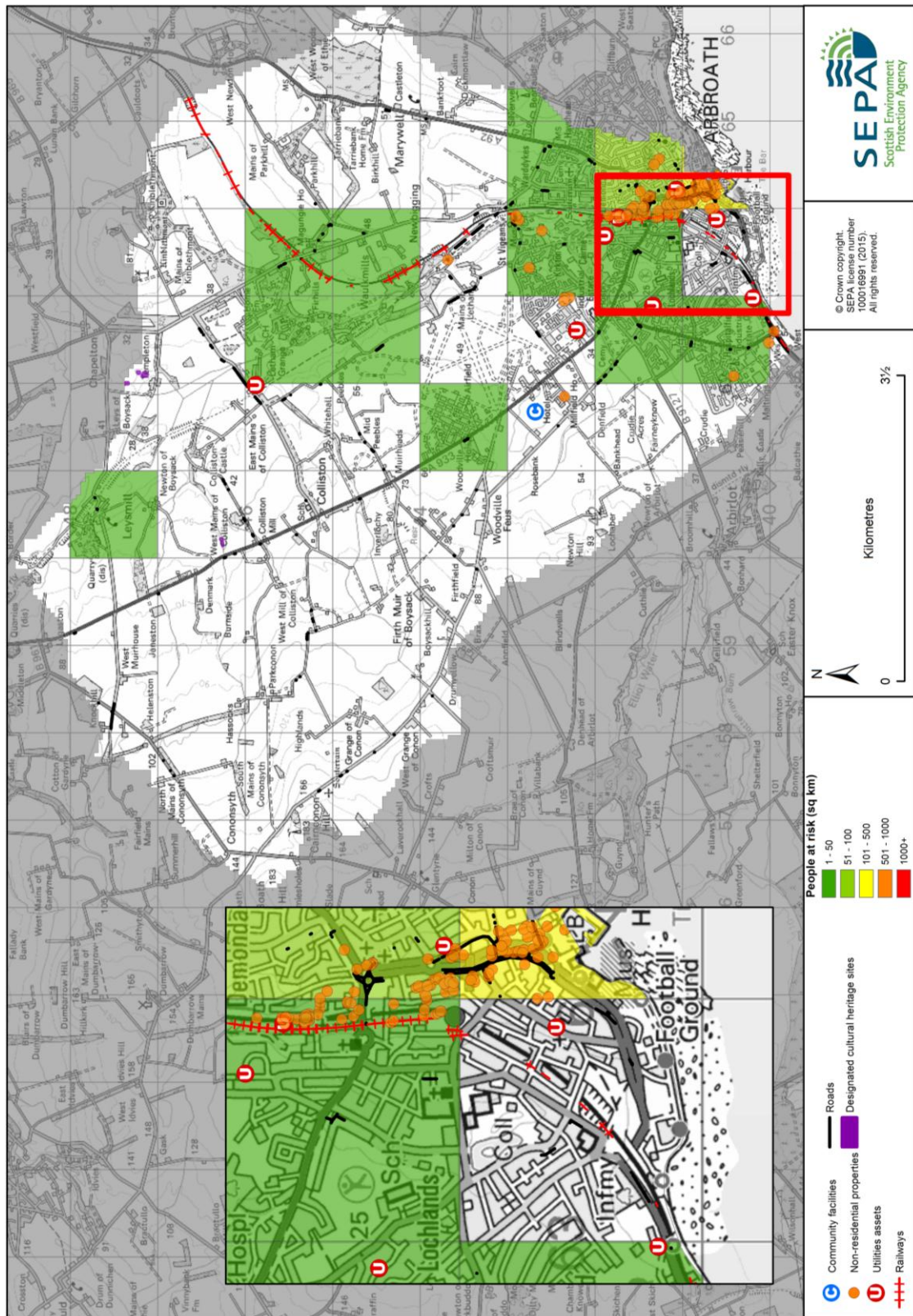


Figure 3: Impacts of flooding

## History of flooding

The following significant floods have been recorded in this Potentially Vulnerable Area:

- 1 December 2009: Arbroath Harbour and Victoria Park flooded from the sea.
- November 2009: The highest river level recorded at the SEPA gauging station on the Brothock Water at Arbroath was in November 2009, when the level reached 1.66m.
- October 1998: Heavy rainfall led to flooding of some properties on Lindsay Street.
- October 1976: Exceptional rainfall led to flooding to the area upstream of Guthrie Port with a number of industrial premises flooded.
- 10 February 1977: High tide and exceptional rainfall producing flows around  $24\text{m}^3/\text{s}$  causing widespread flooding from St Vigeans junction to the Harbour.



## Objectives to manage flooding in Potentially Vulnerable Area 07/07

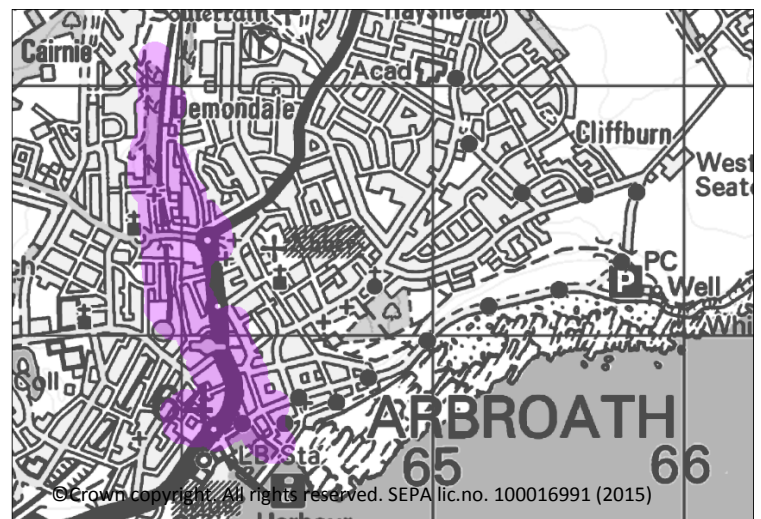
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Arbroath Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties and risk to people in Arbroath caused by flooding from the Brothock Water

Indicators:

- 530 people
- £360,000 Annual Average Damages from residential properties
- £480,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7016, 7017

Target area	Objective	ID	Indicators within PVA
Arbroath, Arbirlot, Auchmithie and Colliston	Reduce economic damages and number of residential properties at risk of surface water flooding in Arbroath, Arbirlot, Auchmithie and Colliston where practical	7014	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 250 residential properties</li> <li>• £1.6 million Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 250 residential properties</li> <li>• £1.6 million Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/07 there are 120 residential properties at risk and Annual Average Damages of £640,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/07

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Arbroath Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (70160006)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Arbroath caused by flooding from the Brothock Water (7016, 7017)		
<b>Delivery lead:</b>	Angus Council		
<b>Priority:</b>	National:		Within local authority:
	<b>17 of 42</b>		<b>1 of 1</b>
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection strategy was developed for Arbroath and identified river and coastal actions to reduce flood risk. The proposed river flood protection scheme will address flood risk from the Brothock Water and include improvements to flood defences and the construction of two flood storage areas. The scheme has been put forward as a priority in the first flood risk management cycle. Coastal flood protection works will be phased in by Angus Council. The scheme will provide a 1 in 200 year standard of protection.		
<b>Potential impacts</b>			
<b>Economic:</b>	The proposed scheme has estimated damages avoided of £16 million and an estimated benefit cost ratio of 2.89.		
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection scheme area. In addition there are two utilities, three roads and one railway line which have been identified as potentially benefitting from this action. There may be negative impacts through disturbance to the local community during the construction phase.		

<b>Environmental:</b>	Flood protection schemes may have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. Flood protection works are located on the Brothock Water (water body ID 5603) and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Furthermore, a number of nationally and locally designated sites are present in the study area and could be positively or negatively impacted. These include conservation areas, scheduled monuments, listed buildings and ancient woodlands.
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<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70140018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Arbroath, Arbirlot, Auchmithie and Colliston where practical (7014)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Not started</b>	<b>Indicative delivery:</b>	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70140019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Arbroath, Arbirlot, Auchmithie and Colliston where practical (7014)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		
<b>Status:</b>	<b>Ongoing</b>	<b>Indicative delivery:</b>	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Arbroath to Dundee area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. A detailed local authority led study has already been undertaken in this area and SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70160017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Arbroath caused by flooding from the Brothock Water (7016, 7017)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain existing Brothock Water Flood Protection Scheme that provides protection to Arbroath from river flooding. The scheme includes an increase in wall height along the Brothock Water through the town, the construction of two flood storage areas retaining flood water upstream and various alterations to culverts and bridges.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Arbroath flood warning area which is part of the Brothock river flood warning scheme. Continue to maintain the Arbroath Coastal flood warning area which is part of the Firth of Forth and Tay coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through SEPA led education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p>		

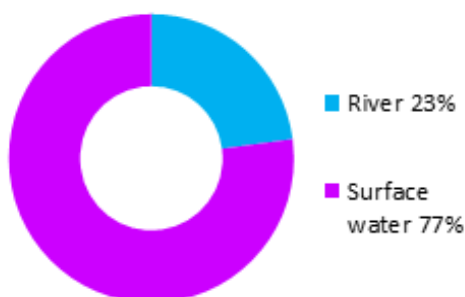
<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		



## Coast North of Arbroath (Potentially Vulnerable Area 07/08)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Kincardine and Angus coastal

### Summary of flooding impacts



#### At risk of flooding

- 30 residential properties
- 10 non-residential properties
- £56,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

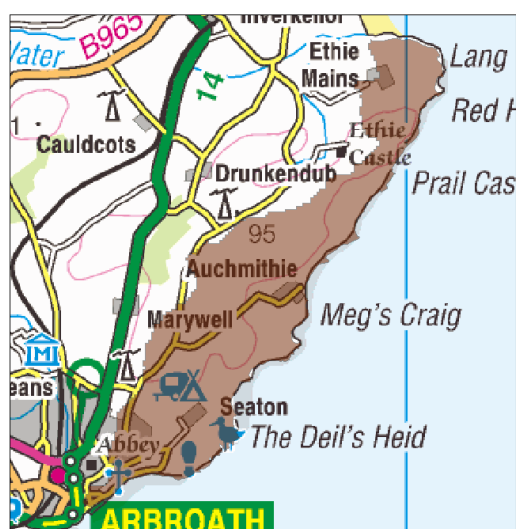
Actions

## Coast North of Arbroath (Potentially Vulnerable Area 07/08)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Kincardine and Angus Coastal

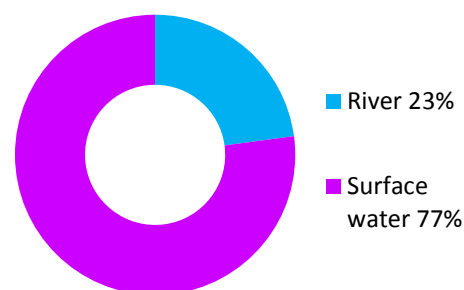
### Background

This Potentially Vulnerable Area is 13km<sup>2</sup> and part of the Kincardine and Angus catchment (shown below). It contains small coastal watercourses that flow into the North Sea and includes the town of Arbroath.



The area has a risk of river and surface water flooding with the majority of flood impacts caused by surface water.

Approximately 30 residential properties and 10 non-residential properties have a risk of flooding. The Annual Average Damages are approximately £56,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The highest risk of flooding is from surface water to Arbroath.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

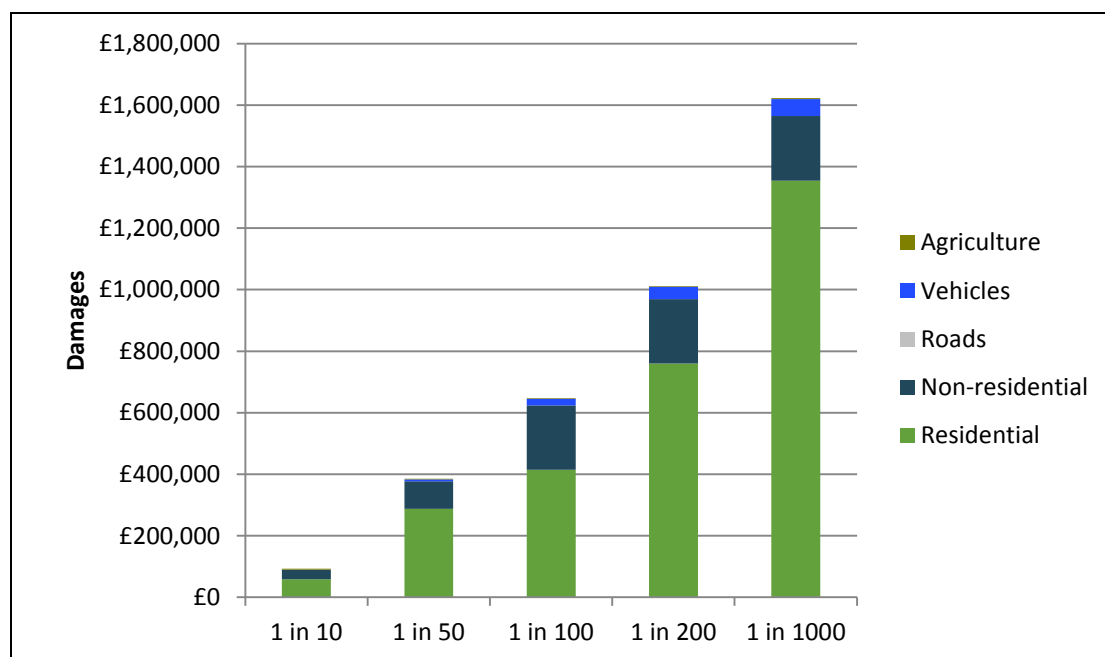
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture. The location of the impacts of flooding is shown in Figure 3.

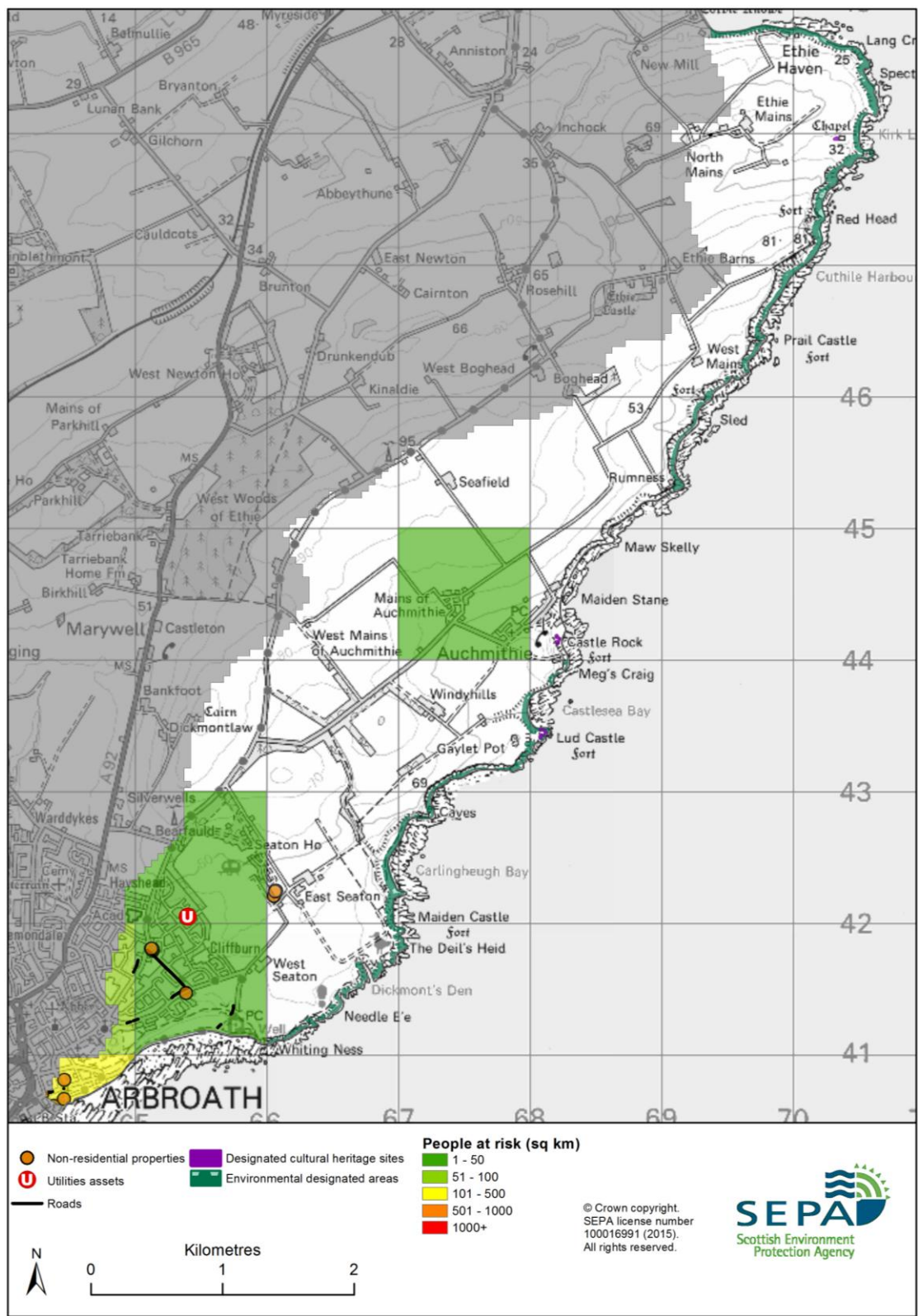
The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and pumping stations). Within this Potentially Vulnerable Area there is one asset identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 100 Low likelihood
Residential properties (total 2,100)	<10	30	60
Non-residential properties (total 150)	<10	10	10
People	<10	70	130
Community facilities	0	0	0
Utilities assets	0	<10	<10
Transport links (excluding minor roads)	0	0	0
Environmental designated areas (km <sup>2</sup> )	0.2	0.2	0.2
Designated cultural heritage sites	3	3	3
Agricultural land (km <sup>2</sup> )	< 0.1	< 0.1	< 0.1

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

**History of flooding**

One coastal flood has been recorded in this Potentially Vulnerable Area. It occurred on 1 December 2009 when Arbroath Harbour and Victoria Park flooded.

## Objectives to manage flooding in Potentially Vulnerable Area 07/08

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for the Coast North of Arbroath Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Arbroath, Arbirlot, Auchmithie and Colliston	Reduce economic damages and number of residential properties at risk of surface water flooding in Arbroath, Arbirlot, Auchmithie and Colliston where practical	7014	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 30 residential properties</li> <li>• £56,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 30 residential properties</li> <li>• £56,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/08 there are 20 residential properties at risk and Annual Average Damages of £41,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/08

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for the Coast North of Arbroath Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70140018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Arbroath, Arbirlot, Auchmithie and Colliston where practical (7014)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70140019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Arbroath, Arbirlot, Auchmithie and Colliston where practical (7014)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Arbroath to Dundee area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. SEPA will engage with the community and promote Floodline. This will be achieved through SEPA led education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		



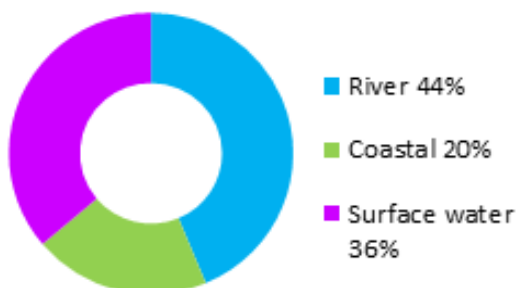
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Angus Council operates an emergency response plan in areas of high flood risk.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Carnoustie and Barry (Potentially Vulnerable Area 07/09)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Dundee coastal

### Summary of flooding impacts



#### At risk of flooding

- 180 residential properties
- 30 non-residential properties
- £470,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

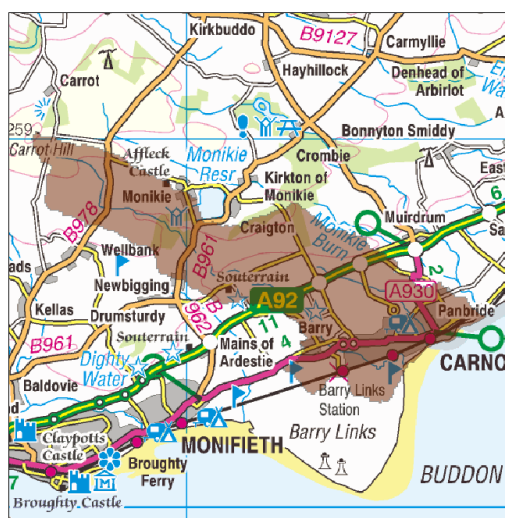
Actions

# Carnoustie and Barry (Potentially Vulnerable Area 07/09)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council	Dundee coastal

## Background

This Potentially Vulnerable Area is 31km<sup>2</sup> and part of the Firth of Tay catchment. It contains the Lochty Burn and Barry Burn and includes the town of Carnoustie.



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The area has a risk of river, coastal and surface water flooding with the majority of damages caused by river flooding.

There are approximately 180 residential properties and 30 non-residential properties at risk of flooding. The Annual Average Damages are approximately £470,000.

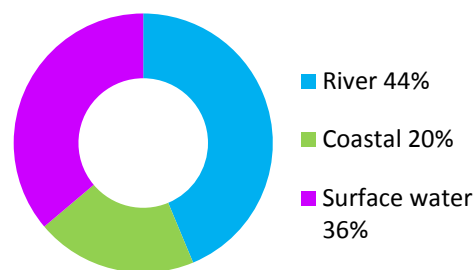


Figure 1: Annual Average Damages by flood source

## Summary of flooding impacts

The highest risk of flooding is in Carnoustie from the Barry Burn and Lochty Burn. Carnoustie also has a risk of surface water flooding.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. The Dundee to Aberdeen railway line is also notably impacted. The location of the impacts of flooding is shown in Figure 3.

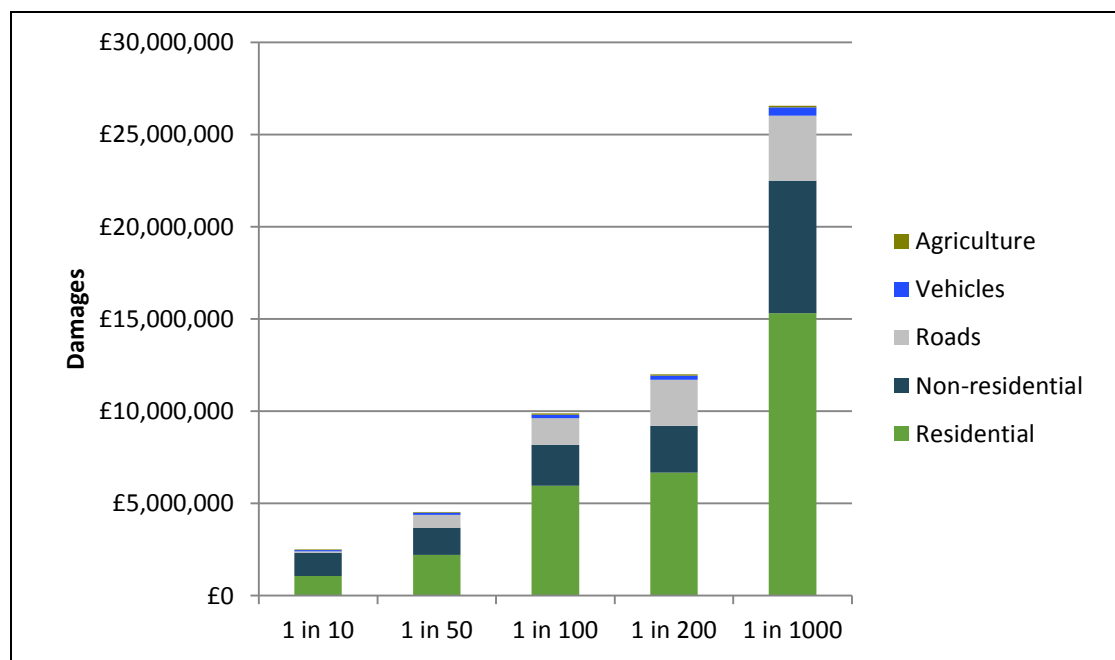
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works

and pumping stations). Within this Potentially Vulnerable Area there are five assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 5,600)	40	180	420
Non-residential properties (total 330)	10	30	50
People	80	400	930
Community facilities	0	0	0
Utilities assets	<10	10	10
Transport links (excluding minor roads)	2 A roads, 2 B roads at 25 locations  1 Railway route at 11 locations: Dundee to Aberdeen	2 A roads, 2 B roads at 54 locations  1 Railway route at 18 locations: Dundee to Aberdeen	2 A roads, 2 B roads at 60 locations  1 Railway route at 21 locations: Dundee to Aberdeen
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	2	3	3
Agricultural land (km <sup>2</sup> )	0.5	1.6	1.9

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood

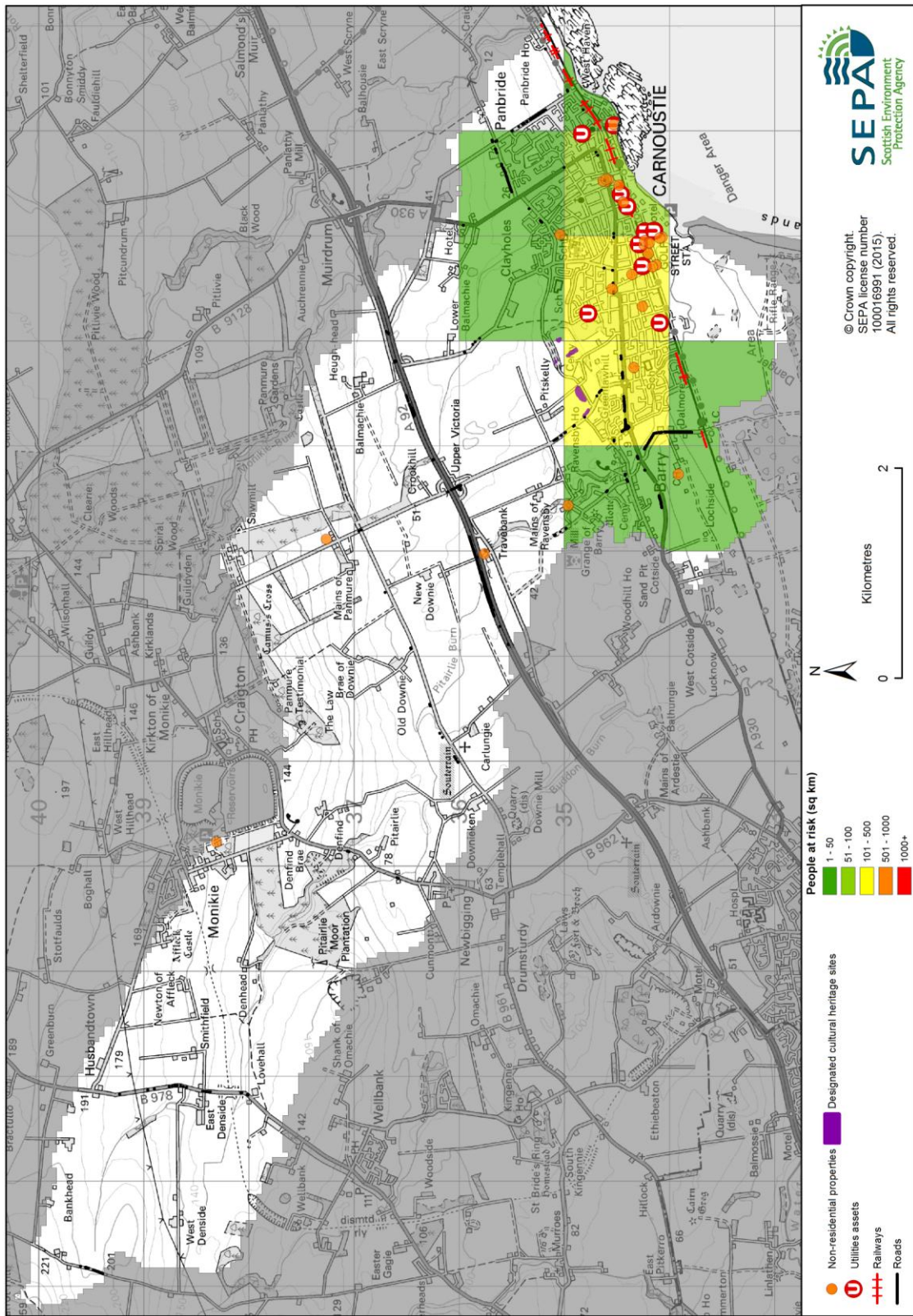


Figure 3: Impacts of flooding

## History of flooding

One coastal flood has been recorded in this Potentially Vulnerable Area. It occurred on 12 January 2005 when Carnoustie Golf Course flooded and sandbags were deployed to protect Links Parade from flooding.

## Objectives to manage flooding in Potentially Vulnerable Area 07/09

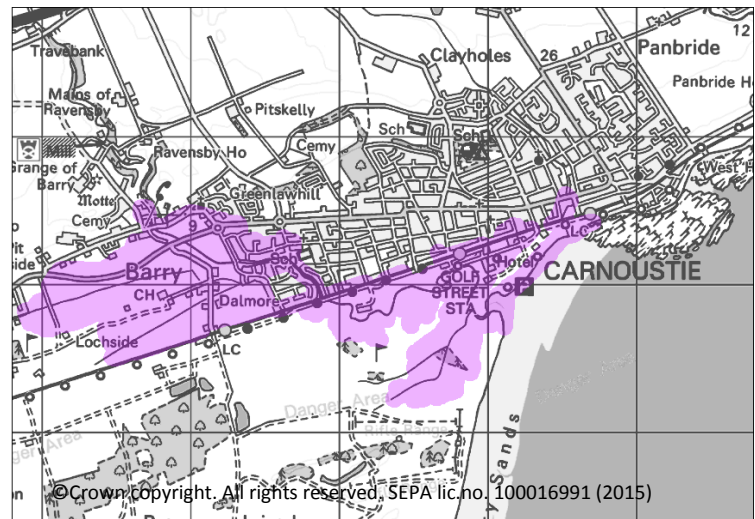
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Carnoustie and Barry Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties in Carnoustie caused by flooding from the Barry Burn and coastal flooding

Indicators:

- £140,000 Annual Average Damages from residential properties
- £120,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7022

Target area	Objective	ID	Indicators within PVA
Carnoustie, Barry, Panbride and Westhaven	Reduce economic damages and number of residential properties at risk of surface water flooding in Carnoustie, Barry, Panbride and Westhaven where practical	7020	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 180 residential properties</li> <li>• £470,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 180 residential properties</li> <li>• £470,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/09 there are 60 residential properties at risk and Annual Average Damages of £170,000.



## Actions to manage flooding in Potentially Vulnerable Area 07/09

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Carnoustie and Barry Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70220005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Carnoustie caused by flooding from the Barry Burn and coastal flooding (7022)		
<b>Delivery lead:</b>	Angus Council		
<b>Priority:</b>	National:		Within local authority:
	<b>75 of 168</b>		<b>5 of 6</b>
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study for Carnoustie is being progressed as a local priority. The study is assessing a number of options to manage flood risk including flood storage, modification of conveyance, installation/modification of fluvial control structures, flood defences, sediment management and the viability of property level protection. The potential for natural flood management is also being assessed, including river/ floodplain restoration, sediment management and wave attenuation. The study is recognising that existing flood defences may not operate to the design standard. The study should take a sustainable approach and consider the interaction between actions upstream and downstream and potential effects on coastal processes along the shoreline.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 37 residential properties and eight non-residential properties at risk of flooding in this location, with potential damages avoided of up to £5.0 million.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments		

<b>Social:</b>	and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The study includes the Barry Burn (water body ID 5953) and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of this river should be considered by coordinating with river basin management planning. To be in accord with the FRM Strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Barry Links Special Area of Conservation, and Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. Listed buildings are also present within the study area and could be positively or negatively impacted.

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70200018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Carnoustie, Barry, Panbride and Westhaven where practical (7020)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70200019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Carnoustie, Barry, Panbride and Westhaven where practical (7020)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70220017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Carnoustie caused by flooding from the Barry Burn and coastal flooding (7022)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing flood defences along the Barry Burn and Pitairlie Burn and the Carnoustie Revetment coastal defences. Existing defences along the Barry Burn and Pitairlie Burn provide a standard of protection to Carnoustie of up to 1 in 100 years.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through SEPA led education events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

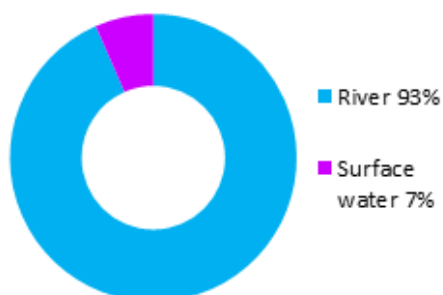
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Angus Council operates an emergency response plan in areas of high flood risk.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## Monifieth (Potentially Vulnerable Area 07/10)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dundee coastal

### Summary of flooding impacts



#### At risk of flooding

- 250 residential properties
- 20 non-residential properties
- £680,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

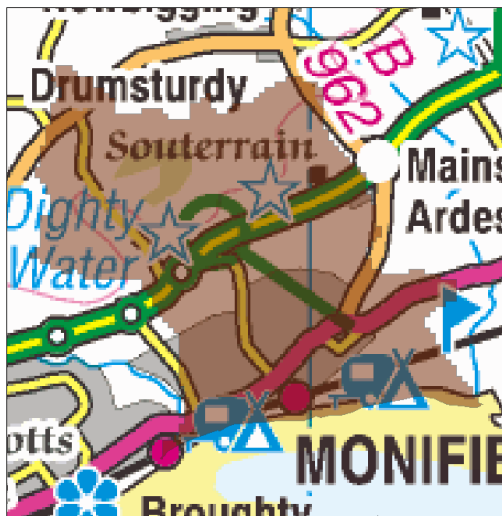
Actions

## Monifieth (Potentially Vulnerable Area 07/10)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dundee coastal

### Background

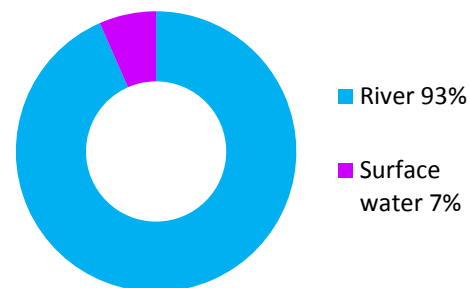
This Potentially Vulnerable Area is 8km<sup>2</sup> and part of the Firth of Tay catchment (shown below). It contains the Monifieth Burn and includes the town of Monifieth.



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The area is at risk from river and surface water flooding with the majority of damages caused by river flooding.

There are approximately 250 residential properties and 20 non-residential properties at risk of flooding. The Annual Average Damages are approximately £670,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The highest risk of flooding is in Monifieth from the Monifieth Burn. Monifieth is also notably impacted from surface water flooding.

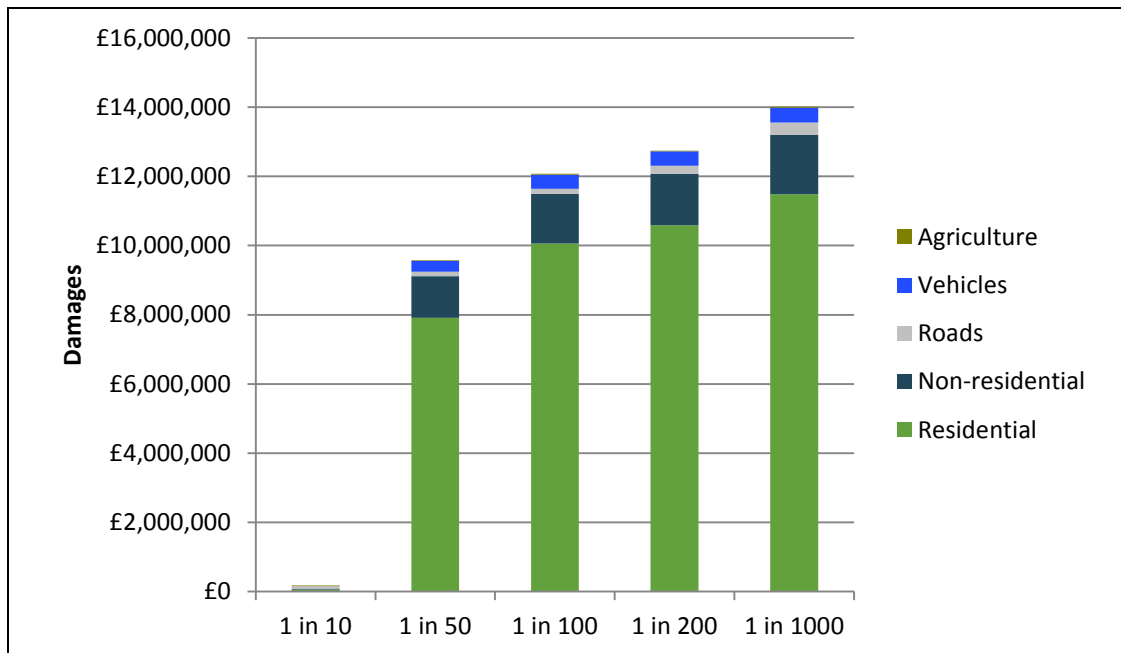
The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

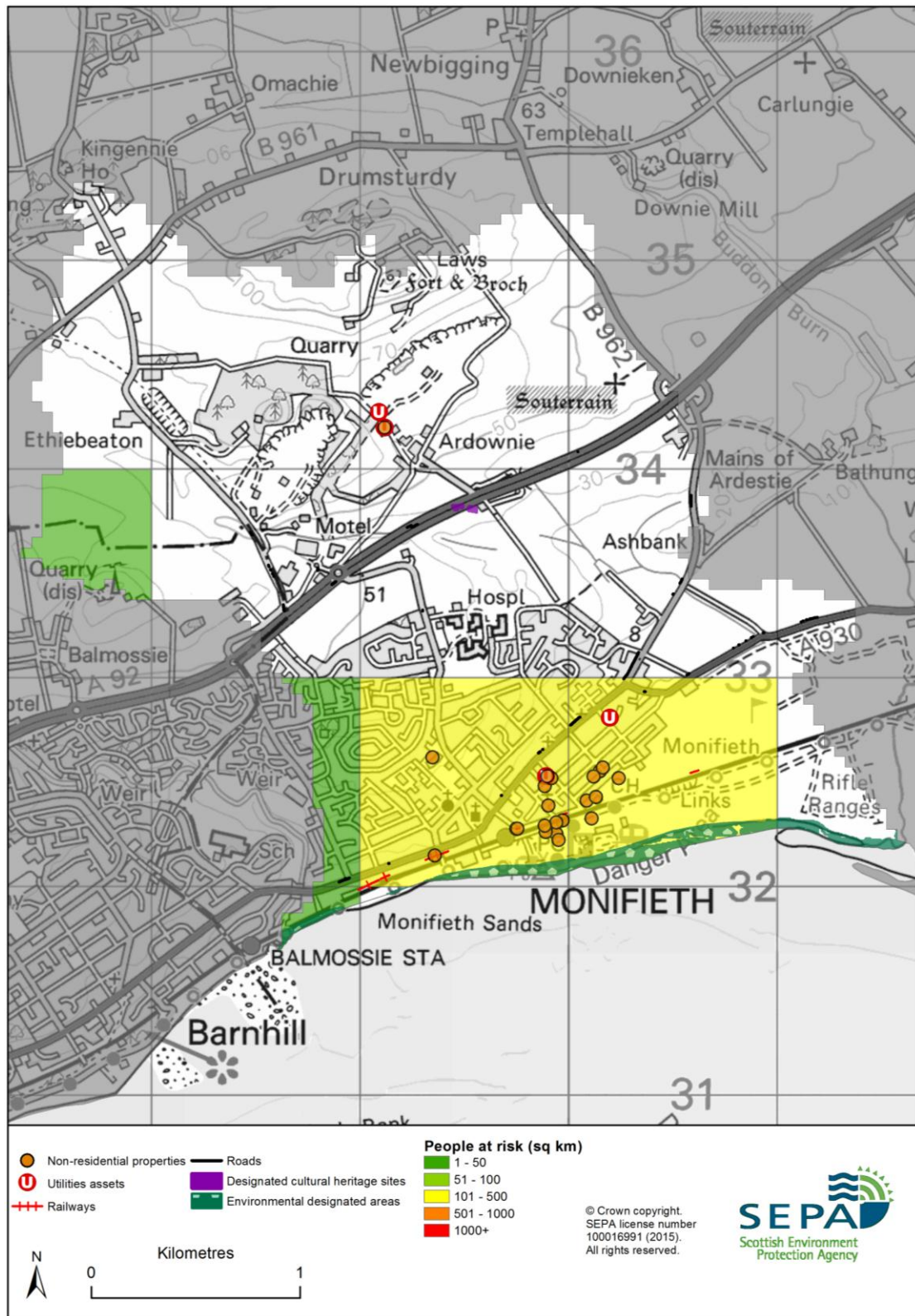
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 3,100)	<10	250	280
Non-residential properties (total 170)	<10	20	30
People	<10	550	610
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	2 A roads, 1 B road at 15 locations  1 Railway route at 2 locations: Dundee to Aberdeen	2 A roads, 1 B road at 21 locations  1 Railway route at 9 locations: Dundee to Aberdeen	2 A roads, 1 B road at 27 locations  1 Railway route at 9 locations: Dundee to Aberdeen
Environmental designated areas (km <sup>2</sup> )	0.3	0.3	0.3
Designated cultural heritage sites	0	1	1
Agricultural land (km <sup>2</sup> )	0.1	0.3	0.4

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood





**Figure 3: Impacts of flooding**

### History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

## Objectives to manage flooding in Potentially Vulnerable Area 07/10

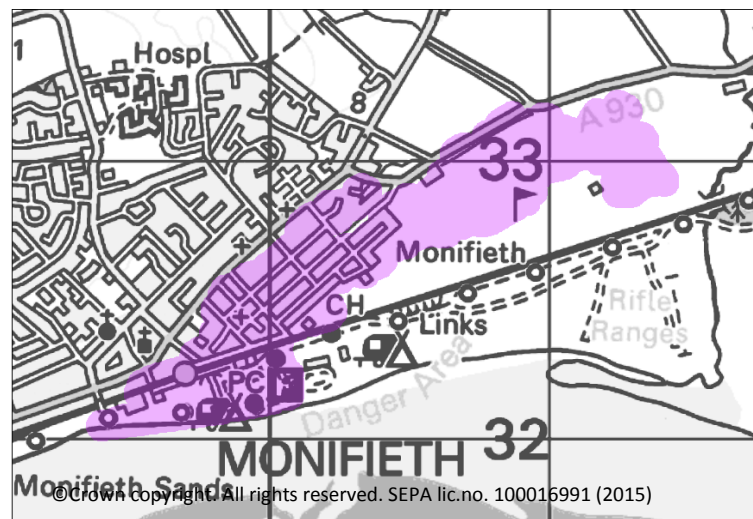
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Monifieth Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties and risk to people in Monifieth caused by flooding from the Monifieth Burn

Indicators:

- 640 people
- £520,000 Annual Average Damages from residential properties
- £26,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7023, 7024

Target area	Objective	ID	Indicators within PVA
Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical	7021	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 250 residential properties</li> <li>• £670,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 250 residential properties</li> <li>• £670,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/10 there are 30 residential properties at risk and Annual Average Damages of £44,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/10

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Monifieth Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties in Monifieth affected by flooding from the Monifieth Burn. Further feasibility assessment will be required to assess delivery potential. A local authority study has been proposed for this area which can inform the scoping exercise once complete.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70230005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Monifieth caused by flooding from the Monifieth Burn (7023, 7024)		
<b>Delivery lead:</b>	Angus Council		
<b>Priority:</b>	National: <b>24 of 168</b>	Within local authority:	<b>2 of 6</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Monifieth to assess whether flood storage, flood defences and sediment management could reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		

Potential impacts	
<b>Economic:</b>	The study could benefit 243 residential properties and 15 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £17 million.
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the study area. In addition the study could benefit two utilities and one railway line located within the study area.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought. The Buddon Burn (water body ID 5954) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to improve the condition of this river should be considered by coordinating with river basin management planning. To be in accord with the FRM Strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. Listed buildings, Sites of Special Scientific Interest and Ramsar sites are also present within the study area and could be positively or negatively impacted.

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Dundee City Council, Perth and Kinross Council and Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Arbroath to Dundee area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70230017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Monifieth caused by flooding from the Monifieth Burn (7023, 7024)		
<b>Delivery lead:</b>	Angus Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Monifeith Flood Protection Scheme. The scheme includes coastal protection works at Tayview Caravan Park.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council and Dundee City Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.		

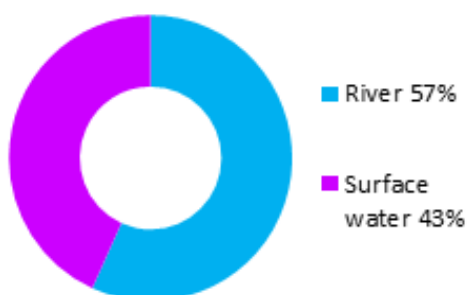
<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		



## Downfield and Dundee (Potentially Vulnerable Area 07/11)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dighty Water

### Summary of flooding impacts



#### At risk of flooding

- 190 residential properties
- 80 non-residential properties
- £580,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

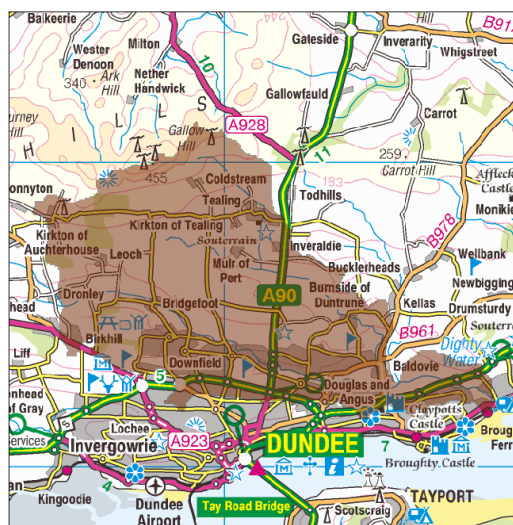
Actions

# Downfield and Dundee (Potentially Vulnerable Area 07/11)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dighty Water

## Background

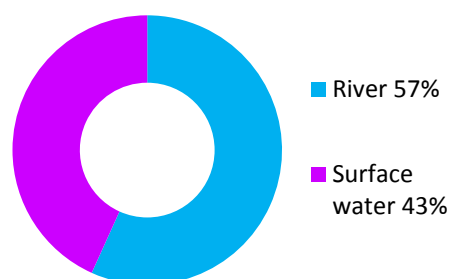
This Potentially Vulnerable Area is 73km<sup>2</sup> and part of the Firth of Tay catchment (shown below). It is situated in the lower reaches of the Dighty Water and includes the city of Dundee.



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This Potentially Vulnerable Area has a risk of river and surface water flooding.

There are approximately 190 residential properties and 80 non-residential properties at risk of flooding. The Annual Average Damages are approximately £580,000.



**Figure 1:** Annual Average Damages by flood source

## Summary of flooding impacts

The highest risk of flooding is in Dundee from the Dighty Water. Dundee is also notably impacted by surface water flooding.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

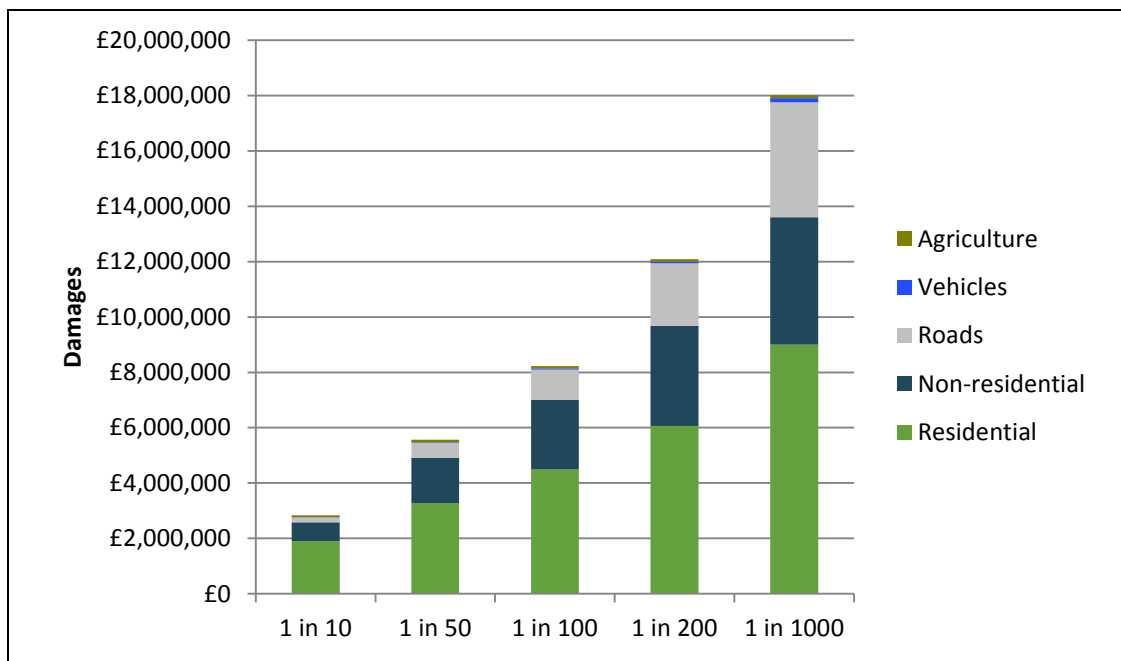
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

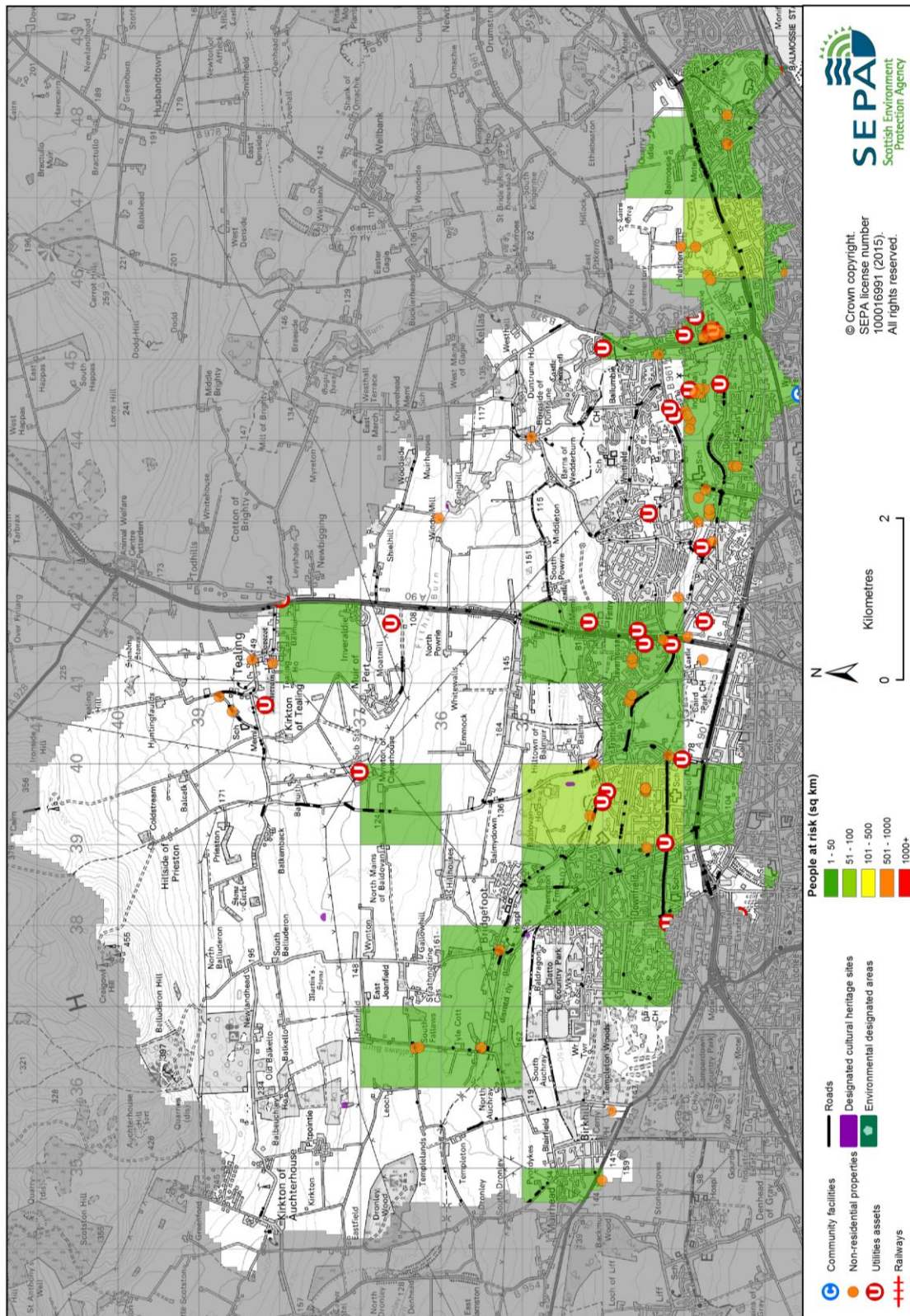
The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and pumping stations). Within this Potentially Vulnerable Area there are two assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 27,500)	80	190	260
Non-residential properties (total 950)	50	80	90
People	170	420	570
Community facilities	0	0	0
Utilities assets	<10	20	30
Transport links (excluding minor roads)	4 A roads, 3 B roads at 63 locations  1 Railway route at 1 location: Dundee to Aberdeen	4 A roads, 3 B roads at 104 locations  1 Railway route at 1 location: Dundee to Aberdeen	5 A roads, 3 B roads at 112 locations  1 Railway route at 1 location: Dundee to Aberdeen
Environmental designated areas (km <sup>2</sup> )	0.1	0.1	0.1
Designated cultural heritage sites	9	13	14
Agricultural land (km <sup>2</sup> )	1.5	1.8	2.1

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

Flooding occurred in this Potentially Vulnerable Area on 4 September 2009 and 1 November 2009. On both occasions, the outskirts of Dundee city centre were affected following flooding of the Dighty Water, Fithie Burn, Murrows and Gelly Burn watercourses. The cause of flooding was prolonged rainfall which exceeded the capacity of the watercourses, and it was severe enough to cause damage to some properties.

## Objectives to manage flooding in Potentially Vulnerable Area 07/11

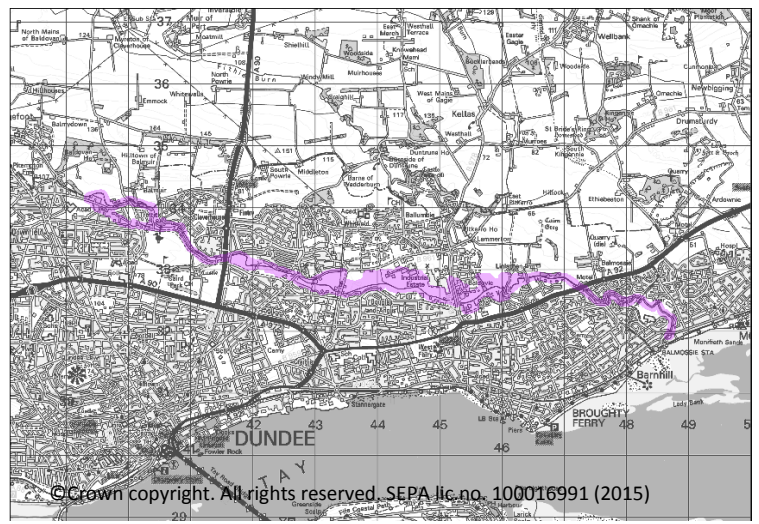
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Downfield and Dundee Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties and risk to people in Dundee caused by flooding from the Dighty Water and Fithie Burn

Indicators:

- 250 people
- £150,000 Annual Average Damages from residential properties
- £83,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7027, 7028

Target area	Objective	ID	Indicators within PVA
Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical	7021	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 190 residential properties</li> <li>• £580,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 190 residential properties</li> <li>• £580,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/11 there are 80 residential properties at risk and Annual Average Damages of £250,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/11

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Downfield and Dundee Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>post 2021</b>
<b>Description:</b>	The area under consideration includes properties in Dundee affected by flooding from the Dighty Water. A review of the flood risk in this location is required to assess the potential for flood warning delivery and subsequent to that appropriate timescales for delivery can be determined.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70270005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Dundee caused by flooding from the Dighty Water and Fithie Burn (7027, 7028)		
<b>Delivery lead:</b>	Angus Council		
<b>Priority:</b>	National: <b>54 of 168</b>	Within local authority:	<b>3 of 6</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Dundee to reduce the risk of flooding from the Dighty Water and Fithie Burn. The study should assess whether flood defences, sediment management and natural flood management could reduce flood risk. Natural flood management options that should be considered include river / floodplain restoration and sediment management. The study		



	should also investigate the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. It should be noted that part of the study requirements may be met by the integrated catchment study for Dundee.
Potential impacts	
<b>Economic:</b>	The study could benefit 534 residential properties and 138 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £5.8 million.
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition the study could benefit three utilities and two roads located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management. The physical condition of a number of rivers within the study area is identified by SEPA to be at less than good status. These include parts of the Dighty Water, Fithie Burn and Dronley Burn (water body IDs 6001, 6004 and 6007). Opportunities to improve the condition of these rivers should be considered by coordinating with river basin management planning. Conservation areas, listed buildings and local nature reserves are also present in the study area and could be positively or negatively impacted.

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Dundee City Council, Perth and Kinross Council and Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		

<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Arbroath to Dundee area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (70270012)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Dundee caused by flooding from the Dighty Water and Fithie Burn (7027, 7028)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Dighty Flood Action Group and Strathmartine Community Council Flood Group operate in this area. The groups aim to increase community resilience to flooding.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council and Dundee City Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

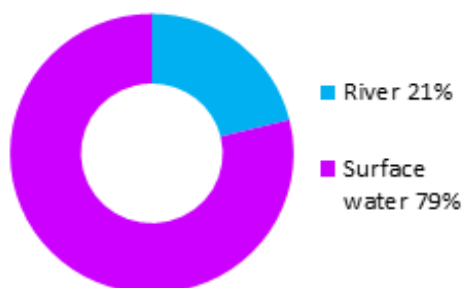
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Angus Council operates an emergency response plan in areas of high flood risk. Dundee City Council owns and operates an emergency flood plan for Dundee City.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Invergowrie (Potentially Vulnerable Area 07/12)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council, Perth and Kinross Council	Invergowrie Burn

### Summary of flooding impacts



#### At risk of flooding

- 240 residential properties
- 60 non-residential properties
- £740,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	Natural flood management study	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

## Invergowrie (Potentially Vulnerable Area 07/12)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council, Perth and Kinross Council	Invergowrie Burn

### Background

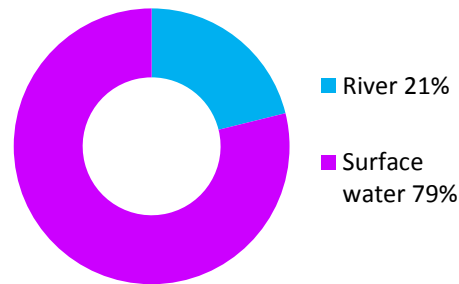
This Potentially Vulnerable Area is 37km<sup>2</sup> and part of the Forth of Tay catchment (shown below). It contains the Invergowrie Burn and includes the town of Invergowrie as well as the west of Dundee City.



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The area has a risk of river and surface water flooding with the majority of damages caused by surface water flooding.

There are approximately 240 residential properties and 60 non-residential properties at risk of flooding. The Annual Average Damages are approximately £740,000.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

The greatest risk of flooding in this area is from surface water to Invergowrie. There is also notable risk of river flooding in Invergowrie and Dundee from the Invergowrie Burn.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads, notably the A90. The location of the impacts of flooding is shown in Figure 3.

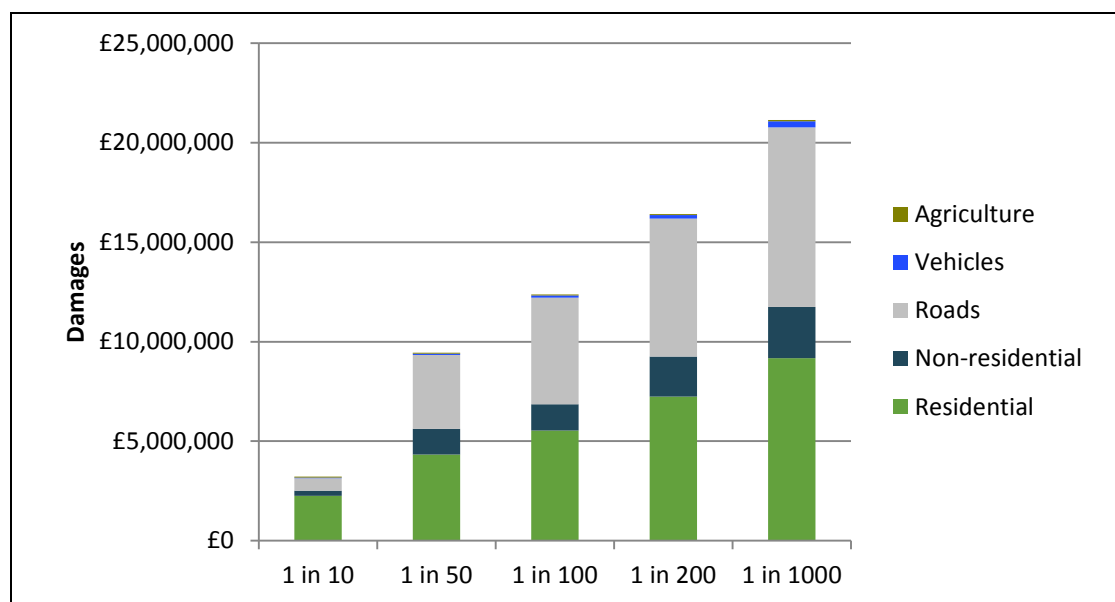
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works

and pumping stations). Within this Potentially Vulnerable Area there are two assets identified as being at risk of flooding.

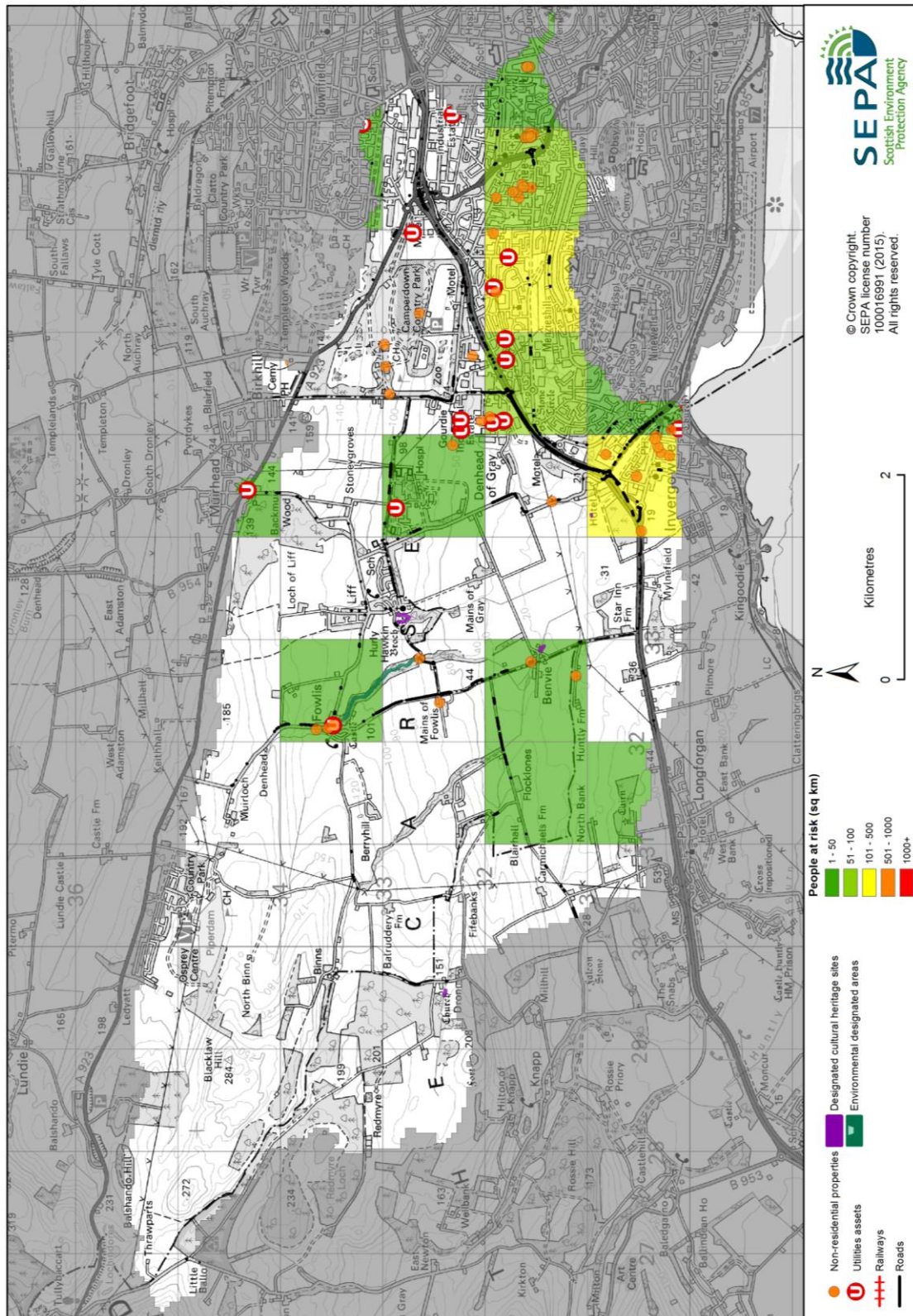
	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 10,000)	90	240	270
Non-residential properties (total 1,100)	20	60	70
People	190	520	600
Community facilities	0	0	0
Utilities assets	<10	10	10
Transport links (excluding minor roads)	3 A roads at 38 locations  1 Railway route at 3 locations: Dundee to Dunblane	3 A roads at 78 locations  1 Railway route at 3 locations: Dundee to Dunblane	3 A roads at 91 locations  1 Railway route at 3 locations: Dundee to Dunblane
Environmental designated areas (km <sup>2</sup> )	0.1	0.1	0.1
Designated cultural heritage sites	6	8	9
Agricultural land (km <sup>2</sup> )	0.6	0.6	0.7

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood





**Figure 3: Impacts of flooding**

## History of flooding

One flood has been recorded in this Potentially Vulnerable Area. It occurred in August 2004 when flooding from Invergowrie Burn affected properties on Main Street, Burnside Road and at Balruddery Farm. It also flooded the highway in Boniface Road and Boniface Place.

## Objectives to manage flooding in Potentially Vulnerable Area 07/12

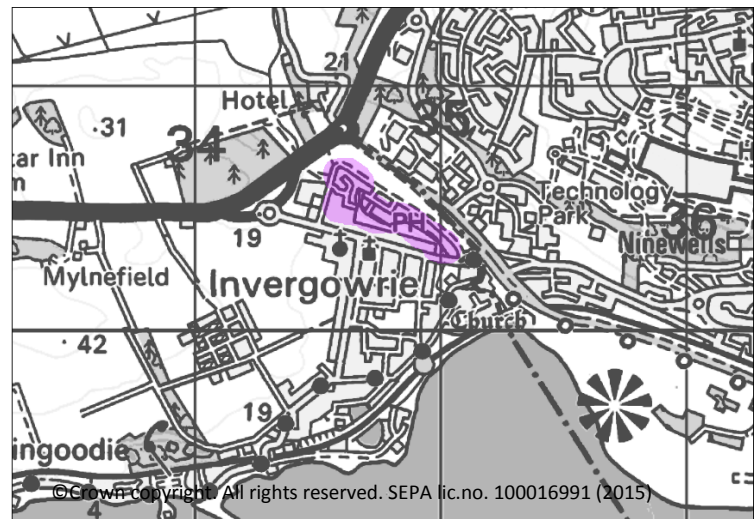
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Invergowrie Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties in Invergowrie and Dundee caused by flooding from the Invergowrie Burn

Indicators:

- £110,000 Annual Average Damages from residential properties
- £1,700 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7031

Target area	Objective	ID	Indicators within PVA
Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical	7021	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 240 residential properties</li> <li>• £740,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 240 residential properties</li> <li>• £740,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/12 there are 220 residential properties at risk and Annual Average Damages of £590,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/12

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Invergowrie Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	Natural flood management study	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (70310003)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Invergowrie and Dundee caused by flooding from the Invergowrie Burn (7031)		
<b>Delivery lead:</b>	Perth and Kinross Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A natural flood management study has been recommended for Dundee to assess whether river / floodplain restoration and sediment management could help reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
<b>Potential impacts</b>			
<b>Economic:</b>	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. Fifty-two residential and non-residential properties could potentially benefit from natural flood management actions in this location.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. Invergowrie Burn (water body ID 6405) is located within the study area and the physical condition of this river is identified by SEPA to be at less than good status. Opportunities to		

<b>Environmental:</b>	improve the condition of this river should be considered by coordinating with river basin management planning. Listed buildings are also present in the study area and could be positively or negatively impacted.
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<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Dundee City Council, Perth and Kinross Council and Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community through local participation in national initiatives, including partnership working with Neighbourhood Watch Scotland. In addition, SEPA will engage with local authorities and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Local authorities, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Angus Council operates an emergency response plan in areas of high flood risk. Dundee City Council owns and operates an emergency flood plan for Dundee City.		

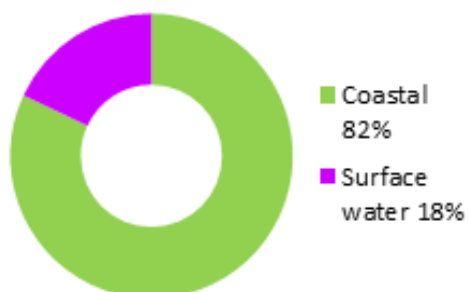


<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Dundee and Broughty Ferry (Potentially Vulnerable Area 07/13)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dundee coastal

### Summary of flooding impacts



#### At risk of flooding

- 1,300 residential properties
- 460 non-residential properties
- £4.3 million Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

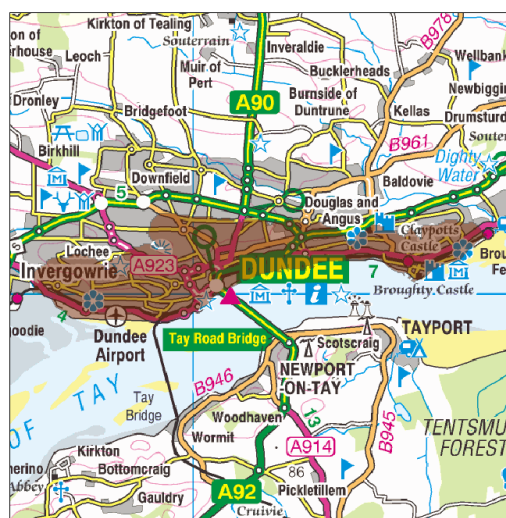
Actions

## Dundee and Broughty Ferry (Potentially Vulnerable Area 07/13)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Angus Council, Dundee City Council	Dundee coastal

### Background

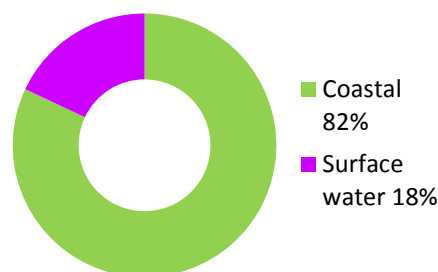
This Potentially Vulnerable Area is 21km<sup>2</sup> (shown below). It contains small coastal watercourses that flow into the Firth of Tay and includes Dundee and Broughty Ferry.



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The area has a risk of coastal and surface water flooding with the majority of damages caused by coastal flooding.

There are approximately 1,300 residential properties and 460 non-residential properties at risk of flooding. The Annual Average Damages are approximately £4.3 million.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The highest risk of flooding is in Dundee and Broughty Ferry from coastal and surface water flooding. The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

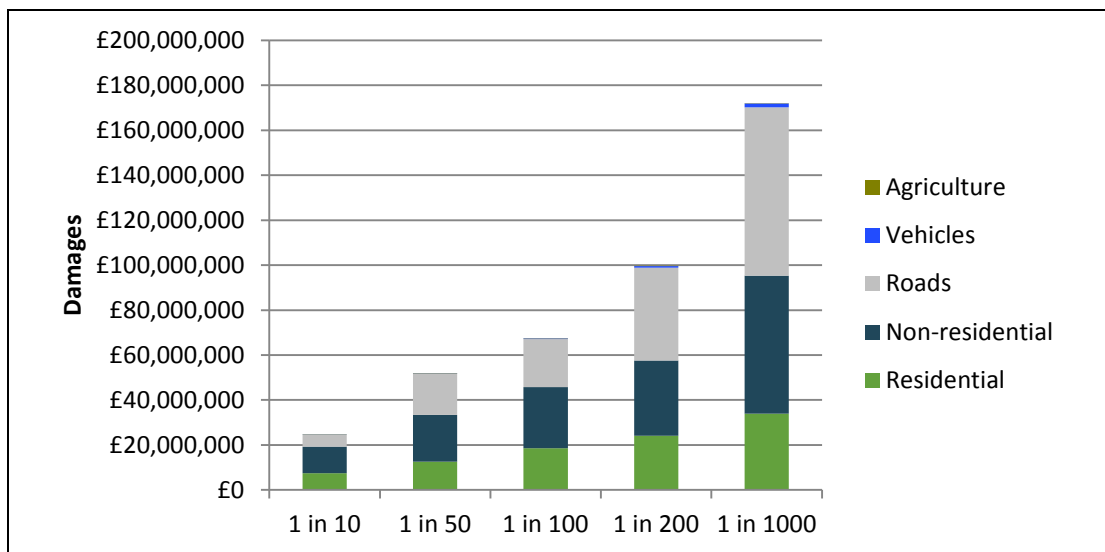
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to roads and non-residential properties followed by damages to residential properties. Other parts of the transport network (Dundee airport and railway routes) are also notably impacted. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

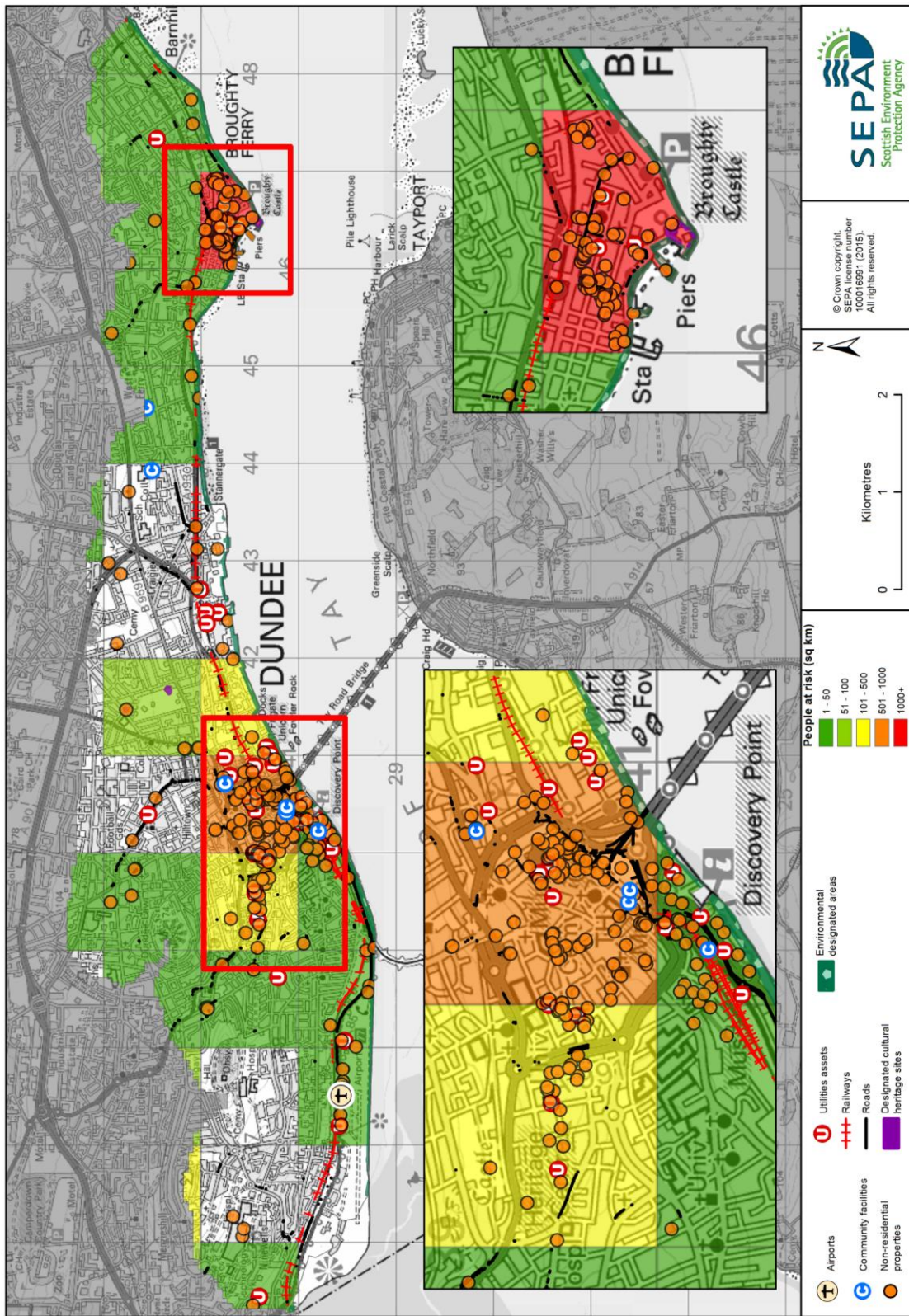
The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and pumping stations). Within this Potentially Vulnerable Area there are 12 assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 41,000)	560	1,300	1,600
Non-residential properties (total 4,400)	160	460	620
People	1,200	2,800	3,600
Community facilities	<10 Emergency services	<10 Includes: emergency services, educational buildings and healthcare facilities	<10 Includes: emergency services, educational buildings and healthcare facilities
Utilities assets	10	40	50
Transport links (excluding minor roads)	5 A roads, 1 B road at 69 locations  3 Railway routes at 36 locations: Dundee to Aberdeen Dundee to Dunblane Dundee to Thornton Junctions  Dundee Airport	7 A roads, 3 B roads at 250 locations  3 Railway routes at 65 locations: Dundee to Aberdeen Dundee to Dunblane Dundee to Thornton Junctions  Dundee Airport	7 A roads, 4 B road at 336 locations  3 Railway routes at 74 locations: Dundee to Aberdeen Dundee to Dunblane Dundee to Thornton Junctions  Dundee Airport
Environmental designated areas (km <sup>2</sup> )	0.9	0.9	1.0
Designated cultural heritage sites	8	23	26
Agricultural land (km <sup>2</sup> )	0.4	0.5	0.6

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

This area has a long history of coastal flooding and more recently surface water flooding. The following significant floods have been recorded in this Potentially Vulnerable Area:

- 7 September 2010: Dundee businesses forced to evacuate staff in Seagate, West Henderson's Wynd, Hospital Street, and Dock Street due to surface water flooding.
- 21 August 2008: Flooding primarily to Dundee City centre and other locations across the city from surface water. The flooding resulted in disruption to traffic flows and basement flooding in areas of the city centre.
- 2006: Riverside Drive, Dundee closed due to wave overtopping.
- 16 August 2004: Dundee City centre was affected by surface water flooding, resulting in basement flooding and disruption to traffic flows. The event was estimated to be a 1 in 100 year event.
- 11 August 2004: Surface water flooding occurred in Dundee City centre and many smaller locations across the city. Additionally, the green urban fringe of the city was affected by surface water runoff causing some roads to become impassable. The rainfall event was estimated to be a 1 in 200 year event.
- 5 February 1983: Coastal flooding at Broughty Ferry resulted in Newport Pier being submerged almost to the booking office. Water entered sheds at Eastern Wharf and King William Dock. Fishing boats were moored to lamp posts in Fisher Street.
- 17 December 1921: Broughty Ferry's Newport Pier and Fisher Street inundated by highest coastal flood level in the period 1883-1983. Water overflowed the docks at Dundee and flowed into the adjacent streets and sheds.
- 12 February 1899: Exceptional high tide in the River Tay estuary caused widespread flooding.
- 28 December 1879: Approximately 75 deaths occurred and damage caused to lighthouse and numerous homes when the Tay Bridge collapsed under heavy flooding from high tides.
- 8 February 1868: Dundee Harbour flooded.

## Objectives to manage flooding in Potentially Vulnerable Area 07/13

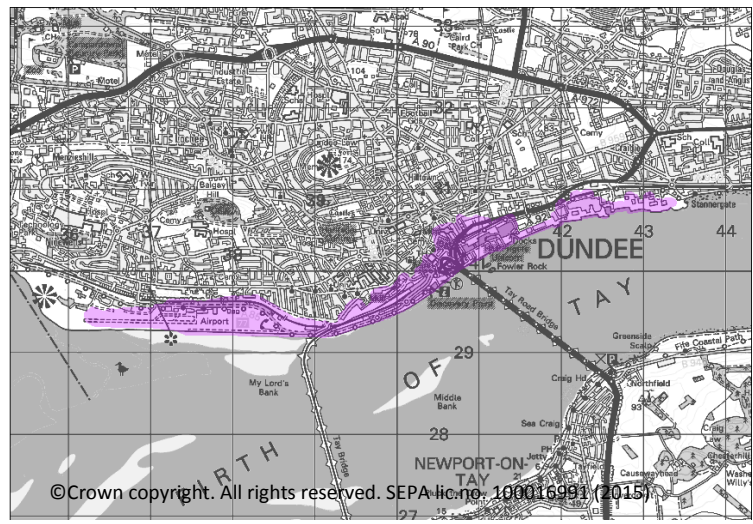
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Dundee and Broughty Ferry Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties in Dundee caused by coastal flooding

Indicators:

- £310,000 Annual Average Damages from residential properties
- £1.0 million Annual Average Damages from non-residential properties

Target area:



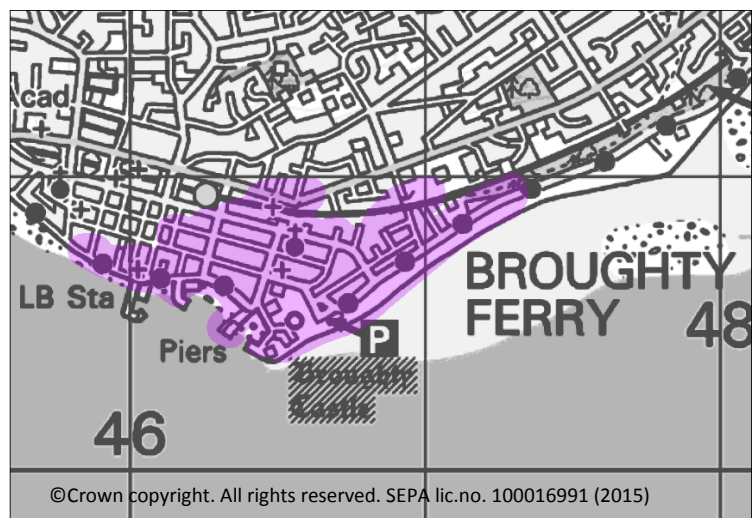
Objective ID: 7034

### Reduce economic damages to residential and non-residential properties and risk to people in Broughty Ferry caused by coastal flooding

Indicators:

- 1,600 people
- £690,000 Annual Average Damages from residential properties
- £150,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7035, 7036

Target area	Objective	ID	Indicators within PVA
Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical	7021	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 1,300 residential properties</li> <li>• £4.3 million Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 1,300 residential properties</li> <li>• £4.3 million Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/13 there are 260 residential properties at risk and Annual Average Damages of £800,000.



## Actions to manage flooding in Potentially Vulnerable Area 07/13

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Dundee and Broughty Ferry Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	Natural flood management works	New flood warning	Community flood action groups	Property level protection scheme	Site protection plans
Flood protection study	Natural flood management study	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
Maintain flood protection scheme	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (70350006)</b>				
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Broughty Ferry caused by coastal flooding (7035, 7036)				
<b>Delivery lead:</b>	Dundee City Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>2 of 42</b>		<b>1 of 2</b>		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	A flood protection scheme has been proposed along the Broughty Ferry coastline. The scheme will include new sea walls and set-back embankments, sand dune replenishment and rock armour. The scheme will provide a 1 in 200 year (plus climate change) standard of protection.				
<b>Potential impacts</b>					
<b>Economic:</b>	The proposed scheme may benefit 450 residential properties at risk of flooding in this location, with estimated damages avoided of £97 million. The flood protection scheme has an estimated benefit cost ratio of 9.8.				
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection scheme area. There may be negative impacts through disturbance to the local community during the construction phase.				
<b>Environmental:</b>	Flood protection schemes may have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority)				

<b>Environmental:</b>	should seek to ensure that the works will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. In addition, a number of nationally and locally designated sites are also present in the study area and could be positively or negatively impacted. These include conservation areas, scheduled monuments, listed buildings and designated bathing waters.
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<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (70340006)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Dundee caused by coastal flooding (7034)		
<b>Delivery lead:</b>	Dundee City Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>5 of 42</b>	<b>2 of 2</b>	
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection scheme has been proposed for the Dundee coastline. The scheme will include set-back walls and flood defences. The construction work to raise the sea wall at the Central Waterfront is to commence in 2015/16. The scheme will provide a 1 in 200 year (plus climate change) standard of protection.		
<b>Potential impacts</b>			
<b>Economic:</b>	The proposed scheme may benefit 200 residential and non-residential properties at risk of flooding. The economic benefits have been estimated west and east of the rail bridge. West of the rail bridge to the airport has estimated damages avoided of £55 million. The scheme has an estimated benefit cost ratio of 2.2. East of the rail bridge to Stannergate has estimated damages avoided of £330 million. The scheme has an estimated benefit cost ratio of 35.8.		
<b>Social:</b>	A reduction in flood risk may have a positive benefit to the health and wellbeing of the community. In addition there are two emergency services and one railway station which have been identified as potentially benefitting from this action. There may be negative impacts through disturbance to the local community during the construction phase.		
<b>Environmental:</b>	Flood protection scheme may have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. To be in accord with the FRM Strategy, the responsible authority (and where applicable, the licensing authority) should seek to ensure that the works will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. In addition, a number of nationally and locally designated sites are also present in the study area and could be positively or negatively impacted by the action. These include listed buildings, local nature reserves and Sites of Special Scientific Interest.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210018)</b>
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie,

	Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Dundee City Council, Perth and Kinross Council and Angus Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70210019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Dundee, Broughty Ferry, Invergowrie, Lochee and Monifieth where practical (7021)		
<b>Delivery lead:</b>	Scottish Water in partnership with local authorities		
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	An integrated catchment study will be carried out to support the surface water management plan process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the Arbroath to Dundee area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. A detailed local authority led study has already been undertaken in this area and SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70340017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Dundee caused by coastal flooding (7034)		
<b>Delivery lead:</b>	Dundee City Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain existing flood defences along the coast.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70350017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in Broughty Ferry caused by coastal flooding (7035, 7036)		
<b>Delivery lead:</b>	Dundee City Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain existing flood defences along the coast.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Broughty Ferry, Dundee Central and Riverside West flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through community safety partnership events. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Angus Council and Dundee City Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

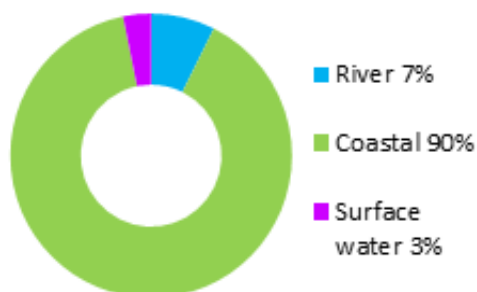
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Dundee City Council owns and operates an emergency flood plan for Dundee City.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Tayport and Newburgh (Potentially Vulnerable Area 07/14)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

### Summary of flooding impacts



#### At risk of flooding

- 140 residential properties
- 30 non-residential properties
- £540,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

Actions

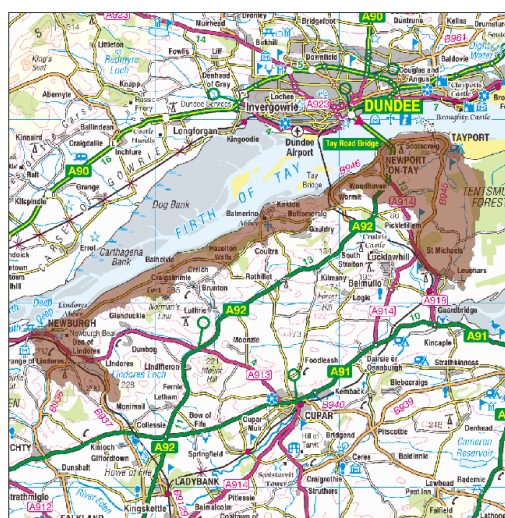


# Tayport and Newburgh (Potentially Vulnerable Area 07/14)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

## Background

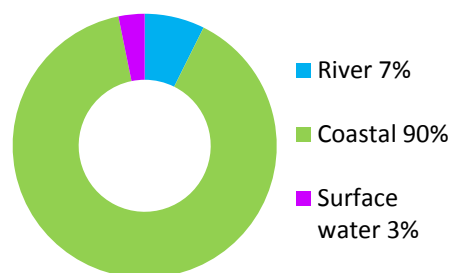
This Potentially Vulnerable Area is 65km<sup>2</sup>. It contains small coastal watercourses that flow into the Firth of Tay and includes the towns of Newburgh, Leuchars, Newport-on-Tay and Tayport.



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The area has a risk of river, coastal and surface water flooding with the majority of damages caused by coastal flooding.

There are approximately 140 residential properties and 30 non-residential properties at risk of flooding. The Annual Average Damages from flooding are approximately £540,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

The highest risk of flooding is in Newburgh from river and coastal flooding and in Tayport from coastal flooding.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. Two railway routes are also notably impacted. The location of the impacts of flooding is shown in Figure 3.

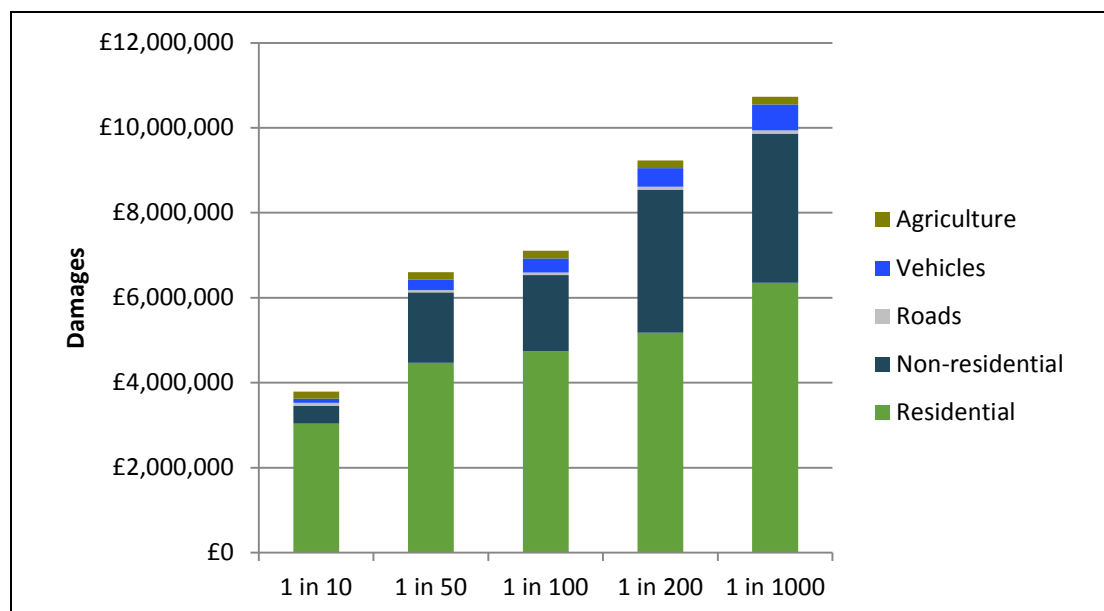
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works

and pumping stations). Within this Potentially Vulnerable Area there are six assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
<b>Residential properties (total 5,700)</b>	100	140	170
<b>Non-residential properties (total 480)</b>	20	30	30
<b>People</b>	220	310	370
<b>Community facilities</b>	0	0	0
<b>Utilities assets</b>	<10	<10	<10
<b>Transport links (excluding minor roads)</b>	3 A roads, 5 B roads at 29 locations  2 Railway routes at 15 locations: Perth to Thornton Junctions Dundee to Thornton Junctions	3 A roads, 5 B roads at 31 locations  2 Railway routes at 15 locations: Perth to Thornton Junctions Dundee to Thornton Junctions	3 A roads, 5 B roads 31 locations  2 railway routes at 16 locations: Perth to Thornton Junctions Dundee to Thornton Junctions
<b>Environmental designated areas (km<sup>2</sup>)</b>	1.5	1.5	1.5
<b>Designated cultural heritage sites</b>	11	12	12
<b>Agricultural land (km<sup>2</sup>)</b>	2.9	3.2	3.3

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood

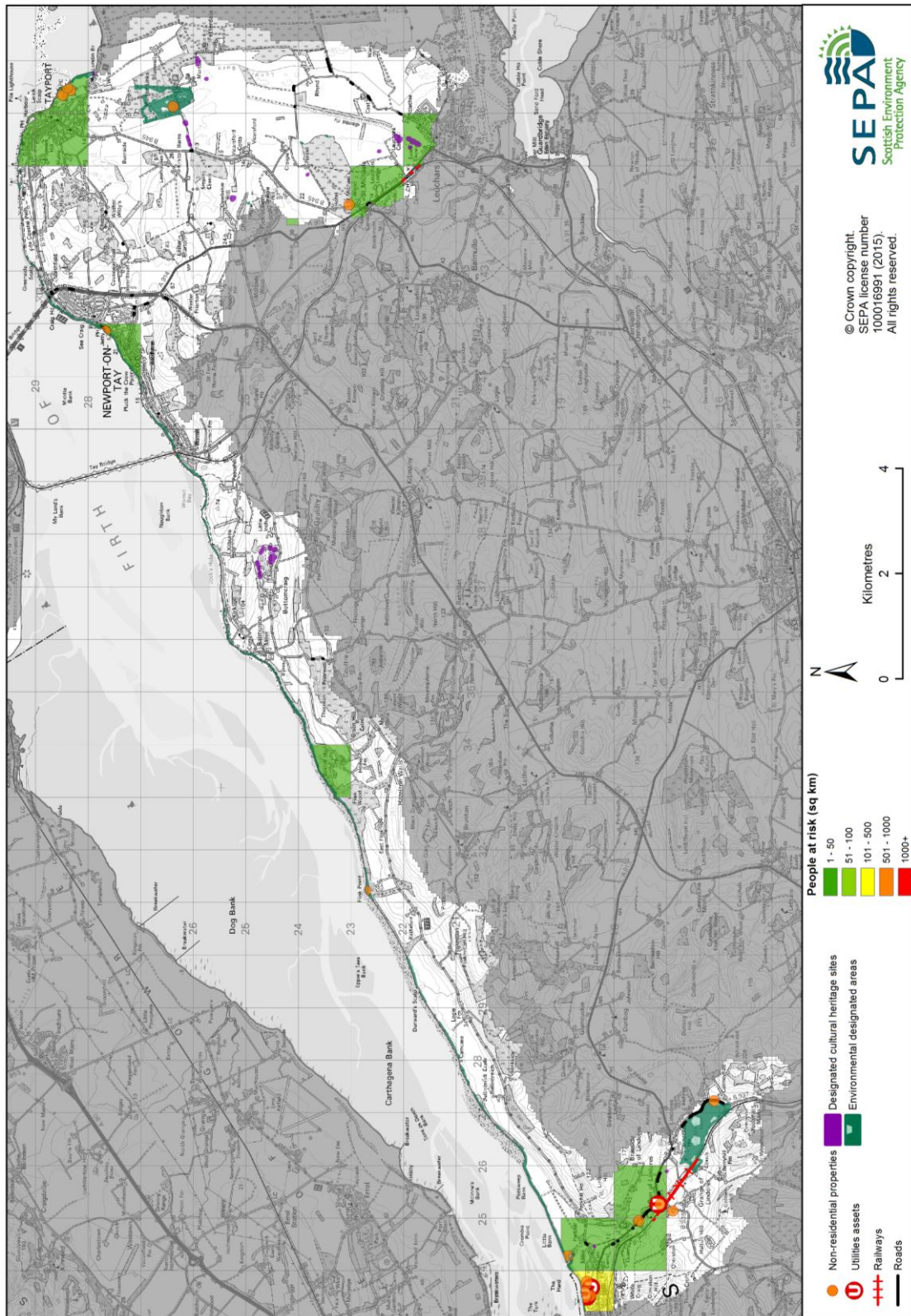


Figure 3: Impacts of flooding

## History of flooding

The following significant coastal floods have been recorded in this Potentially Vulnerable Area:

- 12 February 1899: Exceptional high tide in the River Tay estuary caused widespread flooding.
- 28 December 1879: Approximately 75 deaths occurred and damage caused to lighthouse and numerous homes when the Tay Bridge collapsed under heavy flooding from high tides.

## Objectives to manage flooding in Potentially Vulnerable Area 07/14

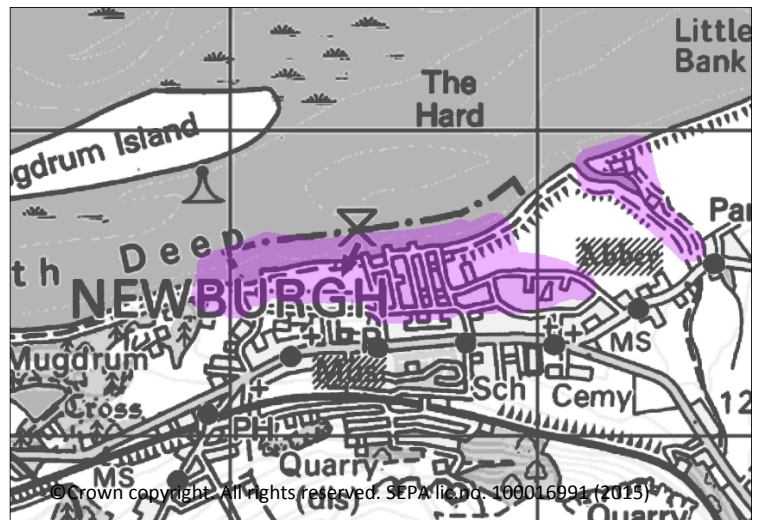
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Tayport and Newburgh Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties in Newburgh caused by coastal flooding

Indicators:

Target area:

- £350,000 Annual Average Damages from residential properties
- £92,000 Annual Average Damages from non-residential properties



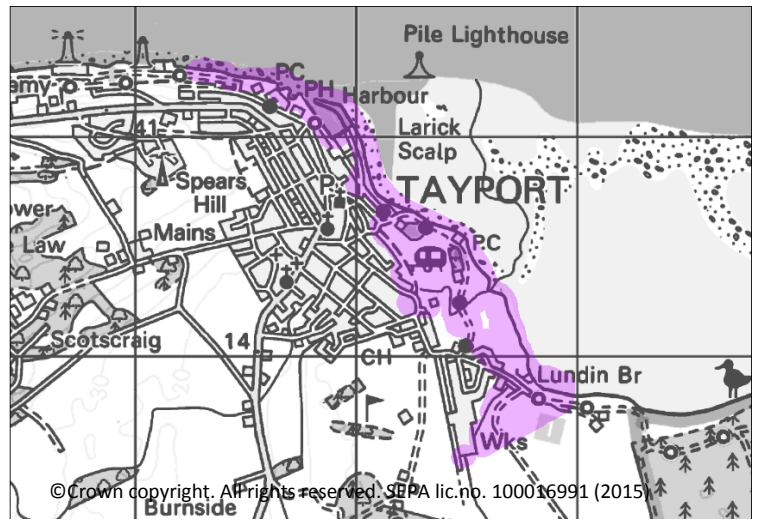
Objective ID: 7037

### Reduce economic damages to residential and non-residential properties in Tayport caused by coastal flooding

Indicators:

Target area:

- £93,000 Annual Average Damages from residential properties
- £390 Annual Average Damages from non-residential properties



Objective ID: 7038

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 140 residential properties</li> <li>• £540,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 140 residential properties</li> <li>• £540,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 07/14

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Tayport and Newburgh Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	<i>Surface water plan/study</i>	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70370005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Newburgh caused by coastal flooding (7037)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National:		Within local authority:
	<b>25 of 168</b>		<b>2 of 16</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Newburgh to assess whether flood defences and natural flood management could reduce flood risk. Natural flood management options that should be considered include wave attenuation. The study should also investigate the viability of property level protection. The study should take a sustainable approach and consider the interaction between actions and potential effects on coastal processes along the shoreline.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 117 residential properties and 12 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £12 million.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition the study could benefit three utilities which are located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		

<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. To be in accord with the FRM Strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. Conservation areas, Sites of Special Scientific Interest and Ramsar sites are also present in the study area and could be positively or negatively impacted.
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<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70380005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Tayport caused by coastal flooding (7038)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National: <b>104 of 168</b>	Within local authority: <b>14 of 16</b>	
<b>Status:</b>	<b>Ongoing</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been progressed for Tayport to assess whether flood defences and natural flood management could reduce flood risk.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 17 residential properties and one non-residential property at risk of flooding in this location, with potential damages avoided of up to £2.8 million.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. To be in accord with the FRM Strategy, the responsible authority should seek to ensure as part of the study that the action will not have an adverse effect on the integrity of the Firth of Tay and Eden Estuary Special Area of Conservation and Special Protection Area. A Ramsar site is also present in the study area and could be positively or negatively impacted.		



<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water Integrated Catchment Studies will be considered as these projects are completed. SEPA will seek to develop flood mapping in the St Andrews area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Newburgh, Newport on Tay and Tayport flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will engage with the community and promote Floodline. This will be achieved through property level protection events delivered by the Scottish Flood Forum, SEPA led education events and promoting community resilience groups where possible with Fife Council. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Fife Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

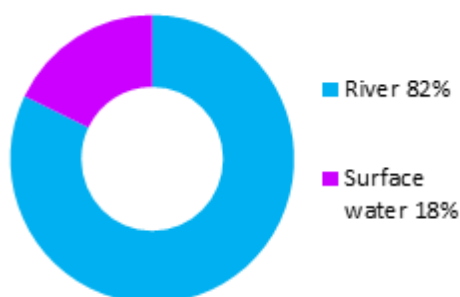
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Lucklawhill (Potentially Vulnerable Area 07/15)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

### Summary of flooding impacts



#### At risk of flooding

- 20 residential properties
- 10 non-residential properties
- £130,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

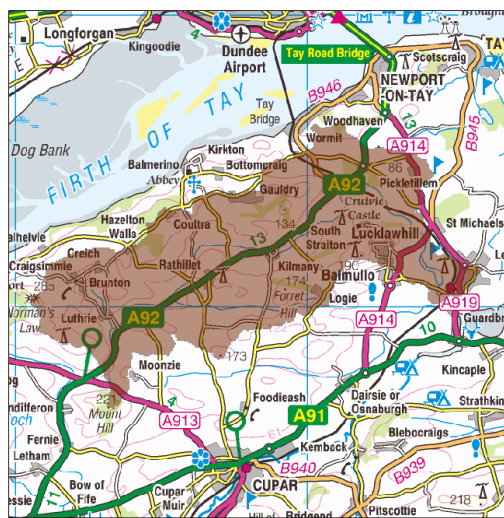
Actions

# Lucklawhill (Potentially Vulnerable Area 07/15)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

## Background

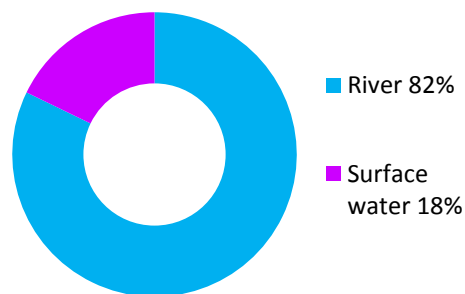
This Potentially Vulnerable Area is 63km<sup>2</sup> and part of the Firth of Tay catchment group. It contains the Motray Water and includes the towns of Leuchars and Lucklawhill.



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The main sources of flooding are from river and surface water, with the majority of damages caused by river flooding.

There are approximately 20 residential properties and 10 non-residential properties at risk of flooding. The Annual Average Damages from flooding are approximately £130,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

Work carried out since the National Flood Risk Assessment in 2011 has concluded that the risk of flooding in this Potentially Vulnerable Area is now relatively low. The designation of this Potentially Vulnerable Area will be reviewed in the next flood risk management planning cycle.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

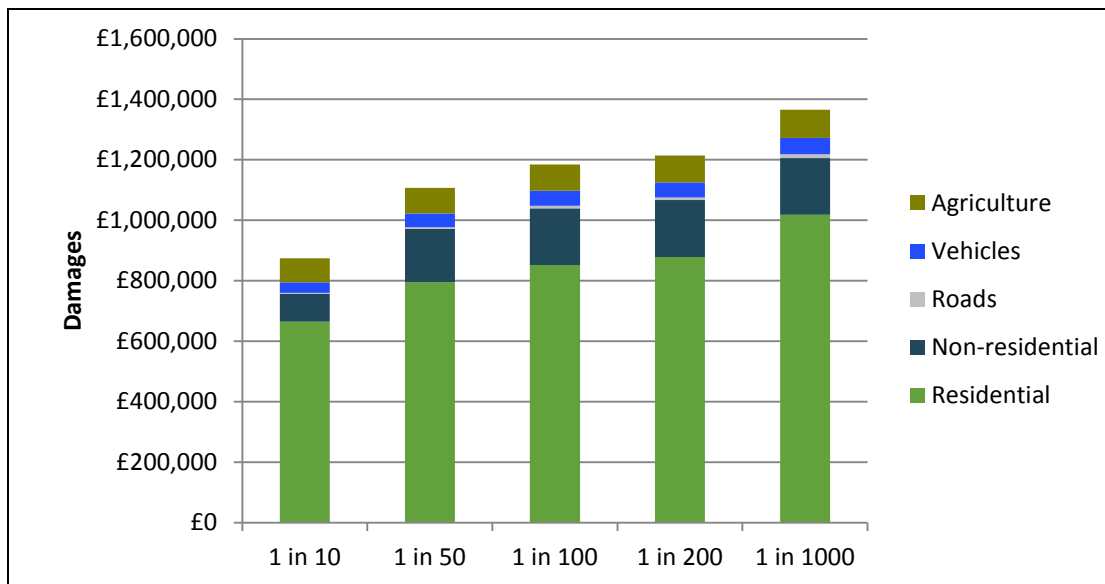
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

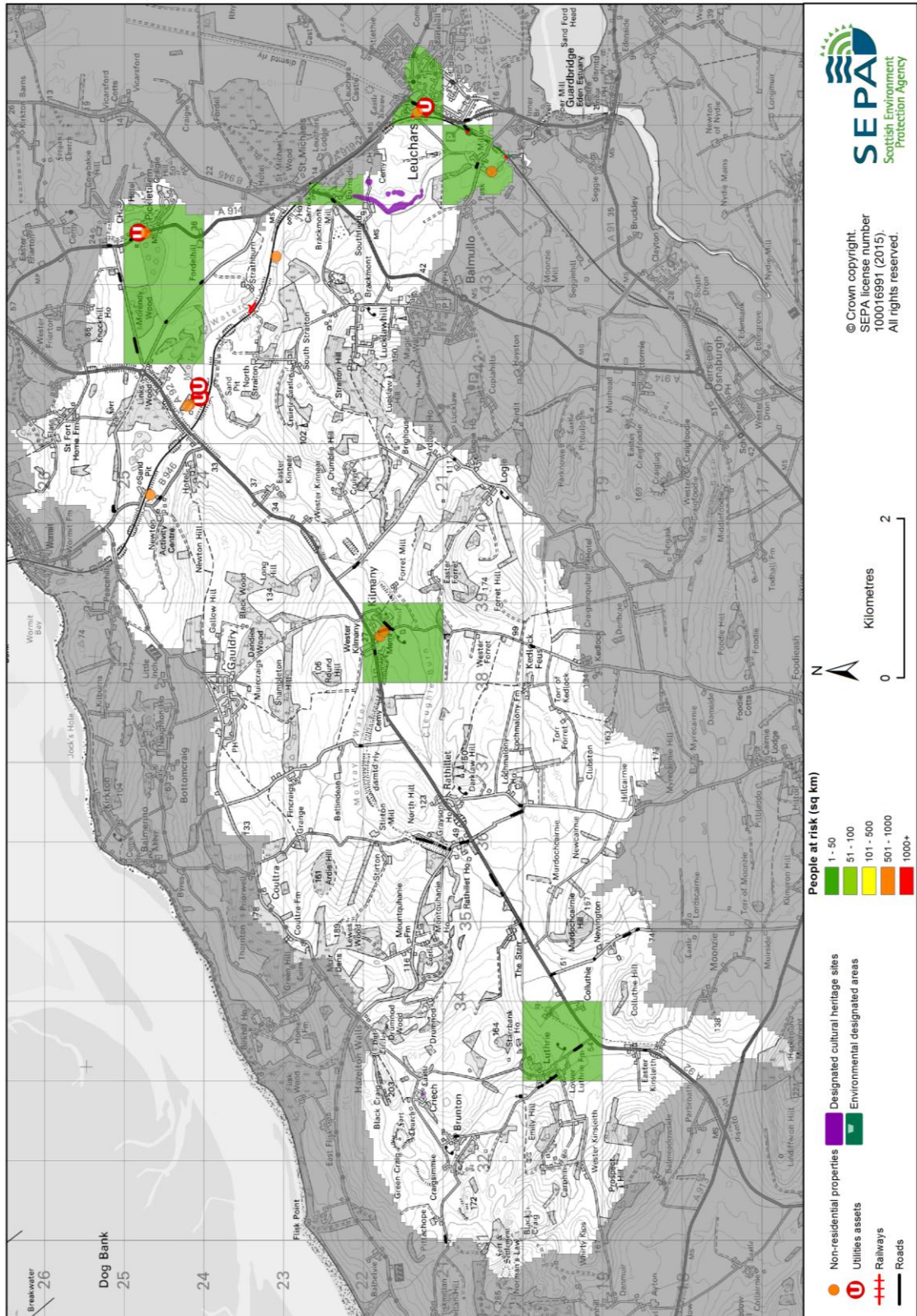
The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and pumping stations). Within this Potentially Vulnerable Area there is one asset identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 1,300)	10	20	30
Non-residential properties (total 170)	<10	10	10
People	30	50	60
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	3 A roads, 1 B road at 20 locations  1 Railway route at 9 locations: Dundee to Ladybank	3 A roads, 1 B road at 20 locations  1 Railway route at 9 locations: Dundee to Ladybank	3 A roads, 1 B road at 21 locations  1 Railway route at 9 locations: Dundee to Ladybank
Environmental designated areas (km <sup>2</sup> )	0.1	0.1	0.1
Designated cultural heritage sites	1	2	3
Agricultural land (km <sup>2</sup> )	2.1	2.4	2.5

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

No significant floods have been recorded in this Potentially Vulnerable Area.

## Objectives to manage flooding in Potentially Vulnerable Area 07/15

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Lucklawhill Potentially Vulnerable Area.

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £130,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 20 residential properties</li> <li>• £130,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		



## Actions to manage flooding in Potentially Vulnerable Area 07/15

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Lucklawhill Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<i>New flood warning</i>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<i>Flood protection study</i>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<i>Maintain flood protection scheme</i>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the St Andrews area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will carry out an assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Fife Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

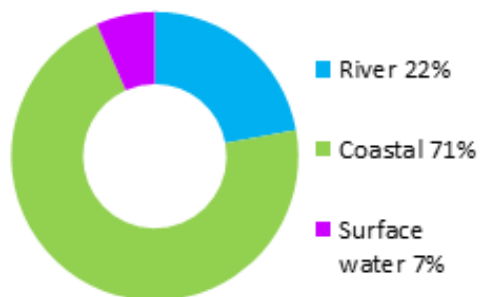
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Fife Council operates an emergency flood plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## St Andrews to Guardbridge (Potentially Vulnerable Area 07/16)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

### Summary of flooding impacts



#### At risk of flooding

- 80 residential properties
- 40 non-residential properties
- £680,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	<i>Natural flood management works</i>	New flood warning	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

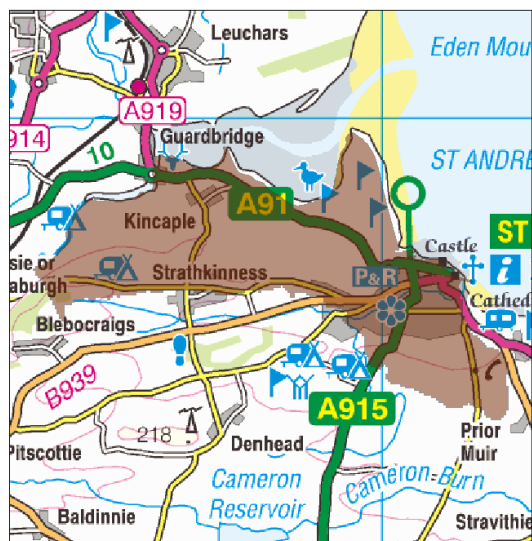
Actions

# St Andrews to Guardbridge (Potentially Vulnerable Area 07/16)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

## Background

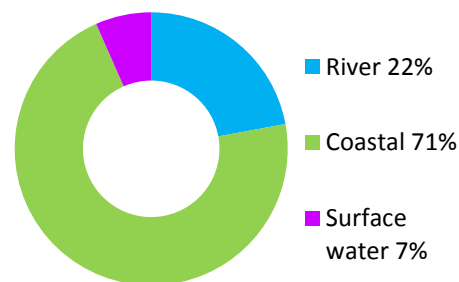
This Potentially Vulnerable Area is 23km<sup>2</sup> (shown below). It is situated on the south side of the River Eden and the Eden Estuary and also contains the lower reaches of the Kinness Burn. It includes the urban areas of Guardbridge and St Andrews.



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This Potentially Vulnerable Area has a risk of river, coastal and surface water flooding with the majority of damages caused by coastal flooding.

There are approximately 80 residential properties and 40 non-residential properties at risk of flooding. The Annual Average Damages are approximately £670,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

The highest risk of flooding is in St Andrews from the Kinness Burn and surface water flooding. Roads are notably impacted with A91 road showing the highest damages.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to roads, residential properties and non-residential properties. The location of the impacts of flooding is shown in Figure 3.

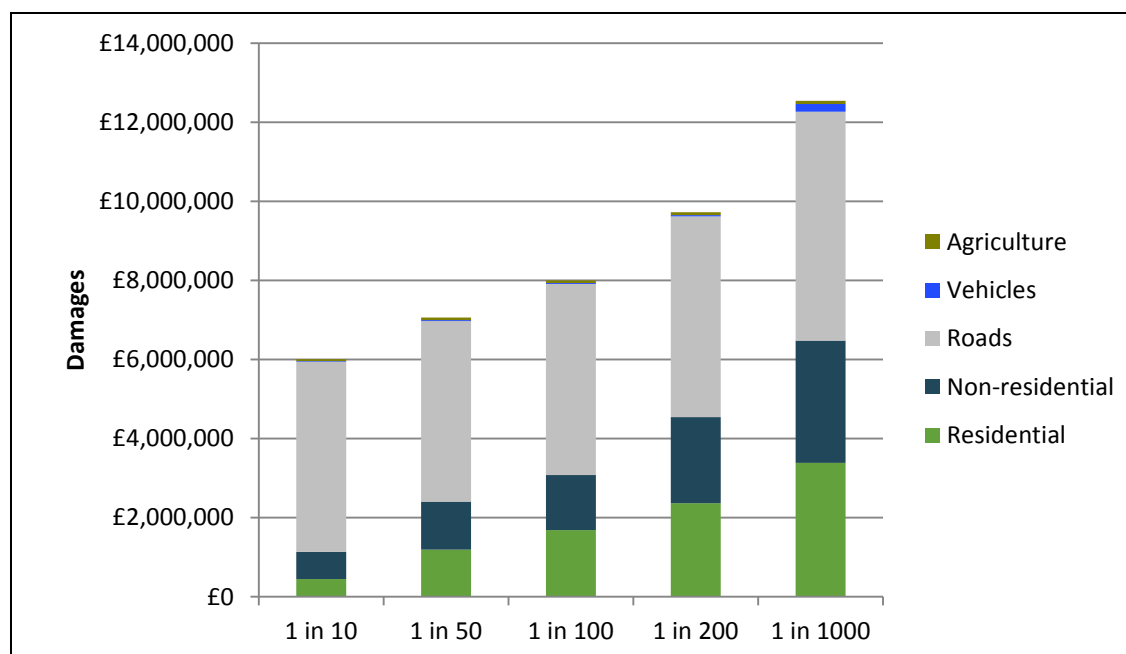
The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and

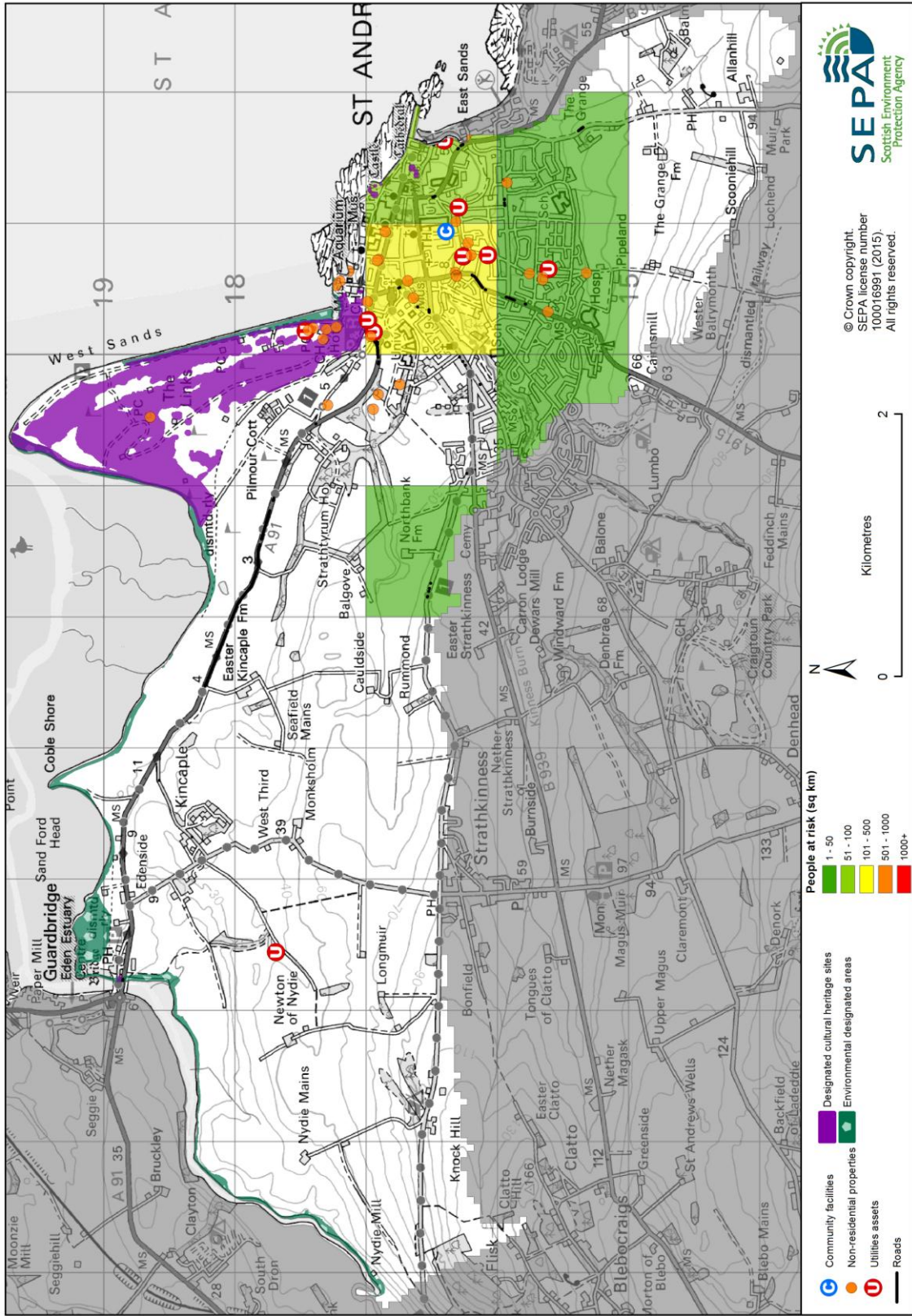
pumping stations). Within this Potentially Vulnerable Area there are two assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 5,900)	10	80	110
Non-residential properties (total 940)	20	40	60
People	30	180	240
Community facilities	0	<10 Educational buildings	<10 Includes: educational buildings and emergency services
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	3 A roads, 1 B road at 23 locations	3 A roads, 1 B road at 35 locations	3 A roads, 1 B road at 45 locations
Environmental designated areas (km <sup>2</sup> )	0.9	1.0	1.0
Designated cultural heritage sites	6	8	8
Agricultural land (km <sup>2</sup> )	1.9	2.6	3.0

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**



## History of flooding

The following significant floods have been recorded in this Potentially Vulnerable Area:

- 15 December 2012: St Andrews was affected when a combination of wind and high tides caused large waves and coastal flooding along the east coast of Scotland.
- 30 March 2010: St Andrews was affected when a tidal surge coincided with the highest mean tides of the year causing extensive flooding along the east coast of Scotland.
- 10-11 August 2004: Kinness Burn overtopped resulting in flooding of properties in Murray Park, Auld Burn Park and Dempster Terrace.
- April 1988: Kinness Burn flooded affecting properties in Dempster Court, St Nicholas Street and Wood Burn Place.

## Objectives to manage flooding in Potentially Vulnerable Area 07/16

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for St Andrews to Guardbridge Potentially Vulnerable Area.

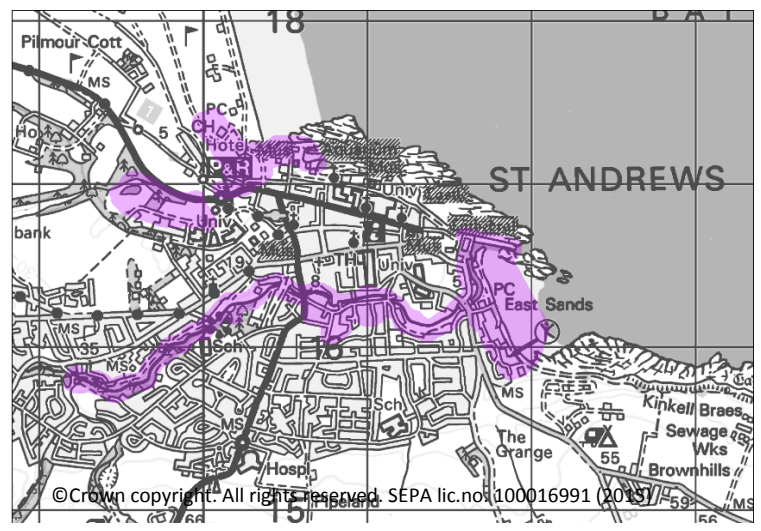
### Reduce economic damages to residential and non-residential properties and risk to people in St Andrews caused by flooding from the Kinness Burn

Indicators:

- 180 people
- £87,000 Annual Average Damages from residential properties
- £49,000 Annual Average Damages from non-residential properties

Objective ID: 7042, 7043

Target area:



Target area	Objective	ID	Indicators within PVA
St Andrews	Reduce economic damages and number of residential properties at risk of surface water flooding in St Andrews where practical	7040	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 80 residential properties</li> <li>• £670,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 80 residential properties</li> <li>• £670,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/16 there are 10 residential properties at risk and Annual Average Damages of £41,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/16

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for St Andrews to Guardbridge Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	<i>Natural flood management works</i>	New flood warning	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	Maintain flood warning	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (70420006)</b>				
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in St Andrews caused by flooding from the Kinness Burn (7042, 7043)				
<b>Delivery lead:</b>	Fife Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>8 of 42</b>		<b>1 of 1</b>		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	A flood protection scheme has been proposed for the Kinness Burn in St Andrews. The scheme requires detailed study and design. Part of this proposed flood protection scheme is located in Potentially Vulnerable Area 07/17. The benefits and impacts have been assessed for the whole scheme.				
<b>Potential impacts</b>					
<b>Economic:</b>	Estimated damages avoided of £11 million. The flood protection scheme has an estimated benefit cost ratio of 6.0.				
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.				
<b>Environmental:</b>	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. The proposed flood protection works are located on the Kinness Burn (water body ID 6107). The physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management				

**Environmental:** planning.

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include St Andrews which is affected by flooding from the Kinness Burn. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70420005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties and risk to people in St Andrews caused by flooding from the Kinness Burn (7042, 7043)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>57 of 168</b>	<b>7 of 16</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for St Andrews to assess whether a combination of structural actions could reduce flood risk from the Kinness Burn. The study should look at installation / modification of fluvial control structures, flood defences and natural flood management. Natural flood management options that should be considered include runoff control, river / floodplain restoration and sediment management. The study should also investigate the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. It should build on previous studies carried out in 2007 and 2011. Part of this proposed flood protection study is located in Potentially Vulnerable Area 07/17. The benefits and impacts have been assessed for the whole study.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 127 residential properties and six non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.1 million.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the study area. In addition the study could benefit two utilities located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		

<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Kinness Burn (water body ID 6107) is located within the study area and the physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Conservation areas, designated bathing waters and listed buildings are also present in the study area and could be positively or negatively impacted.
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<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70400018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in St Andrews where practical (7040)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to develop flood mapping in the St Andrews area to improve understanding of coastal flood risk. The extent and timing of improvements will depend on detailed scoping and data availability. Where this work coincides with local authority studies, SEPA will work collaboratively to ensure consistent modelling approaches are applied.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (70540030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Guardbridge and St Andrews flood warning areas which are part of the Firth of Forth and Tay coastal flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.</p> <p>From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council and community resilience groups where possible.</p> <p>Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.</p>		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Fife Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.</p>		



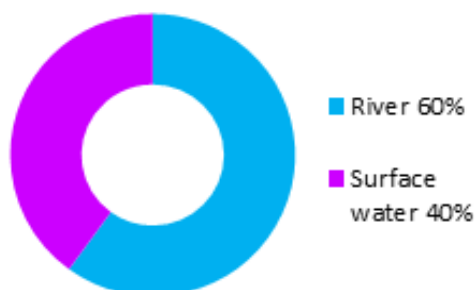
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations.</p> <p>Fife Council operates an emergency flood plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.</p>		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

## St Andrews (Denhead and Strathkinness) (Potentially Vulnerable Area 07/17)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

### Summary of flooding impacts



#### At risk of flooding

- 40 residential properties
- <10 non-residential properties
- £94,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

Flood protection scheme/works	<i>Natural flood management works</i>	New flood warning	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

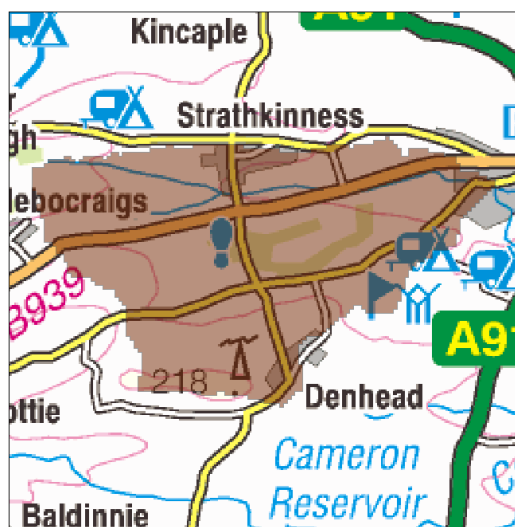
Actions

## St Andrews (Denhead and Strathkinness) (Potentially Vulnerable Area 07/17)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	North Fife coastal

### Background

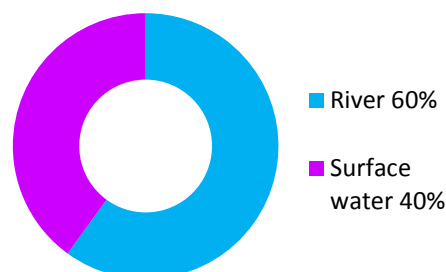
This Potentially Vulnerable Area is 13km<sup>2</sup>. It is situated in the upper reaches of the Kinness Burn and includes St Andrews and Strathkinness.



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The area has a risk of river and surface water flooding. The majority of damages are caused by river flooding.

There are approximately 40 residential properties at risk of flooding. The Annual Average Damages from flooding are approximately £94,000.



**Figure 1:** Annual Average Damages by flood source

### Summary of flooding impacts

The highest risk of flooding is in St Andrews from the Kinness Burn. St Andrews is also notably impacted by surface water flooding.

The risk of flooding to people and property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

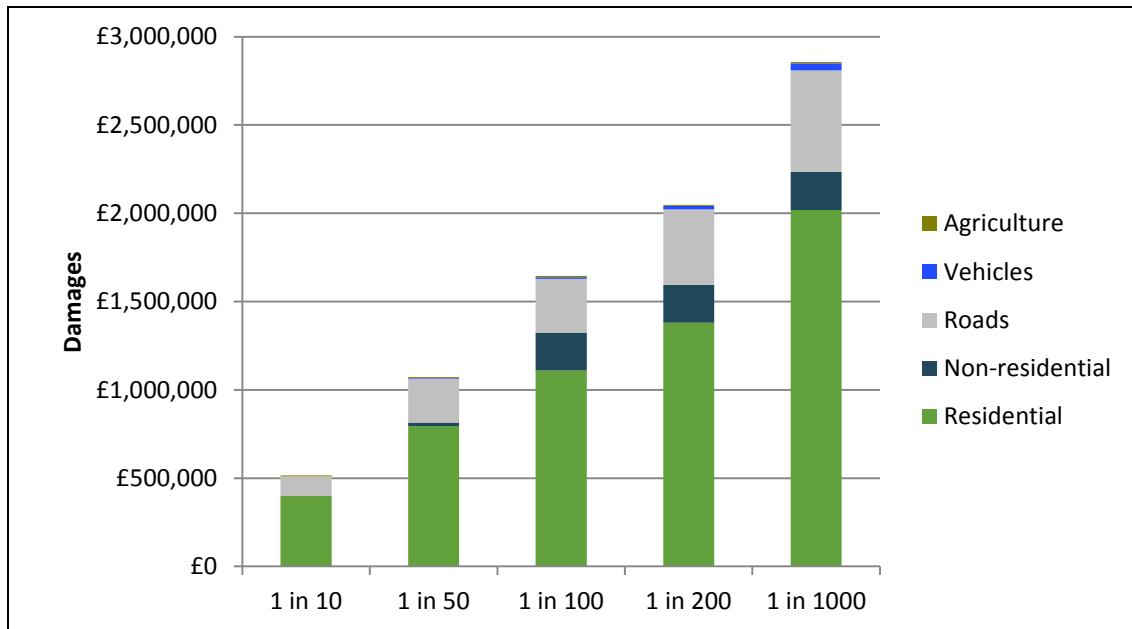
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads. The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

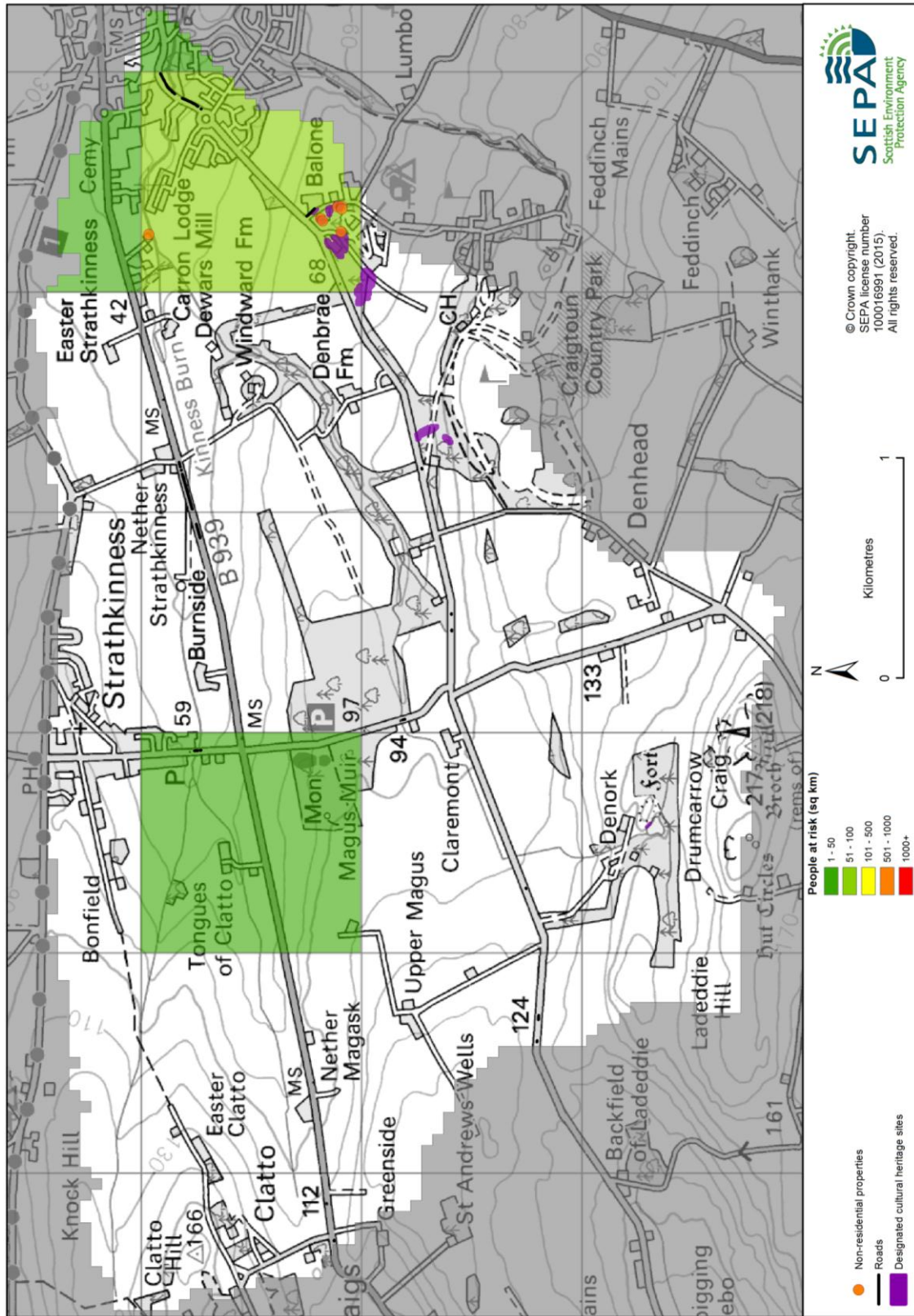
The risk of flooding to utilities in Table 1 does not include Scottish Water data. Scottish Water undertook a national assessment of above ground assets at medium likelihood of flooding (including water treatment works, wastewater treatment works and pumping stations). Within this Potentially Vulnerable Area there are three assets identified as being at risk of flooding.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 870)	10	40	50
Non-residential properties (total 190)	<10	<10	<10
People	30	80	110
Community facilities	0	0	0
Utilities assets	0	0	0
Transport links (excluding minor roads)	1 B road at 3 locations	1 B road at 4 locations	1 B road at 4 locations
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	2	2	2
Agricultural land (km <sup>2</sup> )	0.1	0.2	0.2

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

The following floods have been recorded that are relevant to this area:

- 10-11 August 2004: Kinness Burn overtopped resulting in flooding of properties in Murray Park, Auld Burn Park and Dempster Terrace.
- April 1988: Kinness Burn flooded affecting properties in Dempster Court, St Nicholas Street and Wood Burn Place.

## Objectives to manage flooding in Potentially Vulnerable Area 07/17

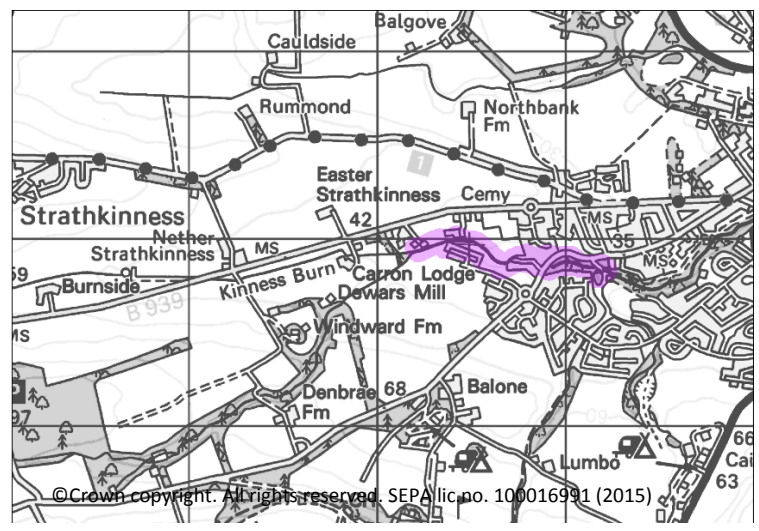
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for St Andrews (Denhead and Strathkinness) Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties in St Andrews caused by flooding from the Kinness Burn

Indicators:

- £52,000 Annual Average Damages from residential properties
- £220 Annual Average Damages from non-residential properties

Target area:



Objective ID: 7046

Target area	Objective	ID	Indicators within PVA
St Andrews	Reduce economic damages and number of residential properties at risk of surface water flooding in St Andrews where practical	7040	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 40 residential properties</li> <li>• £94,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 40 residential properties</li> <li>• £94,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/17 there are 20 residential properties at risk and Annual Average Damages of £38,000.



## Actions to manage flooding in Potentially Vulnerable Area 07/17

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for St Andrews (Denhead and Strathkinness) Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	<i>Natural flood management works</i>	New flood warning	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
Flood protection study	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	Awareness raising	Surface water plan/study	Emergency plans/response
<i>Maintain flood protection scheme</i>	Strategic mapping and modelling	Flood forecasting	Self help	Maintenance	Planning policies

<b>Action (ID):</b>	<b>FLOOD PROTECTION SCHEME/WORKS (70420006)</b>				
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in St Andrews caused by flooding from the Kinness Burn (7046)				
<b>Delivery lead:</b>	Fife Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>8 of 42</b>		<b>1 of 1</b>		
<b>Status:</b>	<b>Under development</b>	Indicative delivery:	<b>2016-2021</b>		
<b>Description:</b>	A flood protection scheme has been proposed for the Kinness Burn in St Andrews. The scheme requires detailed study and design. Part of this proposed flood protection scheme is located in Potentially Vulnerable Area 07/16. The benefits and impacts have been assessed for the whole scheme.				
<b>Potential impacts</b>					
<b>Economic:</b>	Estimated damages avoided of £11 million. The flood protection scheme has an estimated benefit cost ratio of 6.0.				
<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. There may be negative impacts through disturbance to the local community during the construction phase.				
<b>Environmental:</b>	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed. The proposed flood protection works are located on the Kinness Burn (water body ID 6107). The physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management				

**Environmental:** planning.

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include St Andrews which is affected by flooding from the Kinness Burn. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70420005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in St Andrews caused by flooding from the Kinness Burn (7046)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>57 of 168</b>	<b>7 of 16</b>	
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for St Andrews to assess whether a combination of structural actions could reduce flood risk from the Kinness Burn. The study should look at installation / modification of fluvial control structures, flood defences and natural flood management. Natural flood management options that should be considered include runoff control, river / floodplain restoration and sediment management. The study should also investigate the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream. It should build on previous studies carried out in 2007 and 2011. Part of this proposed flood protection study is located in Potentially Vulnerable Area 07/16. The benefits and impacts have been assessed for the whole study.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 127 residential properties and six non-residential properties at risk of flooding in this location, with potential damages avoided of up to £6.1 million.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the study area. In addition the study could benefit two utilities located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		

<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Kinness Burn (water body ID 6107) is located within the study area and the physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Conservation areas, designated bathing waters and listed buildings are also present in the study area and could be positively or negatively impacted.
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<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70400018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in St Andrews where practical (7040)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Fife Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

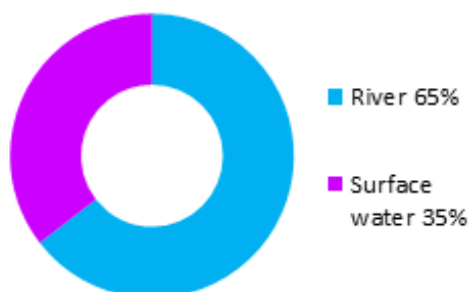
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Fife Council operates an emergency flood plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Cupar (Potentially Vulnerable Area 07/18)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	River Eden

### Summary of flooding impacts



#### At risk of flooding

- 260 residential properties
- 80 non-residential properties
- £1.3 million Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

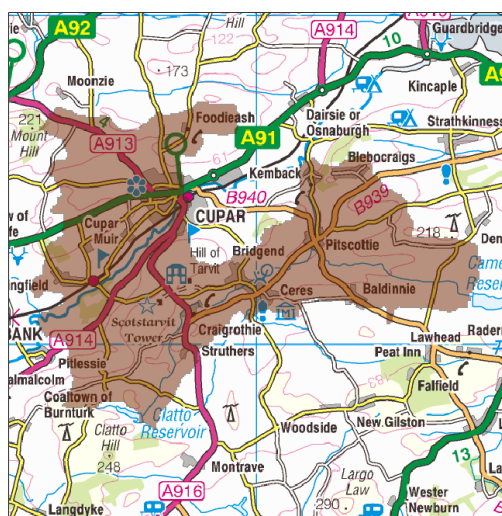
Actions

## Cupar (Potentially Vulnerable Area 07/18)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council	River Eden

### Background

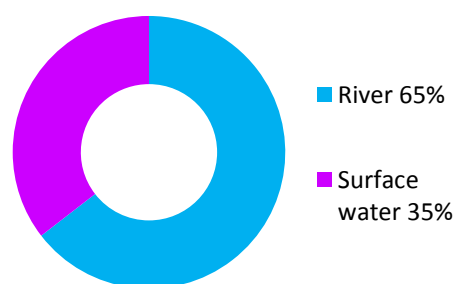
This Potentially Vulnerable Area is 63km<sup>2</sup> (shown below). It is situated in the lower reaches of the River Eden catchment and includes the town of Cupar.



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The area has a risk of river and surface water flooding with the majority of damages caused by river flooding.

There are approximately 260 residential properties and 80 non-residential properties at risk of flooding. The Annual Average Damages are approximately £1.3 million.



**Figure 1: Annual Average Damages by flood source**

### Summary of flooding impacts

The highest risk of flooding is in Cupar from the River Eden and Lady Burn. Cupar is also notably impacted by surface water flooding.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties.

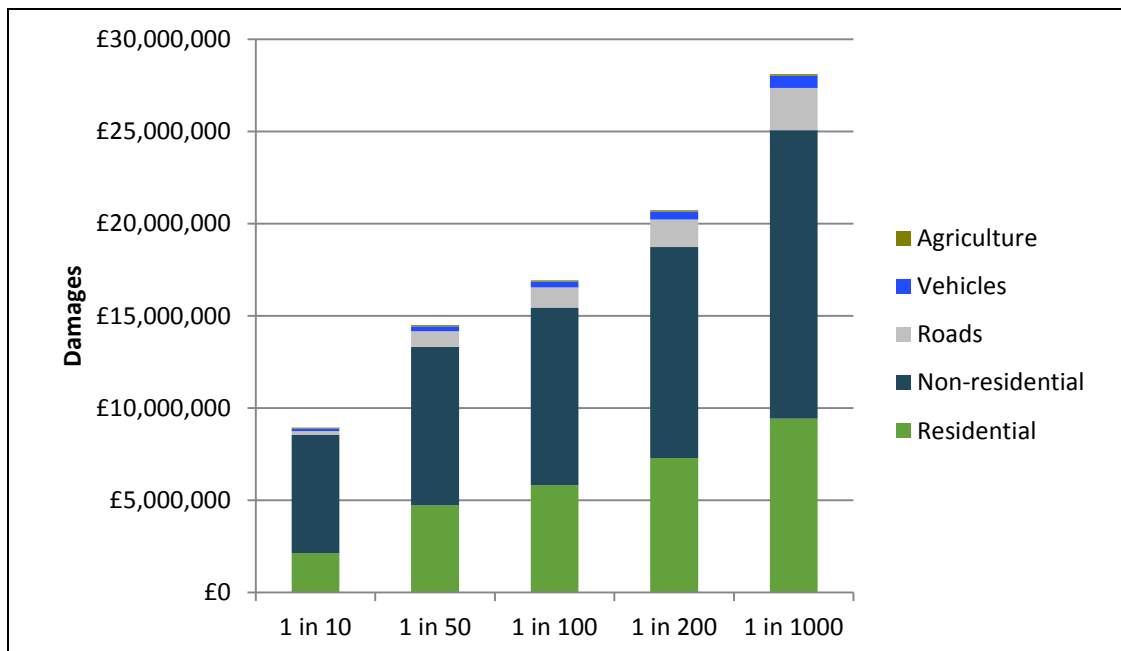
The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.



	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 5,100)	90	260	260
Non-residential properties (total 710)	50	80	110
People	200	580	580
Community facilities	0	0	<10 Includes: educational buildings and emergency services
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	4 A roads, 2 B roads at 36 locations  1 Railway route at 11 locations: Dundee to Ladybank	4 A roads, 2 B roads at 58 locations  1 Railway route at 13 locations: Dundee to Ladybank	4 A roads, 2 B roads at 63 locations  1 Railway route at 13 locations: Dundee to Ladybank
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	2	2	3
Agricultural land (km <sup>2</sup> )	1.2	1.5	1.6

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood

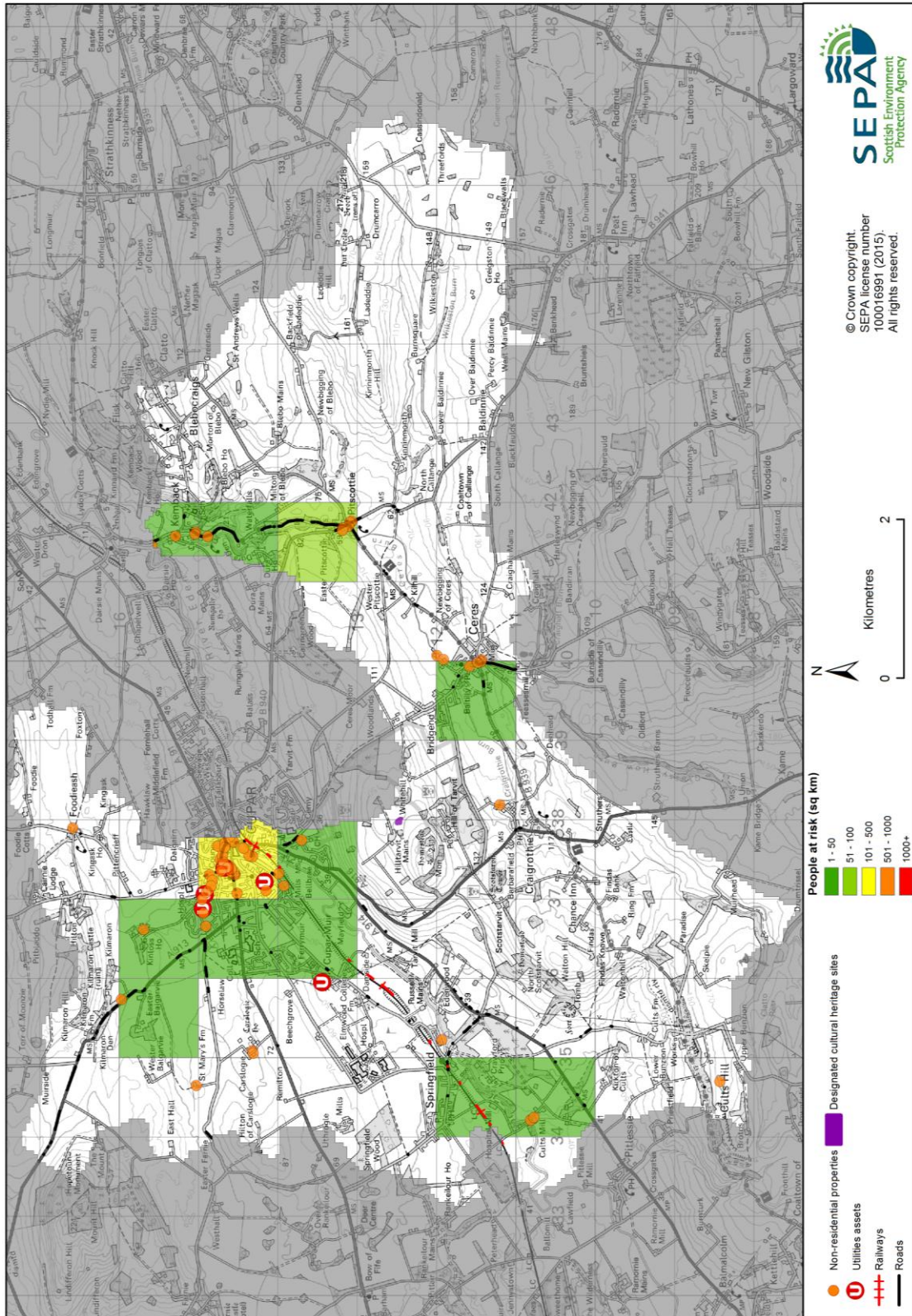


Figure 3: Impacts of flooding

## History of flooding

The following floods have been recorded in this Potentially Vulnerable Area:

- 12 October 2012: Extensive flooding of Pitscottie and Dura Den, causing many homes to be damaged and the C54 road through Dura Den to be washed away.
- 6 July 2009: Heavy rain caused extensive surface water flooding in Cupar. Most roads into Cupar were closed and homes and businesses were affected.
- 6 February 2001: It was reported in the Courier that Cart Haugh Park in Cupar was flooded. Peak flow of 54.2 m<sup>3</sup>/s was recorded at the Kemback gauging station, indicating that this flood event on the River Eden was a 1 in 5 year event. This event resulted from combined heavy rain and snowmelt.
- 6 November 2000: Peak flow of 54.8 m<sup>3</sup>/s was recorded at the Kemback gauging station, indicating that this flood event on the River Eden was a 1 in 5 year event.
- April 1992: Widespread flooding occurred throughout Fife when more than 80mm of rain fell in 24 hours. This resulted in significant flooding in Cupar from the River Eden. The highest river level (2.2m) was recorded at the SEPA gauging station on the River Eden at Kemback, downstream of Cupar.

## Objectives to manage flooding in Potentially Vulnerable Area 07/18

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Cupar Potentially Vulnerable Area.

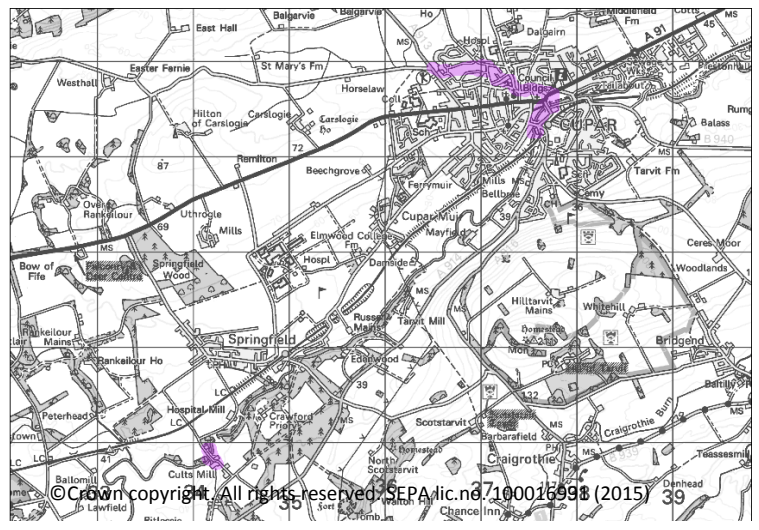
### Reduce economic damages to residential and non-residential properties in Cupar caused by flooding from the River Eden and Lady Burn. Reduce risk to people from river flooding in Cults and Cupar.

Indicators:

- 350 people
- £120,000 Annual Average Damages from residential properties
- £62,000 Annual Average Damages from non-residential properties

Objective ID: 7049, 7051

Target area:



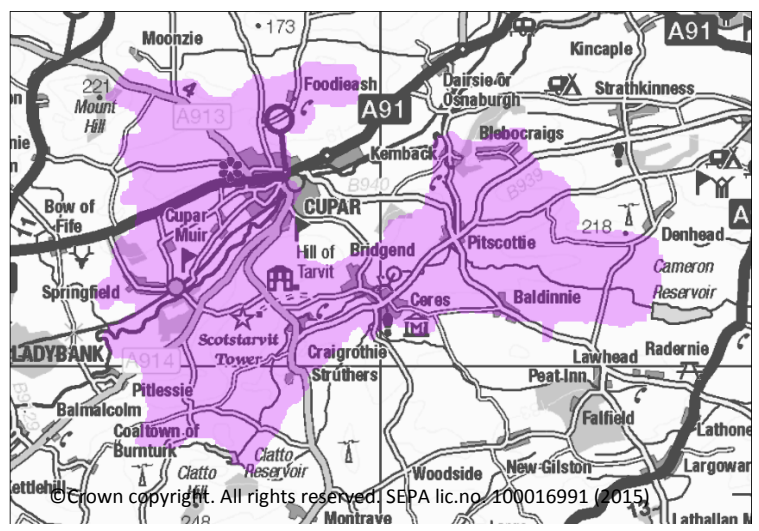
### Reduce economic damages to residential and non-residential properties in the Cupar Potentially Vulnerable Area caused by river flooding

Indicators:

- £79,000 Annual Average Damages from residential properties
- £460,000 Annual Average Damages from non-residential properties

Objective ID: 7050

Target area:



Target area	Objective	ID	Indicators within PVA
Cupar and Springfield	Reduce economic damages and number of residential properties at risk of surface water flooding in Cupar and Springfield where practical	7047	* See note below
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 260 residential properties</li> <li>• £1.3 million Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 260 residential properties</li> <li>• £1.3 million Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

\* This objective will be monitored using surface water flood risk across the Potentially Vulnerable Area. For 07/18 there are 150 residential properties at risk and Annual Average Damages of £450,000.

## Actions to manage flooding in Potentially Vulnerable Area 07/18

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Cupar Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<i>Community flood action groups</i>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<i>Natural flood management study</i>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<b>Surface water plan/study</b>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include Cupar. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70500025)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Cupar Potentially Vulnerable Area caused by river flooding (7050)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National: <b>84 of 168</b>	Within local authority:	<b>12 of 16</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Kemback and Pitscottie to assess whether flood defences and sediment management could reduce flood risk. The study should also investigate the viability of property level protection and property relocation. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction		

	between actions upstream and downstream.
Potential impacts	
<b>Economic:</b>	The study could benefit 45 residential properties and 18 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £5.0 million.
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management.

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70510005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Cupar Potentially Vulnerable Area caused by river flooding (7050) Reduce economic damages to residential and non-residential properties in Cupar caused by flooding from the River Eden and Lady Burn. Reduce risk to people from river flooding in Cults and Cupar. (7049, 7051)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National:		Within local authority:
	<b>25 of 168</b>		<b>2 of 16</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Cupar and Cults Mill to assess whether flood storage, flood defences and natural flood management could reduce flood risk. Natural flood management options that should be considered include river / floodplain restoration and sediment management. The study should also investigate the viability of property level protection and property relocation. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
<b>Economic:</b>	The study could benefit 144 residential properties and 18 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £19 million.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community and socially vulnerable people located within the flood protection study area. In addition the study could benefit two utilities and two roads located within the study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the		

<b>Environmental:</b>	environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management. The physical condition of a number of rivers within the study area is identified by SEPA to be at less than good status. These include parts of the River Eden, Foodieash Burn, Fernie Burn, Kettle Burn, Laprig Burn, Glassart Burn and Ballingall Burn (water body IDs 6200, 6205, 6206, 6209, 6211, 6212 and 6213). Opportunities to improve the condition of these rivers should be considered by coordinating with river basin management planning. In addition, conservation areas and listed buildings are also present in the study area and could be positively or negatively impacted.
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<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (70470018)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Cupar and Springfield where practical (7047)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water Integrated Catchment Studies will be considered as these projects are completed.		



<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70490017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Cupar caused by flooding from the River Eden and Lady Burn. Reduce risk to people from river flooding in Cults and Cupar. (7049, 7051)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Millfield of Cupar Flood Protection Scheme. The scheme aims to manage surface water runoff and has a design standard of protection of 1 in 100 years.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70500017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Cupar caused by flooding from the River Eden and Lady Burn. Reduce risk to people from river flooding in Cults and Cupar. (7049, 7051)  Reduce economic damages to residential and non-residential properties in the Cupar Potentially Vulnerable Area caused by river flooding (7050)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing flood defences along the Blebo Burn, Ceres Burn, Craigrothie Burn, Latch Burn and an unnamed watercourse (old lade). These defences provide protection against flooding in Pitscottie and Ceres.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Fife Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

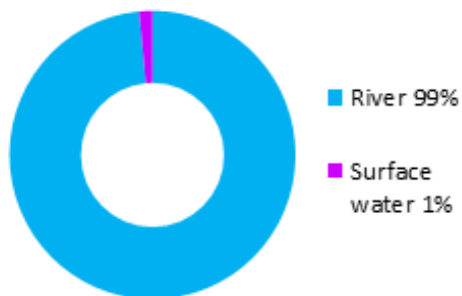
<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Fife Council operates an emergency flood plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001) Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.		

## Auchtermuchty and Pleasance (Potentially Vulnerable Area 07/19)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council, Perth and Kinross Council	River Eden

### Summary of flooding impacts



#### At risk of flooding

- 170 residential properties
- 30 non-residential properties
- £610,000 Annual Average Damages

(damages by flood source shown left)

Summary of flooding impacts

### Summary of objectives to manage flooding

Objectives have been set by SEPA and agreed with flood risk management authorities. These are the aims for managing local flood risk. The objectives have been grouped in three main ways: by reducing risk, avoiding increasing risk or accepting risk by maintaining current levels of management.

Many organisations, such as Scottish Water and energy companies, actively maintain and manage their own assets including their risk from flooding. Where known, these actions are described here. Scottish Natural Heritage and Historic Environment Scotland work with site owners to manage flooding where appropriate at designated environmental and/or cultural heritage sites. These actions are not detailed further in the Flood Risk Management Strategies.

Objectives

### Summary of actions to manage flooding

The actions below have been selected to manage flood risk.

<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<b>Natural flood management study</b>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

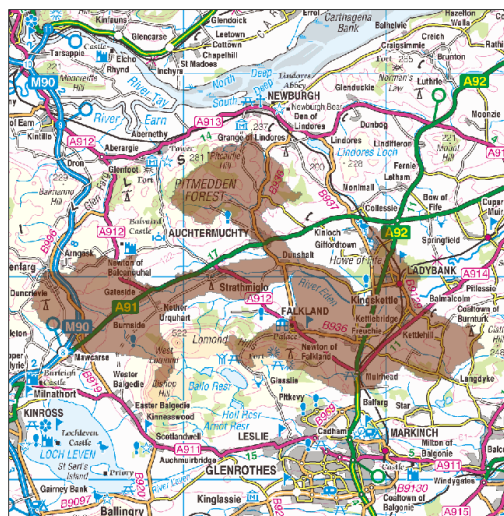
Actions

# Auchtermuchty and Pleasance (Potentially Vulnerable Area 07/19)

Local Plan District	Local authority	Main catchment
Tay Estuary and Montrose Basin	Fife Council, Perth and Kinross Council	River Eden

## Background

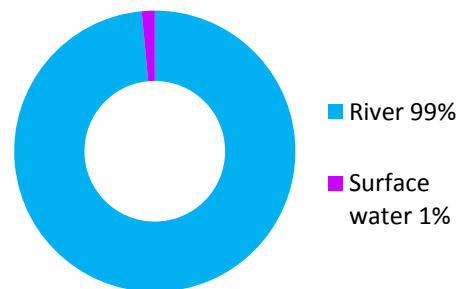
This Potentially Vulnerable Area is 101km<sup>2</sup> (shown below). It is situated in the upper reaches of the River Eden catchment and includes Auchtermuchty.



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This Potentially Vulnerable Area has a risk of river and surface water flooding with the majority of damages caused by river flooding.

There are approximately 170 residential properties and 30 non-residential properties at risk of flooding. The Annual Average Damages are approximately £610,000.



**Figure 1: Annual Average Damages by flood source**

## Summary of flooding impacts

The highest risk of flooding is in Auchtermuchty from the Auchtermuchty Burn. The risk of flooding is dispersed across this area and may also impact Strathmiglo, Kettlebridge and Falkland.

The risk of flooding to people, property, as well as to community facilities, utilities, the transport network, designated sites and agricultural land is summarised in Table 1.

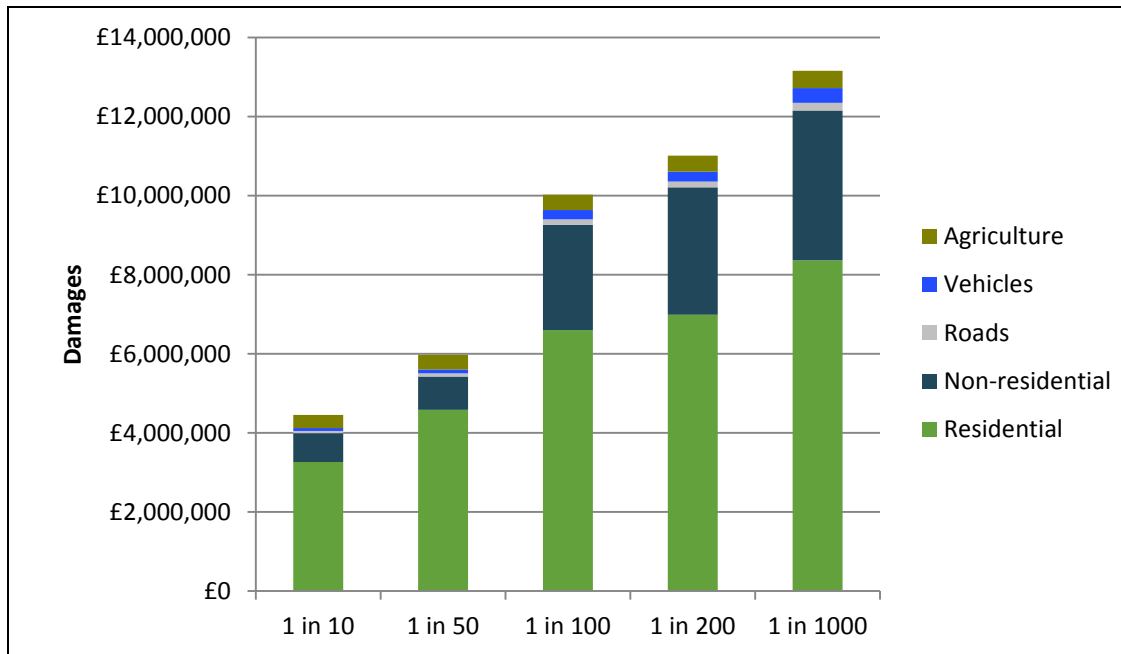
The damages associated with floods of different likelihood are shown in Figure 2. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

The location of the impacts of flooding is shown in Figure 3.

The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 4,200)	110	170	170
Non-residential properties (total 560)	20	30	30
People	240	360	360
Community facilities	0	0	0
Utilities assets	<10	<10	<10
Transport links (excluding minor roads)	1 M road (M90), 4 A roads, 4 B roads at 50 locations  2 Railway routes at 16 locations: Perth to Ladybank Dundee to Ladybank	1 M road (M90), 4 A roads, 4 B roads at 55 locations  2 Railway routes at 16 locations: Perth to Ladybank Dundee to Ladybank	1 M road (M90), 4 A roads, 4 B roads at 56 locations  2 Railway routes at 17 locations: Perth to Ladybank Dundee to Ladybank
Environmental designated areas (km <sup>2</sup> )	0	0	0
Designated cultural heritage sites	10	11	11
Agricultural land (km <sup>2</sup> )	5.6	7.0	7.6

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood

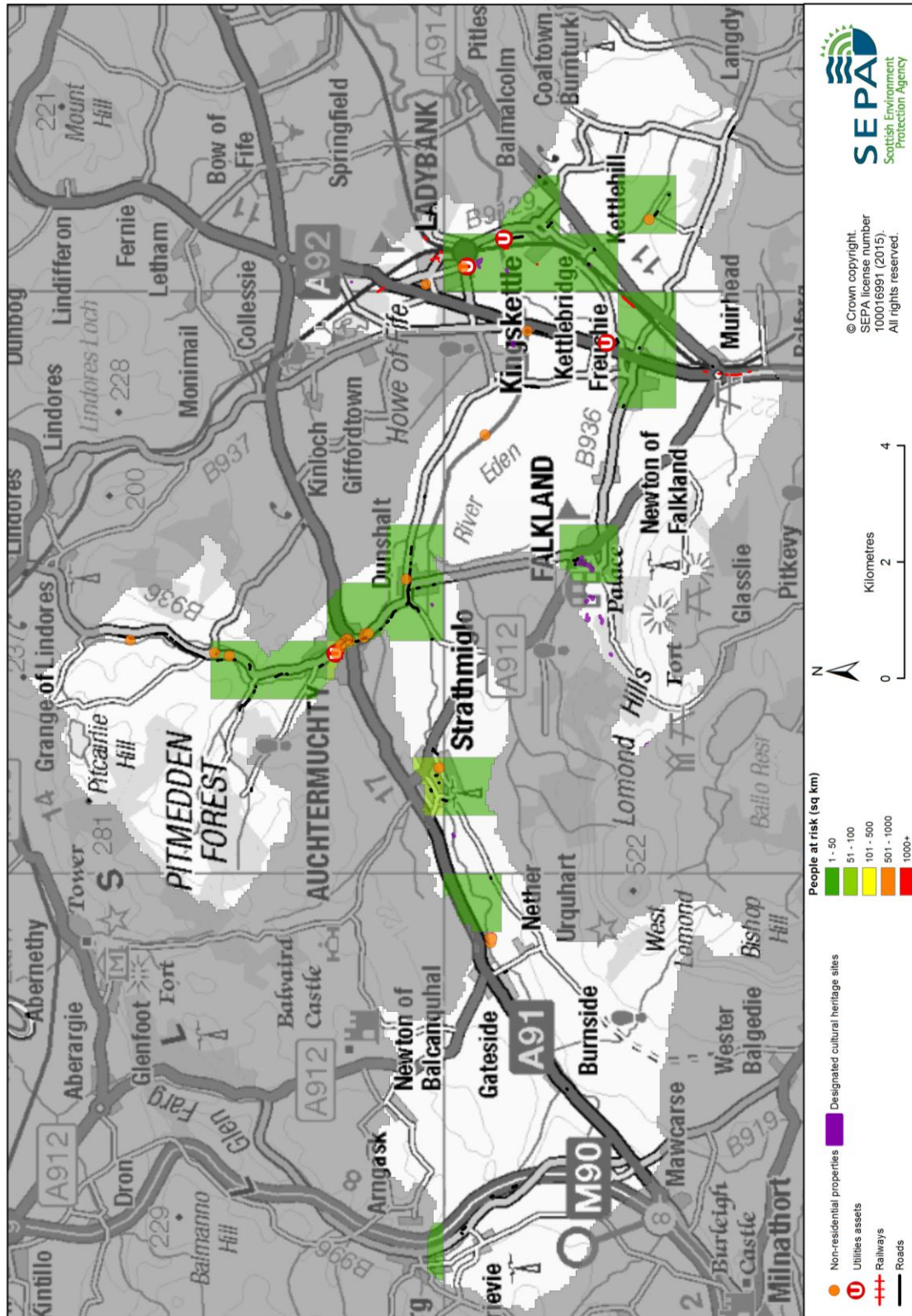


Figure 3: Impacts of flooding



## History of flooding

The following flood events have been recorded in this area:

- July 2011: A small number of properties flooded in Falkland after overnight rainfall.
- 3 August 2008: Homes and cars were affected by water up to 1m deep after a culvert became blocked on the Pitillock Burn at Freuchie Mill. Freuchie village was also affected.

## Objectives to manage flooding in Potentially Vulnerable Area 07/19

Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target areas have been set to focus actions; they do not necessarily correspond to areas at risk in SEPA's flood map. The objectives below have been set for Auchtermuchty and Pleasance Potentially Vulnerable Area.

### Reduce economic damages to residential and non-residential properties in Auchtermuchty caused by flooding from the Auchtermuchty Burn

Indicators:

Target area:

- £140,000 Annual Average Damages from residential properties
- £13,000 Annual Average Damages from non-residential properties



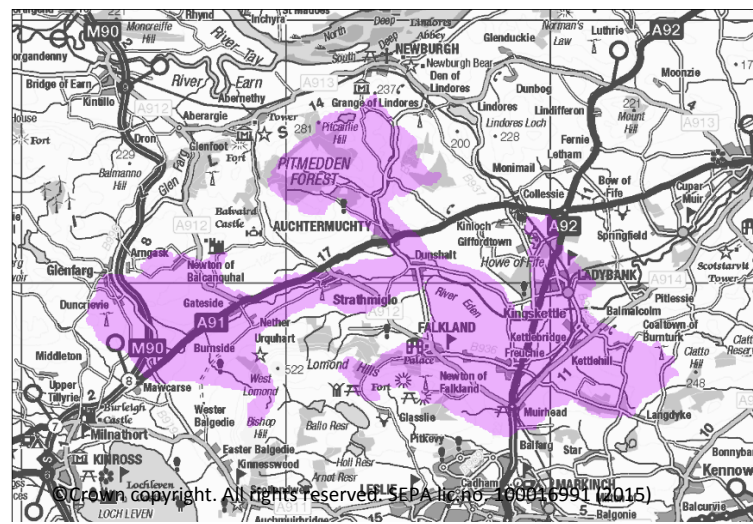
Objective ID: 7052

### Reduce economic damages to residential and non-residential properties in the Auchtermuchty and Pleasance Potentially Vulnerable Area caused by river flooding

Indicators:

Target area:

- £260,000 Annual Average Damages from residential properties
- £89,000 Annual Average Damages from non-residential properties



Objective ID: 7053

Target area	Objective	ID	Indicators within PVA
Applies across Tay Estuary and Montrose Basin Local Plan District	Avoid an overall increase in flood risk	7001	<ul style="list-style-type: none"> <li>• 170 residential properties</li> <li>• £610,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Reduce overall flood risk	7054	<ul style="list-style-type: none"> <li>• 170 residential properties</li> <li>• £610,000 Annual Average Damages</li> </ul>
Applies across Tay Estuary and Montrose Basin Local Plan District	Organisations such as Scottish Water, energy companies and Historic Environment Scotland actively maintain and manage their own assets, including the risk of flooding. These actions are not detailed further in the Flood Risk Management Strategies.		

## Actions to manage flooding in Potentially Vulnerable Area 07/19

Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives was based on a detailed assessment and comparison of economic, social and environmental criteria. The actions shaded and then described below have been selected as the most appropriate for Auchtermuchty and Pleasance Potentially Vulnerable Area.

Selected actions					
<i>Flood protection scheme/works</i>	<i>Natural flood management works</i>	<b>New flood warning</b>	<b>Community flood action groups</b>	<i>Property level protection scheme</i>	<i>Site protection plans</i>
<b>Flood protection study</b>	<b>Natural flood management study</b>	<i>Maintain flood warning</i>	<b>Awareness raising</b>	<i>Surface water plan/study</i>	<b>Emergency plans/response</b>
<b>Maintain flood protection scheme</b>	<b>Strategic mapping and modelling</b>	<b>Flood forecasting</b>	<b>Self help</b>	<b>Maintenance</b>	<b>Planning policies</b>

<b>Action (ID):</b>	<b>NEW FLOOD WARNING (70540010)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	The area under consideration includes properties affected by flooding in Fife and Perth and Kinross and is likely to include Auchtermuchty. Further feasibility assessment will be required to assess delivery potential and the final detail of communities for which warnings can be provided will be determined during the scoping process.		

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (70520005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Auchtermuchty caused by flooding from the Auchtermuchty Burn (7052)		
<b>Delivery lead:</b>	Fife Council		
<b>Priority:</b>	National: <b>72 of 168</b>	Within local authority:	<b>10 of 16</b>
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A flood protection study has been recommended for Auchtermuchty to assess whether flood storage and natural flood management could further reduce flood risk. The study should supplement previous studies carried out by Fife Council and consider the existing flood protection works. Natural flood management options that should be		

	considered include river / floodplain restoration and sediment management. The study should also investigate property relocation and the viability of property level protection. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.
Potential impacts	
<b>Economic:</b>	The study could benefit 44 residential properties and 13 non-residential properties at risk of flooding in this location, with potential damages avoided of up to £4.7 million. Sixty of these residential and non-residential properties are at risk from high likelihood flooding and may benefit from natural flood management actions.
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.
<b>Environmental:</b>	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment and designated sites. Where possible, opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Glassart Burn (water body ID 6212) is located within the study area and the physical condition of this river has been identified by SEPA to be at less than good status. Opportunities to improve the condition of the river should be considered by coordinating with river basin management planning. Conservation areas and listed buildings are also present in the study area and could be positively or negatively impacted.

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (70530003)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Auchtermuchty and Pleasance Potentially Vulnerable Area caused by river flooding (7053)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	A natural flood management study has been recommended for Dunshalt, Freuchie Mill and Kingskettle to assess whether river / floodplain restoration and sediment management could help reduce flood risk. The study should take a catchment approach and consider the potential benefits and disbenefits and interaction between actions upstream and downstream.		
Potential impacts			
<b>Economic:</b>	The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. Sixty residential and non-residential properties could potentially benefit from natural flood management actions in this location.		
<b>Social:</b>	Social impacts will depend on the outcome of the study and recommended actions. A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. Natural flood management actions can restore and enhance natural environments		

<b>Social:</b>	and create opportunities for recreation and tourism.
<b>Environmental:</b>	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. A natural flood management study is proposed in an area where the physical condition of a number of rivers is identified by SEPA to be at less than good status. These include: parts of the River Eden, Fernie Burn, Kettle Burn, Laprig Burn, Glassart Burn and Ballingall Burn (water body IDs 6200, 6206, 6209, 6211, 6212 and 6213). Opportunities to improve the condition of these rivers should be considered by coordinating with river basin management planning. In addition, listed buildings are present in the study area and could be positively or negatively impacted.

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 1,100km <sup>2</sup> of improved surface water data is currently available within this Local Plan District. The inclusion of additional surface water hazard data resulting from the completion of local authority surface water management plans and Scottish Water integrated catchment studies will be considered as these projects are completed.		

<b>Action (ID):</b>	<b>STRATEGIC MAPPING AND MODELLING (70540019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Scottish Water		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	Scottish Water will review the assessment of flood risk within the highest risk sewer catchments to improve knowledge and understanding of surface water flood risk.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70520017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in Auchtermuchty caused by flooding from the Auchtermuchty Burn (7052)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing Auchtermuchty Flood Protection Scheme. The scheme consists mainly of flood walls and a low earth embankment. The scheme has a design standard of protection of 1 in 50 years.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD PROTECTION SCHEME (70530017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Auchtermuchty and Pleasance Potentially Vulnerable Area caused by river flooding (7053)		
<b>Delivery lead:</b>	Fife Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing Dunshalt Village Flood Protection Scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (70540009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	The Scottish Flood Forecasting Service is a joint initiative between SEPA and the Met Office that produces daily, national flood guidance statements which are issued to Category 1 and 2 Responders. The service also provides information which allows SEPA to issue flood warnings, giving people a better chance of reducing the impact of flooding on their home or business. For more information please visit SEPA's website.		

<b>Action (ID):</b>	<b>COMMUNITY FLOOD ACTION GROUPS (70530012)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Auchtermuchty and Pleasance Potentially Vulnerable Area caused by river flooding (7053)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Falkland Flood Action Group, Freuchie Flood Action Group and the Kettle and District Flood Resilience Group operate in this area and aim to increase community resilience to flooding. Glenfarg Community Council also operates in this area and have prepared a community resilience plan to help prepare for and respond to emergencies.		

<b>Action (ID):</b>	<b>SELF HELP (70540011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	—		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Everyone is responsible for protecting themselves and their property from flooding. Property and business owners can take simple steps to reduce damage and disruption to their homes and businesses should flooding happen. This includes preparing a flood plan and flood kit, installing property level protection, signing up to Floodline and Resilient Communities initiatives, and ensuring that properties and businesses are insured against flood damage.		

<b>Action (ID):</b>	<b>AWARENESS RAISING (70540013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Responsible authorities		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	SEPA and the responsible authorities have a duty to raise public awareness of flood risk. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact. From 2016 SEPA will undertake flood risk education and awareness raising activities. In addition, SEPA will engage with Fife Council and community resilience groups where possible. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		



<b>Action (ID):</b>	<b>MAINTENANCE (70540007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Fife Council and Perth and Kinross Council, asset / land managers		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Local authorities have a duty to assess watercourses and carry out clearance and repair works where such works would substantially reduce flood risk. They produce schedules of clearance and repair works and make these available for public inspection. Scottish Water undertake inspection and repair on the public sewer network. Asset owners and riparian landowners are responsible for the maintenance and management of their own assets including those which help to reduce flood risk.		

<b>Action (ID):</b>	<b>EMERGENCY PLANS/RESPONSE (70540014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (7054)		
<b>Delivery lead:</b>	Category 1 and 2 Responders		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Providing an emergency response to flooding is the responsibility of many organisations, including local authorities, the emergency services and SEPA. Effective management of an emergency response relies on emergency plans that are prepared under the Civil Contingencies Act 2004 by Category 1 and 2 Responders. The emergency response by these organisations is co-ordinated through regional and local resilience partnerships. This response may be supported by the work of voluntary organisations. Fife Council operates an emergency flood plan. Fife Council also provides flood sacks for use in emergencies and has installed flood pods containing flood protection products for use in emergencies in flood risk areas.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (70010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (7001)		
<b>Delivery lead:</b>	Planning authority		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	<p>Scottish Planning Policy and accompanying Planning Advice Notes set out Scottish Ministers' priorities for the operation of the planning system and for the development and use of land. In terms of flood risk management, the policy supports a catchment-scale approach to sustainable flood risk management and aims to build the resilience of our cities and towns, encourage sustainable land management in our rural areas, and to address the long-term vulnerability of parts of our coasts and islands. Under this approach, new development in areas with medium to high likelihood of flooding should be avoided. For further information on the application of national planning policies see Annex 2.</p>		

# Flood Risk Management Strategy

## Tay Estuary and Montrose Basin Local Plan District

This section provides supplementary information on the characteristics and impacts of river, coastal and surface water flooding. Future impacts due to climate change, the potential for natural flood management and links to river basin management are also described within these chapters.

Detailed information about the objectives and actions to manage flooding are provided in Section 2.

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## 3.1 Introduction

In the Tay Estuary and Montrose Basin Local Plan District, river flooding is reported across four distinct river catchments. Coastal flooding and surface water flooding are reported across the whole Local Plan District.

A summary of the number of properties and Annual Average Damages from river, coastal and surface water flooding is outlined in Table 1.

	Total number of properties at risk <sup>1</sup>	Annual Average Damages	Local authority
<b>River catchments</b>			
River North Esk catchment	170	£560,000	Aberdeenshire Council Angus Council Perth and Kinross Council
River South Esk catchment	230	£810,000	Angus Council Perth and Kinross Council
Firth of Tay catchment group	1,500	£4.0 million	Dundee City Council Fife Council Perth and Kinross Council
Kincardine and Angus catchment group	370	£1.1 million	Aberdeenshire Council Angus Council
<b>Coastal flooding</b>			
Tay Estuary and Montrose Basin coastal area	1,700	£5.3 million	Aberdeenshire Council Angus Council Dundee City Council Fife Council
<b>Surface water flooding</b>			
Tay Estuary and Montrose Basin Local Plan District	2,000	£4.3 million	Aberdeenshire Council Angus Council Dundee City Council Fife Council Perth and Kinross Council

**Table 1:** Summary of flood risk from various sources within the Tay Estuary and Montrose Basin Local Plan District

<sup>1</sup> Total number of residential and non-residential properties at risk of flooding.

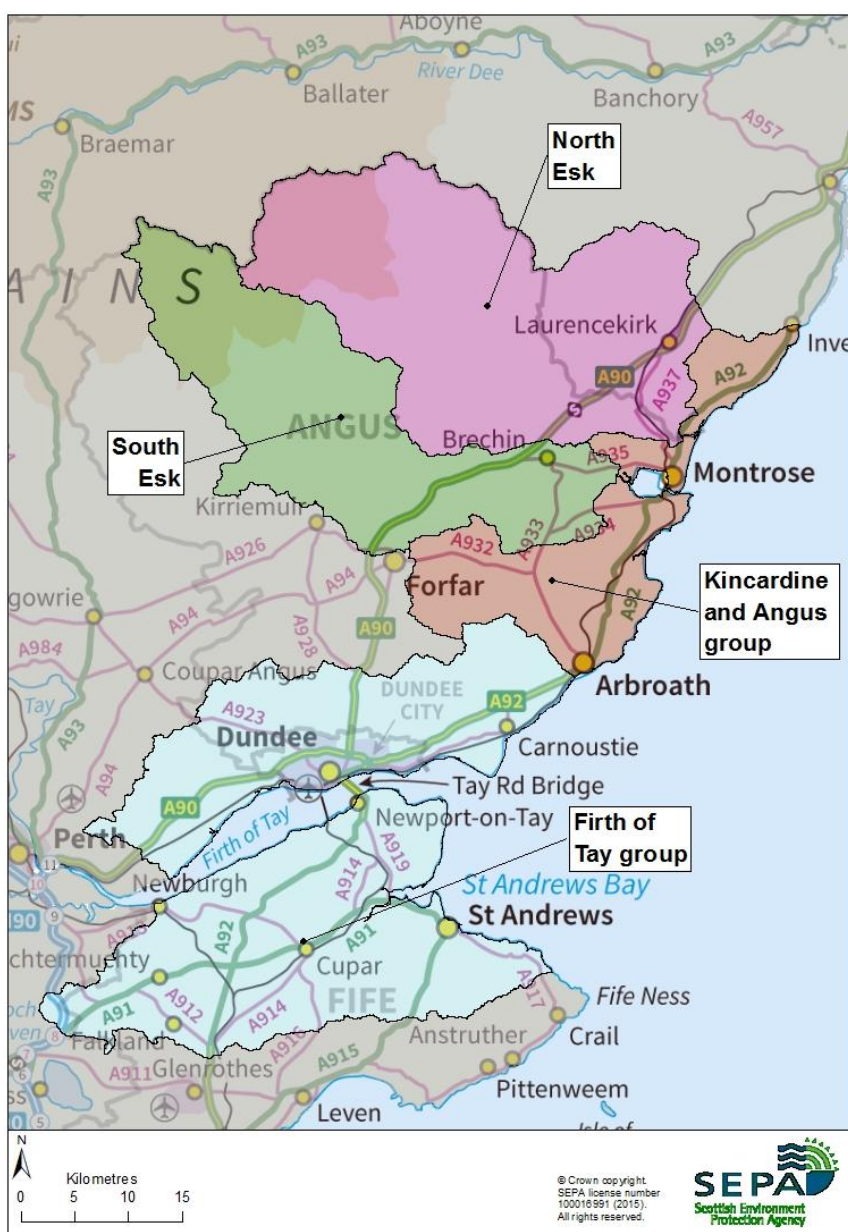
## 3.2 River flooding

### Tay Estuary and Montrose Basin Local Plan District

This section provides supplementary information on river flooding at the catchment level. It provides an overview of the catchment's natural characteristics, flood risk and the existing actions to manage flooding. It outlines the likely impact of climate change and the potential for natural flood management.

Detailed information about the objectives and actions to manage flooding are provided in Section 2.

In the Tay Estuary and Montrose Basin Local Plan District, river flooding is reported across four distinct river catchments, shown below.



**Figure 1:** River catchments within the Tay Estuary and Montrose Basin Local Plan District

## River flooding River North Esk catchment

### Catchment overview

The River North Esk catchment covers an area of 765km<sup>2</sup>. The main watercourses include the River North Esk, Luther Water and West Water. The catchment is mainly rural but also contains some dispersed urban centres including Laurencekirk and Fettercairn.

The Highland boundary fault cuts across the catchment from Kirkton of Menmuir in the west to Auchenblae in the east. The fault line marks distinct differences in topography, rainfall and land use.

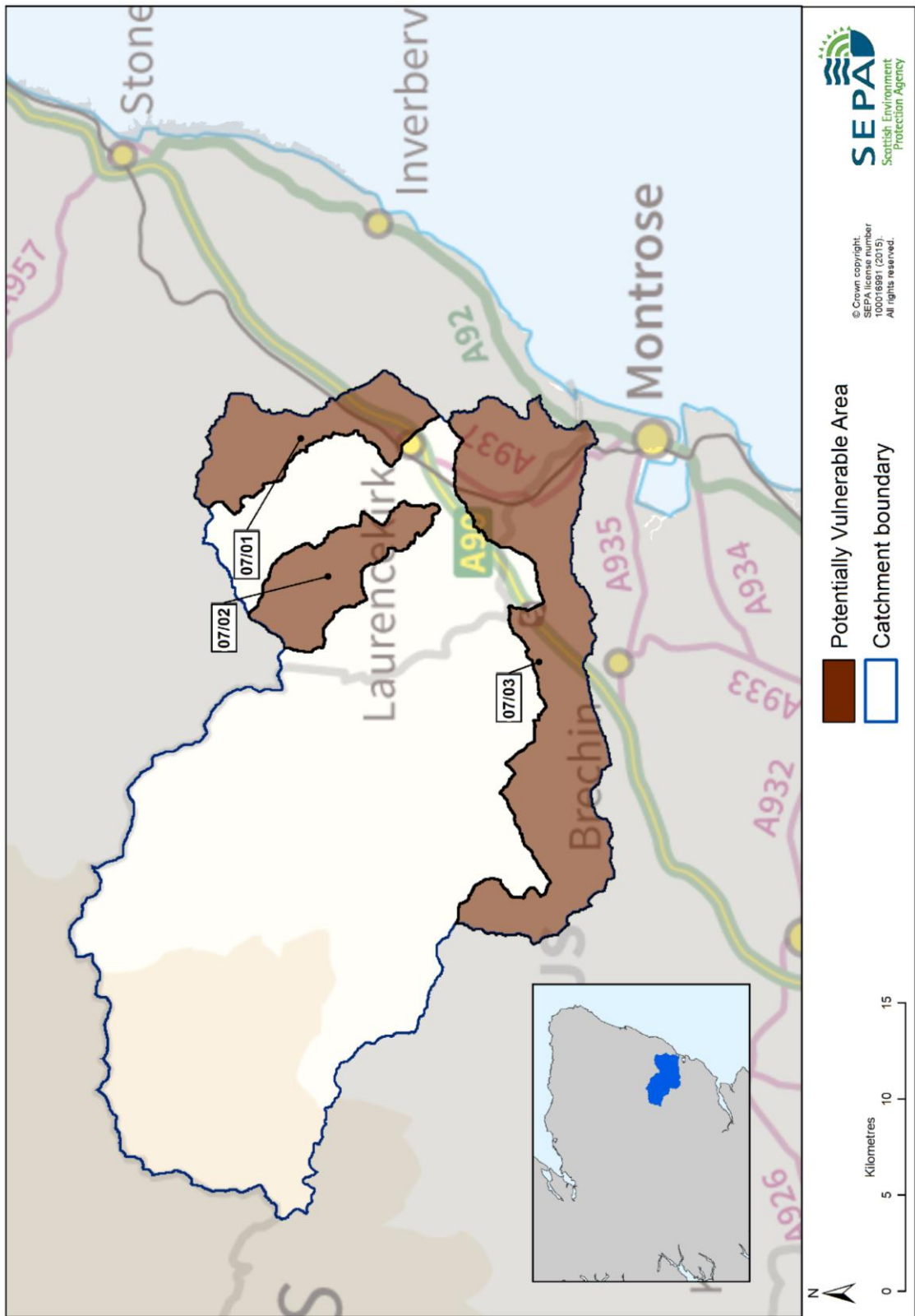
North of the Highland boundary fault the catchment is steep and upland in nature, rising to its highest point of 939m in its headwaters at Mount Keen. Rainfall is higher in the headwaters of the catchment with the average annual rainfall between 1000-1250mm. The land cover includes montane habitats, heather and heather grassland.

To the south of the Highland fault the catchment is more lowland in nature, featuring gentle slopes. In the lower reaches of the catchment rainfall is lower with average annual rainfall between 600-700mm. The catchment is more lowland in nature and the land cover is largely arable with more settlements.

### Flood risk in the catchment

Within the River North Esk catchment approximately 110 residential and 60 non-residential properties are at risk of river flooding. It is estimated that 67% of these properties are located within Potentially Vulnerable Areas. There are three Potentially Vulnerable Areas at risk of river flooding in this catchment (Figure 1):

- Laurencekirk (07/01)
- Fettercairn (07/02)
- North of Brechin (07/03).



**Figure 1:** The River North Esk catchment and Potentially Vulnerable Areas with a risk of river flooding

## Main areas at risk

The main areas at risk of river flooding, the number of properties at risk and the total Annual Average Damages caused by river flooding are shown in Table 1. The Annual Average Damages include damages to residential and non-residential properties, transport, emergency services and agriculture.

	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Fettercairn	50	£100,000
Auchenblae	10	£89,000
Edzell	10	£1,000 <sup>1</sup>

**Table 1:** Main areas at risk of river flooding

## Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the River North Esk catchment are approximately £560,000. The damages are distributed as follows:

- 61% residential properties (£340,000)
- 14% agriculture (£80,000)
- 11% non-residential properties (£60,000)
- 7% emergency services (£40,000)
- 5% roads (£30,000)
- 2% vehicles (£10,000).

Figure 2 shows the Annual Average Damages throughout the catchment. The highest damages are in and around the towns of Fettercairn and Auchenblae. This is due to the higher density of residential properties and a scattering of non-residential properties affected by flooding from the Burn of Cauldcots and Luther Water respectively.

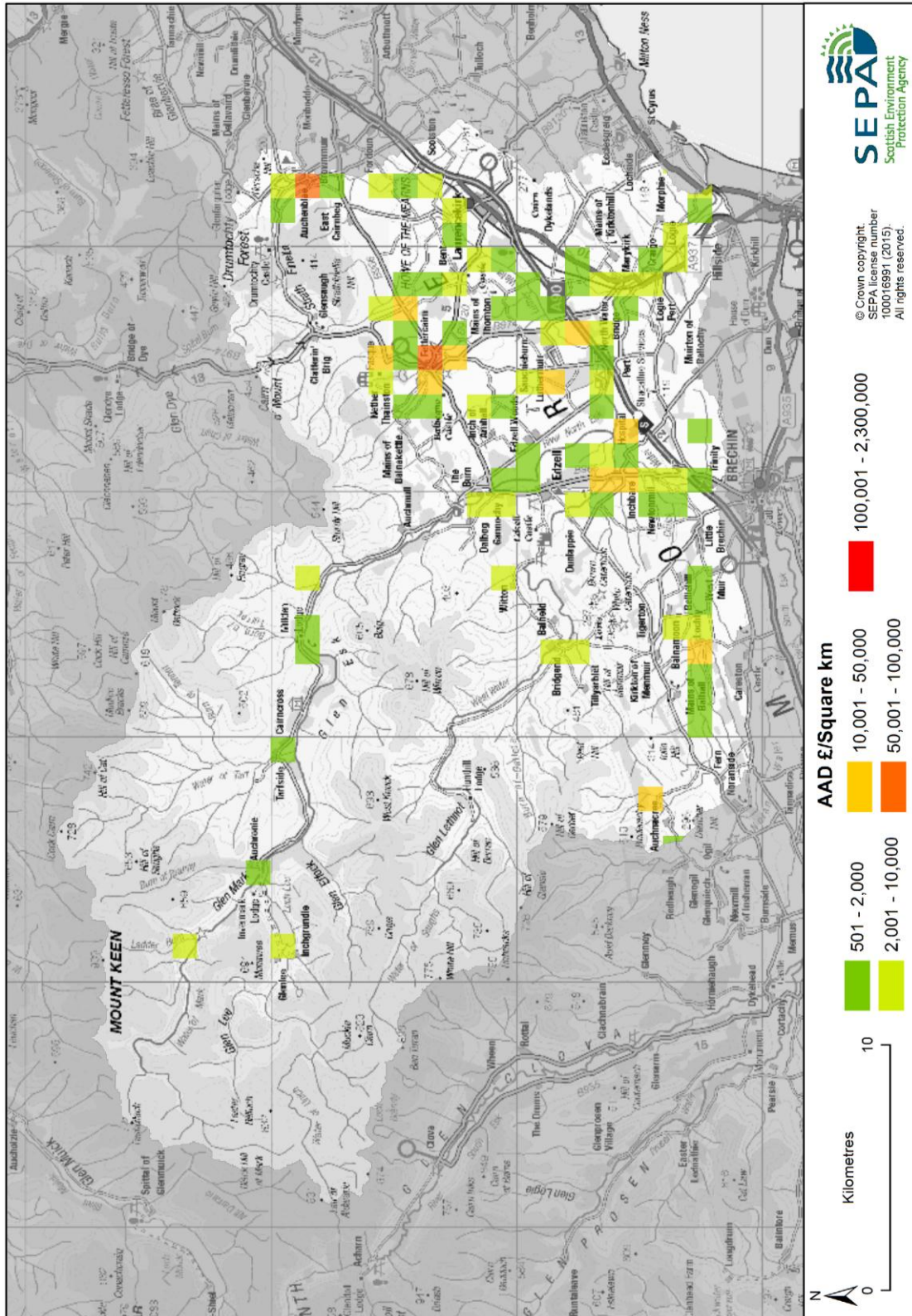
Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
Community facilities	0	
Utility assets	0	
Roads (excluding minor roads)	6	3 A roads at 10 locations 3 B roads at 38 locations
Railway routes	1	Dundee to Aberdeen (4 locations at risk)
Agricultural land (km <sup>2</sup> )	23.5	

**Table 2:** Infrastructure and agricultural land at risk of river flooding

<sup>1</sup> The damages presented in this report are derived from SEPA data that is assessed at a strategic level. The damages and number of properties at Edzell may be underestimated due to small watercourses not being modelled





**Figure 2:** Annual Average Damages from river flooding

## Designated environmental and cultural heritage sites at risk

Within the catchment there are approximately 18 designated cultural heritage sites at risk of river flooding. These sites include scheduled monuments, gardens and designed landscapes and listed buildings.

It is estimated that three environmental designated areas are at risk of river flooding. This includes a Special Protection Area (the Cairngorms Massif) and two Sites of Special Scientific Interest, including the North Esk and West Water Palaeochannels.

## History of flooding

The River North Esk and its tributaries have a long history of flooding. Urban areas affected by flooding include Fettercairn and Edzell.

Perhaps the most significant flood occurred on 30 September 1962 when widespread torrential rain caused flooding and destruction in many areas of Angus with three bridges being swept away, the river rising 11 feet in two hours and a 23 year old camper being swept away by Water of Mark floodwaters.

The highest river level was recorded at SEPA's Logie Mill gauging station in November 2002 with a peak flow of 636 m<sup>3</sup>/s. This was the highest flow recorded at this gauging station since the start of recording in 1983. Seven houses and several people were evacuated in Marykirk, Logie and Kinnaber by emergency services. Houses and commercial property were affected in Laurencekirk and Fettercairn.

A recent flood happened on 21 December 2012 with 40 houses affected and 20 residents moved to temporary accommodation when Whishop Burn flooded in Edzell. Fettercairn also flooded affecting properties.

The earliest flood on record occurred in January 1933 with flooding occurring across the catchment. At a village near Laurencekirk a burn overflowed and houses were inundated.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters in Section 2.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This chapter describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapters in Section 2.

## Flood protection schemes

There is one formal flood protection scheme in this catchment that reduces the risk of river flooding to Fettercairn with a 1 in 20 year flood event design standard of protection.

## River flood warning schemes

There are five river flood warning areas within this catchment as shown in Table 3 and Figure 3. Table 3 shows the total number of properties in the flood warning area and the percentage of those properties that have signed up to receive flood warnings. Note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Number of properties within FWA	% of properties registered July 2014
Arnhall and Millhouse	River North Esk	5	20%
Edzell	River North Esk	1	0%
Inchbare	River North Esk	8	13%
Logie Mill and Craigo	River North Esk	13	85%
Marykirk	River North Esk	15	53%

**Table 3:** Flood warning areas

## Community groups

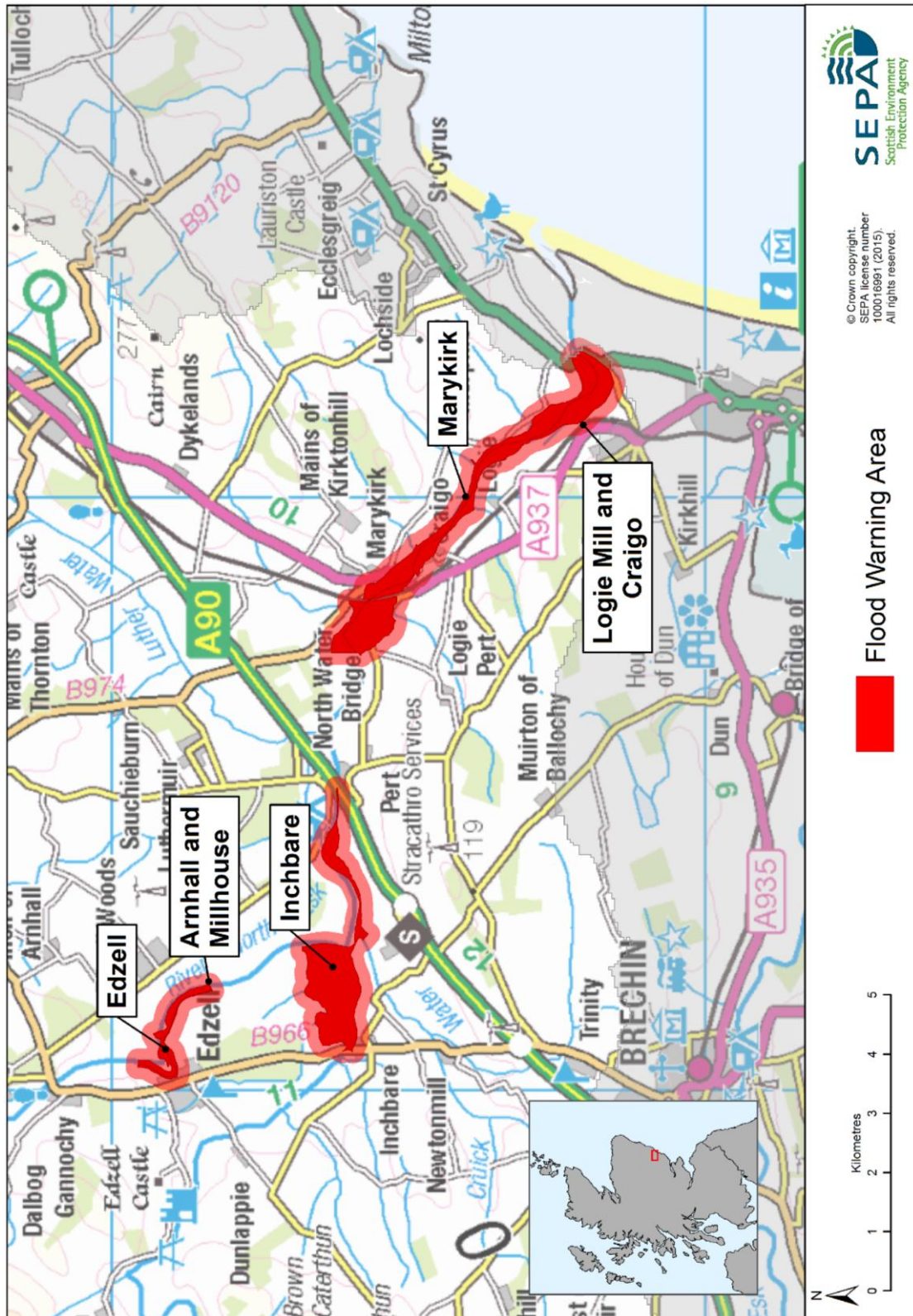
The following community groups are known to operate within this catchment:

- Edzell Community Flood Action Group is a local group formed in the aftermath of the December 2012 flooding. Regular meetings are held to liaise between responsible authorities and residents to improve response and resilience
- Fettercairn Flood Resilience Group is a community run group set up in spring 2013 and supported, where possible, by Aberdeenshire Council.

## Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection. In this catchment:

- Aberdeenshire Council provides a range of flood protection products at cost price with free delivery across Aberdeenshire, available for all types of flooding
- Aberdeenshire Council also owns and operates river level gauges on telemetry for Fettercairn and Marykirk
- Angus Council provides flood protection products at cost price for flood risk areas
- Angus Council also uses sandbags in some flood risk areas as part of an emergency response plan.



**Figure 3: River flood warning areas**

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the River North Esk catchment may increase by 35%<sup>2</sup>. This would potentially increase the number of residential properties at risk of river flooding from approximately 110 to 140 and the number of non-residential properties from approximately 55 to 60.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for runoff reduction, floodplain storage and sediment management. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

Natural flood management initiatives are already underway in this catchment. An example of a natural flood management project that benefits ecology and flood risk management is the Balmaleedy re-meandering project.

### Runoff reduction

Approximately one third of the River North Esk catchment contains areas of medium or high potential for runoff reduction. In the north this includes areas surrounding Mount Keen, Hill of Cat, Hill of Saughs and Hill of Cammie. In the south these areas can be found around the Hill of Warren and to the east the Cairn O' Mount.

### Floodplain storage

The potential for floodplain storage within the catchment appears limited to Loch Lee, upstream of the Luther Water at Laurencekirk, North Water Bridge at Marykirk, the Sauchie Burn near Luthermuir, and the River North Esk, south of Edzell at Inchbare.

### Sediment management

Across the catchment sediment erosion and deposition appears to be balanced, particularly in the upper reach of the River North Esk and its tributaries. Sediment deposition appears to be high on the Devilly Burn which may have some effect on the Fettercairn Potentially Vulnerable Area. In the lower reaches of the River North Esk,

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<sup>2</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

sediment deposition appears to be high to the north west of Marykirk. This may occur due to higher levels of sediment erosion on the lower reach of the Black Burn and may be attributable to natural processes. Further investigation may be required to determine whether sediment management would be beneficial.

## River flooding River South Esk catchment

### Catchment overview

The River South Esk covers an area of 563km<sup>2</sup>. The main watercourses include the River South Esk, Brothock Water, Prosen Water and Noran Water. The catchment is mainly rural and contains the town of Brechin.

The Highland boundary fault cuts across the catchment from Balloch in the west to Ogil in the east. The faultline marks distinct differences in topography, rainfall and land use.

North of the boundary fault the catchment is steep and upland in nature rising to its highest point of 1,000m at the Mounth. Rainfall is higher in the headwaters with the average annual rainfall between 1250-1500mm.

To the south of the Highland fault, the catchment is more lowland in nature, with gentle slopes. The rainfall is lower with average between 700-800mm annually.

### Flood risk in the catchment

Within the River South Esk catchment approximately 150 residential and 80 non-residential properties are at risk of river flooding. It is estimated that 60% of these properties are located within the Potentially Vulnerable Area. There is one Potentially Vulnerable Area in this catchment area which covers the town of Brechin (07/05) (Figure 1).

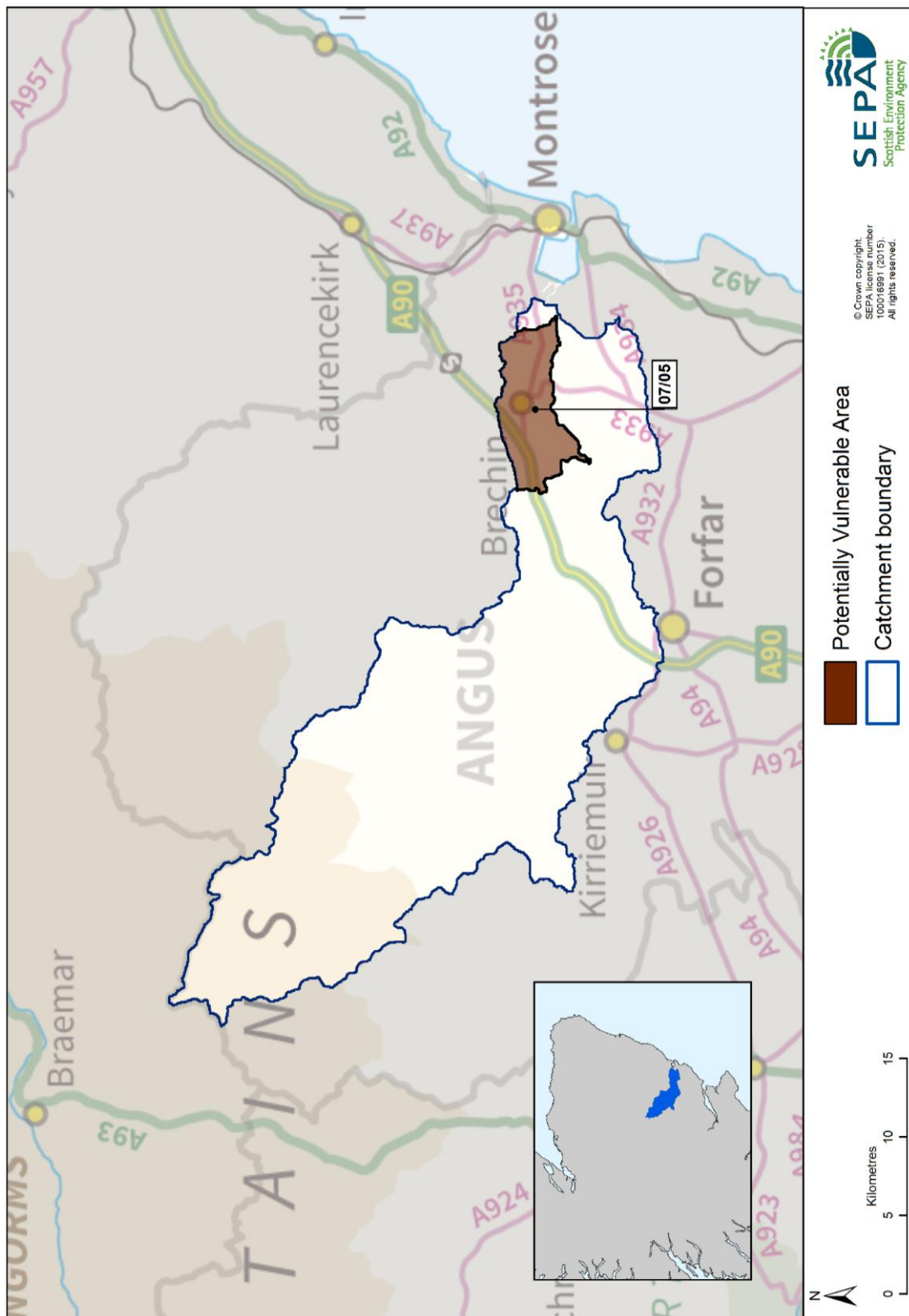
#### Main areas at risk

Brechin is the main urban area at risk of river flooding, where approximately 80 residential and 50 non-residential properties are at risk and the Annual Average Damages caused by river flooding are £410,000. This includes damages to residential and non-residential properties, transport and agriculture.

#### Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the River South Esk catchment are approximately £810,000. The damages are distributed as follows:

- 41% non-residential properties (£330,000)
- 38% residential properties (£310,000)
- 7% emergency services (£60,000)
- 7% agriculture (£60,000)
- 5% roads (£40,000)
- 2% vehicles (£14,000).



**Figure 1:** The River South Esk catchment and Potentially Vulnerable Areas with a risk of river flooding



Figure 2 shows the Annual Average Damages throughout the catchment. The highest damages can be seen to the south east of Brechin. This is due to the higher density of residential properties and a scattering of non-residential properties affected by flooding from the River South Esk.

Table 1 shows further information about infrastructure and agricultural land at risk of flooding within this catchment.

	Number at risk	Further detail
<b>Community facilities</b>	0	
<b>Utility assets</b>	<10	Includes: electricity substations, fuel extraction and telephone exchanges
<b>Roads (excluding minor roads)</b>	8	4 A roads at 27 locations 4 B roads at 22 locations
<b>Railway routes</b>	0	
<b>Agricultural land (km<sup>2</sup>)</b>	23.2	

**Table 1:** Infrastructure and agricultural land at risk of river flooding

### Designated environmental and cultural heritage sites at risk

Within the catchment approximately nine designated cultural heritage sites are at risk of river flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield sites and listed buildings.

Approximately 11 environmental designated areas are at risk of river flooding. These include two Special Areas of Conservation, four Special Protection Areas and five Sites of Special Scientific Interest. Amongst the sites at risk are Caenlochan and the Cairngorms Massif.

### History of river flooding

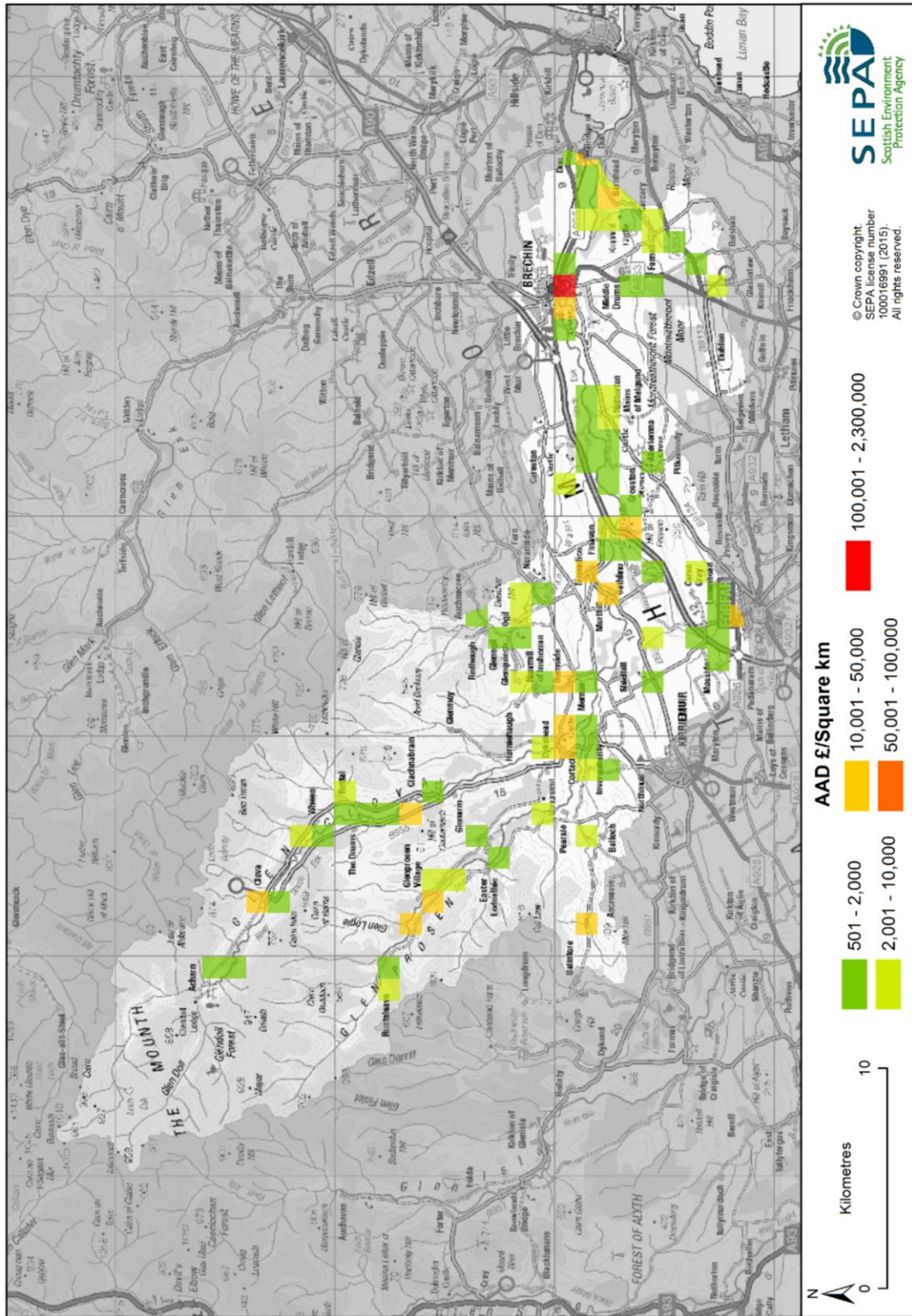
According to flood records, the town of Brechin has a long history of flooding.

Perhaps the most significant flood occurred on 5 October 1920 when the river reached 8-9 feet above normal levels. River Street flooded from Fordmouth to the bridge up to a depth of 5 inches. 58 houses flooded up to a depth of 3 feet.

The earliest flood on record dates back to 1774 when houses were inundated by flood water on River Street.

A recent flood occurred in November 2002, which was also the biggest flood recorded at the SEPA's Brechin gauging station. The river reached a peak of 2.8 metres above normal levels, flooding large areas of town and necessitating evacuation and temporary relocation of families. 30 properties were affected and roads were closed.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters in Section 2.



**Figure 2:** Annual Average Damages from river flooding

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapters.

### Flood protection schemes

There is one flood protection scheme currently under construction which is in Brechin and is due to be completed in January 2016. Natural flood management works are also underway as part of the flood protection scheme.

### River flood warning schemes

There are three river flood warning areas within this catchment, as shown in Table 2 and Figure 3. Table 2 shows the total number of properties in the flood warning area and the percentage of those properties that have signed up to receive flood warnings. Please note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Number of properties within FWA	% of properties registered July 2014
Brechin	River South Esk	332	23%
Finavon and Tannadice	River South Esk	89	31%
Kinnaird/Bridge of Dun	River South Esk	40	53%

**Table 2:** River flood warning areas

### Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- Angus Council provides flood protection products at cost price for flood risk areas
- Angus Council also uses sandbags in some high risk areas as part of an emergency response plan.

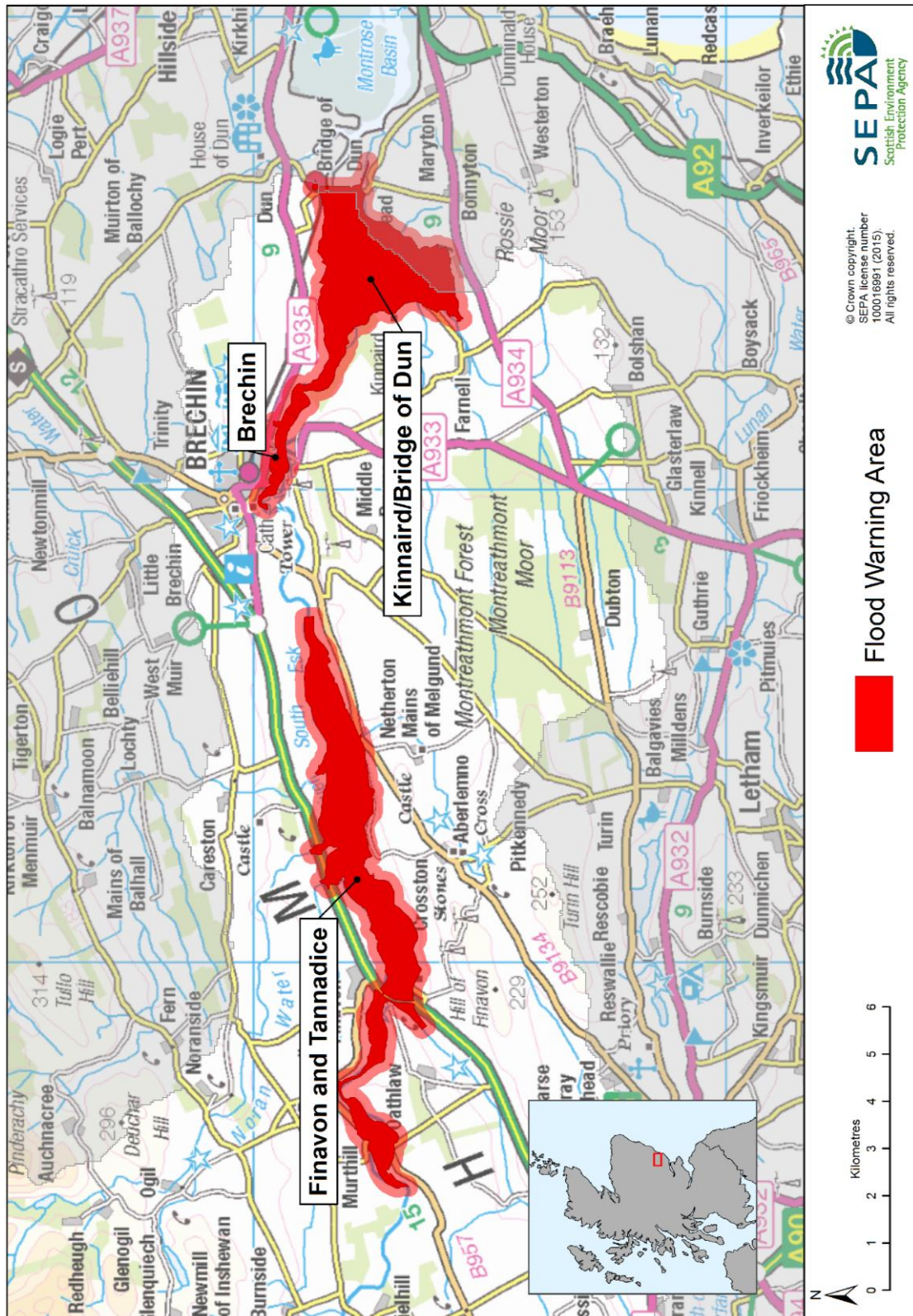


Figure 3: River flood warning areas

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the River South Esk catchment may increase by 35%<sup>1</sup>. This would potentially increase the number of residential properties at risk of river flooding from approximately 150 to 280 and the number of non-residential properties from approximately 80 to 100.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for runoff reduction, floodplain storage and sediment management. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

A number of natural flood management initiatives are already underway in this catchment. Upland reforestation is being implemented by Angus Council as part of Brechin flood protection scheme. A further two projects are currently underway in this catchment. This is the South Esk pilot project, led by SEPA, and the Glen Clova tree planting project, led by the Esk Fisheries Board with support from Angus Council. Both initiatives have the potential to reduce flood risk whilst delivering multiple benefits.

### Runoff reduction

The greatest runoff reduction potential is in the north of the catchment. This includes areas surrounding Cairn Baddoch, Loch Brandy and Ben Tirran. Brechin Potentially Vulnerable Area is located in the south of the catchment and further investigation will be required to determine how much impact natural flood management actions could have on flooding in this area.

### Floodplain storage

Floodplain storage potential has been identified upstream and downstream of Brechin on the River South Esk. An area that it would be valuable to investigate further is located upstream of Brechin.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

## **Sediment management**

Across the catchment there are reaches of moderate erosion and deposition. This is particularly true for the northern reaches of the River South Esk and its tributaries. Further downstream on the River South Esk, particularly between Finavon and Brechin, sediment erosion and deposition appears high. This may be attributable to natural processes. Further investigations may be required to determine whether natural flood management actions may help manage sediment in these stretches of the river.

## River flooding Firth of Tay catchment group

### Catchment overview

The Firth of Tay river catchment group comprises of a number of smaller catchments. It covers a total area of 1,051km<sup>2</sup>. The main rivers in this group are the Elliot Water, Monikie Burn, Barry Burn, Dighty Water, River Eden, Kenly Water and Motray Water.

The Firth of Tay catchment group is gently sloping with dry soils typical of a low lying east coast location. Land use is dominated by agriculture, mainly arable farming and horticulture.

The average annual rainfall for this catchment group is low for Scotland, with 600-700mm falling in the lower part of the catchment, rising to 800-1000mm in the upper catchment.

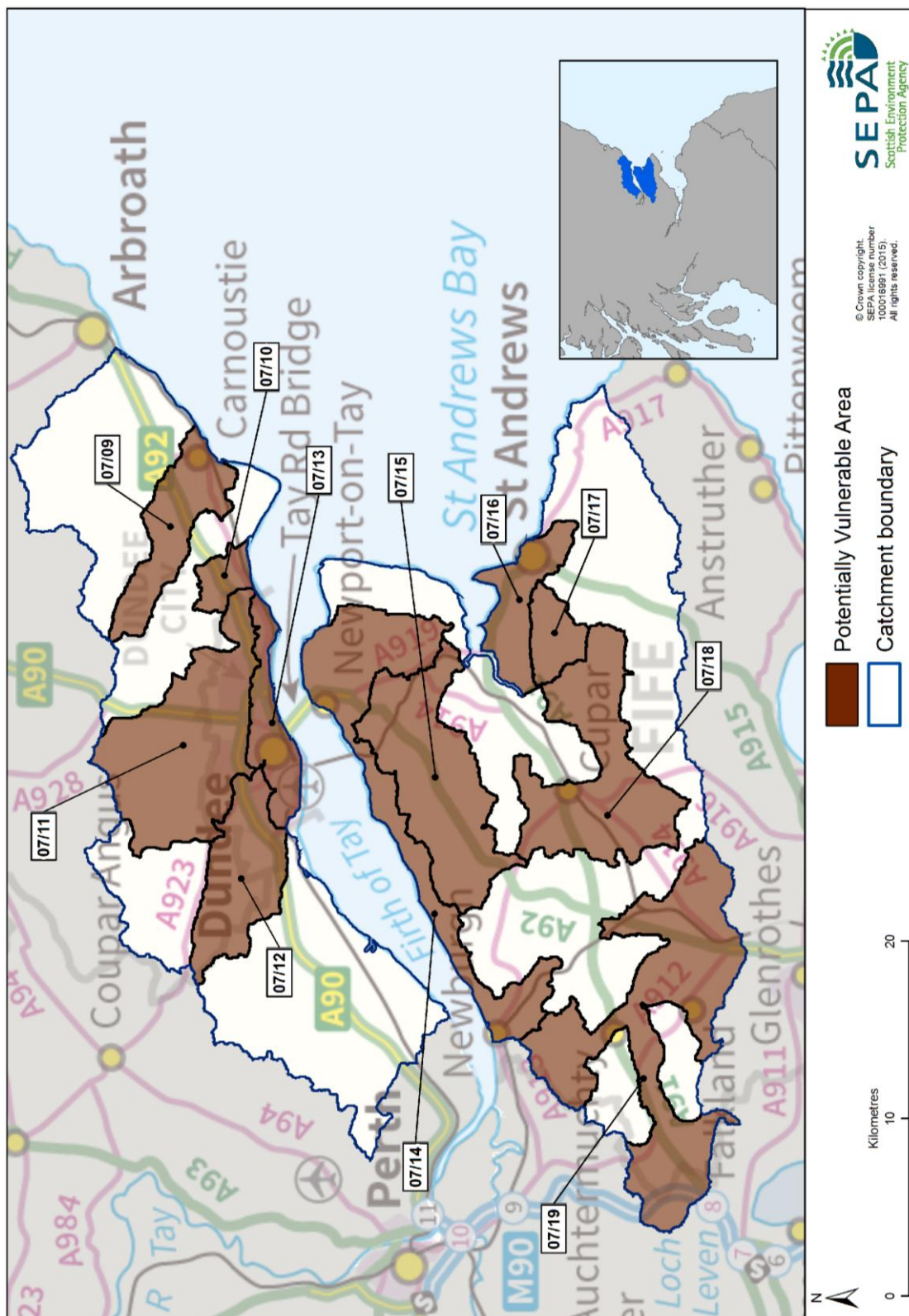
### Flood risk in the catchment

Within the Firth of Tay catchment group approximately 1,200 residential and 250 non-residential properties are at risk of river flooding. It is estimated that 83% of these properties are located within Potentially Vulnerable Areas. There are 11 Potentially Vulnerable Areas at risk of river flooding in this catchment group (Figure 1):

- Carnoustie and Barry (07/09)
- Monifieth (07/10)
- Downfield and Dundee (07/11)
- Invergowrie (07/12)
- Dundee and Broughty Ferry (07/13)
- Tayport and Newburgh (07/14)
- Lucklawhill (07/15)
- St Andrews to Guardbridge (07/16)
- St Andrews (Denhead and Strathkinness) (07/17)
- Cupar (07/18)
- Auchtermuchty and Pleasance (07/19).

### Main areas at risk

The main areas with a risk of river flooding can be seen in Table 1 which shows the number of properties at risk and the Annual Average Damages caused by river flooding. This includes damages to residential and non-residential properties, transport and agriculture.



**Figure 1:** The Firth of Tay catchment group and Potentially Vulnerable Areas with a risk of river flooding



	Residential and non-residential properties at risk of river flooding	Annual Average Damages
Monifieth	280	£650,000
Dundee (incl. Invergowrie)	210	£390,000
Cupar	160	£260,000
St Andrews	140	£270,000
Carnoustie/Barry	120	£200,000
Auchtermuchty	60	£200,000
Strathmiglo	40	£100,000
Falkland	10	£29,000
Freuchie	10	£19,000
Tayport	10	£9,000

**Table 1:** Main areas at risk of river flooding

### Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Firth of Tay catchment group are approximately £4.0 million. The damages are distributed as follows:

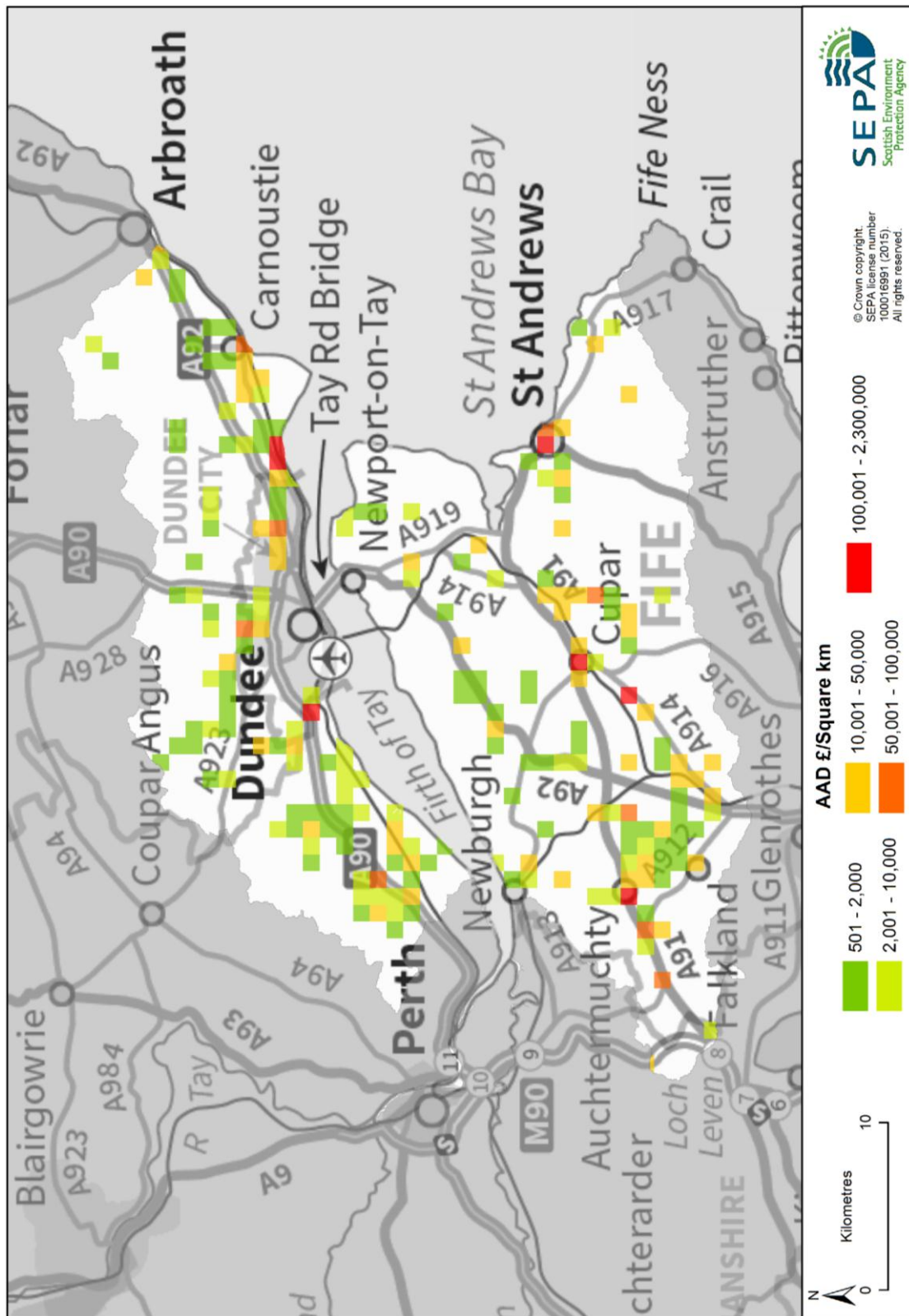
- 55% residential properties (£2.2 million)
- 30% non-residential properties (£1.2 million)
- 7% emergency services (£280,000)
- 4% agriculture (£150,000)
- 2% roads (£90,000)
- 2% vehicles (£80,000).

Figure 2 shows the Annual Average Damages throughout this catchment group. The highest damages can be seen west of Springfield due to a higher density of non-residential properties at risk of flooding from the River Eden and at Monifieth due to higher density of residential properties at risk of flooding from the Monifieth Burn.

Table 2 shows further information about infrastructure and agricultural land at risk of flooding within this catchment group.

	Number at risk	Further detail
<b>Community facilities</b>	0	
<b>Utility assets</b>	20	Includes electricity substations, fuel extraction and cooling sites
<b>Roads (excluding minor roads)</b>	25	1 M roads (M90) at 2 locations 10 A roads at 101 location, 14 B roads at 92 locations
<b>Railway routes</b>	4	Dundee to Aberdeen (15 locations at risk) Dundee to Dunblane (9 locations at risk) Dundee to Thornton junctions (8 locations at risk) Perth to Thornton junctions (13 locations at risk)
<b>Agricultural land (km<sup>2</sup>)</b>	44.2	

**Table 2:** Infrastructure and agricultural land at risk of river flooding



**Figure 2:** Annual Average Damages from river flooding

## Designated environmental and cultural heritage sites at risk

Within the catchment group there are approximately 40 designated cultural heritage sites with a risk of river flooding. These sites include scheduled monuments, gardens and designed landscapes, battlefield sites and listed buildings.

It is estimated that 20 environmental designated areas are at risk of river flooding. This includes two Special Areas of Conservation, three Special Protection Areas and 15 Sites of Special Scientific Interest. Amongst these sites are the Firth of Tay and Eden Estuary, Barry Links and Tentsmuir.

## History of river flooding

Perhaps the most significant floods in this catchment group happened in January 1993 and April 1992. In January 1993 the River Eden caused serious flooding in Auchtermuchty and Strathmiglo with the highest recorded river level of 1.67m above normal level at SEPA's Strathmiglo gauging station. In April 1992 there was widespread flooding throughout Fife when more than 80mm of rain fell in 24 hours. This caused significant flooding in Cupar from the River Eden. This was also the highest recorded river level of 2.2m above normal levels at SEPA's Kemback gauging station.

A recent flood happened on 11 October 2012 in Pitscottie and Dura Den from the Ceres Burn when a road and part of a house was washed away.

The earliest flood recorded in this catchment group dates back to 22 October 1864 when widespread flooding throughout Fife was recorded. 49mm of rain fell in a single day.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters in Section 2.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapters.

### Flood protection schemes

There are six flood protection schemes in this catchment group:

- Carnoustie (Barry Burn) Flood Prevention Scheme
- Millfield of Cupar Flood Prevention Scheme
- Ceres Village Flood Prevention Scheme
- Pitscottie Village Flood Prevention Scheme
- Auchtermuchty Flood Prevention Scheme
- Dunshalt Village Flood Prevention Scheme.

## Community groups

The following community groups are known to operate within this catchment group:

- Carse of Gowrie Sustainability Group
- Dighty Flood Action Group
- Falkland Flood Action Group
- Freuchie Flood Action Group
- Kettle and District Flood Action Group
- Strathmartine Community Council Flood Group.

## Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- Dundee City Council owns and operates an emergency flood plan for Dundee City
- Dundee City Council also supplies and distributes sandbags to Dundee City prior to and during flood events
- Fife Council operates an emergency flood plan
- Fife Council also installed flood pods containing flood protection products close to areas with properties at risk of flooding.

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Firth of Tay catchment may increase by 35%<sup>1</sup>. This would potentially increase the number of residential properties at risk of river flooding from approximately 1,200 to 1,400 and the number of non-residential properties from approximately 250 to 270.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for runoff reduction, floodplain storage and sediment management. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

In this catchment group the Lingo Burn in-stream works is a natural flood management project with potential benefits for ecology and flood risk management.

### **Runoff reduction**

This catchment group is largely urbanised and low lying therefore, potential sites to reduce runoff are scarce. The majority of potential sites are located on the south side of the Firth of Tay surrounding Cupar, St Andrews and the Tentsmuir Forest. Further local investigation will be required to determine how much impact natural flood management actions could have on flooding in this area.

### **Floodplain storage**

Contrary to the potential for runoff reduction, the potential to store water within the catchments appears high. There are a number of potential floodplain storage sites laying to the west of Dundee at Kilspindie and Inchture and to the west of Cupar at the Howe of Fife. Other potential sites are scattered throughout the catchment group. Potentially Vulnerable Areas Tayport and Newburgh (07/14), Lucklawhill (07/15) and Auchtermuchty and Pleasance (07/19) contain large areas of potential floodplain storage that may benefit from further investigation.

### **Sediment management**

High erosion and sediment deposition occurs on the Rossie Drain, Motray Water and Pitairlie Burn and may potentially affect flooding in Potentially Vulnerable Areas Auchtermuchty and Pleasance (07/19), Lucklawhill (07/15) and Carnoustie and Barry (07/09). Sediment deposition also appears to be high on the Dighty Water on the outskirts of Dundee City and on the River Eden, south of Ladybank. While much of this may be attributed to natural processes, there may be river reaches that would benefit from actions to manage sediment, such as improvement of bankside vegetation.

## River flooding Kincardine and Angus catchment group

### Catchment overview

The Kincardine and Angus catchment group comprises of a number of smaller catchments. It covers an area of approximately 350km<sup>2</sup>. The main river catchments include the Lunan Water, Brothock Water and Den Finella Burn.

These catchments are gently sloping and low lying, with dry soils typical of east coast location. Intensive agriculture dominates the land use for arable and horticultural production.

The average annual rainfall for this catchment group is very low for Scotland, with 600-700mm falling in the lower part of the catchment, rising to 700-800mm in the upper catchment.

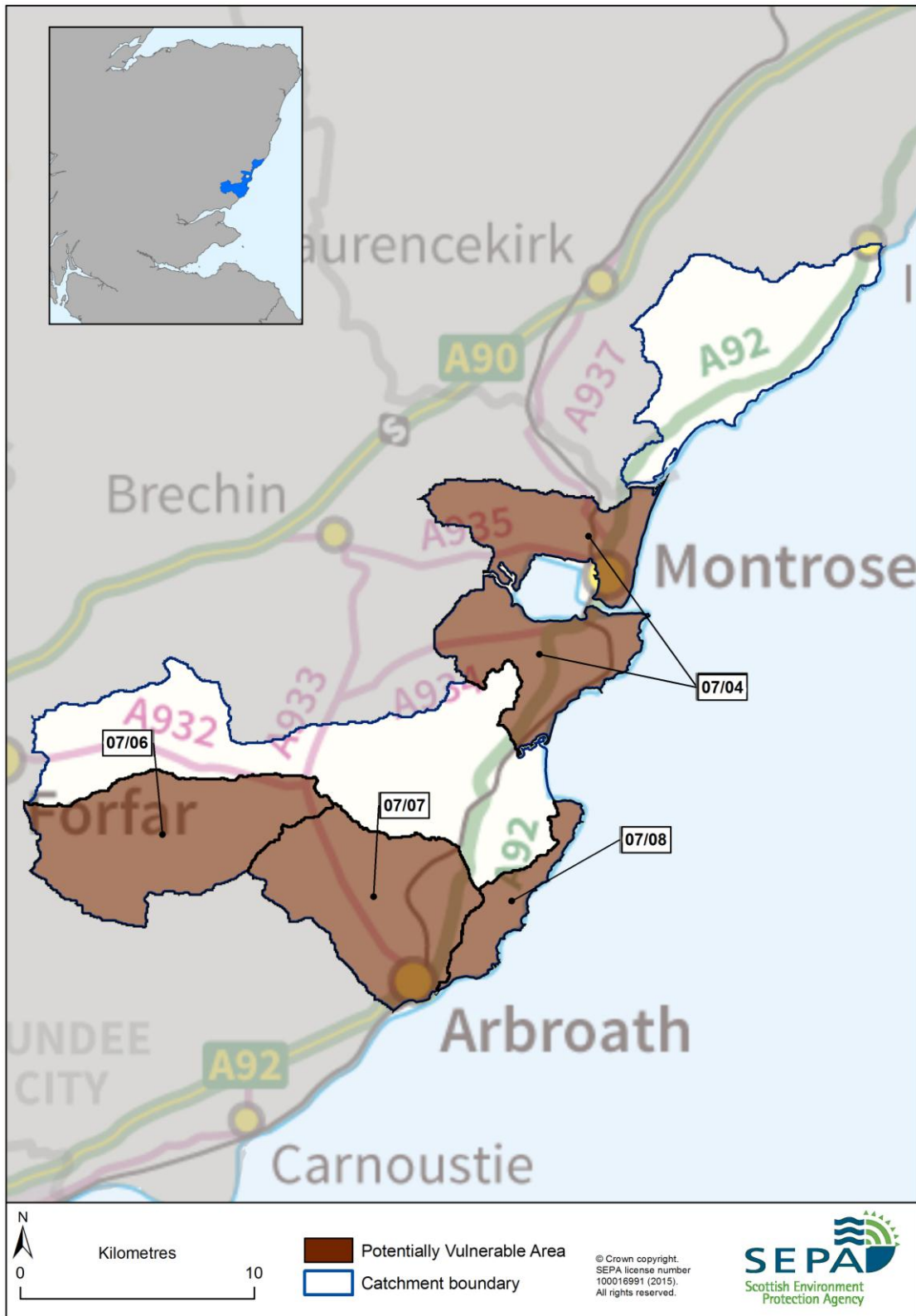
### Flood risk in the catchment

Within the Angus and Kincardine catchment group approximately 240 residential and 130 non-residential properties have a risk of river flooding. It is estimated that 92% of these properties are located within Potentially Vulnerable Areas. There are four Potentially Vulnerable Areas at risk of river flooding in this catchment group (Figure 1):

- Montrose Basin (07/04)
- Lunan Water (07/06)
- Arbroath (07/07)
- Coast North of Arbroath (07/08).

### Main areas at risk

Arbroath is the main urban area with a risk of river flooding, where approximately 190 residential and 110 non-residential properties are at risk and the Annual Average Damages caused by river flooding in Arbroath are £870,000. This includes damages to residential and non-residential properties, transport and agriculture.



**Figure 1:** The Kincardine and Angus catchment group and Potentially Vulnerable Areas with a risk of river flooding

## Economic activity and infrastructure at risk

The Annual Average Damages caused by river flooding in the Kincardine and Angus catchment group are estimated to be approximately £1.1 million. The damages are distributed as follows:

- 44% non-residential properties (£490,000)
- 44% residential properties (£480,000)
- 5% emergency services (£60,000)
- 3% agriculture (£30,000)
- 2% roads (£20,000)
- 2% vehicles (£20,000).

Figure 2 shows the Annual Average Damages throughout the catchment group. The highest damages can be seen around Arbroath. This is due to the higher density of residential and non-residential properties at risk of flooding from the Brothock Water.

Table 1 shows further information about infrastructure and agricultural land at risk of flooding within this catchment group.

	Number at risk	Further detail
Community facilities	0	
Utility assets	<10	Includes: electricity substations and fuel extraction sites.
Roads (excluding minor roads)	8	5 A roads at 51 locations 3 B roads at 16 locations
Railway routes	1	Dundee to Aberdeen (10 locations at risk)
Agricultural land (km <sup>2</sup> )	11.7	

**Table 1:** Infrastructure and agricultural land at risk of river flooding

## Designated environmental and cultural heritage sites at risk

Within the catchment group there are approximately 14 designated cultural heritage sites at risk of river flooding. These include scheduled monuments, gardens and designed landscapes, battlefield sites and listed buildings.

It is estimated that 10 environmental designated areas are at risk of river flooding. This includes a Special Area of Conservation (the River South Esk), two Special Protection Areas (Montrose Basin and St Cyrus) and seven Sites of Special Scientific Interest.





**Figure 2: Annual Average Damages from river flooding**

## History of flooding

The highest river level recorded at SEPA's gauging station on the Brothock Water, Arbroath was in November 2009 where the river levels reached 1.66m.

Perhaps the most significant flood in the Kincardine and Angus catchment group occurred on 10 February 1977, with widespread flooding from the Brothock Water in Arbroath between St Vigean's Junction and the harbour. Severe flooding was also reported upstream of Guthrie. People and property (both residential and non-residential) were impacted.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters of this document.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapters in Section 2.

### Flood protection schemes

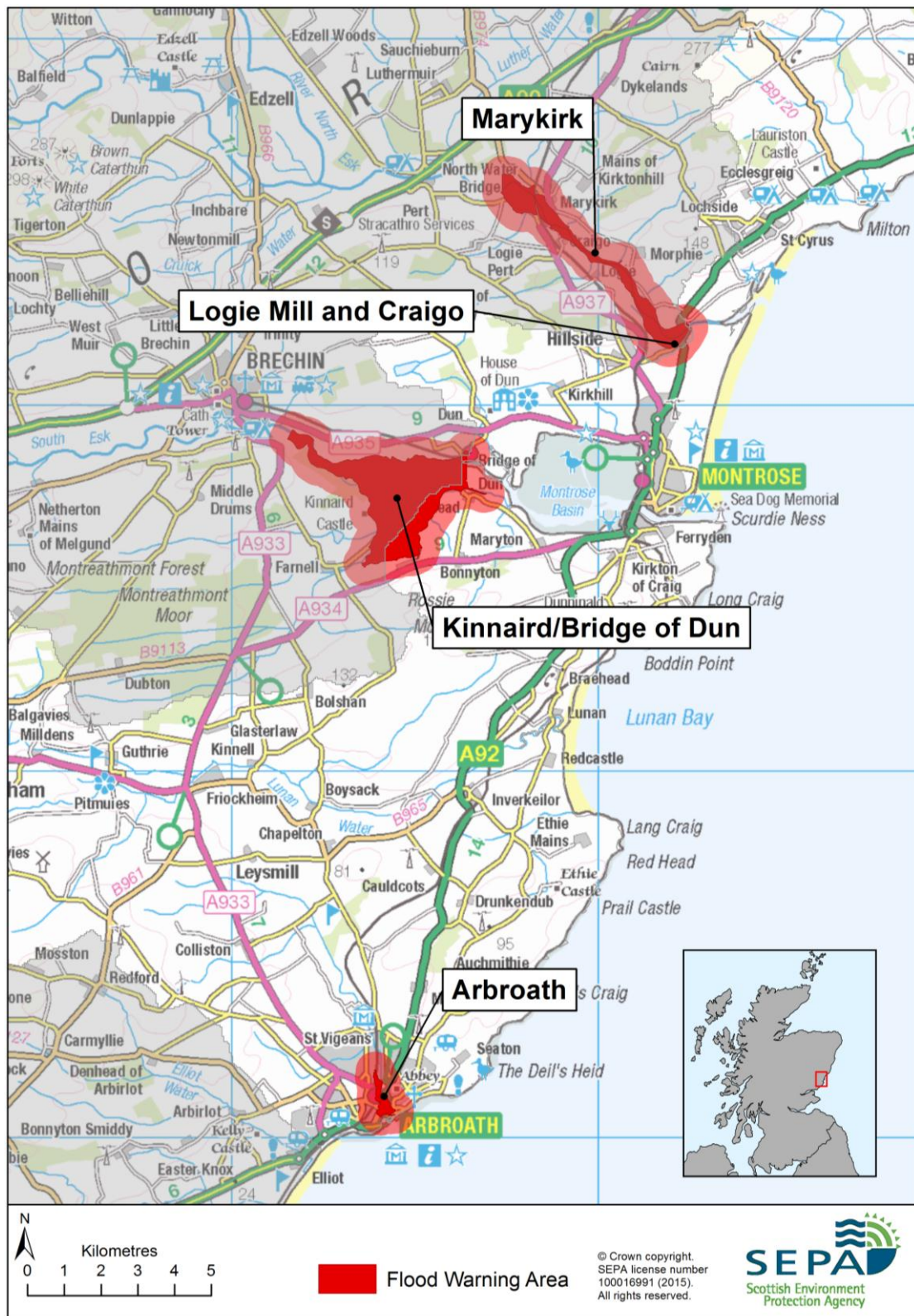
There is one flood protection scheme in this catchment group, which reduces the risk of river flooding to Arbroath from Brothock Water.

### River flood warning schemes

There are four river flood warning areas within this catchment group as shown in Table 2 and Figure 3. Table 2 shows the total number of properties in the flood warning area and the percentage of those properties that have signed up to receive flood warnings. Note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	River	Number of properties within FWA	% of properties registered July 2014
Arbroath	Brothock Water	674	14%
Kinnaird/Bridge of Dun	River South Esk	40	53%
Logie Mill and Craigo	River North Esk	13	85%
Marykirk	River North Esk	15	53%

**Table 2:** Flood warning areas



**Figure 3:** Flood warning areas

## Awareness raising campaigns and community groups

Ferryden Flood Action Group is currently being formed in this catchment group.

## Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- Angus Council provides flood protection products at cost price for flood risk areas
- Angus Council also uses sandbags in some high risk areas as part of an emergency response plan.

## Climate change and future flood risk

The UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The predicted increase in rainfall and river flows may increase the potential for river flooding.

Under the UKCP09 high emissions scenario for 2080, average peak river flows for the Kincardine and Angus catchment may increase by 35%<sup>1</sup>. This would potentially increase the potential number of residential properties at risk of river flooding from approximately 240 to 290 and the number of non-residential properties from approximately 130 to 150.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for runoff reduction, floodplain storage and sediment management. They show areas where natural flood management could be effective and where further detailed assessment should take place. This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters of this document.

### Runoff reduction

Within this catchment group there appears to be very limited potential for runoff reduction.

### Floodplain storage

To the north west of Letham there are sites with a medium and high storage potential, along with other locations along the Lunan Water and Brothie Burn.

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<sup>1</sup> From the study 'An assessment of the vulnerability of Scotland's river catchments and coasts to the impacts of climate change' (CEH, 2011)

## **Sediment management**

Sediment deposition is higher on the upper reach of the Lunan Water, north of Letham which may affect Lunan Water Potentially Vulnerable Area (07/06). The Brothock Water also experiences some level of sediment deposition, particularly within Arbroath town centre. While much of this will be attributable to natural processes, there may be river reaches which would benefit from actions to manage sedimentation, such as improvement of bankside vegetation.

## 3.3 Coastal flooding

### Tay Estuary and Montrose Basin Local Plan District

This chapter provides supplementary information on flooding for coastal areas. It provides an overview of the natural characteristics of the coast, a summary of flood risk within the coastal area and a brief history of flooding. It also outlines the likely impact of climate change and the potential for natural flood management.

Information about the objectives and actions to manage flood risk are provided in Section 2.

#### Coastal overview

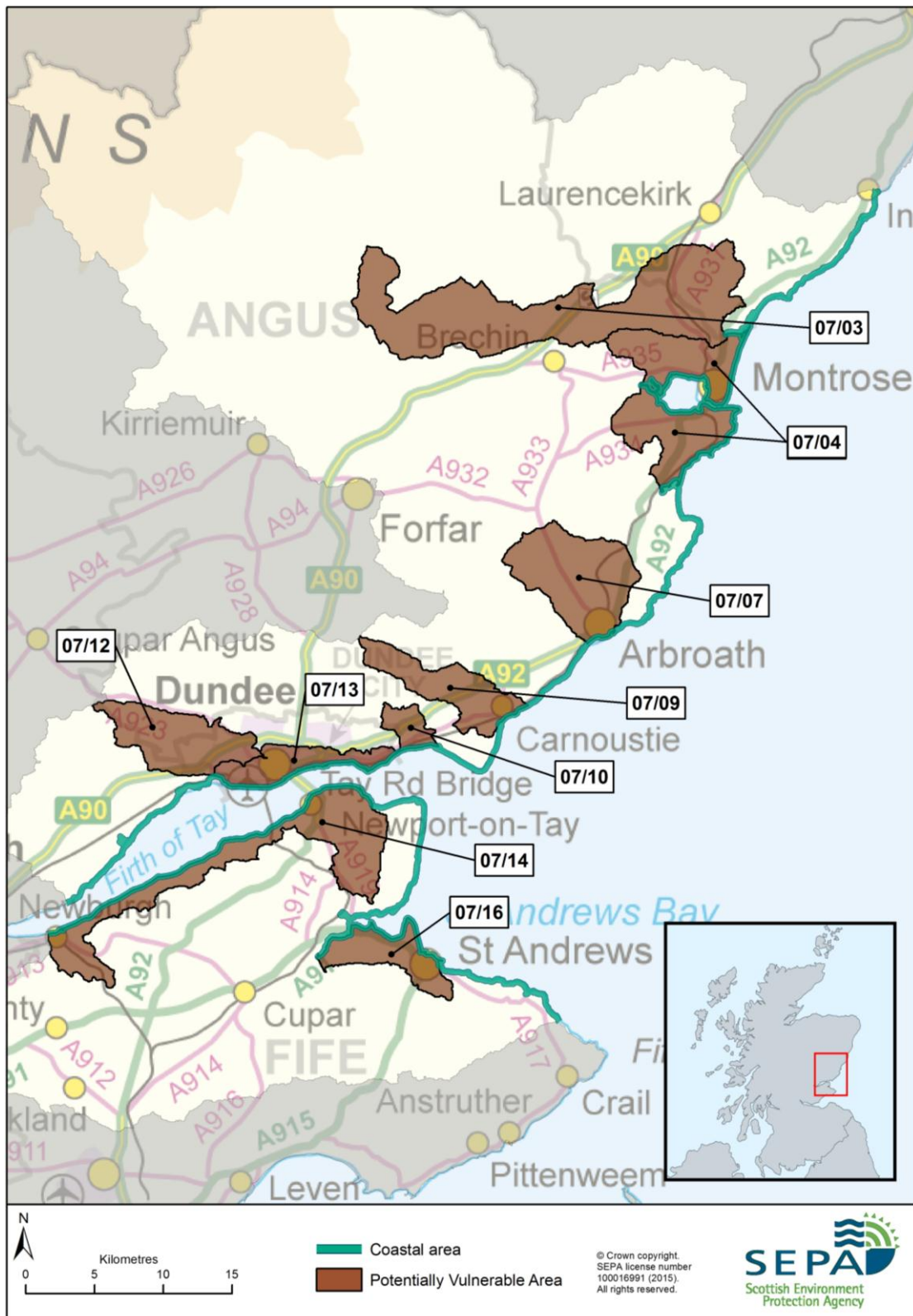
The Tay Estuary and Montrose Basin Local Plan District has 233km of coastline stretching from Inverbervie in the north to Fife Ness in the south. The coastline includes the Montrose Basin, the outer Firth of Tay and the areas of Angus and Fife that are exposed to the North Sea. There are several coastal communities in this area including Montrose, Arbroath, Carnoustie, Dundee and St Andrews.

The inner Firth of Tay typically includes habitats such as mudflats, salt marshes and reed beds. This area includes the largest continuous stand of reed bed in the UK. The outer Firth of Tay is more sandy beaches and dunes. The entrance to the Firth of Tay has large sand dune systems on both the north (Barry Links) and south shores (Tentsmuir Dunes).

#### Flood risk

Within the Tay Estuary and Montrose Basin Local Plan District approximately 1,400 residential properties and 340 non-residential properties are at risk of coastal flooding. It is estimated that 99% of these properties are located within Potentially Vulnerable Areas. There are nine Potentially Vulnerable Areas in this Local Plan District that have a risk of coastal flooding (Figure 1):

- North of Brechin (07/03)
- Montrose Basin (07/04)
- Arbroath (07/07)
- Carnoustie and Barry (07/09)
- Monifeith (07/10)
- Invergowrie (07/12)
- Dundee and Broughty Ferry (07/13)
- Tayport and Newburgh (07/14)
- St Andrews to Guardbridge (07/16).



**Figure 1:** Tay Estuary and Montrose Basin Local Plan District coastal area and Potentially Vulnerable Areas with a coastal flood risk

## Main areas at risk

The main areas at risk of coastal flooding, the number of properties at risk and the total Annual Average Damages caused by coastal flooding are shown in Table 1. The Annual Average Damages include damages to residential and non-residential properties, transport, emergency services and agriculture.

	Residential and non-residential properties at risk of coastal flooding	Annual Average Damages
Dundee and Broughty Ferry	1,300	£3.5 million
Montrose	150	£310,000
Newburgh	130	£450,000
Carnoustie	50	£98,000
St Andrews	20	£47,000
Arbroath	20	£40,000
Newport on Tay/Tayport	10	£25,000
Ferryden	<10	£20,000

**Table 1:** Main areas at risk of coastal flooding

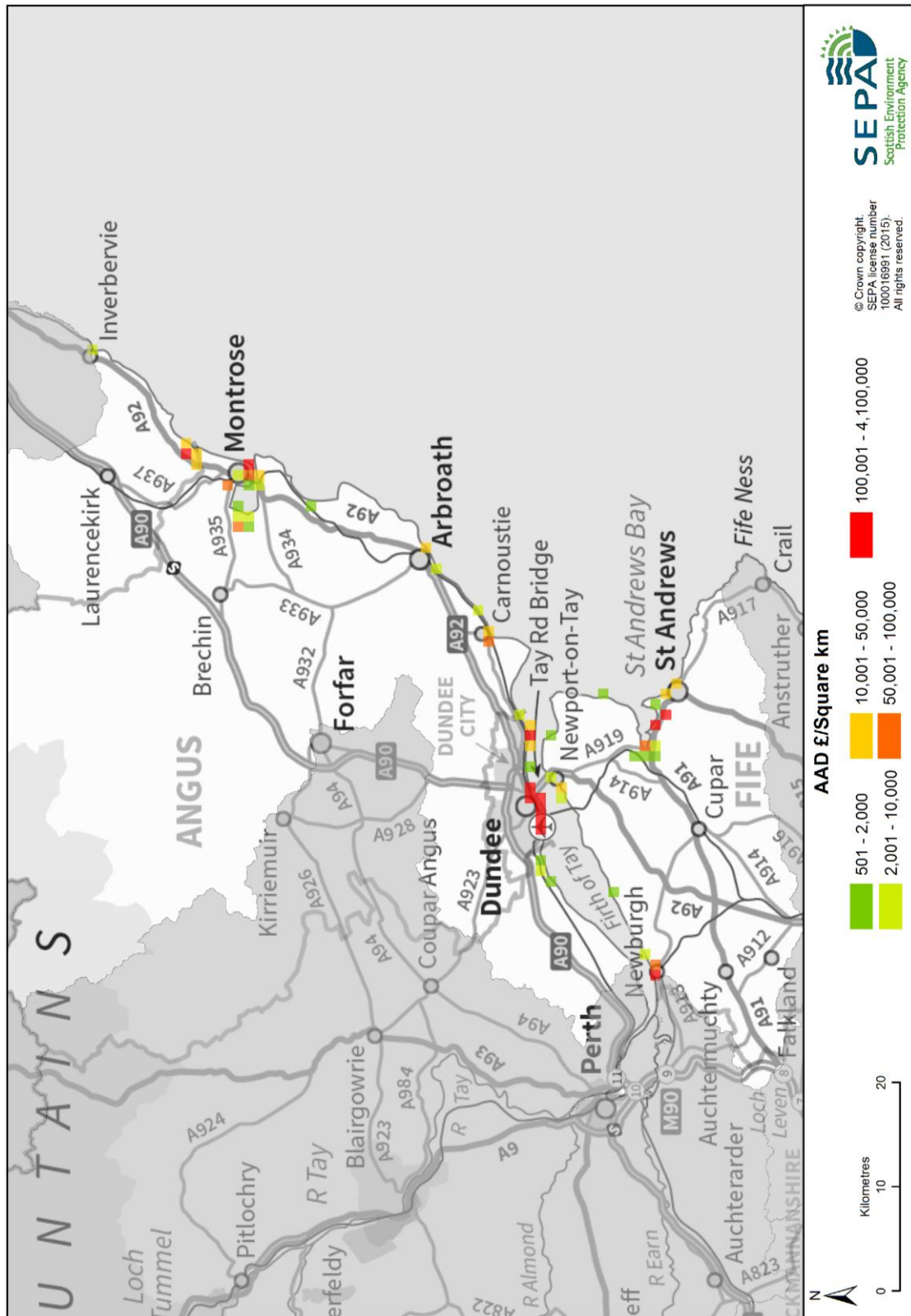
## Economic activity and infrastructure at risk

The Annual Average Damages caused by coastal flooding in the Tay Estuary and Montrose Basin Local Plan District are approximately £5.3 million. The damages are distributed as follows:

- 40% roads (£2.1 million)
- 28% non-residential properties (£1.5 million)
- 28% residential properties (£1.5 million)
- 3% emergency services (£170,000)
- <1% vehicles (£40,000)
- <1% agriculture (£20,000).

Figure 2 shows the Annual Average Damages throughout the coastal area. The highest damages can be seen around Dundee and Broughty Ferry due to the impact on roads and high density of businesses and homes. High damages can also be seen in Newburgh due to the density of residential properties along the coastline and around the Montrose Basin and Guardbridge due to the density of local businesses.





**Figure 2:** Annual Average Damages from coastal flooding

Table 2 shows further information about infrastructure and agricultural land at risk of coastal flooding.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes: educational buildings and emergency services
<b>Utility assets</b>	30	Includes: electricity substations and telephone exchanges
<b>Roads (excluding minor roads)</b>	10	7 A roads at 107 locations 3 B roads at 4 locations
<b>Railway routes</b>	3	Dundee to Aberdeen (26 locations at risk) Dundee to Ladybank (3 locations at risk) Dundee to Dunblane (2 locations at risk)
<b>Airports</b>	1	Dundee airport
<b>Agricultural land (km<sup>2</sup>)</b>	8.6	

**Table 2:** Infrastructure and agricultural land at risk of coastal flooding

### Designated environmental and cultural heritage sites at risk

Within the coastal area there are approximately 18 designated cultural heritage sites at risk of coastal flooding. These include scheduled monuments, gardens and designed landscapes and listed buildings.

It is estimated that 23 environmental designated areas are at risk of coastal flooding. These include three Special Areas of Conservation, four Special Protection Areas and 16 Sites of Special Scientific Interest. Notably these include the Firth of Tay and Eden Estuary, St Cyrus and the Tayport – Tentsmuir Coast.

### History of coastal flooding

The Tay Estuary and Montrose Basin has a long history of coastal flooding. Urban areas often affected include Dundee, Broughty Ferry and Arbroath.

Probably the most significant flood occurred on 28 December 1879 with 75 deaths and damage to a lighthouse. Numerous homes were damaged when the Tay Bridge collapsed under heavy flooding from high tides. This flood was estimated to have a 25-49 year return period.

A recent flood happened on 15 December 2012 when a combination of wind and high tides caused large waves and coastal flooding along the east coast of Scotland.

The earliest flood on record dates back to 8 February 1868 when houses and roads flooded in Dundee and the Dundee Harbour was also impacted. This flood was estimated to have 25-49 year return period.

Further detail about the history of flooding in this area is available in the relevant Potentially Vulnerable Area chapters in Section 2.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

This section describes the existing actions that are in place to manage flood risk and are in addition to the information presented in the relevant Potentially Vulnerable Area chapters in Section 2.

### Flood protection schemes

There are two flood protection schemes that reduce the risk of coastal flooding:

- Carnoustie Coastal Protection Scheme
- Monifieth Coastal Protection Scheme.

### Planned flood protection schemes

Planned flood protection schemes in this area include:

- To raise the sea wall at Dundee's central waterfront
- To extend coastal revetments in Broughty Ferry.

### Coastal flood warning schemes

There are nine coastal flood warning areas within this Local Plan District as shown in Table 3 and Figure 3.

Table 3 shows the total number of properties in the flood warning area and the percentage of those properties that have signed up to receive flood warnings. Note that this is not the number of properties at risk of flooding.

Flood warning area (FWA)	Number of properties within FWA	% of properties registered January 2014
Arbroath Coastal	22	27%
Broughty Ferry	1,027	10%
Dundee Central	787	6%
Guardbridge	6	0%
Newburgh	160	21%
Newport on Tay	38	3%
Riverside West	27	19%
St Andrews	106	11%
Tayport	259	14%

**Table 3:** Coastal flood warning areas



**Figure 3:** Coastal flood warning areas

## Community groups

The following community groups are known to operate within this coastal area:

- Carse of Gowrie Sustainability Group
- Ferryden Community Action Group.

## Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection. In this coastal area:

- Dundee City Council owns and operates an emergency flood plan for Dundee
- Dundee City Council also supplies and distributes sandbags to Dundee prior to and during flood events
- Fife Council installed flood pods containing flood protection products close to areas containing properties at risk of flooding
- Aberdeenshire Council provides a range of flood protection products at cost price with free delivery across Aberdeenshire, available for all types of flooding
- Aberdeenshire Council also owns and operates river level gauges on telemetry for Fettercairn and Marykirk
- Angus Council provides flood protection products at cost price for flood risk areas
- Angus Council also uses sandbags in some high flood risk areas as part of an emergency response plan.

## Climate change and future flood risk

UK Climate Projections (UKCP09) predicts that climate change may increase sea levels. The magnitude of sea level rise varies around the coastline.

For the UKCP09 high emissions scenario, the predicted average sea level increase for the Tay Estuary and Montrose Basin Local Plan District is between 0.48m-0.49m by 2080. This may increase the number of residential properties at risk of coastal flooding from approximately 1,400 to 2,700 and the number of non-residential properties from approximately 340 to 590. Coastal flood modelling by SEPA has not taken into account the impacts of a future climate on wave overtopping or storminess, which could increase the number of people affected by coastal flooding.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.

## Potential for natural flood management

The assessment of the potential for natural flood management is shown on SEPA's flood maps (<http://www.sepa.org.uk/environment/water/flooding/flood-maps/>). The maps indicate the potential for wave attenuation and estuarine surge attenuation. They show areas where natural flood management could be effective and where further detailed assessment should take place.

This information was used to identify where local authorities could include natural flood management as part of flood risk management schemes and studies. The proposed schemes and studies are listed in the relevant Potentially Vulnerable Area chapters in Section 2.

### Wave energy

The assessment shows that there is generally high potential for wave attenuation along the coast from Inverbervie to Montrose and a medium to high potential along the coast from Montrose to Carnoustie. Medium to high potential has been identified around Carnoustie, Montrose, Arbroath, St Andrews, Dundee, Monifieth, Tayport and Newport on Tay.

The assessment shows that there may be potential for estuarine surge attenuation in and around Montrose, Dundee and Newport on Tay.

## 3.4 Surface water flooding

### Tay Estuary and Montrose Basin Local Plan District

This chapter provides supplementary information on surface water flooding across the Local Plan District. It provides an overview of the main areas at risk and the history of surface water flooding. The predicted impacts on infrastructure are also identified. The impacts on environmental sites and agricultural land have not been assessed.

Information about the objectives and actions to manage flood risk are provided in Section 2.

#### Flood risk

Within the Tay Estuary and Montrose Basin Local Plan District approximately 1,100 residential properties and 860 non-residential properties are at risk of surface water flooding. It is estimated that 98% of these properties are located within Potentially Vulnerable Areas.

#### Main areas at risk

The main areas at risk of surface water flooding can be seen in Table 1, which shows the number of properties at risk and the Annual Average Damages caused by surface water flooding. The damages include impacts to residential and non-residential properties, vehicles, emergency services and roads.

	Residential and non-residential properties at risk of surface water flooding	Annual Average Damages
Dundee	930	£1.2 million
Arbroath	230	£600,000
Cupar	180	£480,000
Carnoustie	80	£110,000
Montrose	60	£230,000
Brechin	60	£190,000
St Andrews	60	£67,000
Monifieth	50	£35,000
Leuchars	<10	£9,500
Tayport	<10	£6,700

**Table 1:** Main areas at risk of surface water flooding

## Economic activity and infrastructure at risk

The Annual Average Damages caused by surface water flooding in the Tay Estuary and Montrose Basin Local Plan District are approximately £4.3 million. The damages are distributed as follows:

- 47% non-residential properties (£2.0 million)
- 28% roads (£1.2 million)
- 20% residential properties (£880,000)
- 4% emergency services (£180,000)
- 1% vehicles (£30,000).

Figure 1 shows the distribution of Annual Average Damages throughout the Local Plan District. The highest Annual Average Damages are found along the Dundee coastline and Dundee city centre due to the high number of businesses located around the city's harbour. High damages are also seen in Montrose, Arbroath and Cupar.

Table 2 shows the approximate number of further infrastructure assets which are at risk of flooding within this Local Plan District.

	Number at risk	Further detail
<b>Community facilities</b>	<10	Includes: educational buildings, healthcare services and emergency services
<b>Utility assets</b>	120	Includes: electricity substations, fuel extraction sites and telephone exchanges
<b>Roads (excluding minor roads)</b>	50	20 A roads at 630 locations 30 B roads at 230 locations
<b>Railway routes</b>	4	Dundee to Aberdeen (140 locations at risk) Dundee to Dunblane (30 locations at risk) Dundee to Ladybank (40 locations at risk) Perth to Ladybank (20 locations at risk)

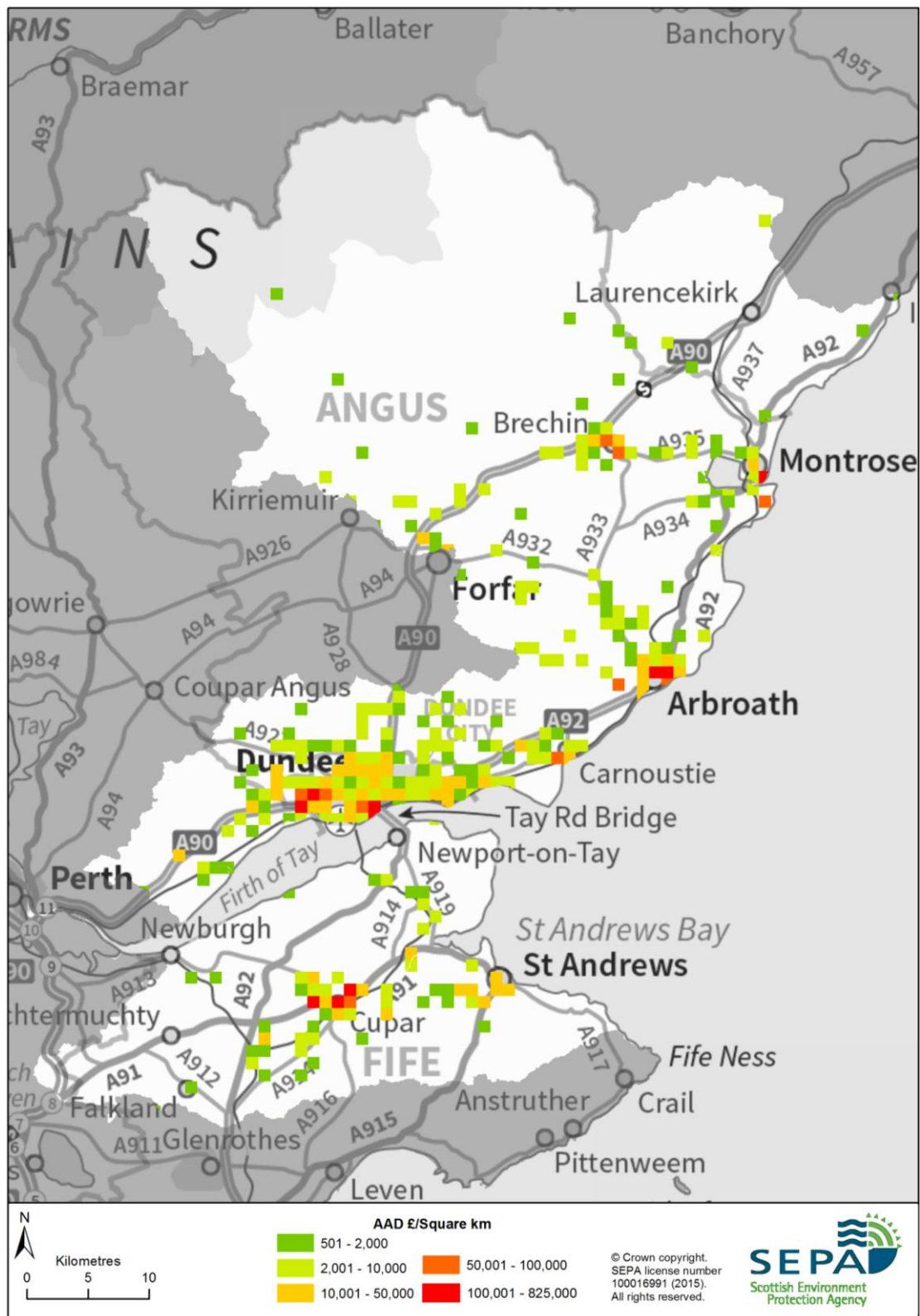
**Table 2:** Infrastructure at risk of surface water flooding

## Designated environmental and cultural heritage sites at risk

Within the Local Plan District it is estimated that approximately 128 designated cultural heritage sites are at risk of surface water flooding. These sites include scheduled monuments, gardens and designed landscapes and listed buildings.

The impact of surface water flooding on environmental sites has not been assessed and is assumed to be relatively low.





**Figure 1: Annual Average Damages from surface water flooding**

## History of surface water flooding

A number of surface water floods have been recorded mostly affecting Dundee.

Perhaps the most significant surface water flood occurred on 11 August 2004 in Dundee city centre and many smaller locations across the city. Additionally the green urban fringe of the city was affected by surface water runoff causing some roads to become impassable. The rainfall was estimated to have a 1 in 200 year magnitude.

A recent surface water flood occurred on 7 September 2010 in Dundee when businesses were forced to evacuate staff in Seagate, West Henderson's Wynd, Hospital Street and Dock Street.

The earliest surface water flood on record occurred on 16 August 2004 again in Dundee when the city centre was affected resulting in basement flooding and disruption to traffic flows. The rainfall was estimated to have a 1 in 100 year magnitude.

Further detail about the history of flooding is available in the relevant Potentially Vulnerable Area chapters in Section 2.

## Managing flood risk

A range of public bodies have responsibility for managing flood risk in Scotland and they are working closer than ever before to target action in the areas where the greatest benefit can be gained. Members of the public also have a role to play and are the first line of defence against flooding by taking action to protect themselves and their property from flooding. Further information about roles and responsibilities is provided in Section 1.

### Surface water management priority areas

The areas at highest risk from surface water flooding have been prioritised. These priority areas were identified using SEPA flood models, supplemented with historical flood information and, where available, more detailed modelling from local authorities. These priority areas require the preparation of surface water management plans, the details of which can be found in the relevant Potentially Vulnerable Area chapters in Section 2.

### Flood protection schemes

There are two formal flood protection schemes for the management of surface water:

- Dunshalt Village Flood Protection Scheme
- Millfield of Cupar Flood Protection Scheme.

## Community groups

The following community groups are known to operate within the Tay Estuary and Montrose Basin Local Plan District:

- Carse of Gowrie Sustainability Group
- Dighty Flood Action Group
- Edzell Community Flood Action Group
- Falkland Flood Action Group
- Ferryden Flood Action Group
- Fettercairn Flood Resilience Group
- Freuchie Flood Action Group
- Kettle and District Flood Action Group
- Strathmartine Flood Group.

## Property level protection

Each local authority has its own incentives or subsidies to help property owners with property level protection:

- Aberdeenshire Council provides a range of flood protection products at a cost price with free delivery across Aberdeenshire, available for all types of flooding
- Aberdeenshire Council also owns and operates river level gauges on telemetry for Fettercairn and Marykirk
- Angus Council uses sandbags in some high risk areas as part of an emergency response plan
- Fife Council operates an emergency flood plan
- Fife Council also installed flood pods containing flood protection products close to areas with properties at risk of flooding.

## Climate change and future flood risk

UK Climate Projections (UKCP09) predicts that climate change may lead to warmer and drier summers, warmer and wetter winters with less snow, and more extreme temperature and rainfall. The pluvial modelling undertaken considered climate change scenarios with a 20% increase in rainfall intensity.

Under these conditions it is estimated that the number of residential properties at risk of surface water flooding may increase from approximately 1,100 to 1,600 and the number of non-residential properties from approximately 860 to 1,100.

The predicted increases in flood risk are solely based on the impact of a changing climate on the magnitude of flooding; they do not take into account any potential increase due to population change, development pressures or urban creep, nor do they take into account any mitigation as a result of actions contained in this or future Flood Risk Management Strategies.



## Annex 1: Glossary

Term	Definition
Accretion	Accumulation of sediment.
Actions	Actions describe where and how flood risk will be managed. These actions have been set by SEPA and agreed with flood risk management authorities following consultation. Selection of actions to deliver the agreed objectives has been based on a detailed assessment and comparison of economic, social and environmental criteria.
Annual Average Damages (AAD)	Depending on its size or severity each flood will cause a different amount of damage to a given area. Annual Average Damages are the theoretical average economic damages caused by flooding when considered over a very long period of time. It does not mean that damage will occur every year: in many years there will be no damages, in some years minor damages and in a few years major damages may occur. High likelihood events, which occur more regularly, contribute proportionally more to AADs than rarer events. Within the Flood Risk Management Strategies AADs incorporate economic damages to the following receptors: residential properties, non-residential properties, vehicles, emergency services, agriculture and roads. They have been calculated based on the principles set out in the Flood Hazard Research Centre Multi-Coloured Handbook (2010).
Appraisal	Appraisal is the process of defining objectives, examining options and weighing up the costs, benefits, risks and uncertainties before a decision is made. The FRM Strategy appraisal method is designed to set objectives and identify the most sustainable combination of actions to tackle flooding from rivers, sea and surface water.
Appraisal baseline	Defines the existing level of flood risk under the current flood risk management regime.
Awareness raising	Public awareness, participation and community support are essential components of sustainable flood risk management. SEPA and the responsible authorities have a duty to raise public awareness of flood risk. This is undertaken both individually and collaboratively by a range of organisations. Improved awareness of flood risk and actions that prepare individuals, homes and businesses for flooding can reduce the overall impact.
Bathing waters	Bathing waters are classed as protected areas under Annex IV of the Water Framework Directive (WFD). There are 84 designated bathing waters in Scotland. <sup>i</sup>
Benefit cost ratio (BCR)	A benefit cost ratio summarises the overall value for money of an action or project. It is expressed as the ratio of benefits to costs (both expressed as present value monetary values). A ratio of greater than 1:1 indicates that the economic benefits associated with an action are greater than the economic costs of implementation; therefore this is taken as the threshold of economic viability. It should be acknowledged that it is not always possible to accurately estimate economic values for all elements of benefit, and BCR is just one a number of techniques used in appraisal.
Blue infrastructure	Blue infrastructure is often complementary to 'green infrastructure' and includes sustainable drainage systems, swales (shallow, broad and vegetated channels designed to store and/or convey runoff and remove pollutants <sup>ii</sup> ), wetlands, rivers, canals (and their banks) and other watercourses <sup>iii</sup>
Candidate Potentially Vulnerable Area (PVAc)	Candidate PVAs are those areas identified after the National Flood Risk Assessment (2011), as a result of new information, where the impact of flooding is potentially sufficient to justify further assessment and appraisal. They will be considered for inclusion as new PVAs in the next flood risk management planning cycle.
Catchment	All the land drained by a river and its tributaries.

Term	Definition
Category 1 and 2 Responders (Cat 1 / 2)	Category 1 and 2 Responders are defined as part of the Civil Contingencies Act 2004 which seeks to minimise disruption in the event of an emergency. Category 1 Responders are 'core' responders: local authorities, police, fire and rescue services, ambulance service, NHS health boards, SEPA and the Maritime and Coastguard Agency. Category 2 Responders are key co-operating responders in support of Category 1 Responders. These include gas and electricity companies, rail and air transport operators, harbour authorities, telecommunications providers, Scottish Water, the Health and Safety Executive and NHS National Services Scotland <sup>iv</sup> .
Channel improvement	Where work has been carried out on a river channel allowing an increase in the volume of water it can carry.
Characterisation	Provides a description of the natural characteristics of catchments, coastlines and urban areas in terms of hydrology, geomorphology, topography and land use. It also includes the characterisation of existing levels of flood risk and existing flood risk management activity.
Coastal flooding	Flooding that results from high sea levels or a combination of high sea levels and stormy conditions. The term coastal flooding is used under the Flood Risk Management (Scotland) Act 2009, but in some areas it is also referred to as tidal flooding and covers areas such as estuaries and river channels that are influenced by tidal flows.
Combined sewer	Combined sewers transport sewage from homes and industry as well as carrying surface water runoff from gutters, drains and some highways. Heavy or prolonged rainfall can rapidly increase the flow in a combined sewer until the amount of water exceeds sewer capacity.
Combined sewer (overflow) (CSO)	Combined sewer overflows are purposely designed structures to ensure any excess water from sewerage systems is discharged in a controlled way and at a specific managed location.
Community facility	Within the FRM Strategies this term includes: Emergency Services (Police, Fire, Ambulance, Coastguard, Mountain Rescue) Educational Buildings (crèche, nursery, primary, secondary, further, higher and special education premises) Healthcare facilities: hospitals, health centres and residential care homes
Community flood action groups	Community flood action groups are community based resilience groups which, on behalf of local residents and business, help to prepare for and minimise the effects of flooding. They reflect the interests of their local communities and may differ in composition and remit. There are over 60 groups already established in Scotland. The Scottish Flood Forum provides support for both new and existing groups.
Confluence	Where two or more rivers meet.
Conveyance	Conveyance is a measure of the carrying capacity of a watercourse. Increasing conveyance enables flow to pass more rapidly and reducing conveyance slows flow down. Both actions can be effective in managing flood risk depending on local conditions.
Cultural heritage site	Historic Environment Scotland maintains lists of buildings of special architectural or historic interest; these buildings are referred to as 'listed buildings'. The highest level of designation is a World Heritage Site. Other designations included in this assessment are scheduled monuments, gardens and designed landscapes, and battlefields.
Culvert	A pipe, channel or tunnel used for the conveyance of a watercourse or surface drainage water under a road, railway, canal or other obstacle.
Damages	Flood damages are categorised as direct or indirect i.e. as a result of the flood water itself, or subsequent knock on effects. Damage to buildings and contents caused by flood water are an example of direct damages, whilst loss of industrial production, travel disruption or stress and anxiety are indirect. Some damages can be quantified in monetary terms, and others can only be described.

Term	Definition
	<p>The potential damages avoided by implementation of a flood risk management action are commonly referred to as the benefits of that action. When comparing the effectiveness of different actions, it is useful to consider estimated damages and damages avoided across the lifespan of the action. Within the FRM Strategies, a 100 year appraisal period has been used as standard. This allows costs, damages and benefits across this time frame to be compared in present value terms.</p> <p>See also 'Annual Average Damages'</p>
Demountable defences	<p>A temporary flood barrier is one that is only installed when the need arises, that is, when flooding is forecast. A demountable flood defence is a particular type of temporary defence that requires built-in parts and therefore can only be deployed in one specific location.<sup>v</sup></p>
Deposition	<p>A natural process leading to an accumulation of sediment on a river bed, floodplain or coastline.</p>
Economic impact	<p>An assessment of the economic value of the positive and negative effects of flooding and / or the actions taken to manage floods.</p>
Embankment	<p>Flood embankments are engineered earthfill structures designed to contain high river levels or protect against coastal flooding. They are commonly grass-covered, but may need additional protection against erosion by swiftly flowing water, waves or overtopping.</p>
Emergency plans / response	<p>Emergency response plans are applicable for all types of flooding. They set out the steps to be taken during flooding in order to maximise safety and minimise impacts where possible. Under the Civil Contingencies Act, Category 1 Responders have a duty to maintain emergency plans. Emergency plans may also be prepared by individuals, businesses, organisations or communities.</p>
Environmental impact	<p>A change in the environment as a result of an action or activity. Impacts can be positive or negative and may vary in significance, scale and duration.</p>
Environmental Impact Assessment (EIA)	<p>Environmental Impact Assessment (EIA) is a process which identifies the potential environmental impacts, both negative and positive, of a proposal.</p>
Environmental sites / environmental designated areas/ environmentally designated sites	<p>Areas formally designated for environmental importance, such as Sites of Special Scientific Interest (SSSI), Special Protection Area (SPA) or Special Areas of Conservation (SAC).</p>
Episodic erosion	<p>Erosion induced by a single event, such as a storm.</p>
Erosion	<p>A natural process leading to the removal of sediment from a river bed, bank or floodplain or coastline.</p>
Estuarine surge attenuation	<p>A reduction in the wave energy caused by storm surge. Breakwaters (barriers built out into the sea to protect a coast or harbour from the force of waves) or habitats such as saltmarsh can slow down and reduce the inland impact of storm surges (the rising of the sea due to wind and atmospheric pressure changes associated with storms), thereby reducing coastal flood risk.</p>
Estuary	<p>A coastal body of water usually found where a river meets the sea; the part of the river that is affected by tides.</p>
Fault (fault line)	<p>A break or fracture in the earth's crust as a result of the displacement of one side with respect to the other. In Scotland the Great Glen Fault is a major geological fault line cutting diagonally across the Highlands from Fort William to Inverness.</p>
Flash flood	<p>A flood that occurs a short period of time after high intensity rainfall or a sudden snow melt. A sudden increase in the level and velocity of the water body is often characteristic of these events, leaving a short time for warning or actions.</p>
Flashy watercourse	<p>A 'flashy' river or watercourse has a short lag time (the delay between peak rainfall intensity and peak river discharge), high peak discharge, and quickly returns to average flow. Rivers with these characteristics</p>

Term	Definition
	can be prone to flooding and leave a short time for warning or actions.
Flood	In the terms of the FRM Act, 'flood' means a temporary covering by water, from any source, of land not normally covered by water. This does not include a flood solely from a sewerage system, as a result of normal weather or infrastructure drainage. A flood can cause significant adverse impacts on people, property and the environment. drainage.
Flood bund	A constructed retaining wall, embankment or dyke designed to protect against flooding to a specified standard of protection.
Flood defence	Infrastructure, such as flood walls, embankments or flood storage intended to protect an area against flooding to a specified standard of protection.
Flood extent	The area that has been affected by flooding, or is at risk of flooding from one or more sources for a particular likelihood.
Flood forecasting	SEPA operates a network of over 250 rainfall, river and coastal monitoring stations throughout Scotland that generate data 24 hours a day. This hydrological information is combined with meteorological information from the Met Office. A team of experts then predict the likelihood and timing of river, coastal and surface water flooding. This joint initiative between SEPA and the Met Office forms the Scottish Flood Forecasting Service.
Flood frequency	The probability that a particular size/severity of flood will occur in a given year (see likelihood).
Flood gate	An adjustable, sometimes temporary, barrier used as a flood defence to control the flow of water within a water system or during a flood. Flood gates can also be part of operational flood defences or protect individual buildings or sites.
Flood guard	Flood guards cover a variety of types of door and window barriers that can be fitted to individual properties and operated by the owners / occupiers prior to a flood event. They act as a physical barrier to water entering the property and can provide protection against frequent and relatively shallow flooding.
Flood hazard	In terms of the FRM Act, hazard refers to the characteristics (extent, depth, velocity) of a flood.
Flood hazard map	Flood hazard maps are required by the FRM Act to show information that describes the nature of a flood in terms of the source, extent, water level or depth and, where appropriate, velocity of water. Flood hazard and risk maps are referred to collectively as flood maps and are available on the SEPA website.
Flood Prevention Scheme / Flood Protection Scheme (FPS)	A flood protection scheme, as defined by the FRM Act, is a scheme by a local authority for the management of flood risk within the authority area. This includes defence measures (flood prevention schemes) formerly promoted under the Flood Prevention (Scotland) Act 1961.
Flood protection study	Flood protection studies aim to refine understanding of the hazard and risk associated with flooding in a particular area, catchment or coastline. They will involve detailed assessment of flood hazard and / or risk and may develop options for managing flood risk.
Flood protection works	Flood protection works can include the same flood defence measures that would make up a formal Flood Protection Scheme but without the legal process, protections and requirements that would come by delivering the works as a scheme.
Flood risk	A measure of the combination of the likelihood of flooding occurring and the associated impacts on people, the economy and the environment.
Flood Risk Assessment (FRA)	Flood Risk Assessments are detailed studies of an area where flood risk may be present. These are often used to inform planning decisions, may help to develop flood schemes and have also contributed to the National Flood Risk Assessment.



Term	Definition
Flood Risk Management (Scotland) Act 2009 (FRM Act)	The flood risk management legislation for Scotland. It transposes the EC Floods Directive into Scots Law and aims to reduce the adverse consequences of flooding on communities, the environment, cultural heritage and economic activity.
Flood risk management cycle	Under the FRM Act flood risk management planning is undertaken in six year cycles. The first planning cycle is 2015 – 2021. The first delivery cycle is lagged by approximately 6 months and is from 2016 - 2022.
Flood Prevention (Scotland) Act 1961	The Flood Prevention (Scotland) Act 1961 gave local authorities discretionary powers to make and build flood prevention schemes. It was superseded by the Flood Risk Management (Scotland) Act 2009.
Flood Risk Management Local Advisory Groups	FRM Local Advisory Groups are stakeholder groups convened to advise SEPA and lead local authorities in the preparation of Flood Risk Management Plans. SEPA and lead local authorities must have regard to the advice they provide.
Flood Risk Management Plans (FRM Plans)	A term used in the FRM Act. FRM Plans set out the actions that will be taken to reduce flood risk in a Local Plan District. They comprise Flood Risk Management Strategies, developed by SEPA, and Local Flood Risk Management Plans produced by lead local authorities.
Flood Risk Management Strategy (FRM Strategy)	Sets out a long-term vision for the overall reduction of flood risk. They contain a summary of flood risk in each Local Plan District, together with information on catchment characteristics and a summary of objectives and actions for Potentially Vulnerable Areas.
Flood risk map	Complements the flood hazard maps published on the SEPA website providing detail on the impacts of flooding on people, the economy and the environment. Flood hazard and risk maps are referred to collectively as flood maps and are available on the SEPA website.
Flood wall	A flood defence feature used to defend an area from flood water to a specified standard of protection.
Flood Warning area (FWA)	A Flood Warning area is where SEPA operates a formal Flood Monitoring Scheme to issue targeted Flood Warning messages for properties located in the area. <sup>vi</sup>
Flood warning scheme	A flood warning scheme is the network of monitoring on a coastal stretch or river, which provides SEPA with the ability to issue Flood Warnings.
Floods Directive	European Directive 2007/60/EC on the Assessment and Management of Flood Risks builds on and is closely related to the Water Framework Directive (see river basin management planning). It was transposed into Scots Law by the Flood Risk Management (Scotland) Act 2009. The Directive requires Member States to assess if all watercourses and coastlines are at risk from flooding, to map the flood extent, assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk <sup>vii</sup> .
Floodplain	Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would naturally flow but for the presence of flood defences and other structures where they exist.
Floodplain storage	Floodplains naturally store water during high flows. Storage can be increased through natural or man-made features to increase flood depth or slow flows in order to reduce flooding elsewhere.
Gabion	A metal cage filled with rocks often used in river bank protection.
Green infrastructure	The European Commission defines green infrastructure as “the use of ecosystems, green spaces and water in strategic land use planning to deliver environmental and quality of life benefits. It includes parks, open spaces, playing fields, woodlands, wetlands, road verges, allotments and private gardens. Green infrastructure can contribute to climate change mitigation and adaptation, natural disaster risk mitigation, protection against flooding and erosion as well as biodiversity conservation.” See also ‘blue infrastructure’ <sup>viii</sup>

Term	Definition
Groundwater flooding	This type of flooding is caused by water rising up from underlying rocks or flowing from springs. In Scotland groundwater is generally a contributing factor to flooding rather than the primary source.
Integrated catchment study (ICS)	In urban areas, the causes of flooding are complex because of the interactions between rivers, surface water drainage and combined sewer systems and tidal waters. Scottish Water works with SEPA and local authorities to assess these interactions through detailed studies.
Land use planning (LUP)	The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups.
Lead local authority	A local authority responsible for leading the production, consultation, publication and review of a Local Flood Risk Management Plan.
Likelihood of flooding	The chance of flooding occurring. <b>High likelihood:</b> A flood is likely to occur in the defined area on average once in every ten years (1:10). Or a 10% chance of happening in any one year. <b>Medium likelihood:</b> A flood is likely to occur in the defined area on average once in every two hundred years (1:200). Or a 0.5% chance of happening in any one year. <b>Low likelihood:</b> A flood is likely to occur in the defined area on average once in every thousand years (1:1000). Or a 0.1% chance of happening in any one year.
Local Flood Risk Management Plans (Local FRM Plan)	Local Flood Risk Management Plans, produced by lead local authorities, will take forward the objectives and actions set out in Flood Risk Management Strategies. They will provide detail on the funding, timeline of delivery, arrangements and co-ordination of actions at the local level during each six year FRM planning cycle.
Local Nature Reserve (LNR)	A Local Nature Reserve is a protected area of land designated by a local authority because of its local special natural interest and / or educational value. Local authorities select and designate local nature reserves using their powers under the National Parks and Access to the Countryside Act 1949 <sup>ix</sup> .
Local Plan District	Geographical areas for the purposes of flood risk management planning. There are 14 Local Plan Districts in Scotland.
Local Plan District Partnerships	Each LPD has established a local partnership comprised of local authorities, SEPA, Scottish Water and others as appropriate. These partnerships are distinct from the FRM Local Advisory Groups and they retain clear responsibility for delivery of the FRM actions set out in the Local Flood Risk Management Plans. It is the local partnership that makes decisions and supports the delivery of these plans.
Maintenance	Sections 18 and 59 of the Flood Risk Management (Scotland) Act 2009 put duties of watercourse inspection, clearance and repair on local authorities. In addition, local authorities may also be responsible for maintenance of existing flood protection schemes or defences.
Montane habitat	This habitat encompasses a range of natural or near-natural vegetation occurring in the montane zone, lying above or beyond the natural tree-line.
National Flood Management Advisory Group (NFMAG)	The National Flood Management Advisory Group provides advice and support to SEPA and, where required, Scottish Water, local authorities and other responsible authorities on the production of FRM Strategies and Local FRM Plans.
National Flood Risk Assessment (NFRA)	A national analysis of flood risk from all sources of flooding which also considers climate change impacts. Completed in December 2011 this provides the information required to undertake a strategic approach to flood management that identifies areas at flood risk that require further appraisal. The NFRA will be reviewed and updated for the second cycle of FRM Planning by December 2018.

<b>Term</b>	<b>Definition</b>
Natural flood management (NFM)	A set of flood management techniques that aim to work with natural processes (or nature) to manage flood risk.
Non-residential properties	Properties that are not used for people to live in, such as shops or other public, commercial or industrial buildings.
Objectives	Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding.
One in 200 year flood	See 'likelihood of flooding' and 'return period'.
Planning policies	Current national planning policies, Scottish Planning Policy and accompanying Planning Advice notes restrict development within the floodplain and limit exposure of new receptors to flood risk. In addition to national policies, local planning policies may place further requirements within their area of operation to restrict inappropriate development and prevent unacceptable risk.
Potentially Vulnerable Areas (PVA)	Catchments identified as being at risk of flooding and where the impact of flooding is sufficient to justify further assessment and appraisal. There were 243 PVAs identified by SEPA in the National Flood Risk Assessment and these are the focus of the first FRM planning cycle.
Property level protection	Property level protection includes flood gates, sandbags and other temporary barriers that can be used to prevent water from entering individual properties during a flood.
Property level protection scheme	Some responsible authorities may have a formal scheme to provide, install and maintain property level protection for properties.
Ramsar sites	Ramsar sites are wetlands of international importance designated under the Ramsar Convention.
Receptor	Refers to the entity that may be impacted by flooding (a person, property, infrastructure or habitat). The vulnerability of a receptor can be reduced by increasing its resilience to flooding.
Residual risk	The risk that remains after risk management and mitigation. This may include risk due to very severe (above design standard) storms or risks from unforeseen hazards.
Resilience	The ability of an individual, community or system to recover from flooding.
Responsible authority	Designated under the FRM (Scotland) Act 2009 and associated legislation as local authorities, Scottish Water and, from 21 December 2013, the National Park Authorities and Forestry Commission Scotland. Responsible authorities, along with SEPA and Scottish Ministers, have specific duties in relation to their flood risk related functions.
Return period	A measure of the rarity of a flood event. It is the statistical average length of time separating flood events of a similar size. (see likelihood)
Revetment	Sloping structures placed on banks or at the foot of cliffs in such a way as to deflect the energy of incoming water.
Riparian	The riparian area is the interface between land and a river or stream. For the purposes of FRM this commonly refers to the riparian owner, which denotes ownership of the land area beside a river or stream.
River basin management planning (RBMP)	The Water Environment and Water Services (Scotland) Act 2003 transposed the European Water Framework Directive into Scots law. The Act created the River Basin Management Planning process to achieve environmental improvements to protect and improve our water environment. It also provided the framework for regulations to control the negative impacts of all activities likely to have an impact on the water environment.
Runoff reduction	Actions within a catchment or sub-catchment to reduce the amount of runoff during rainfall events. This can include intercepting rainfall,

Term	Definition
	storing water, diverting flows or encouraging infiltration.
Scottish Advisory and Implementation Forum for Flooding (SAIFF)	The stakeholder forum on flooding set up by the Scottish Government to ensure legislative and policy aims are met and to provide a platform for sharing expertise and developing common aspirations and approaches to reducing the impact of flooding on Scotland's communities, environment, cultural heritage and economy.
Sediment balance	Within a river where erosion and deposition processes are equal over the medium to long-term resulting in channel dimensions (width, depth, slope) that are relatively stable.
Sediment management	Sediment management covers a wide range of activities that includes anything from the small scale removal of dry gravels to the dredging of whole river channels and the reintroduction of removed sediment into the water environment. Historically, sediment management has been carried out for several reasons, including reducing flood risk, reducing bank erosion, for use as aggregate and to improve land drainage.
Self help	Self help actions can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources, frequency and scales of flooding. They focus on awareness raising and understanding of flood risk.
Sewer flooding (and other artificial drainage system flooding)	Flooding as a result of the sewer or other artificial drainage system (e.g. road drainage) capacity being exceeded by rainfall runoff or when the drainage system cannot discharge water at the outfall due to high water levels (river and sea levels) in receiving waters.
Site protection plans	Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.
Shoreline Management Plan (SMP)	A Shoreline Management Plan is a large scale assessment of the coastal flood and erosion risks to people and the developed, historic and natural environment. It sets out a long-term framework for the management of these risks in a sustainable manner.
Site of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest are protected by law under the Nature Conservation (Scotland) Act 2004 to conserve their plants, animals and habitats, rocks and landforms <sup>x</sup> .
Source of flooding	The type of flooding. This can be coastal, river, surface water or groundwater.
Special Area of Conservation (SAC)	Special Areas of Conservation are strictly protected sites designated under the European Habitats Directive. The Directive requires the establishment of a European network of protected areas which are internationally important for threatened habitats and species <sup>xi</sup> .
Special Protection Areas (SPA)	Special Protection Areas are strictly protected sites classified in accordance with the European Birds Directive. They are classified for rare and vulnerable birds (as listed in the Directive), and for regularly occurring migratory species <sup>xii</sup> .
Standard of protection (SoP)	All flood protection structures are designed to be effective up to a specified flood likelihood (Standard of Protection). For events beyond this standard, flooding will occur. The chosen Standard of Protection will determine the required defence height and / or capacity.
Storage area	A feature that can be used to store floodwater, this can be natural in the form of low lying land or manmade such as a reservoir or modified landform.
Strategic Environmental Assessment (SEA)	A process for the early identification and assessment of the likely significant environmental effects, positive and negative, of activities. Often considered before actions are approved or adopted.
Strategic Flood Risk Assessment (SFRA)	A Strategic Flood Risk Assessment is designed for the purposes of specifically informing the Development Plan Process. A SFRA involves the collection, analysis and presentation of all existing and readily available flood risk information (from any source) for the area of interest. It constitutes a strategic overview of flood risk.

Term	Definition
Strategic mapping and modelling	Strategic mapping and modelling actions have been identified in locations where SEPA is planning to undertake additional modelling or analysis of catchments and coastlines, working collaboratively with local authorities where appropriate, to improve the national understanding of flood risk.
Surcharge	Watercourses and culverts can carry a limited amount of water. When they can no longer cope, they overflow, or 'surcharge'.
Surface water flooding	Flooding that occurs when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead <sup>xiii</sup>
Surface water management plan (SWMP)	A plan that takes an integrated approach to drainage accounting for all aspects of urban drainage systems and produces long term and sustainable actions. The aim is to ensure that during a flood the flows created can be managed in a way that will cause minimum harm to people, buildings, the environment and business.
Surface water plan/study	The management of flooding from surface water sewers, drains, small watercourses and ditches that occurs, primarily in urban areas, during heavy rainfall. FRM Strategy actions in this category include: Surface Water Management Plans, Integrated Catchment Studies and assessment of flood risk from sewerage systems (FRM Act Section 16) by Scottish Water. These have been selected as appropriate for each Potentially Vulnerable Area.
Sustainable flood risk management	The sustainable flood risk management approach aims to meet human needs, whilst preserving the environment so that these needs can be met not only in the present, but also for future generations. The delivery of sustainable development is generally recognised to reconcile three pillars of sustainability – environmental, social and economic.
Sustainable drainage systems (SuDS)	A set of techniques designed to slow the flow of water. They can contribute to reducing flood risk by absorbing some of the initial rainfall and then releasing it gradually, thereby reducing the flood peak and helping to mitigate downstream problems. SuDS encourage us to take account of quality, quantity and amenity / biodiversity.
UK Climate Change Projections (UKCP09)	The leading source of climate change information for the UK. It can help users to assess their climate risks and plan how to adapt to a changing climate. The high emissions scenario refers to the SRES A1F1 emission scenario. See Annex 1 of the UKCP09 Climate change projections report for details. <sup>xiv</sup>
Utility assets	Within the FRM Strategies this refers to electricity sub stations, mineral and fuel extraction sites, telephone assets, television and radio assets.
Voe	A dialect term, common in place names and used to refer to a small bay or creek in Orkney or Shetland.
Vulnerability	A measure of how likely someone or something is to suffer long-term damage as a result of flooding. It is a combination of the likelihood of suffering harm or damage during a flood (susceptibility) and the ability to recover following a flood (resilience).
Wave energy dissipation	Process by which a wave loses its energy.
Wave overtopping	Wave overtopping occurs when water passes over a flood wall or other structure as a result of wave action. Wave overtopping may lead to flooding particularly in exposed coastal locations.

<sup>i</sup> <http://apps.sepa.org.uk/bathingwaters/> accessed 14/10/2015 last updated 2015

<sup>ii</sup> <http://www.susdrain.org/delivering-suds/using-suds/suds-components/swales-and-conveyance-channels/swales.html> accessed 12/10/2015 last updated 2012

<sup>iii</sup> <http://www.gov.scot/Resource/Doc/362219/0122541.pdf> accessed 12/10/2015 last updated 2011

<sup>iv</sup> <http://www.legislation.gov.uk/ukpga/2004/36/schedule/1> accessed 12/10/2015 last updated 2004

<sup>v</sup> <http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter9.aspx?pagenum=10> accessed 12/10/2015 last update 07/03/2012

<sup>vii</sup> [http://ec.europa.eu/environment/water/flood\\_risk/](http://ec.europa.eu/environment/water/flood_risk/) accessed 12/10/2015 last updated 17/09/2015

<sup>viii</sup> <http://www.gov.scot/Resource/Doc/362219/0122541.pdf> accessed 12/10/2015 last updated 2011

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- <sup>ix</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/local-designations/lmr/> accessed 12/10/2015 last updated 12/07/2015
- <sup>x</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/sssis/> accessed 12/10/2015 last updated 21/01/2015
- <sup>xi</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/sac/> accessed 12/10/2015 last updated 01/03/2013
- <sup>xii</sup> <http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/international-designations/spa/> accessed 12/10/2015 last updated 01/03/2013
- <sup>xiii</sup> <http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfs#w=x=357683&y=355134&scale=2> accessed 12/10/2015 last updated 12/10/2015
- <sup>xiv</sup> <http://ukclimateprojections.metoffice.gov.uk> Document © Crown copyright 2009 accessed 01/12/15 last updated 30/04/2012

## Annex 2: Land use planning

### Flood risk management actions from national planning policies

#### AVOID DEVELOPMENT IN MEDIUM TO HIGH RISK AREAS

- a) **Planning authorities** work in partnership undertaking catchment-wide Strategic Flood Risk Assessments to inform their development plan allocations in line with SEPA's guidance and Land Use Vulnerability.
- b) **Planning authorities and SEPA** require the submission of flood risk assessments that accord with SEPA's *Technical Flood Risk Guidance for Stakeholders*, to support planning applications where there is a potential flood risk. The flood risk assessment should be used to demonstrate as far as possible that the development will be safe for its lifetime, without increasing flood risk elsewhere and, where possible, takes opportunities to reduce flood risk overall.
- c) **SEPA** ensures that its flood risk advice to planning authorities is clear and appropriate. SEPA, in consultation with planning authorities, undertakes an annual assessment of planning advice and its contribution to flood risk.
- d) **SEPA and planning authorities** engage at an early stage of the development plan process to agree appropriate forms of development to help inform the preparation and implementation of Strategic Flood Risk Assessments.

#### REDUCE IMPACTS TO EXISTING BUILDINGS

- a) **SEPA, planning authorities and local communities** are required to engage at an early stage of the development plan process to agree the best long term land uses for areas where relocation, abandonment and/or change of use have been identified to deliver sustainable flood risk management. Where possible, new land uses should aim to achieve multiple benefits for local communities such as the creation of blue / green infrastructure and increased resilience to climate change.

#### PROTECT AND ENHANCE NATURAL FEATURES THAT HAVE A POSITIVE IMPACT ON REDUCING OVERALL FLOOD RISK

- a) **SEPA and planning authorities** are required to engage early in the development plan process to identify opportunities for the restoration and protection of natural features which help manage flood risk. Opportunities should be maximised to achieve multiple benefits such as the development of green / blue infrastructure and improved place making. Areas of land that may contribute to flood management should be identified and protected.

#### NEW DEVELOPMENTS ARE DESIGNED TO ENSURE THAT SURFACE WATER DRAINAGE DOES NOT INCREASE FLOOD RISK ON OR OFF SITE

- a) **SEPA** prepares guidance for planning authorities and developers on the use of surface water hazard maps for land use planning purposes.
- b) **Planning authorities** support the implementation of Surface Water Management Plans, developed by the local authorities, through development plan allocations and policies. Surface Water Management Plans should take account of development opportunities that could contribute to the reduction of surface water flood risk.
- c) **SEPA** engages at an early stage of the development plan process to progress exemplar projects that demonstrate the potential for land use planning to mitigate surface water flooding and contribute to wider environmental benefits.

- a) **NEW DEVELOPMENT IS RESILIENT TO PREDICTED FUTURE CHANGES IN CLIMATE** **Planning authorities** ensure that climate change is considered in Strategic Flood Risk Assessments and Flood Risk Assessments, based upon the best scientific evidence and the information requirements of planners to make informed decisions.

Table 1: Objectives and actions that reflect national Land Use Planning policies and guidance

## Annex 3: Acknowledgements

SEPA gratefully acknowledges the cooperation and input that various parties have provided, including *inter alia*, the following organisations:

### **Ordnance Survey**

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### **Local authorities**

SEPA acknowledges the provision of flood models and other supporting data and information from local authorities in Scotland and their collaboration in the production of flood risk management information.

### **Scottish Water**

SEPA acknowledges the inclusion of surface water flooding data generated by Scottish Water in preparation of flood risk information.

Further detail on the datasets that have been used in the development of the Flood Risk Management Strategies can be found in the Strategic Appraisal Methodology, which is available from the SEPA webpage.



