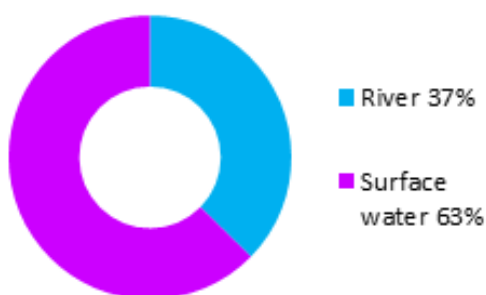


## Lasswade, Penicuik, Dalkeith and Musselburgh (Potentially Vulnerable Area 10/22)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	River Esk (Lothian)

### Summary of flooding impacts



#### At risk of flooding

- 320 residential properties
- 320 non-residential properties
- £1.8 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>	Community flood action groups	<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

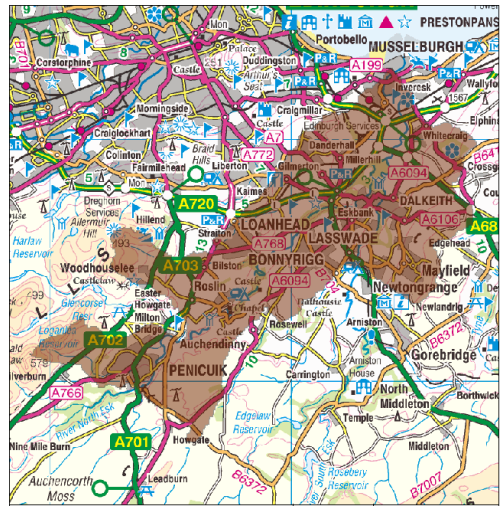
Actions

# Lasswade, Penicuik, Dalkeith and Musselburgh (Potentially Vulnerable Area 10/22)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, East Lothian Council, Midlothian Council	River Esk (Lothian)

## Background

This Potentially Vulnerable Area is 97km<sup>2</sup> and is part of the Almond and Edinburgh catchment (shown below). This is a large, mainly rural area covering southern Musselburgh, Dalkeith, Lasswade, Bonnyrigg and Penicuik.

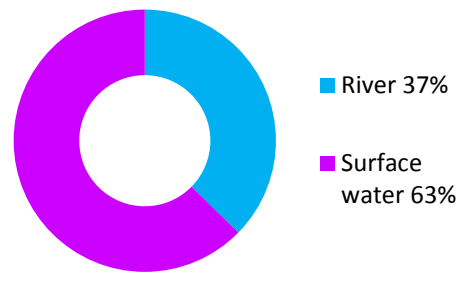


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The main watercourse is the River Esk, forming after the confluence of the River North Esk and River South Esk on the outskirts of Dalkeith. Other notable watercourses include the Park Burn and the Bilston Burn. The majority of damages are caused by surface water flooding.

There are approximately 320 residential properties and 320 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £1.8 million.



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

## Summary of flooding impacts

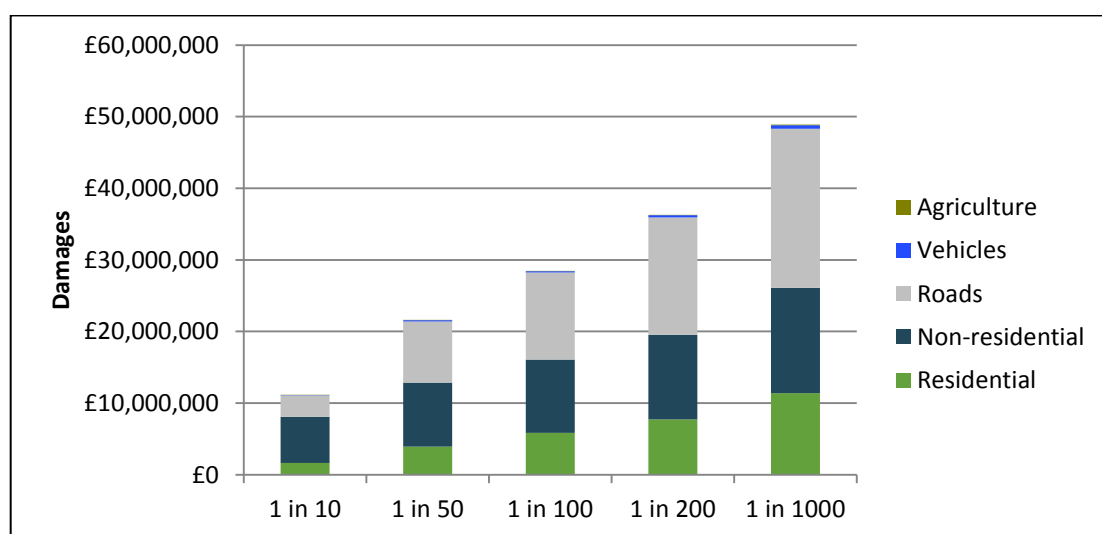
The highest risk of surface water flooding is in Dalkeith, Lasswade and Bonnyrigg. The highest risk of river flooding is from the River Esk, the River South Esk, the River North Esk and the Loan Burn to Musselburgh, Dalkeith and Newbattle, Lasswade and Bonnyrigg and Penicuik. Musselburgh is also at risk from coastal flooding from the Firth of Forth.

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, notably the A720, A7 and A1, followed by damages to non-residential properties.

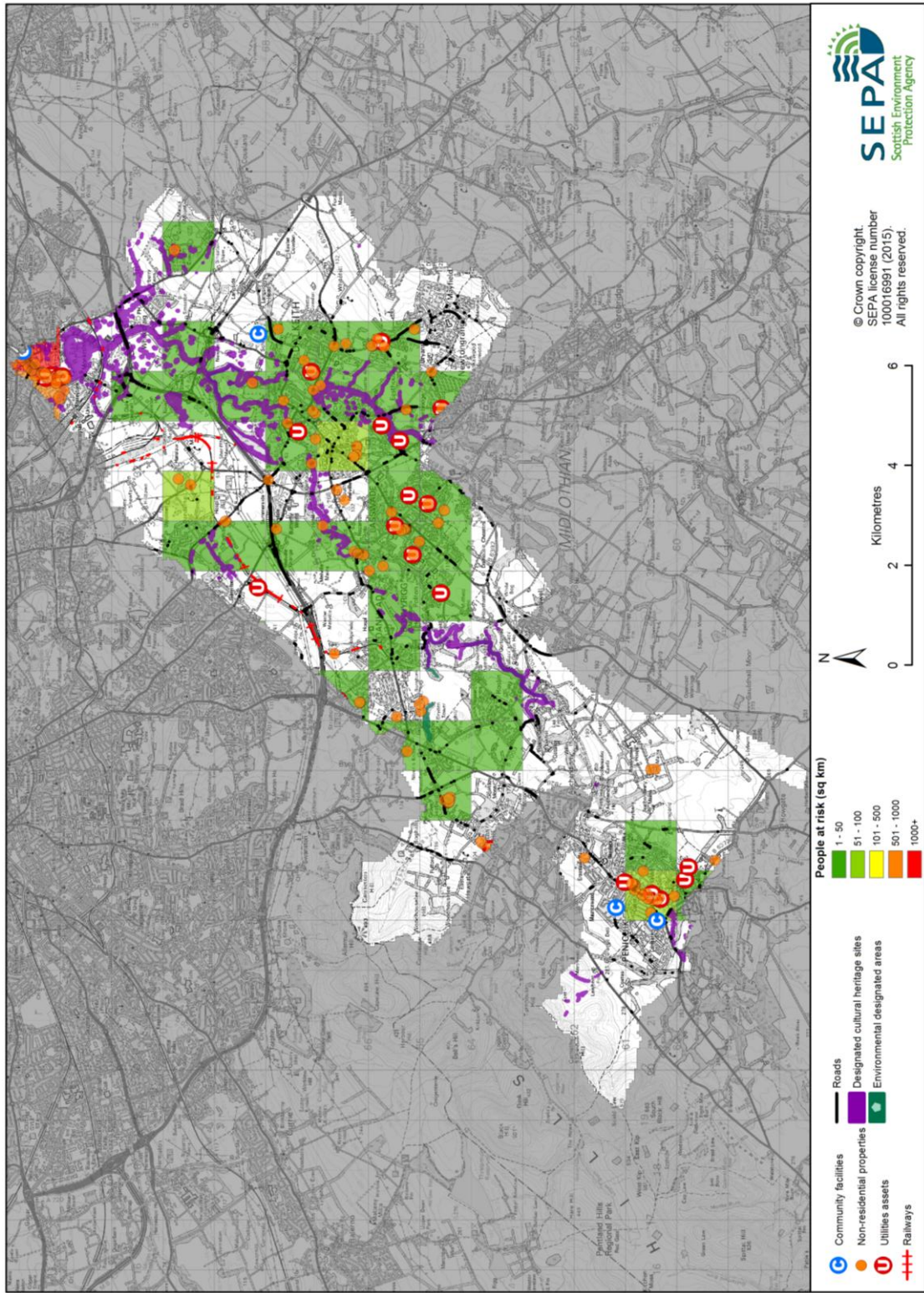
The location of the impacts of flooding is shown in Figure 3. The figures presented for Annual Average Damages include damages to residential properties, non-residential properties, transport and agriculture.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 34,000)	60	320	490
Non-residential properties (total 3,500)	140	320	370
People	140	700	1,100
Community facilities	<10 Educational buildings	<10 Educational buildings	<10 Includes: educational buildings and emergency services
Utilities	<10	20	30
Transport links (excluding minor roads)	15 A roads, 11 B roads at 286 locations  1 Railway route at 2 locations: Berwick-upon-Tweed to Edinburgh	15 A roads, 11 B roads at 427 locations  1 Railway route at 5 locations: Berwick-upon-Tweed to Edinburgh	15 A roads, 12 B roads at 497 locations  1 Railway route at 7 locations: Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km <sup>2</sup> )	0.1	0.1	0.1
Designated cultural heritage sites	38	47	49
Agricultural land (km <sup>2</sup> )	0.8	1.1	1.2

**Table 1:** Summary of flooding impacts



**Figure 2:** Damages by flood likelihood



**Figure 3: Impacts of flooding**

## History of flooding

Two significant floods have been recorded in this area. On 6 October 1990 Musselburgh was affected by flooding from the River Esk. On 13 August 1948 evacuation was required in Musselburgh after flooding occurred in Eskside West, Eskside East, Shorthope Street, Millhill and areas of the High Street.

## Objectives to manage flooding in Potentially Vulnerable Area 10/22

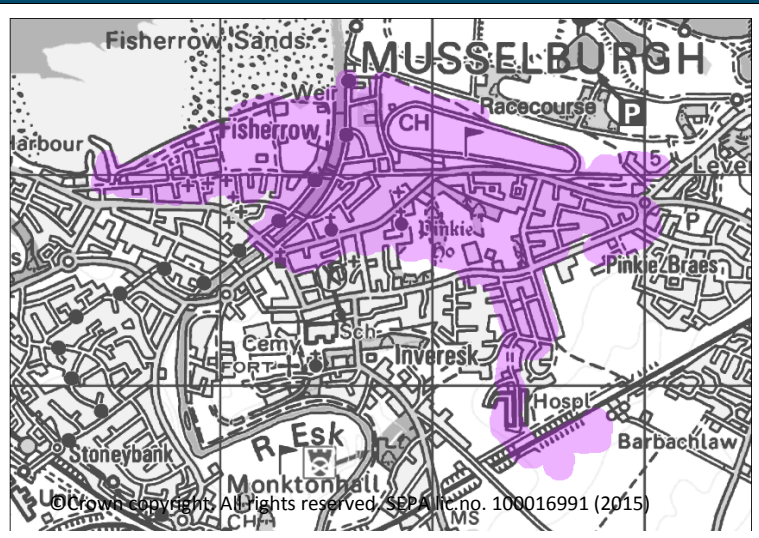
Objectives provide a common goal and shared ambition for managing floods. These objectives have been set by SEPA and agreed with flood risk management authorities following consultation. They were identified through an assessment of the underlying evidence of the causes and impacts of flooding. Target 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 Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area.

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

Indicators:

- 2,800 people
- £1.6 million Annual Average Damages from residential properties
- £1.2 million Annual Average Damages from non-residential properties

Target area:



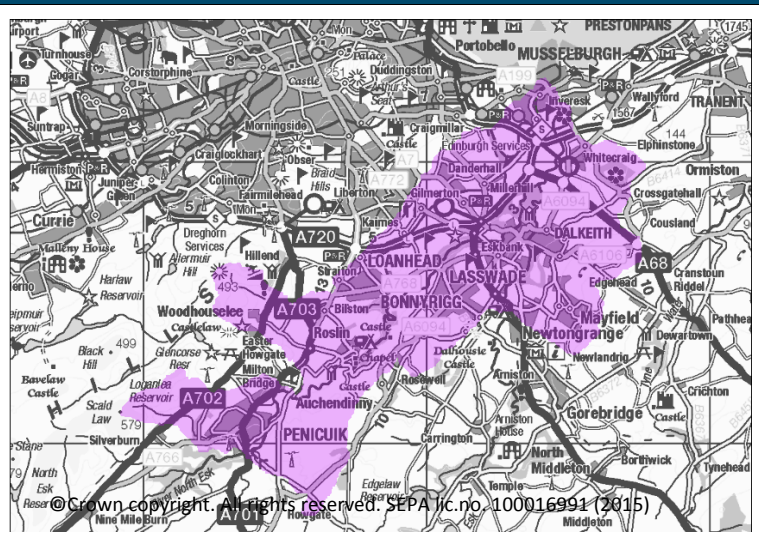
Objective ID: 10075, 10076

### Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding

Indicators:

- £65,000 Annual Average Damages from residential properties
- £39,000 Annual Average Damages from non-residential properties

Target area:



Objective ID: 10077

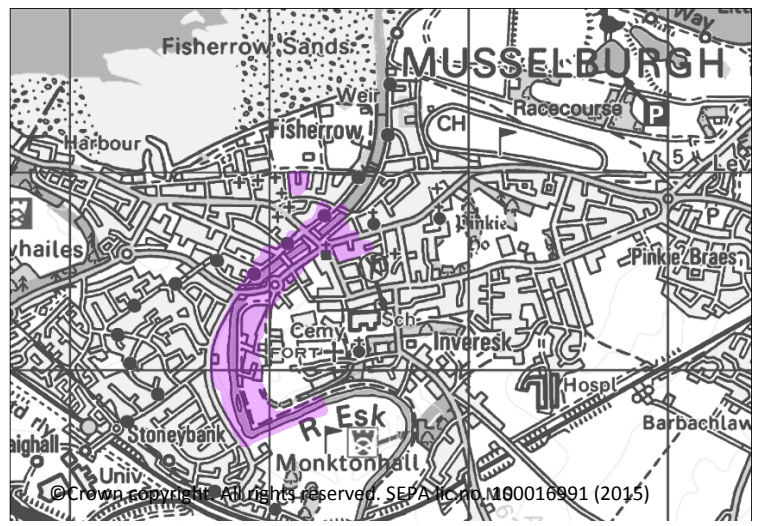
**Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk**

Indicators:

Target area:

- £96,000 Annual Average Damages from residential properties
- £390,000 Annual Average Damages from non-residential properties

Objective ID: 10078



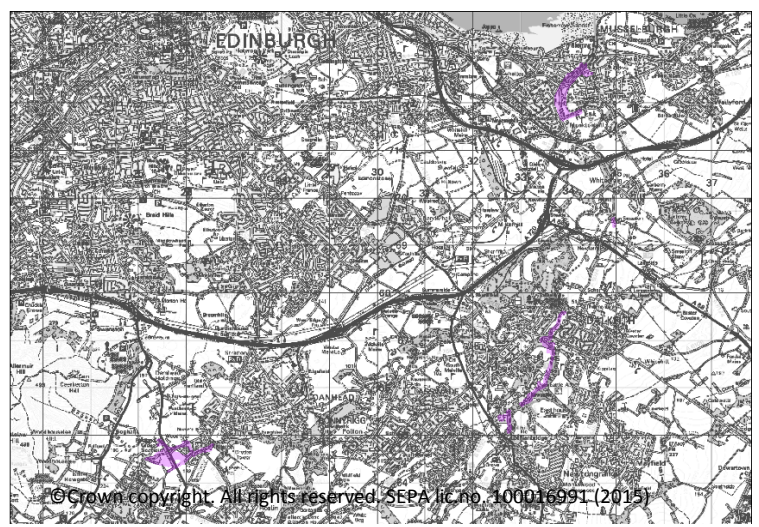
**Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding**

Indicators:

Target area:

- 370 people

Objective ID: 10079



Target area	Objective	ID	Indicators within PVA
Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical	10052	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	<ul style="list-style-type: none"> <li>• 320 residential properties</li> <li>• £1.8 million Annual Average Damages</li> </ul>
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	<ul style="list-style-type: none"> <li>• 320 residential properties</li> <li>• £1.8 million Annual Average Damages</li> </ul>
Applies across Forth Estuary 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 10/22 there are 170 residential properties at risk and Annual Average Damages of £1.1 million.



## Actions to manage flooding in Potentially Vulnerable Area 10/22

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 Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area.

Selected actions					
Flood protection scheme/works	<i>Natural flood management works</i>	<i>New flood warning</i>	Community flood action groups	<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 SCHEME/WORKS (100750006)</b>				
<b>Objective (ID):</b>	<p>Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding (10079)</p> <p>Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk (10078)</p> <p>Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)</p> <p>Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)</p>				
<b>Delivery lead:</b>	East Lothian Council				
<b>Priority:</b>	National:		Within local authority:		
	<b>11 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 for Musselburgh to reduce flood risk from the River Esk. The scheme would consist of flood defences and earth embankments and would provide a 1 in 200 year standard of protection. Part of this proposed scheme is located in Potentially Vulnerable Area 10/21. The benefits and impacts have been assessed for the whole scheme.				
<b>Potential impacts</b>					
<b>Economic:</b>	The proposed scheme may benefit 1489 residential properties and 407 non-residential properties at risk of flooding in this location, with estimated damages avoided of £30 million. The flood protection scheme has an estimated benefit cost ratio of 5.3.				

<b>Social:</b>	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community. In addition there are three educational buildings 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 can 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 Forth 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, gardens and designed landscapes, battlefields, listed buildings, Sites of Special Scientific Interest, Ramsar sites and ancient woodlands.

<b>Action (ID):</b>	<b>FLOOD PROTECTION STUDY (100770005)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)		
<b>Delivery lead:</b>	Midlothian Council		
<b>Priority:</b>	National:	Within local authority:	
	<b>142 of 168</b>	<b>1 of 1</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 Dalkeith and Lasswade to assess whether flood defences and sediment management could reduce flood risk. 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.		
<b>Potential impacts</b>			
<b>Economic:</b>	The study could benefit 11 residential properties and three non-residential properties at risk of flooding in this location, with potential damages avoided of up to £650,000.		
<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.		
<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. Conservation areas, gardens and designed landscapes and ancient woodlands are also present in the study area and could be positively or negatively impacted.		

<b>Action (ID):</b>	<b>NATURAL FLOOD MANAGEMENT STUDY (100750003)</b>		
<b>Objective (ID):</b>	<p>Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding (10079)</p> <p>Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk (10078)</p> <p>Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)</p> <p>Reduce economic damages to residential and non-residential properties and risk to people in Musselburgh caused by flooding from the River Esk and coastal flooding (10075, 10076)</p>		
<b>Delivery lead:</b>	East Lothian Council		
<b>Status:</b>	<b>Not started</b>	Indicative delivery:	<b>2016-2021</b>
<b>Description:</b>	<p>A natural flood management study has been recommended for Musselburgh to assess whether wave attenuation could help reduce flood risk. The study should link with the proposed flood protection scheme in Musselburgh. Part of this proposed study is located in Potentially Vulnerable Area 10/21. The benefits and impacts have been assessed for the whole study.</p>		
<b>Potential impacts</b>			
<b>Economic:</b>	<p>The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events.</p>		
<b>Social:</b>	<p>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.</p>		
<b>Environmental:</b>	<p>Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. The Leith Docks to Port Seton coastline (water body ID 200034) 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 the 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 Forth Special Protection Area.</p>		

<b>Action (ID):</b>	<b>SURFACE WATER PLAN/STUDY (100520018)</b>		
<b>Objective (ID):</b>	<p>Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)</p>		
<b>Delivery lead:</b>	The City of Edinburgh Council, Midlothian Council, East Lothian 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 (100520019)</b>		
<b>Objective (ID):</b>	Reduce economic damages and number of residential properties at risk of surface water flooding in Edinburgh, Musselburgh, Penicuik, Lasswade, Loanhead, Newtongrange and Dalkeith where practical (10052)		
<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 (100990016)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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 Lower Esk area to improve understanding of 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 (100990019)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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 (100770017)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)		
<b>Delivery lead:</b>	Midlothian Council		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the existing flood protection schemes and defences. These include defences along the Bilston Burn, the Rullion Road Penicuik Flood Protection Scheme and the Polton Road Bridge Relief Culvert Flood Protection Scheme.		

<b>Action (ID):</b>	<b>MAINTAIN FLOOD WARNING (100990030)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<b>Delivery lead:</b>	SEPA		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	Continue to maintain the Musselburgh flood warning area which is part of the Esk (East Lothian) river flood warning scheme.		

<b>Action (ID):</b>	<b>FLOOD FORECASTING (100990009)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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 (100770012)</b>		
<b>Objective (ID):</b>	Reduce economic damages to residential and non-residential properties in the Lasswade, Penicuik, Dalkeith and Musselburgh Potentially Vulnerable Area caused by river flooding (10077)		
<b>Delivery lead:</b>	Community		
<b>Status:</b>	<b>Existing</b>	Indicative delivery:	<b>Ongoing</b>
<b>Description:</b>	East Lothian Tenants and Residents Panel operate in this area. The group aims to involve the community in area-specific issues and could help increase community resilience to flooding.		

<b>Action (ID):</b>	<b>SELF HELP (100990011)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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 (100990013)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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 (100990007)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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 (100990014)</b>		
<b>Objective (ID):</b>	Reduce overall flood risk (10099)		
<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. East Lothian Council strategically deploys temporary flood barriers and sandbags when properties are threatened by flooding.		

<b>Action (ID):</b>	<b>PLANNING POLICIES (100010001)</b>		
<b>Objective (ID):</b>	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
<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.		