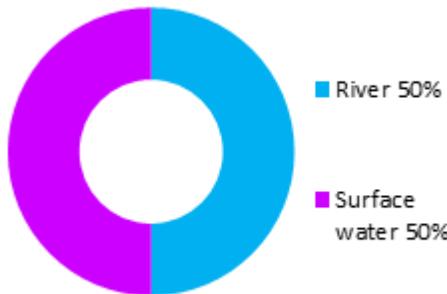


South Gyle, Broxburn and Bathgate (Potentially Vulnerable Area 10/27)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, West Lothian Council	River Almond

Summary of flooding impacts



At risk of flooding

- 1,600 residential properties
- 330 non-residential properties
- £2.4 million Annual Average Damages

(damages by flood source shown left)

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.

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

Summary of flooding impacts

Objectives

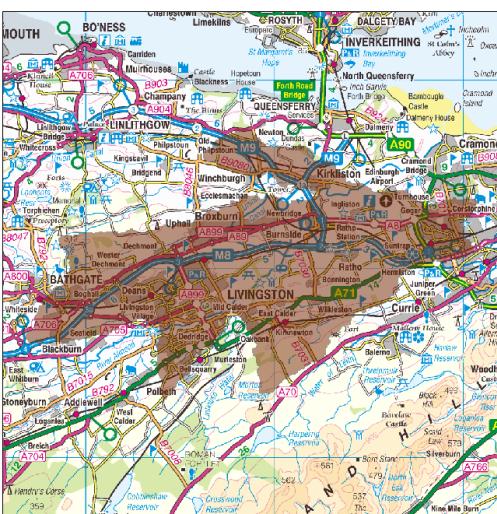
Actions

South Gyle, Broxburn and Bathgate (Potentially Vulnerable Area 10/27)

Local Plan District	Local authority	Main catchment
Forth Estuary	The City of Edinburgh Council, West Lothian Council	River Almond

Background

This Potentially Vulnerable Area is 154km² and situated in the lower reaches of the River Almond catchment (shown below). It includes the western areas of Edinburgh including Edinburgh Airport and South Gyle, Bathgate, Broxburn and Livingston.



The main watercourses are the River Almond and its tributaries the Brox Burn and the Gogar Burn.

The area has a risk of river and surface water flooding.

There are approximately 1,600 residential properties and 330 non-residential properties at risk of flooding.

The Annual Average Damages are approximately £2.4 million.

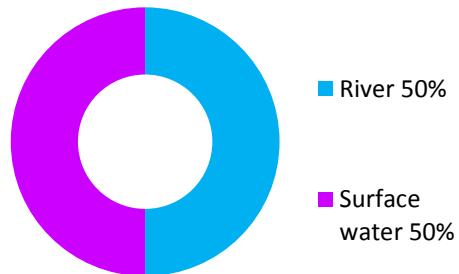


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

The highest risk of river flooding is from the Gogar Burn, Brox Burn and the River Almond to South Gyle (Edinburgh), Broxburn and Kirkliston. The highest risk of surface water flooding is in Edinburgh, Broxburn, Livingston and Bathgate.

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, non-residential properties and 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.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 51,000)	130	1,600	1,900
Non-residential properties (total 4,500)	70	330	370
People	290	3,500	4,300
Community facilities	0	<10 Includes: educational buildings and emergency services	<10 Includes: educational buildings and emergency services
Utilities	20	70	90
Transport links (excluding minor roads)	2 M roads (M8, M9), 8 A roads, 9 B roads at 352 locations 5 Railway routes at 64 locations: Dalmeny to Winchburgh and Haymarket West Junctions Midcalder Junction to Holytown Junction Carstairs to Edinburgh Drumgelloch to Newbridge Junction	2 M roads (M8, M9), 8 A roads, 9 B roads at 540 locations 5 Railway routes at 120 locations: Dalmeny to Winchburgh and Haymarket West Junctions Midcalder Junction to Holytown Junction Carstairs to Edinburgh Drumgelloch to Newbridge Junction Edinburgh Airport	2 M roads (M8, M9), 9 A roads, 9 B roads at 615 locations 5 Railway routes at 123 locations: Dalmeny to Winchburgh and Haymarket West Junctions Midcalder Junction to Holytown Junction Carstairs to Edinburgh Drumgelloch to Newbridge Junction Edinburgh Airport
Environmental designated areas (km²)	0	0	0
Designated cultural heritage sites	27	32	34
Agricultural land (km²)	3.5	5.0	5.3

Table 1: Summary of flooding impacts

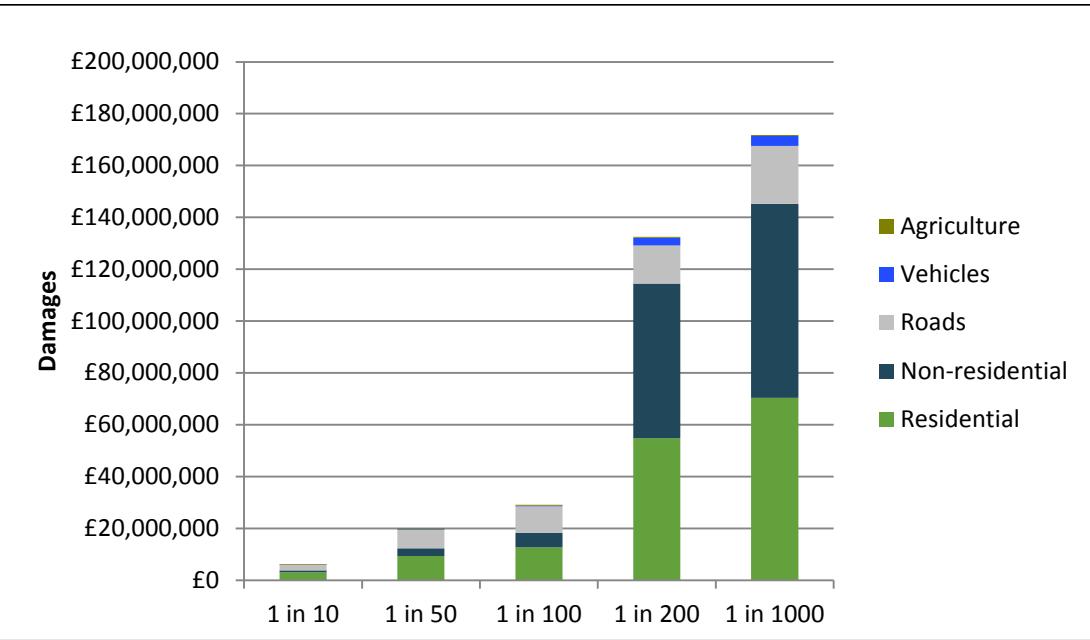


Figure 2: Damages by flood likelihood

History of flooding

The following significant floods have been recorded in this area:

- 20 August 2008: Over 100 properties flooded including at least five businesses.
- 2004 and 2005: A series of flood events in Broxburn resulted in the promotion of the Broxburn Flood Protection Scheme.
- 8 November 2000: High water levels on the River Almond caused flooding in Kirkliston.
- 26 April 2000: High water levels on the Gogar Burn caused flooding at Edinburgh Airport and nearby hotel.

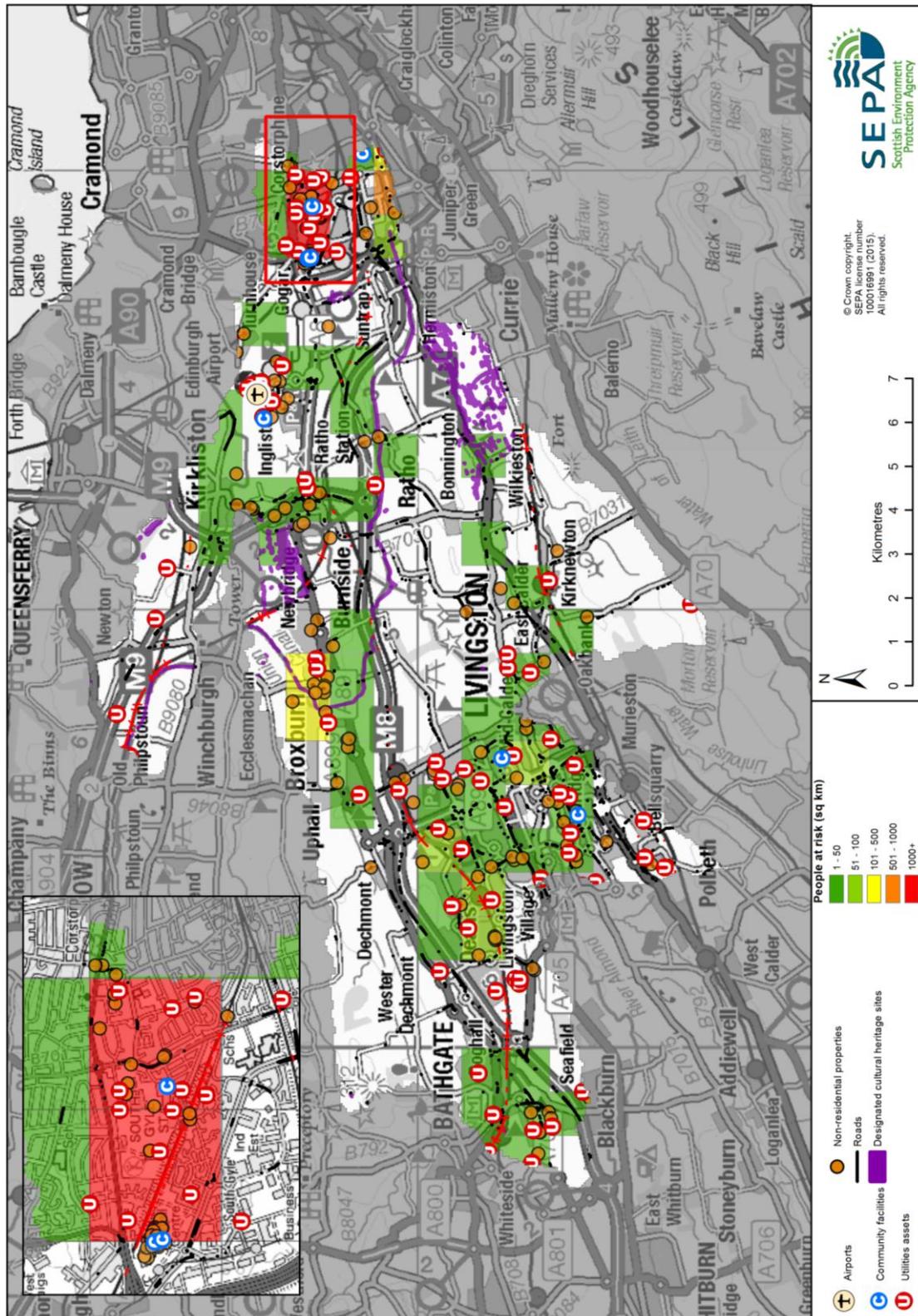


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 10/27

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 South Gyle, Broxburn and Bathgate Potentially Vulnerable Area.

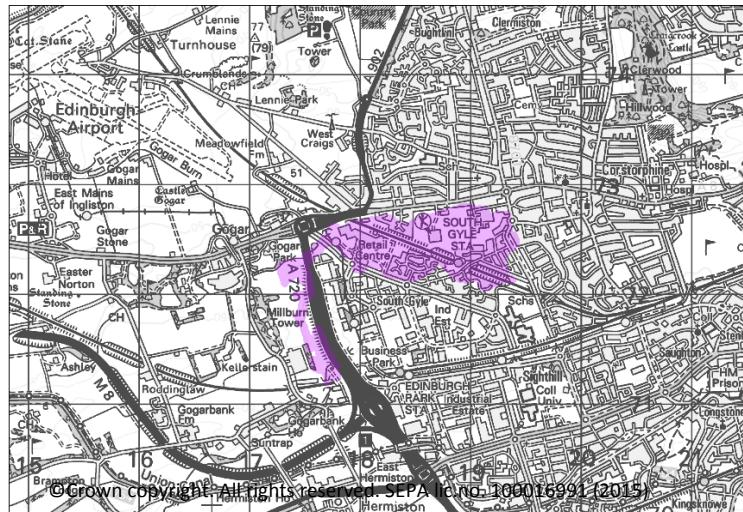
Reduce economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Gogar Burn

Indicators:

- £290,000 Annual Average Damages from residential properties

Objective ID: 10088

Target area:



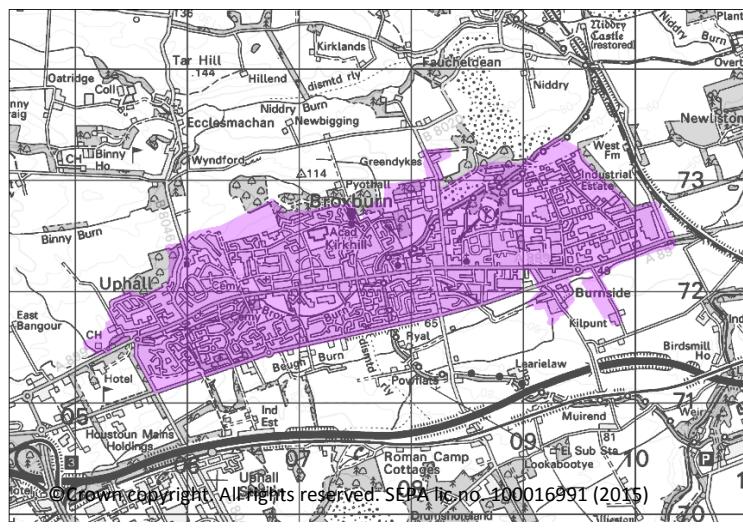
Accept that significant flood risk in Broxburn is managed appropriately. Maintain existing actions that reduce economic damages to residential and non-residential properties in Broxburn caused by flooding from the Brox Burn.

Indicators:

- £190,000 Annual Average Damages from residential properties
- £15,000 Annual Average Damages from non-residential properties

Objective ID: 10089

Target area:

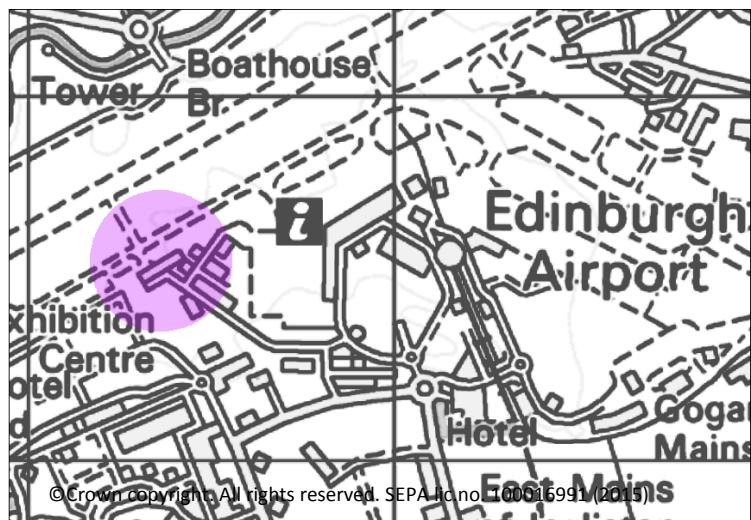


Reduce risk to community facilities in the South Gyle, Broxburn and Bathgate Potentially Vulnerable Area caused by river flooding

Indicators:

- One emergency service (airport fire station)

Target area:



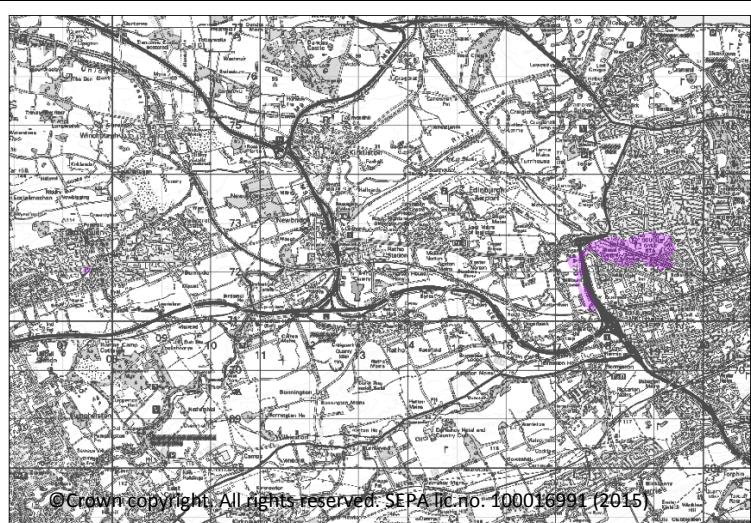
Objective ID: 10090

Reduce risk to people from river flooding in Broxburn and South Gyle

Indicators:

- 2,000 people

Target area:



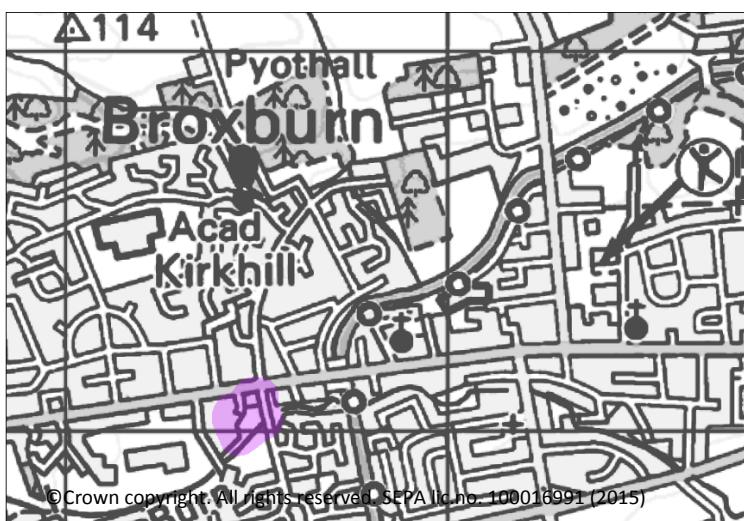
Objective ID: 10091

Reduce economic damages to residential and non-residential properties in Broxburn, West Main Street, caused by flooding from the Brox Burn

Indicators:

- 30 residential properties
- £14,000 Annual Average Damages from residential properties
- <10 non-residential properties

Target area:



Objective ID: 10096

Target area	Objective	ID	Indicators within PVA
Winchburgh	Reduce the physical or disruption risk related to the transport network for rail	10303	• 2.2km of rail track at 12 locations
Bathgate	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical	10045	* See note below
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
Broxburn and eastern Uphall	Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical	10085	* See note below
Livingston and Mid Calder	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical	10102	* See note below
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk	10001	• 1,600 residential properties • £2.4 million Annual Average Damages
Applies across Forth Estuary Local Plan District	Reduce overall flood risk	10099	• 1,600 residential properties • £2.4 million Annual Average Damages
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 10/27 there are 450 residential properties at risk and Annual Average Damages of £1.2 million.

Actions to manage flooding in Potentially Vulnerable Area 10/27

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 South Gyle, Broxburn and Bathgate 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

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100960006)		
Objective (ID):	Reduce economic damages to residential and non-residential properties in Broxburn, West Main Street, caused by flooding from the Brox Burn (10096)		
Delivery lead:	West Lothian Council		
Priority:	National:		Within local authority:
	36 of 42		1 of 1
Status:	Under development	Indicative delivery:	2016-2021
Description:	A flood protection scheme has been proposed for Broxburn (Liggat Syke) to complete the Broxburn flood prevention scheme. The scheme would consist of two flood storage basins in the catchment of the Liggat Syke and provide a 1 in 100 year standard of protection.		
Potential impacts			
Economic:	The flood protection scheme has an estimated benefit cost ratio of 1.22.		
Social:	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.		
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed.		

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100850006)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical (10102) Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical (10085)		
Delivery lead:	West Lothian Council		
Status:	Under development	Indicative delivery:	2016-2021
Description:	A surface water management project looking at 'legacy' sustainable drainage systems has been proposed for Livingston and Broxburn. The project would look to move 'legacy' sustainable drainage systems into public ownership and would be taken forward jointly by West Lothian Council and Scottish Water.		
Potential impacts			
Economic:	The economic impacts have not been defined at this stage.		
Social:	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.		
Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed.		

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (100850026)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical (10102) Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical (10085)		
Delivery lead:	West Lothian Council		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Surface water management works have been proposed for West Lothian as recommended in the West Lothian surface water management plan. The works include a range of local surface water management activities in specific locations in Livingston and Broxburn.		
Potential impacts			
Economic:	The economic impacts have not been defined at this stage.		
Social:	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.		

Environmental:	Flood protection schemes can have both positive and negative impacts on the ecological quality of the environment depending on how they are designed.
-----------------------	---

Action (ID):	FLOOD PROTECTION SCHEME/WORKS (10303021)		
Objective (ID):	Reduce the physical or disruption risk related to the transport network for rail (10303)		
Delivery lead:	Network Rail		
Status:	Under development	Indicative delivery:	2016-2021
Description:	Network Rail will carry out civil engineering work which will reduce the risk of flooding on identified sections of the rail network within this Potentially Vulnerable Area.		

Action (ID):	FLOOD PROTECTION STUDY (100900005)		
Objective (ID):	Reduce risk to people from river flooding in Broxburn and South Gyle (10091) Reduce risk to community facilities in the South Gyle, Broxburn and Bathgate Potentially Vulnerable Area caused by river flooding (10090) Reduce economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Gogar Burn (10088)		
Delivery lead:	The City of Edinburgh Council		
Priority:	National: 166 of 168		Within local authority: 3 of 3
Status:	Not started	Indicative delivery:	2022-2027
Description:	A flood protection study has been recommended for Gogar Burn in Edinburgh to assess whether direct 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. This study should also aim to improve the accuracy of the flood mapping in the Gyle / Gogar Burn area. The study has low national priority and is to be carried out in the second flood risk management cycle.		
Potential impacts			
Economic:	Potential damages avoided of up to £160,000. The airport fire station is the key receptor at risk of flooding.		
Social:	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 there is one community facility which has been identified as potentially benefitting from any proposed actions.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the		

Environmental:	environment land designated sites. Where possible opportunities to enhance and restore the environment should be sought, for example through natural flood management. The Gogar Burn (water body ID 3004) 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.
-----------------------	---

Action (ID):	SURFACE WATER PLAN/STUDY (100450018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical (10045)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100450019)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Bathgate where practical (10045)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2027
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520018)		
Objective (ID):	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)		
Delivery lead:	The City of Edinburgh Council, Midlothian Council, East Lothian Council		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100520019)		
Objective (ID):	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)		
Delivery lead:	Scottish Water in partnership with local authorities		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (100850018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Broxburn and eastern Uphall where practical (10085)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	SURFACE WATER PLAN/STUDY (101020018)		
Objective (ID):	Reduce economic damages and number of residential properties at risk of surface water flooding in Livingston and Mid Calder where practical (10102)		
Delivery lead:	West Lothian Council		
Status:	Ongoing	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990016)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Not started	Indicative delivery:	2016-2021
Description:	SEPA will seek to incorporate additional surface water data into the flood maps to improve understanding of flood risk. Approximately 2,600km ² 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 when these projects are completed.		

Action (ID):	STRATEGIC MAPPING AND MODELLING (100990019)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Scottish Water		
Status:	Not started	Indicative delivery:	2016-2021
Description:	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.		

Action (ID):	MAINTAIN FLOOD PROTECTION SCHEME (100890017)		
Objective (ID):	Accept that significant flood risk in Broxburn is managed appropriately. Maintain existing actions that reduce economic damages to residential and non-residential properties in Broxburn caused by flooding from the Brox Burn. (10089)		
Delivery lead:	West Lothian Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the existing Broxburn Flood Protection Scheme. The scheme consists of flood walls and embankments together with the replacement road bridges.		

Action (ID):	FLOOD FORECASTING (100990009)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	COMMUNITY FLOOD ACTION GROUPS (100890012)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Community		
Status:	Existing	Indicative delivery:	Ongoing
Description:	East Burnside Village Community Flood Action Group operates in this area.		

Action (ID):	SELF HELP (100990011)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		

Action (ID):	AWARENESS RAISING (100990013)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Responsible authorities		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	MAINTENANCE (100990007)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Local authorities, asset / land managers		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	SITE PROTECTION PLANS (100900015)		
Objective (ID):	Reduce risk to community facilities in the South Gyle, Broxburn and Bathgate Potentially Vulnerable Area caused by river flooding (10090)		
Delivery lead:	Edinburgh Airport		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<p>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. Edinburgh Airport operates a site protection plan.</p>		

Action (ID):	EMERGENCY PLANS/RESPONSE (100990014)		
Objective (ID):	Reduce overall flood risk (10099)		
Delivery lead:	Category 1 and 2 Responders		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>The City of Edinburgh Council operates Emergency Action Packs to determine where people should be deployed during flood events. The City of Edinburgh Council owns temporary pallet barriers and sandbags that can be used to protect properties from river flooding. West Lothian Council provides sandbags and Aquasacs for public use in emergencies.</p>		

Action (ID):	PLANNING POLICIES (100010001)		
Objective (ID):	Avoid an overall increase in flood risk (10001) Reduce overall flood risk (10099)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		