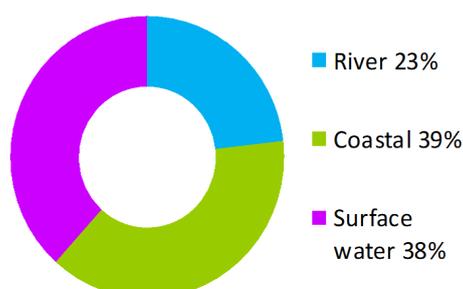


Yoker catchment - Clyde (Clydebank to Partick) (Potentially Vulnerable Area 11/05)

Local Plan District	Local authority	Main catchment
Clyde and Loch Lomond	East Dunbartonshire Council, Glasgow City Council, West Dunbartonshire Council	River Clyde

Summary of flooding impacts



At risk of flooding

- 4,900 residential properties
- 700 non-residential properties
- £8.1 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>	<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

Yoker catchment – Clyde (Clydebank to Partick) (Potentially Vulnerable Area 11/05)

Local Plan District	Local authority	Main catchment
Clyde and Loch Lomond	East Dunbartonshire Council, Glasgow City Council, West Dunbartonshire Council	River Clyde

Background

This Potentially Vulnerable Area is located to the south east of Loch Lomond on the northern bank of the River Clyde (shown below).

The area stretches from Clydebank in the west and extends east to incorporate parts of Bearsden, Drumchapel and the north west of Glasgow City. It is approximately 80km².

The area has a risk of river surface water and coastal flooding. Damages are split fairly evenly over all sources of flooding.

There are approximately 4,900 residential properties and 700 non-residential properties at risk of flooding. The Annual Average Damages are £8.1 million.

Flood Source	Percentage
River	23%
Coastal	39%
Surface water	38%

Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

There are a number of communities at risk of flooding from river, surface water and coastal sources with impacts to properties, infrastructure and community facilities. Due to the heavily urbanised nature in the south of this area, river flooding and surface water flooding may be closely linked with a large potential for interaction.

River flooding to properties is identified within the areas of Clydebank, Drumchapel and Yoker. The Yoker Burn, originating in Bearsden and flowing through Clydebank, has been culverted over much of its length. Glasgow City Council undertook a study of the Yoker Burn and the Yokermains Burn, looking at the interaction of surface water and river flooding. The study showed a large extent of flooding to properties in the area. The information from these studies has been incorporated into this assessment.

There are a number of smaller watercourses which flow into the Clyde Estuary and present a risk of river flooding. The Loch Humphrey / Duntocher Burn originates from Greenside Reservoir and flows to the west of Clydebank. The burn is intersected by a number of structures as it passes through these urban areas. Within Duntocher there are a large number of residential properties at risk of flooding. Downstream of the Duntocher Burn properties within the Mountblow area are also at risk. The Garscadden Burn and its tributaries are known to cause flooding to the residential area of Bearsden, which borders Drumchapel (Colquhoun Park/Conon Avenue).

There are approximately 2,300 residential properties at risk of surface water flooding. The main transport routes, which run from east to west across the Potentially Vulnerable Area, are at risk including the A82 and A739. The areas at highest risk from surface water flooding will require the preparation of surface water management plans.

Scottish Water and local authorities have completed a number of studies in the area. These have included strategic and detailed assessments of surface water risk and interaction with river flooding, with the potential for mitigation action. Many of these studies have been helped by the partnership working developed within the Metropolitan Glasgow Strategic Drainage Partnership. This has led to the implementation of schemes and works to protect properties from river 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 non-residential properties followed by damages to residential properties.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 4,900 to 6,300 and the number of non-residential properties from approximately 700 to 950.

The location of the impacts of flooding is shown in Figure 3. The areas with the highest impacts are Clydebank, Drumchapel and Partick. Various roads including the A82 and railways are also at risk of flooding.

History of flooding

Flood records in the area predominantly relate to surface water flooding at Bearsden in East Dunbartonshire. These events have impacted roads, properties and businesses. Notable flooding occurred in Bearsden in 2005, 2006, 2007 and 2008 which resulted in disruptions to railway services and flooding of houses. Flooding also occurred in this part of Glasgow City in January 1934, which affected the railway services and suspended traffic.

The Garscadden Burn and its tributaries have also caused flooding to the residential area of Bearsden, which borders Drumchapel (Colquhoun Park/Conon Ave Bearsden). Significant flooding was recorded in a narrow corridor in Glasgow City on 21 October 2013, which affected various parts of north and north west Glasgow.

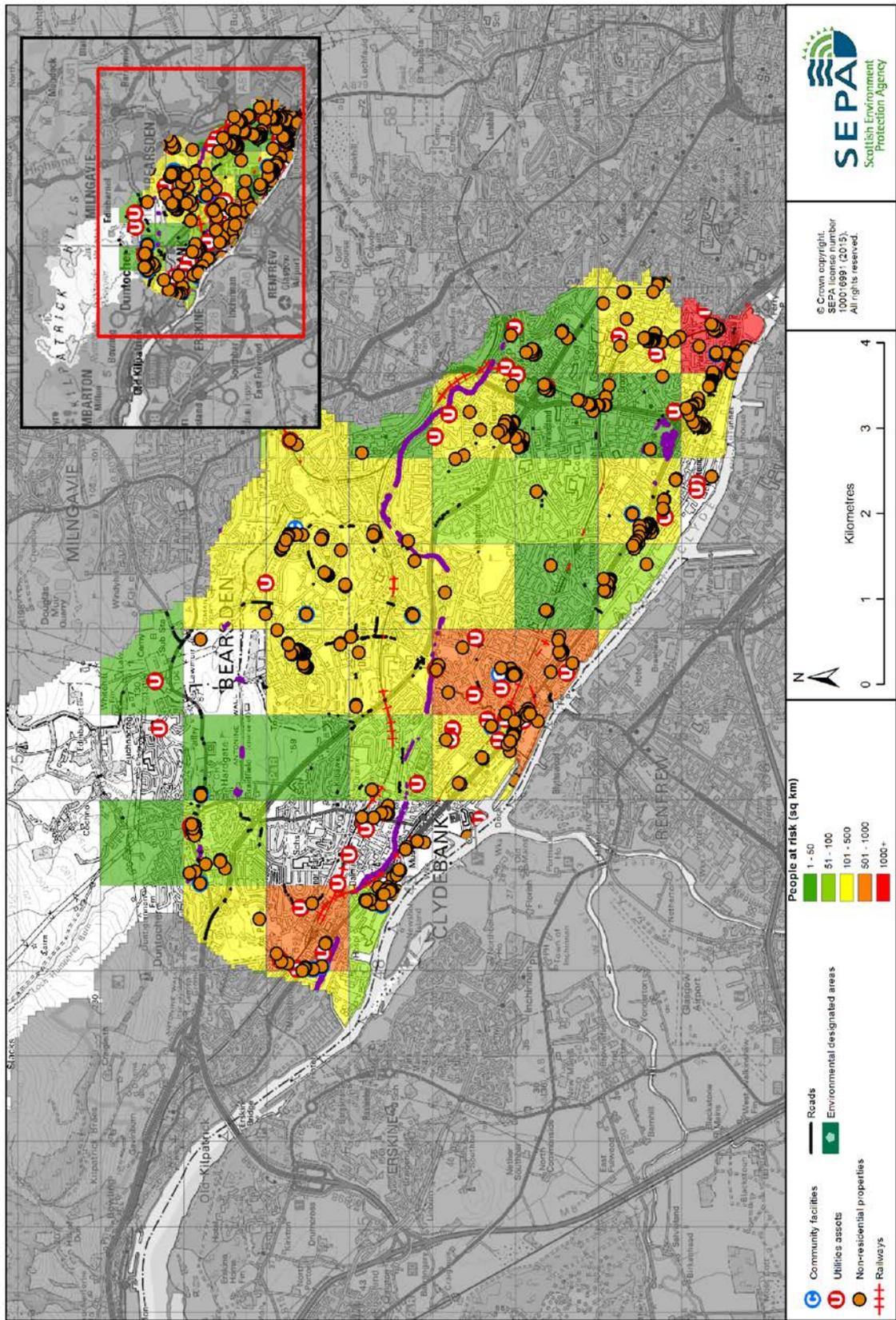


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 11/05

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 Yoker catchment - Clyde (Clydebank to Partick) Potentially Vulnerable Area.

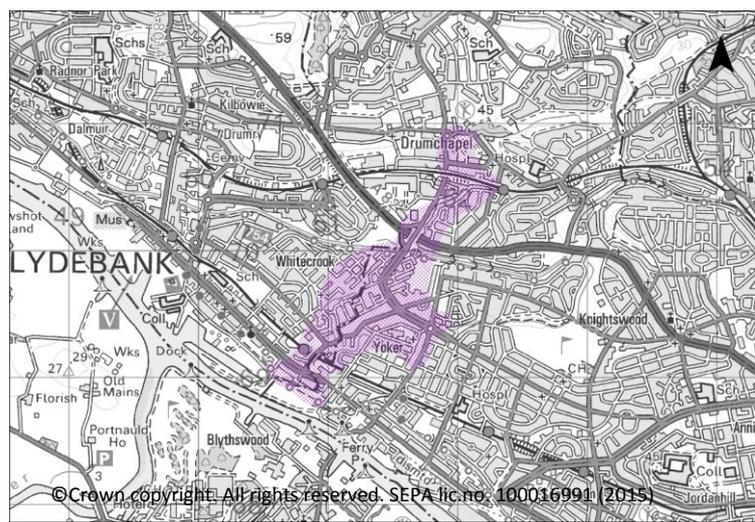
Reduce the risk of river and surface water flooding to residential properties, non-residential properties and transport routes in Yoker Mains and Yoker Burn catchments

Indicators:

- 370 residential properties
- 50 non-residential properties
- £1.2 million Annual Average Damages
- 3.0km of road

Objective ID: 11016

Target area:



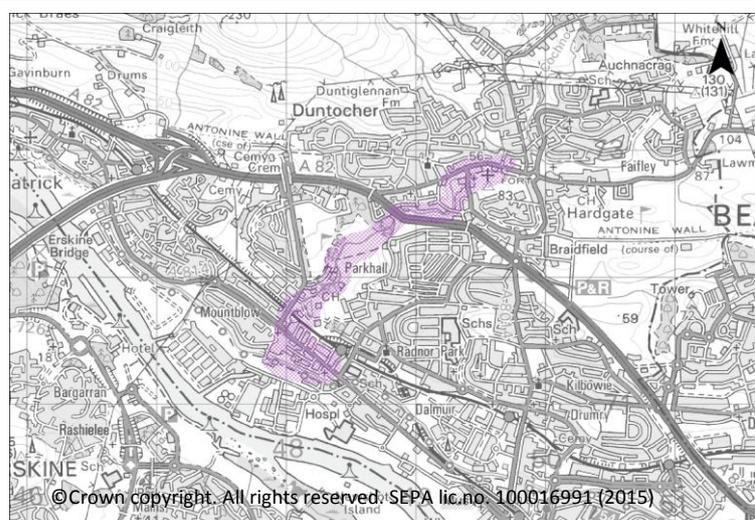
Reduce the risk of flooding from the Duntocher Burn combined with surface water to residential properties, non-residential properties and community facilities

Indicators:

- 370 residential properties
- 30 non-residential properties
- £550,000 Annual Average Damages
- 2 educational buildings

Objective ID: 11079

Target area:



Target area	Objective	ID	Indicators within PVA
Glasgow	Reduce the economic damages and number of people at risk of surface water flooding in Glasgow City	11007	* See note below
Bearsden	Reduce the economic damages and risk to people from surface water flooding in Bearsden	11087	* See note below
Drumchapel, Glasgow	Reduce the economic damages and risk to people from surface water flooding in Drumchapel	11093	* See note below
High Knightswood and Netherton, Glasgow	Reduce the economic damages and risk to people from surface water flooding in High Knightswood, Netherton	11096	* See note below
Scotstoun, Jordanhill and Whiteinch, Glasgow	Reduce the economic damages and risk to people from surface water flooding in Scotstoun, Jordanhill and Whiteinch	11102	* See note below
Yokermain Burn catchment, Glasgow	Reduce the economic damages and risk to people from surface water flooding in the Yokermain Burn catchment	11105	* See note below
Old Kilpatrick, Mountblow	Reduce the economic damages and risk to people from surface water flooding in Old Kilpatrick, Duntocher and Mountblow	11126	* See note below
Applies across Clyde and Loch Lomond Local Plan District	Avoid an overall increase in flood risk	11127	<ul style="list-style-type: none"> • 4,900 residential properties • £8.1 million Annual Average Damages
Applies across Clyde and Loch Lomond Local Plan District	Reduce overall flood risk	11132	<ul style="list-style-type: none"> • 4,900 residential properties • £8.1 million Annual Average Damages
Applies across Clyde and Loch Lomond 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 11/05 there are 2,600 residential properties at risk and Annual Average Damages of £3.1 million.

Actions to manage flooding in Potentially Vulnerable Area 11/05

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 Yoker catchment - Clyde (Clydebank to Partick) 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

Action (ID):	FLOOD PROTECTION STUDY (110160005)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in the Yokermain Burn catchment (11105) Reduce the risk of river and surface water flooding to residential properties, non-residential properties and transport routes in Yoker Mains and Yoker Burn catchments (11016)		
Delivery lead:	Glasgow City Council		
Priority:	National:	Within local authority:	
	36 of 168	5 of 8	
Status:	Not started	Indicative delivery:	2016-2021
Description:	<p>A study is recommended to further investigate the feasibility of a flood protection scheme on the Yoker Burn and Garscadden Burn, focusing on the benefit of direct defences along both banks, the potential benefit for runoff control using natural flood management and the benefits of a property level protection scheme to reduce residual risk. Other actions may also be considered to select the most sustainable combination of actions.</p> <p>A surface water management plan for the Yokermain Burn should be carried out for the area, which will help identify actions to reduce flooding in the area, such as sustainable drainage systems.</p>		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flooding to 130 residential properties and two non-residential properties in this location. The potential damages avoided are estimated to be up to £21 million. The economic impact of natural flood management actions is difficult to define. However, these actions can reduce flood risk for high likelihood events. In this location, it has been estimated that 90 residential and non-residential properties could potentially		

Economic:	benefit from natural flood management actions.
Social:	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. There may be changes in visual amenity and land use as a result of this action.
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. Natural flood management actions can have a positive impact by restoring and enhancing natural habitats. There are no international, national or local level environmental designations that are likely to be impacted by this action. There is likely to be a loss of semi-natural habitat in the footprint and vicinity of the defences. There are likely to be short term negative impacts on water quality during construction from increased sediment. There is the potential for slight positive impacts on water quality from the implementation of sustainable drainage systems in the area.

Action (ID):	FLOOD PROTECTION STUDY (110790005)		
Objective (ID):	Reduce the risk of flooding from the Duntocher Burn combined with surface water to residential properties, non-residential properties and community facilities (11079)		
Delivery lead:	West Dunbartonshire Council		
Priority:	National:	Within local authority:	
	90 of 168	2 of 2	
Status:	Not started	Indicative delivery:	2022-2027
Description:	A study is recommended to further investigate the feasibility of a flood protection scheme on the Duntocher Burn, focusing on upgrading a restrictive culvert under the canal and sustainable drainage systems to reduce surface water flows into the burn. Other actions may also be considered to select the most sustainable combination of actions.		
Potential impacts			
Economic:	The flood protection study should consider how to reduce flood risk to three residential properties and 10 non-residential properties in this location, with potential damages avoided of up to £3.6 million.		
Social:	A reduction in flood risk would have a positive benefit to the health and wellbeing of the community.		
Environmental:	Flood protection studies should consider the positive and negative impacts of proposed actions on the ecological quality of the environment. There are no international, national or local level environmental designations that are likely to be impacted by this action. There may be a loss of woodland and acid and heather grasslands from increasing water levels at Greenside Reservoir. There is the potential for long term positive impacts from the creation of new wetland habitat with this action. Downstream of this action there may be negative impacts on water quality through increased erosion and sedimentation on the Duntocher Burn.		

Action (ID):	NATURAL FLOOD MANAGEMENT STUDY (110160003)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Bearsden (11087) Reduce the risk of river and surface water flooding to residential properties, non-residential properties and transport routes in Yoker Mains and Yoker Burn catchments (11016)		
Delivery lead:	Glasgow Clyde Valley Green Network and local authorities		
Status:	Not started	Indicative delivery:	2016-2021
Description:	A natural flood management study should be undertaken to further investigate the potential benefit from runoff control within the catchment. The strategic screening has identified that there are areas of the upper catchment that could reduce the impact of flooding by altering land management or land cover. If there is an identified benefit of these actions the study should look at engaging with local land owners to establish the potential for future works.		
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 and socially vulnerable people located within the natural flood management study area. Natural flood management actions can restore and enhance natural environments and create opportunities for recreation and tourism.		
Environmental:	Natural flood management actions can have a positive impact on the ecological quality of the environment by restoring and enhancing natural habitats. Garscadden Wood Local Nature Reserve has the potential to be impacted by this action; however, these impacts could be positive if improved land management is implemented. There is the potential for the existing ecosystems in the area to be impacted through a change of land use if woodland planting is undertaken. There are likely to be improvements in water quality through reduced agricultural chemical and sediment runoff, which will have positive impacts on the terrestrial and freshwater habitats and species in the area. There is the potential for implementation of the runoff control action in this area to impact upon the setting of the Antonine Wall World Heritage Site and Scheduled Monument. This impact could be positive or negative.		

Action (ID):	SURFACE WATER PLAN/STUDY (110070018)		
Objective (ID):	Reduce the economic damages and number of people at risk of surface water flooding in Glasgow City (11007)		
Delivery lead:	Glasgow City Council		
Status:	Not started	Indicative delivery:	2028-2033
Description:	The area must be covered by a strategy to manage and reduce surface water flood risk and identify the most sustainable actions to achieve the objectives. This strategy has been developed by the Metropolitan Glasgow Strategic Drainage Partnership. The detailed		

objectives and actions to manage and reduce surface water flood risk will be set out in the area specific surface water management plans described below.

Action (ID):	SURFACE WATER PLAN/STUDY (110871018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Bearsden (11087)		
Delivery lead:	East Dunbartonshire 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the process and improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.		

Action (ID):	SURFACE WATER PLAN/STUDY (110930018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Drumchapel (11093)		
Delivery lead:	Glasgow City 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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 (110960018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in High Knightswood, Netherton (11096)		
Delivery lead:	Glasgow City 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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 (111020018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Scotstoun, Jordanhill and Whiteinch (11102)		
Delivery lead:	Glasgow City Council		
Status:	Not started	Indicative delivery:	2022-2027
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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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 (111050018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in the Yokermain Burn catchment (11105)		
Delivery lead:	Glasgow City 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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 (111260018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Old Kilpatrick, Duntocher and Mountblow (11126)		
Delivery lead:	West Dunbartonshire 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. The Metropolitan Glasgow Strategic Drainage Partnership will support the 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):	STRATEGIC MAPPING AND MODELLING (111320019)		
Objective (ID):	Reduce overall flood risk (11132)		
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 (110160017)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties, non-residential properties and transport routes in Yoker Mains and Yoker Burn catchments (11016)		
Delivery lead:	Glasgow City Council		
Status:	Existing	Indicative delivery:	Ongoing
Description:	There are a number of sections of flood defence along the River Clyde which offer protection to properties in the area. These defences will be maintained, and will continue to manage flooding according to the design standard at the time of construction. Levels of flood risk are likely to increase over time as a consequence of climate change.		

Action (ID):	MAINTAIN FLOOD WARNING (111320030)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	Continue to maintain the Renfrew flood warning area which is part of the Firth of Clyde coastal flood warning scheme.		

Action (ID):	FLOOD FORECASTING (111320009)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	SEPA		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>		

Action (ID):	SELF HELP (111320011)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	—		
Status:	Existing	Indicative delivery:	Ongoing
Description:	<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>West Dunbartonshire Council have in place a flood resilience subsidy scheme which permits any residential or business property at risk of flooding to apply. The scheme enables applicants to purchase selected property level protection products at cost price less a maximum subsidy.</p>		

Action (ID):	AWARENESS RAISING (111320013)		
Objective (ID):	Reduce overall flood risk (11132)		
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 (111320007)		
Objective (ID):	Reduce overall flood risk (11132)		
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):	EMERGENCY PLANS/RESPONSE (111320014)		
Objective (ID):	Reduce overall flood risk (11132)		
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>		

Action (ID):	PLANNING POLICIES (111270001)		
Objective (ID):	Avoid an overall increase in flood risk (11127) Reduce overall flood risk (11132)		
Delivery lead:	Planning authority		
Status:	Existing	Indicative delivery:	Ongoing
Description:	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.		