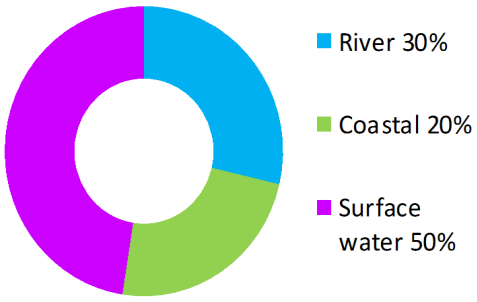
Greenock to Gourock (Potentially Vulnerable Area 11/08)

Local Plan District	Local authority	Main catchment
Clyde and Loch Lomond	Inverclyde Council	Inverclyde coastal

Summary of flooding impacts



At risk of flooding

- 820 residential properties
- 730 non-residential properties
- £1.5 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

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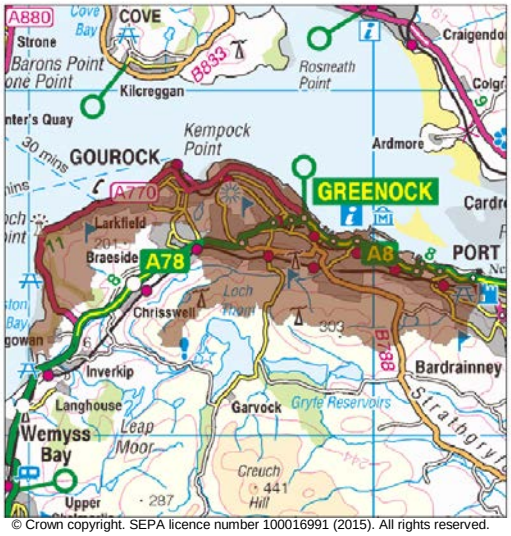
Background

This Potentially Vulnerable Area is located in the north west of the Clyde and Loch Lomond Local Plan District and is approximately 40km^2 (shown below). The area covers the coastline of the Firth of Clyde from Port Glasgow to Ardgowan in the south west, and includes the settlements of Greenock, Gourock and Port Glasgow.



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

There are approximately 820 residential properties and 730 non-residential properties at risk of flooding. The Annual Average Damages are approximately £1.5 million.

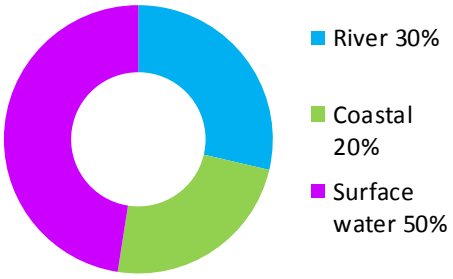


Figure 1: Annual Average Damages by flood source

Summary of flooding impacts

In this area surface water flooding is likely to interact with river flooding where existing watercourses have become extensively culverted. This flooding impacts properties and transport links. The highest risk of surface water flooding is within Greenock on the north side of the A78, between Greenock West railway station and the docklands. The areas at highest risk from surface water flooding will require the preparation of surface water management plans.

River flooding within the area is primarily from small burns including the Hole Burn and Carts Burn, which flow through Greenock and discharge to the Firth of Clyde. These watercourses are partially culverted through the urban area and there have recorded incidents of minor flooding, primarily resulting from exceedance of culvert capacity. In the catchment above Greenock reservoirs have been adapted to provide attenuation during high flows, and reduce flows through the town. There are a number of residential and non-residential properties affected by river flooding. The Greenock Cut aqueduct also flows through Greenock, taking water from Loch Thom to Greenock. This is controlled by a series of sluices along its length.

Coastal flooding is predicted in Port Glasgow, particularly in the area of Coronation Park. It is also likely to affect the dockland areas within Port Glasgow and areas within the vicinity of the West College Scotland Campus, Greenock. Within Gourock Bay, Battery Park is at risk and also properties along the Shore Road. Some agricultural land adjacent to Lunderston Bay, North of Inverkip, will also be affected by coastal flooding. Interaction between sources of river and coastal flooding is likely to occur in the docklands area and the West College Scotland campus area.

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. Non-residential properties affected by surface flooding experience the highest economic impact at approximately 25% of the damages.

Within this Potentially Vulnerable Area it is estimated that climate change will increase the number of residential properties at risk of flooding from approximately 820 to 1,400 and the number of non-residential properties from approximately 730 to 990.

The location of the impacts of flooding is shown in Figure 3. The areas with the greatest impacts are Greenock, Gourock and Port Glasgow with flooding to people, non-residential properties and utilities. Large sections of road and rail infrastructure are susceptible to flooding (notably the A8, A78, A770 and A771), mainly from coastal and surface water sources. There could be significant effects to transport routes where diversion routes are not possible, which includes links to ferry ports and railway infrastructure (notably Greenock West Station).

History of flooding

There have been several incidents of flooding reported within this area from the late 19th Century. River floods have caused the highest impact to properties and people. The most recent river flooding took place in 2013, flooding several streets in the town centre of Greenock, Oak Mill shopping centre and the A78.

Surface water floods have also occurred in the late 19th Century in Port Glasgow, Greenock and Gourock, flooding properties, shipyards, shops, roads and low-lying areas.

In January 2014 coastal floods affected the areas of Gourock, Greenock and Port Glasgow. Cove Road in Gourock was the worst affected. Tidal surges in 1930 and 1974 flooded access to ferry terminals, destroying parts of the port infrastructure, damaging boats and interrupting the ferry service.

	1 in 10 High likelihood	1 in 200 Medium likelihood	1 in 1000 Low likelihood
Residential properties (total 26,000)	150	820	1,100
Non-residential properties (total 5,500)	180	730	860
People	330	1,800	2,400
Community facilities	0	<10 Emergency services	<10 Includes: educational buildings, emergency services and healthcare facilities
Utilities assets	20	50	60
Transport links-road (km)	5.6 (of which 2.8 is A road)	17.2 (of which 8.7 is A road)	19.6 (of which 9.3 is A road)
Transport links-rail (km)	2.8	6.6	7.5
Environmental designated areas (km²)	0	0	0
Designated cultural heritage sites	6	8	12
Agricultural land (km²)	0.0	0.1	0.1

Table 1: Summary of flooding impacts[1]

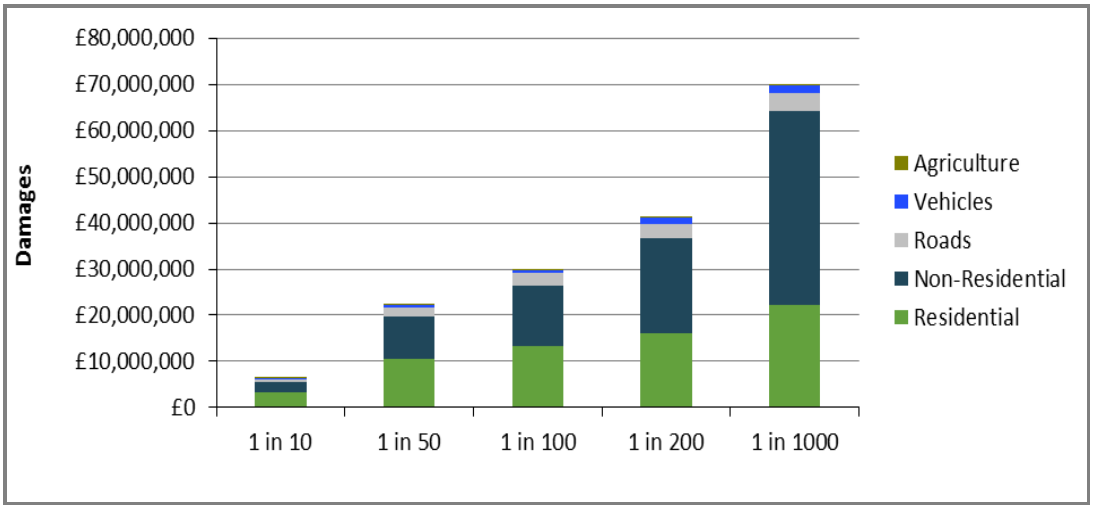


Figure 2: Damages by flood likelihood

[1] Some receptors are counted more than once if flooded from multiple sources

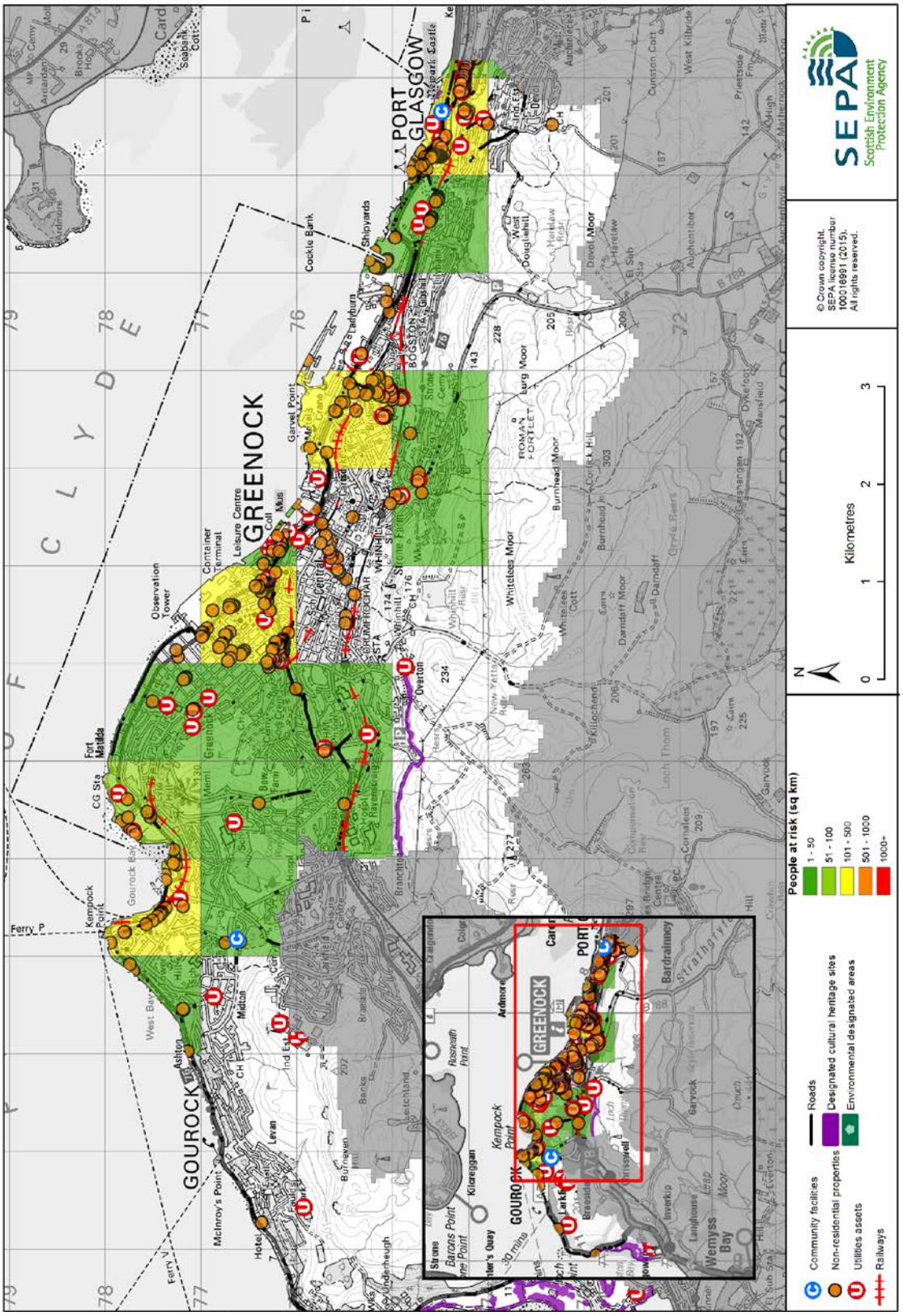
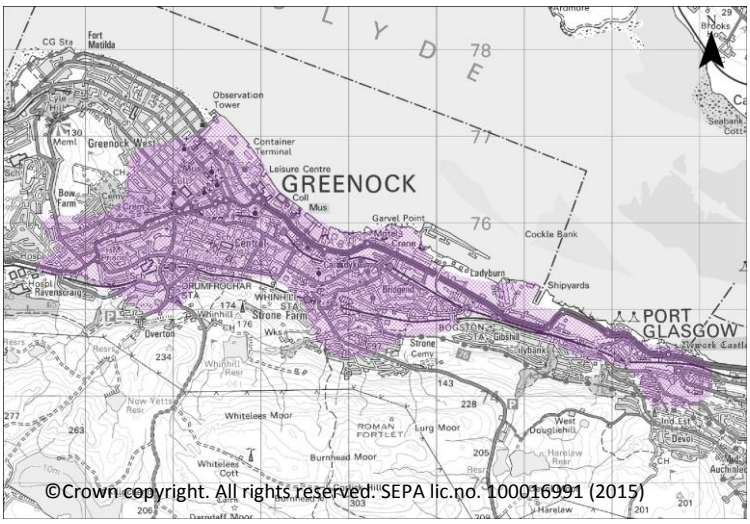


Figure 3: Impacts of flooding

Objectives to manage flooding in Potentially Vulnerable Area 11/08

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 Greenock to Gourock Potentially Vulnerable Area.

Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Greenock

Indicators:	Target area:
• 530 residential properties • 520 non-residential properties • £930,000 Annual Average Damages	
Objective ID: 11028	

Target area	Objective	ID	Indicators within PVA
Greenock	Reduce the economic damages and risk to people from surface water flooding in Greenock	11108	* See note below
Port Glasgow	Reduce the economic damages and risk to people from surface water flooding in Port Glasgow	11109	* See note below
Applies across Clyde and Loch Lomond Local Plan District	Avoid an overall increase in flood risk	11127	• 820 residential properties • £1.5 million Annual Average Damages
Applies across Clyde and Loch Lomond Local Plan District	Reduce overall flood risk	11132	• 820 residential properties • £1.5 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 11/08 there are 330 residential properties at risk and Annual Average Damages of £720,000.

Actions to manage flooding in Potentially Vulnerable Area 11/08

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 Greenock to Gourock 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** (110280006)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Greenock (11028)		
Delivery lead:	Inverclyde Council		
Priority:	National:	Within local authority:	
	4 of 42	**2 of 4**	
Status:	**Under development**	Indicative delivery:	**2016-2021**
Description:	It is recommended that the council look to progress the flood protection scheme proposed for the Coves Burn. The work involves a number of conveyance modification actions including: upgrading of culverts, construction of a new connection chamber and tidal valve. The Controlled Activities Regulations licence has been granted for these works.		
Potential impacts			
Economic:	The scheme will reduce flooding to trunk roads and properties with a potential economic benefit of £3.7 million. The flood protection scheme has an estimated benefit cost ratio of 10.0.		
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. There are no international, national or local level environmental designations that are likely to be impacted by this action. There is likely to be loss of habitat and displacement of species in the vicinity of the conveyance works; however, these may		

Environmental:	re-establish and return to the area. Downstream of this action there may be negative impacts on water quality through increased erosion and sedimentation.

Action (ID):	**FLOOD PROTECTION SCHEME/WORKS** (110280026)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Greenock (11028)		
Delivery lead:	Inverclyde Council		
Priority:	National:	Within local authority:	
	9 of 42	**3 of 4**	
Status:	**Under development**	Indicative delivery:	**2016-2021**
Description:	Work should be progressed as per the Greenock Flood Protection Scheme. The work involves a number of conveyance modification actions, along the Bouverie Burn. The flood protection scheme has an estimated benefit cost ratio of 6.3.		
Potential impacts			
Economic:	The proposed flood protection scheme may benefit residential properties and transport routes in this location, damages avoided are estimated to be £2.8 million.		
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. There are no international, national or local level environmental designations that are likely to be impacted by this action. There is likely to be loss of habitat and displacement of species in the vicinity of the conveyance works; however, these may re-establish and return to the area. Downstream of this action there may be negative impacts on water quality through increased erosion and sedimentation.		

Action (ID):	**SURFACE WATER PLAN/STUDY** (111080018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Greenock (11108)		
Delivery lead:	Inverclyde 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** (111080019)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Greenock (11108)		
Delivery lead:	Scottish Water in partnership with Inverclyde Council		
Status:	**Not started**	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** (111090018)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Port Glasgow (11109)		
Delivery lead:	Inverclyde 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** (111090019)		
Objective (ID):	Reduce the economic damages and risk to people from surface water flooding in Port Glasgow (11109)		
Delivery lead:	Scottish Water in partnership with Inverclyde Council		
Status:	**Not started**	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):	**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 carry out an 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** (110280017)		
Objective (ID):	Reduce the risk of river and surface water flooding to residential properties and non-residential properties in Greenock (11028)		
Delivery lead:	Inverclyde Council		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	There are V-notches on spillways from 5 reservoirs upstream of Greenock which act as automatic attenuation. They restrict the discharge from the reservoirs and reduce peak flows in watercourses downstream during periods of heavy rain. 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 Gourock Cove Road and the Greenock and Port Glasgow flood warning areas which are 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:	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):	**SELF HELP** (111320011)		
Objective (ID):	Reduce overall flood risk (11132)		
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. Inverclyde Council have purchased flood protection products for use throughout Inverclyde.		

Action (ID):	**AWARENESS RAISING** (111320013)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	Responsible authorities		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	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 work towards raising awareness of flood risk through partnership activities with Transport Scotland. Local authorities will be undertaking additional awareness raising activities. Further details will be set out in the Local FRM Plan.		

Action (ID):	**MAINTENANCE** (111320007)		
Objective (ID):	Reduce overall flood risk (11132)		
Delivery lead:	Inverclyde Council, asset / land managers		
Status:	**Existing**	Indicative delivery:	**Ongoing**
Description:	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.		

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:	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.		

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.		