

Falkirk Local Development Plan 3  
Topic Papers April 2024

# Strategic Flood Risk Assessment



Falkirk Council

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# List of Abbreviations

Please see below for the list of abbreviations used in the Falkirk Strategic Flood Risk Assessment.

FRMP: Flood Risk Management Plans (formerly called Flood Risk Management Strategies)

LDP: Local Development Plan

LDP3: Local Development Plan 3

LFMP: Local Flood Risk Management Plans

NPF4: National Planning Framework 4

PVA: Potentially Vulnerable Area

SEPA: Scottish Environment Protection Agency

SFDAD: Scottish Flood Defence Asset Database

SFRA: Strategic Flood Risk Assessment

SWMP: Surface Water Management Plan

Wastewater Pumping Station: WwPS



# 1. Introduction

- 1.1 The Strategic Flood Risk Assessment (SFRA) is accompanying evidence to the Evidence Report for the Falkirk Local Development Plan 3 (LDP3). Its main purpose is to provide a high-level overview of the scope and nature of all sources of existing and future flood risk within the Falkirk LDP area. The Scottish Government's [Local Development Planning Guidance](#), page 74, states that SFRA's are "designed to inform the development planning process, primarily to avoid increasing overall flood risk by avoiding areas of flood hazard". Other purposes for the SFRA include:
- To identify gaps in flood risk information and propose how these gaps will be addressed at the later stages of the LDP3's preparation;
  - To identify actions in the local flood risk management plans that are relevant to LDP3;
  - To inform both the site assessment and strategic environmental assessment of LDP3 so that flood risk is fully taken into account when considering the allocation of land and the preparation of the spatial strategy, development proposals and planning policies;
  - To help identify the need for site-specific flood risk assessments in particular locations;
  - To provide evidence that LDP3 preparation has taken account of National Planning Framework 4 policies that are relevant to sustainable flood risk management and the climate and nature crises; and
  - To inform blue and green infrastructure audits, and strategies.
- 1.2 Reference to the SFRA has been made in the Site Assessment Methodology Topic Paper. The SFRA will act as a screening tool to help understand whether a candidate site needs more detailed information (such as a site-specific flood risk assessment) to fully understand its current and future flood risk. In addition, the SFRA will contribute to the strategic environmental assessment, providing flood risk information for the environmental baseline and to identify, assess, mitigate and monitor the significant flood impacts of LDP3.
- 1.3 It must be stressed from the outset that flood risk evolves both spatially and temporally and that the information in the SFRA is a snapshot in time. The SFRA will be revised during the later stages of LDP3 preparation, as appropriate, for example in response to consultation feedback or if new or updated flood risk information becomes available.

## What do we mean by ‘flood’, ‘flooding’ and ‘flood risk’?

- 1.4 In the SFRA, we use the term ‘flood’ and ‘flooding’ interchangeably to refer “the temporary covering by water from any source of land not normally covered by water”. ‘Flood risk’ means “the combination of the probability of a flood and of the potential adverse consequences, associated with a flood, for human health, the environment, cultural heritage and economic activity”. Both definitions are taken from the Flood Risk Management (Scotland) Act 2009.
- 1.5 Figure 1, below, defines the sources of flood risk using SEPA’s definitions. River (fluvial), coastal and surface water are the main sources of flood risk in the Falkirk LDP area.

**Figure 1: Types of Flood Source**

<b>Flood Source</b>	<b>Definition</b>
River (Fluvial)	Flooding from a river or other watercourse
Coastal	Flooding that results from high sea levels or a combination of high sea levels and stormy conditions.
Surface water Flooding	Flooding that occurs when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead.
Groundwater	Flooding is caused by water rising from underlying rocks or flowing from springs. However, in Scotland, groundwater is generally a contributing factor to flooding rather than the primary source.
Sewer Flooding	Flooding as a result of the sewer or other artificial drainage system (e.g. road drainage) capacity being exceeded by rainfall runoff or when the drainage system cannot discharge water at the outfall due to high water levels (river and sea levels) in receiving waters.
Reservoir Flooding and flooding from other infrastructure	The failure of infrastructure such as reservoirs and canals could result in flooding by releasing large volumes of water very quickly.

## About the Falkirk LDP Area

- 1.6 The LDP area extends to some 300 sq. km. and covers the entire administrative area of Falkirk Council which is located in east-central Scotland, mid-way between Glasgow and Edinburgh. Most of the area's estimated population (160,700 people) live within the network of small to medium sized towns. The principal town of Falkirk, with a population of around 36,000, is centrally located and serves as the main shopping, service and employment centre for the area. Separated from Falkirk by countryside and the Green Belt are the settlements of Larbert, Stenhousemuir, Polmont and Grangemouth. The former three settlements are largely residential in character while Grangemouth is a strategically important port on the Forth and has the largest petrochemical complex in Scotland. In the western parts of the area lie the settlements of Denny, Bonnybridge and Banknock while to the east, overlooking the Forth, sits the town of Bo'ness. Some 18 smaller village communities are scattered across the rural part of the area.
- 1.7 The area has a rich diversity of waterbodies including the Firth of Forth estuary, long and meandering rivers, tributary burns, reservoirs, lochs, ponds, wetlands, and the Union, and Forth and Clyde Canals. Our waterbodies provide many important benefits, or ecosystem services, to the area. They contribute to sustainable flood management, storing large amounts of water and reducing peak flows. They supply fresh drinking water to communities, businesses and agriculture. They support recreation and tourism by offering attractive places to play, visit and enjoy the area's natural and built heritage. They connect places, allowing people and goods to move from, to and through the area. Another key benefit is that they are home to array of habitats and wildlife including birds, fish, invertebrates and mammals.
- 1.8 Falkirk Council has published an [interactive map](#) on its website to show the area's watercourses (such as rivers, burns and the canals) and sustainable urban drainage systems. The map is required by Section 17 of the Flood Risk Management (Scotland) Act 2009, and will be updated from time to time to include new information when it becomes available. The main watercourses shown on the map include:
- River Avon
  - River Carron
  - Union Canal
  - Forth and Clyde Canal
  - Grange Burn
  - Bonny Water
  - Firth of Forth

## 2. Policy Context

- 2.1 This section sets out the key legislation, policy and guidance for the Strategic Flood Risk Assessment (SFRA).

### The Flood Risk Management (Scotland) Act 2009

- 2.2 [The Act](#) introduced a more sustainable and modern approach to flood risk management in Scotland that is better suited to meet current needs and to accommodate the impacts of climate change. It also introduced a co-ordinated and partnership approach as to how Scottish Ministers, SEPA and responsible authorities, including Falkirk Council, manage flood risk in a sustainable way within the Falkirk LDP area.



## National Planning Framework 4 (NPF4)

- 2.3 [NPF4](#) is the national spatial strategy for Scotland. It sets out spatial principles, regional priorities, national developments and national planning policy. NPF4's overarching policy intent for flood risk and water management is "to strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding". This intent is underpinned by three policy outcomes:
- Places are resilient to current and future flood risk;
  - Water resources are used efficiently and sustainably; and
  - Wider use of natural flood risk management benefits people and nature.
- 2.4 NPF4 also sets out Scottish Ministers' expectations for local development plans (LDPs). It says LDPs should strengthen community resilience to the current and future impacts of climate change by avoiding development in areas at flood risk as a first principle. Resilience should also be supported by managing the need to bring previously used sites in built up areas into positive use; planning for adaptation measures; and identifying opportunities to implement improvements to the water environment through natural flood risk management and blue green infrastructure. Plans should also consider the probability of flooding from all sources and make use of relevant flood risk and river basin management plans for the area. For areas where climate change is likely to result in increased flood exposure that becomes unmanageable, consideration should be given to alternative sustainable land use.
- 2.5 Policy 22 is NPF4's specific policy for flood risk. Criterion a) of the policy states development proposals at risk of flooding or in a flood area will only be supported if they are for:
1. Essential infrastructure where the location is required for operational reasons;
  2. Water compatible uses;
  3. Redevelopment of an existing building or site for an equal or less vulnerable use; or
  4. Redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long term safety and resilience can be secured in accordance with relevant SEPA advice.
- 2.6 All the above exemptions are subject to the meeting the relevant conditions set elsewhere in Policy 22. NPF4's glossary defines, for planning purposes, the terms 'at risk of flooding' or 'in a flood risk area' as land or built form with an annual probability of being flooded of greater than 0.5% that includes an appropriate allowance for future climate change. SEPA's Future Flood Maps indicates this risk of flooding.



## Local Development Planning Guidance

- 2.7 The specific requirement for the SFRA can be traced back to the Scottish Government's [Local Development Planning Guidance](#). This recommends preparation of a SFRA at the Evidence Report stage to evidence flood risk information has been gathered to enable NPF4 policy to be taken into account when preparing a LDP.

## Guidance for Planning Authorities on Strategic Flood Risk Assessment

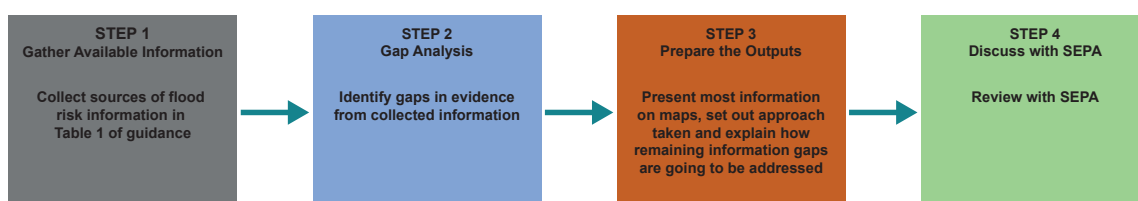
- 2.8 [This guidance](#), published by SEPA, details the steps and information needed to prepare sufficient a strategic flood risk assessment. The guidance has been followed by Falkirk Council in the preparation of the SFRA.

## Flood Risk Management Plans

- 2.9 Flood risk management plans (previously called flood risk management strategies) coordinate efforts to tackle flooding in Scotland. They set the national direction of future flood risk management, helping to target investment and coordinate actions across public bodies. The plans identify the main flood hazards and impacts, setting out objectives for reducing risk and the best combination of actions to achieve this, such as the appropriateness of an alleviation scheme or improving flood warning arrangements. This information is used as a basis for better decision-making across flood risk management organisations like local councils and Scottish Water. A flood risk management plan (FRMP) is available for each of the 14 Local Plan Districts in Scotland. They are approved by the Scottish Government and published by SEPA as Scotland's strategic flood risk management authority.
- 2.10 The [FRMP for the Forth Estuary Local Plan District](#) covers the vast majority of the Falkirk LDP area while the [FRMP for the Forth Local Plan District](#) covers only the far north of the area. Local flood risk management plans (LFRMPs) complement FRMPs, providing additional local detail on how bodies will work together to reduce the effects of flooding in our communities. Edinburgh Council as Lead Local Authority for the Forth Estuary Local Plan District has published [the local Forth Estuary Flood Risk Management Plan](#) and Stirling Council as Lead Local Authority for the Forth Local Plan District has published [the local Forth Flood Risk Management Plan](#). The FRMPs and LFRMPs are in their second cycle and cover the same six year period: 2022-28.
- 2.11 Further detail on these plans, and their related actions, are covered in Section 11 Flood Risk Management Planning.

## 3. Approach Taken

- 3.1 Falkirk Council is following the four-step process as described in detail in SEPA's [Guidance for Planning Authorities on Strategic Flood Risk Assessment](#). This process is summarised below and constitutes the Council's approach to the SFRA. The Council has reached Step 4, which involves reviewing the SFRA with SEPA.



## 4. SEPA Flood Hazard Maps

- 4.1 A key milestone of the Flood Risk Management (Scotland) Act 2009 is the production of the SEPA Flood Hazard Maps. These maps provide a national and useful source of data on flood hazards and include information on the different likelihoods of river (fluvial), coastal and surface flooding:

**Figure 2: Definitions for high, medium and low likelihood of flooding.**

Likelihood of Flooding	River (Fluvial) and Coastal Flooding	Surface Water Flooding
High	1 in 10 annual probability of flooding (or at least 10% chance of flooding each year)	1 in 10 annual probability of flooding (or at least 10% chance of flooding each year)
Medium	1 in 200 annual probability of flooding (or at least 0.5% chance of flooding each year)	1 in 200 annual probability of flooding (or at least 0.5% chance of flooding each year)
Low	1 in 1,000 annual probability of flooding (or at least 0.1% chance of flooding each year)	1 in 200 year annual probability of flooding plus climate change (or greater than 0.5% chance of flooding each year)

- 4.2 The SEPA Flood Hazard Maps now include the Future Flood Maps which provide information on how the areas at risk of river or coastal flooding in a 0.5% Annual Exceedance Probability event may flood due to climate change. The Future Flood Maps are based on the UK Climate Projections' high emission scenarios assuming limited or no global action to reduce greenhouse gas emissions by the 2080s. In addition, the Future Flood Maps are used to indicate, for planning purposes, "areas at risk of flooding", or "in a flood risk area" in terms of NPF4 Policy 22. [SEPA's explanatory note](#) provides a fuller technical explanation of the Future Flood Maps. The latest version of the [SEPA Flood Hazard Maps \(v2.1\)](#) was issued to Falkirk Council in late 2023 and can be viewed on this interactive map.

## Summary by Settlement Area

4.3 The following provides a brief summary of the map with respect to each of the LDP3 settlement areas:

- **Bonnybridge and Banknock:** Watercourses in this area include Doups Burn, Bonny Water, and the Forth and Clyde Canal. River flood risk extends to low lying land along the course of Bonny Water and nearby properties on High Street and Bridge Streets in Bonnybridge. Small watercourses appear to be the source of river flood risk in several streets including Roman Road, Foundry Road, Broomhill Road and Waverley Crescent. Many areas are shown to be at risk of surface water flooding and this is a well-known issue affecting residents and businesses on Seabegs Road.
- **Bo'ness:** The town is located on the Forth Estuary with local watercourses draining to it including the Dean Burn, Gil Burn and the Carriden Burn. The lower reaches of Bo'ness are vulnerable to coastal flooding from the Forth, a risk which was mitigated to some degree by a flood protection scheme. The other main threat is from localised surface water flooding.
- **Denny:** This area includes the town of Denny and surrounding villages of Dunipace, Head of Muir, Fankerton, Stoneywood and is located on the River Carron and its tributaries, the Castlerankine and Avon Burns. River flood risk principally extends to land nearby these watercourses, especially at Winchester Avenue and surrounding development which have been built on the River Carron's floodplain. Most of the area is situated on higher ground and not at risk from river flooding although some locations are affected by surface water flooding.
- **Grangemouth:** The town is a low lying settlement on the Forth Estuary. Coastal flood risk covers extensive areas including Scotland's largest petrochemical complex, the port, residential areas and in and around the village of Skinflats. River flood risk is a particular issue in Grangemouth with the River Carron, River Avon and Grange Burn all flowing through the town and joining the Forth. Multiple locations are also at risk of surface water flooding.
- **Falkirk:** The River Carron flows south of the communities of Mungal, Bainsford and Langlees, meandering and forming active floodplains before reaching the Forth Estuary. Low lying areas adjacent to the River Carron are especially vulnerable to coastal and river flooding. A large undeveloped area, running between Universal Road and the A9, is shown to be at risk of river flooding. Many places in Falkirk are at risk of localised, surface water flooding.
- **Larbert and Stenhousemuir:** The area is similar to Falkirk in that the highest risk of river and coastal flooding is from the River Carron. River flood risk extends to land in South Broomage, Carron and Carronshore, all of which are located immediately north of the river. Surface water flooding is indicated in multiple locations in this area.

- **The Braes:** This area includes the communities of Laurieston, Westquarter, Brightons, Redding, Reddingmuirhead, Maddiston, Polmont and Wallacestone, The River Avon, Westquarter Burn, Gardrum Burn and Manuel Burn are the main watercourses contributing to river flood risk in the area. Many places are also shown to be at risk of surface water flooding.
- **Rural North:** The Firth of Forth is a river and coastal flood risk to the communities of South Alloa, Dunmore and Airth, which are on or close to the estuary. River flood risk also extends to the south of Airth and this risk relates to Pow Burn. Localised, surface water flooding is indicated in several locations in this area.
- **Rural South:** River Avon and its tributary, Culloch Burn, are the main sources of river flood risk to the village of Slamannan. The river poses a flood risk to Avonbridge flowing through this village. Manuel Burn and Crownerland Burn contribute to river flood risk in Whitecross. Lastly, the risk of surface water flooding is identified in many parts of Rural South.



## 5. Climate Change Allowances

- 5.1 A climate change allowance is a prediction of anticipated change in peak river flow, peak rainfall intensity or sea level rise caused by future climate change. SEPA has published guidance, '[Climate changes allowances for flood risk assessment in land use planning - Version 4](#)', that sets out SEPA's required climate change allowances for each of Scotland's 11 river basin regions. The whole of the Falkirk LDP area falls within the Forth Basin Region and you can find this region's allowances from [this map](#) or alternatively from Figure 3 below.

**Figure 3: Climate Change Allowances for the Forth Basin Region**

Type of Allowance	Description of Allowance	Value of Allowance
Peak river flow	Total change to the year 2100	56%
Peak rainfall intensity	Total change to the year 2080	39%
Sea level rise	Cumulative rise (in metres) from 2017 to 2100	0.86m



## 6. Natural Flood Management Maps

- 6.1 The Natural Flood Management Maps, viewable on [SEPA's website](#), identify areas with catchments and along coastlines where implementing a specified nature-based solution could be most effective for sustainable flood risk management and merit further investigation. A map has been produced for each of the following solutions: run-off reduction; floodplain storage; sediment management; estuarine surge attenuation and wave energy dissipation.
- 6.2 [The Inner Forth Habitat Network Pilot](#) has identified actions to improve natural flood management across the Inner Forth Area. These include creating offline water storage ponds for flood attenuation and species; and managed realignment of the Inner Forth.



## 7. Flood Defences and Schemes

### Existing

- 7.1 The Scottish Government's Flood Defence Asset Database (SFDAD) provides a record of the protection schemes constructed by local authorities under flood legislation. In total, there are two schemes in the Falkirk LDP3 area recorded on the database, these being the Grangeburn Road Flood Prevention Scheme (built 1979) and the Bo'ness Foreshore Flood Prevention Scheme 2006 (built 2010). Figure 4 provides a short overview of the schemes.

**Figure 4: Existing Flood Defences and Schemes in the LDP3 area**

Name of Scheme	Grangeburn Road Flood Prevention Scheme	Bo'ness Foreshore Flood Prevention Scheme 2006
Town	Grangemouth	Bo'ness
Watercourse	Grange Burn	Tidal Forth
Scheme Reference	64SCH	99SCH
Defence Asset Summary	No record SFDAD	Wall, embankment and outfall
Type of flooding mitigated	River	Tidal
Flood Protection Act	Flood Prevention (Scotland) 1961 Act	Flood Prevention (Scotland) 1961 Act
Year of Construction	1979	2010

Source: SFDAD



## Planned

- 7.2 The Grangemouth Flood Protection Scheme is the largest flood defence project in Scotland, and one of the biggest in the United Kingdom, protecting communities in Grangemouth, Wholeflats, Glensburgh, Langlees, Carron, Carronshore and Stirling Road, Camelon. The scheme is identified by the Forth Estuary Flood Risk Management Plan as a high priority given the potentially huge costs if an extreme flood event were to occur. In addition, the scheme continues to be of national significance to Scotland having retained its national development status in National Planning Framework 4.
- 7.3 Around 28km of flood defence walls and embankments will be built. These will vary in height along different sections of the river according to the specific flood risk in each area. Improved drainage infrastructure, including new underground pumping stations will be constructed, to remove excess water emanating in the event of heavy rains and/or the inability of water to drain into the watercourses when river levels are high.
- 7.4 Details of the proposed works can be found on [this map](#). Please note the proposed works are not fully finalised and the map may change as the outline design is completed. The statutory publication of the proposed final scheme for public consultation is programmed in 2024. Further information on the project timescales can be found [here](#).
- 7.5 No other flood defences and schemes are currently being planned in the area at the time of writing.



## 8. Past Flooding Events

- 8.1 Flooding has occurred many times, and will continue to happen, in the area. The earliest recorded incident of flooding is from 1553 and the most recent, at the time of writing, is from 2023. As of 10 November 2023, a total of 1,766 separate flooding incidents have been recorded by the Council from various sources including the public, landowners, Council Services and archive information such as historic newspaper reports and old public records. Not every flood incident has been recorded, and some of the information is anecdotal or incomplete.
- 8.2 [This map](#) shows the location, reference number and year of each flooding incident.

### Picture of flooding in Grangemouth (circa 1890)



Source: Falkirk Archives

## 9. Dynamic Coast

- 9.1 Dynamic Coast is a [set of online maps](#) identifying land potentially vulnerable to coastal erosion. They take into account past erosion rates and future sea level rise as a result of climate change. The maps also help identify areas of the coast, where if erosion occurs, coastal flooding could get worse. The loss of land, due to coastal erosion, could be between 50m to 100m from the current coast between Carriden Estate, Bo'ness and the Falkirk Council and West Lothian Council boundary, which includes the village of Blackness. Further information on Dynamic Coast can be found from [this website](#).



## 10. Reservoir Inundation Maps

- 10.1 [The Reservoir \(Scotland\) Act 2011](#) modernised the regulatory regime for the construction, alteration and management of controlled reservoirs in Scotland capable of holding 10,000 or more cubic metres of water. The legislation requires SEPA to establish and maintain a register including information such as the name (if any), location and maximum water capacity of the controlled reservoir. The register also assigns a risk designation (of high, medium or low) to each controlled reservoir taking into account the impacts of an uncontrolled release of water on features below the reservoir. These features could include residential properties, businesses, communities, transport links, agriculture, cultural heritage and the environment. **It must be stressed the designation is not an indication of flood risk.** On [SEPA's website](#), you can view the register and associated maps showing the extent of land that would be flooded in the unlikely event of a controlled reservoir failing.
- 10.2 Figure 5 lists the 12 controlled reservoirs that pose a risk, albeit an unlikely risk, of flooding land in the Falkirk LDP area. Four are located in the area, and the remaining eight are situated in neighbouring local authority areas such as Stirling, North Lanarkshire or West Lothian.

**Figure 5: List of controlled reservoirs.**

Name of Reservoir	Local Authority Area	Maximum Cubic Capacity Reservoir at Top Water Level (3m)
Buckieburn Reservoir	Stirling	689,000
Earlsburn 1	Stirling	352,373
Carron Valley Reservoir	Stirling	21,380,000
Loch Coulter	Stirling	3,790,000
Drumbowie	Falkirk	564,200
Forrestburn	North Lanarkshire	925,752
Black Loch	Falkirk	1,456,675
Gowanbank Reservoir	West Lothian	44,200
Loch Cote	West Lothian	911,000
Millhall Impounding Reservoir	Falkirk	86,376
Millhall Reservoir	Falkirk	113,600
Loch Katrine	Stirling	64,610,000

Source: SEPA

# 11. Flood Risk Management Planning

## Potentially Vulnerable Areas

- 11.1 Potentially Vulnerable Areas (PVAs) are where significant flood risk exists now or is likely to occur in the future. Identifying PVAs helps SEPA, Falkirk Council and other partners plan to protect people, properties, businesses, communities, infrastructure and the environment from flooding. Based on the 2018 National Flood Risk Assessment, Scottish Ministers designated a total of five PVAs covering land in the Falkirk LDP3 area. The five PVAs are:
- Airth (02/10/08)
  - Falkirk and Grangemouth (02/10/10)
  - Bo'ness (02/10/11)
  - Slamannan (02/10/16)
  - South Alloa (02/09/07)
- 11.2 South Alloa (02/09/07) is the only PVA that falls within the Forth Local Plan District. The other four are in the Forth Estuary Local Plan District. As Scotland's strategic flood risk management authority, SEPA has published the flood risk management plan (FRMP) for the Forth Local Plan District and also a separate FRMP for the Forth Estuary Local Plan District. The FRMPs set out the current understanding of flood risk in the PVAs along with objectives and actions to reduce that flood risk. They are each complemented by a local flood risk management plan (LFRMP) which provides detail on how and when the actions will be delivered locally within the target area(s) of a PVA. Edinburgh Council as Lead Local Authority for the Forth Estuary Local Plan District has published the [local Forth Estuary Flood Risk Management Plan](#) and Stirling Council as Lead Local Authority for the Forth Local Plan District has published the [local Forth Flood Risk Management Plan](#). The FRMPs and LFRMPs are in their second cycle and cover the same six-year period: 2022-2028.
- 11.3 [Appendix 1](#) is a spreadsheet showing the actions in the five PVAs, and their target areas, that have a land-use implication in the area. Alternatively, you can view the information on [this map](#). Actions include flood protection schemes and work; flood studies; improved understanding; and surface water management planning.

## 12. Council Flood Studies

- 12.1 A flood study is a technical investigation of flood behaviour in an area that helps identify options to mitigate future flood risk. Figure 6 provides a list of flood studies that have been completed or are programmed in a LFRMP for completion in the future.

**Figure 6: Council flood studies completed or programmed**

Study	PVA Ref.	Target area Ref:	Timescale
Westquarter Flood Study	Falkirk and Grangemouth (02/10/10)	Polmont, Redding and Westquarter (308)	Completed in 2022
Flood Protection Study	Slamannan (02/10/16)	Slamannan (314)	Before 2028
Modelling Study	Falkirk and Grangemouth (02/10/10)	Carron and Carronshore (211) and Larbert and Stenhousemuir (243)	Before 2028
Flood Protection Study	02/10/10	Denny and Dunipace (220)	Before 2028
Flood Protection Studies for Grangemouth Protection Scheme	Falkirk, Grangemouth, Laurieston, Denny, Redding, Dunipace, Cumbernauld, Carron and Stenhousemuir (10/11) <sup>1</sup>	Not applicable	Initial study was completed in 2012. The flood risk model for the scheme has been revised over the years taking account of new data being available such as building, topographical, hydrological data and climate change predictions.

<sup>1</sup>This is a superseded PVA from the first cycle of the local Forth Estuary Flood Risk Management Plan.

## 13. Surface Water Management Plans

13.1 To meet actions in the first cycle of FRMPs and LFRMPs, Falkirk Council commissioned a Strategic Surface Water Management Plan for the Council area. Published in 2022, the plan identifies hotspots (or areas) that are critically at risk of surface water flooding along with potential options to alleviate the risk. The options are grouped under themes including among others: maintenance of drainage network; community engagement; source control; planning and development policies; daylighting culvert opportunities; and detailed studies. Specifically, the plan recommends a surface water management plan (SWMP) for the following hotspots:

- Bonnybridge
- Bo'ness (the SWMP for this area has been produced)
- Carronshore - Wastewater Pumping Station (WwPS)
- Falkirk Town - North East
- Falkirk Town - South West
- Larbert - Lower Larbert WwPS
- Northfoot
- Polmonthill
- Zetland

13.2 These hotspots were chosen as they are likely to benefit the most from a formal surface water management flood scheme.



## 14. Coastal Change Adaptation Plan

- 14.1 The maps produced for Dynamic Coast help identify areas of the coast, where if erosion occurs, coastal flooding could get worst. Coastal change adaptation plans help improve understanding of the risks of coastal erosion and flooding in Scotland today and in the future. A plan for the LDP area's coast is in the final review phase, and is expected to be published before the end of 2024.





## 15. Gap Analysis

- 15.1 Evidence gaps have been identified through collection and review of the data sources for the SFRA. The gaps are summarised per information source below along an action to address these during the later stages of LDP3 preparation.

### SEPA Flood Hazard Maps

- 15.2 The maps do not identify the river extent of small watercourses with catchments less than 3 sq. km. The extents of river, coastal and surface flooding are indicative and do not fully take account of structures, such as culverts, bridges and flood defences which can influence flooding. They also do not take account river and coastal flooding happening simultaneously. In addition, the Future Flood Maps underestimate future river and coastal flood risk in the LDP3 area, applying smaller allowances for climate change and sea level rises than those stated for the Forth Region in SEPA's Climate Change Allowances for Flood Risk Assessment in Land Use Planning (Version 4).
- 15.3 **Action:** To address the above evidence gaps, a site-specific flood risk assessment (FRA) will be required for candidate sites in locations known to be at risk of flooding. Depending on professional judgement, a FRA may be required to consider a candidate site through the site assessment for LDP3, and/or at the planning application stage with the plan specifying the need for a FRA to inform and accompany development proposals. Generally, flood risk assessments are sought by the Council in one or a combination of the following situations:
- The site is close enough to watercourse or drainage ditch that it poses a realistic risk of flooding
  - Historic instances of any form of flooding on the site
  - SEPA Flood Hazard Maps indicate that the site is at risk (low, medium or high) of flooding from any source
  - The site is in or adjacent to a flood bank or flood control structure
  - The site is in or adjacent to coastal waters and/or below the 6m AOD contour.
- 15.4 The site-specific FRA will need to follow the Council's revised Planning Application Advice on Flood Risk and Surface Water Drainage (under preparation) and also run scenarios using the relevant allowances as set out in the latest version of SEPA's Climate Change Allowances for Flood Risk Assessment in Land Use Planning.

## Climate Change Allowances

- 15.5 The gaps associated with climate change allowances and the Future Flood Maps are reported in paragraph 15.2. To address the gaps, a site-specific FRA will be required in the circumstances described in paragraph 15.3.

## Natural Flood Management Maps

- 15.6 The main limitations of the maps are that they are of a high-level nature and therefore not site specific.
- 15.7 **Action:** Opportunities for natural flood management (such as deculverting, and inland storage ponds and wetlands) at the site-specific level will be established, for example, using local knowledge, flood studies, river basin management plans, the strategic environmental assessment, site-specific flood risk assessments etc.

## Flood Defences and Schemes

- 15.8 Grangeburn Road Flood Prevention Scheme and Bo'ness Foreshore Flood Prevention Scheme 2006 were designed and built under the Flood Prevention (Scotland) 1961 Act. Information on the schemes is missing or not up to date on SFDAD. The level of protection, including allowance for climate change, to candidate sites near either scheme or the future Grangemouth Flood Protection Scheme will need to be established.
- 15.9 **Action:** If new development is to be supported near an existing or planned scheme, a detailed assessment of the scheme will be required to establish if areas protected, or to be protected, by the scheme are, or will be, protected to the NPF4 requirement of 0.5% plus climate change. A site-specific flood risk assessment will also be required.

## Dynamic Coast

- 15.10 The Council presently has no coastal adaptation plan in place to augment the mapping of Dynamic Coast.
- 15.11 **Action:** The Council has commenced the coastal adaptation planning process which could identify areas of our coast where:
- Natural or artificial defences will be needed in the long term;
  - No active intervention is needed and free coastal change is accepted; and/or
  - Managed realignment of the coast would be a more effective strategy in the long term.
- 15.12 As reported in paragraph 14.1, the coastal change adaptation plan for the LDP area's coast is in the final review phase, and is expected to be published before the end of 2024.

## Reservoir Inundation Maps

- 15.13 According to SEPA's [guidance](#), the purpose of the inundation maps is only to inform the assignment of risk designations and they were not designed for other purposes, such as land use planning. It is not currently possible to assess the probability of an uncontrolled release of water from a reservoir in a manner consistent with the requirements of NPF4 for development to be free of flood risk up to 0.5% probability (including allowance for climate change). Furthermore, the probability of failure of a controlled reservoir is considered so low that it is beyond the scope of risk considered within NPF4.
- 15.14 **Action:** The Council will consider the risk of reservoir inundation for a candidate site if it is prudent to do so.

## Potentially Vulnerable Areas

- 15.15 Some actions (such as flood studies, surface water management plans, sewer flood risk assessment etc.) identified for a PVA (see Appendix 1) may not have commenced or be complete within the timescales of LDP3 preparation.
- 15.16 **Action:** To address the above information gap, a site-specific FRA will be required in the circumstances described in paragraph 15.3.

## Council Flood Studies

- 15.17 Some future flood studies are dependent on finding available funding and may not have commenced or be complete within the timescales of LDP3 preparation.
- 15.18 **Action:** To address the above information gap, a site-specific FRA will be required in the circumstances described in paragraph 15.3.

## Surface Water Management Plans

- 15.19 Paragraph 13.1 lists specific hotspots that have been identified for further detailed study through a surface water management plan (SWMP). Only the Bo'ness SWMP has been prepared so far. The preparation of the SWMPs for the remaining hotspots is dependent on finding funding. Some of these SWMPs may not have commenced or be finalised within the timescales of LDP3 preparation.
- 15.20 **Action:** To address the above information gap, a site-specific FRA will be required in the circumstances described in paragraph 15.3.

## Coastal Change Adaptation Plan

- 15.21 As mentioned in paragraph 15.10, the Council currently has no coastal change adaptation plan in place.
- 15.22 The coastal change adaptation plan for the LDP area's coast is in the final review phase, and is expected to be published before the end of 2024.

