



Draft Strategic Flood Risk Assessment (November 2024)

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Executive Summary

West Lothian Council require a Strategic Flood Risk Assessment (SFRA) as accompanying evidence to the Evidence Report for the West Lothian Local Development Plan 2 (LDP2). Its main purpose is to provide a high-level overview of the scope and nature of all sources of existing and future flood risk by delivering the intention of National Planning Framework 4 (NPF4) Policy 22 and Policy 10 to strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding.

The Strategic Flood Risk Assessment (SFRA)

This SFRA will guide development planning by ensuring flood risk is integrated into the Council's spatial strategy, development site allocations, and land use policies. It also supports compliance with the Council's statutory duties under the Flood Risk Management (Scotland) Act 2009

This SFRA is a high-level, map-based and strategic-level assessment used to inform the broad direction of the Spatial Strategy.

The key objectives of this SFRA include:

- Providing a robust, up-to-date evidence base to inform the preparation and implementation of the Local Development Plan (LDP), ensuring compliance with national and regional flood risk policies.
- Serving as a reference and policy document to guide and inform the public, private sector, and developers of their responsibilities and obligations under the latest national planning guidance, including the Flood Risk Management (Scotland) Act 2009, National Planning Framework 4 (NPF4), and SEPA guidelines.
- Delivering a comprehensive strategic assessment of flood risk across West Lothian from all potential sources, including:
 - Fluvial flooding (rivers and watercourses).
 - Coastal flooding, including the designation of functional floodplains, coastal erosion, and geomorphic change.
 - Pluvial flooding (surface water).
 - Sewer flooding, groundwater flooding, and residual risks from reservoirs.
 - Accounting for climate change impacts, including updated UK Climate Projections (UKCP18), to ensure long-term resilience.
- Identifying opportunities to reduce flood risk to existing communities and developments through better management of surface water, provision for conveyance, storage of floodwater through appropriate Sustainable Urban Drainage Systems (SUDS);
- Highlighting the need for site-specific flood risk assessments (FRA) for proposed developments in areas identified as at risk of flooding, to ensure development does not exacerbate flood risk.
- Promoting natural flood management (NFM) techniques and the integration of blue / green infrastructure to enhance flood resilience, biodiversity, and community amenity spaces; and

- Documenting existing and planned flood risk management schemes, strategies, and plans, including their status, objectives, and how they align with the broader Spatial Strategy and Flood Risk Management Plans (FRMPs).
- to identify gaps in flood risk information and propose how these gaps will be addressed at the later stages of LDP2 preparation;
- to identify actions in the local flood risk management plans that are relevant to LDP2;
- to inform both the site assessment and strategic environmental assessment of LDP2 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 LDP2 preparation has taken account of NPF4 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.

Gaps in information have been identified through a gap analysis and are recorded and listed. The hazard maps mentioned in this SFRA are part of the SEPA Flood Map and include an allowance for climate change for the 0.5% annual probability flood. However, this is not the latest allowances for climate change.

Introduction

The Strategic Flood Risk Assessment (SFRA) is accompanying evidence to the Evidence Report for the West Lothian Local Development Plan 2 (LDP2). Its main purpose is to provide a high-level overview of the scope and nature of possible sources of existing and future flood risk by delivering the intention of National Planning Framework 4 (NPF4) Policy 22 and Policy 10; to strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding; within the West Lothian geographical area.

The Scottish Government's [Local Development Planning Guidance](#), page 74, states that SFRAs are "designed to inform the development planning process, primarily to avoid increasing overall flood risk by avoiding areas of flood hazard".

The SFRA will act as a screening tool to help understand whether a future 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 LDP2.

It must be noted that the SFRA is a snapshot in time and should be a "live" document that is updated as and when required, for example in response to consultation feedback or if new or updated flood risk information becomes available

In the SFRA,

- the term 'flood' and 'flooding' is used interchangeably to refer to "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.

The Scottish Environment Protection Agency (SEPA) definitions are:

Flood Source	Definition
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 (Pluvial)	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.

The main flood risk in the West Lothian Local Development Plan (LDP) area is expected to be river (fluvial) and surface water (pluvial).

About West Lothian

West Lothian has a mixture of rural and urban areas covering a total of 425 sq. km stretching from Linlithgow in the North, to Breich in the South and from Entryfoot in the West, to Linburn in the East. The main towns being Livingston, Bathgate Linlithgow, Whitburn, Armadale and Broxburn. These towns account for approximately 73% of the population.

The most recent population estimate is 185,580. This is an increase of 1.0% from 2020. West Lothian had the 9th highest population in 2021 out of all 32 local authorities. [West Lothian Council Area Profile \(nrscotland.gov.uk\)](https://www.nrscotland.gov.uk/area-profile/west-lothian)

The area has a diversity of waterbodies; long and meandering rivers, tributary burns, reservoirs, lochs, ponds, wetlands, the Union Canal and includes a small section of the Firth of Forth estuary. 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. Another key benefit is that they are home to array of habitats and wildlife including birds, fish, invertebrates and mammals.

West Lothian Council has developed mapping to illustrate the area's watercourses, including rivers, burns, and canals. The mapping of sustainable urban drainage systems (SUDS) is currently being updated and will be incorporated into the proposed plan.

The main watercourses shown on the map include:

- River Almond
 - Breich Water
 - Killandean Burn
 - Linhouse Water
 - Murieston Water
 - White Burn
- River Avon
 - Brunton Burn
 - Cauld Burn
 - Logie Water
 - Mains Burn
- Water of Leith
- Union Canal
- Firth of Forth

Policy Context

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

The Flood Risk Management (Scotland) Act 2009

[The Act](#) introduces a 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 coordinated, partnership-based approach for managing flood risk sustainably within the West Lothian LDP area, involving Scottish Ministers, SEPA, and responsible authorities like West Lothian Council.

National Planning Framework 4 (NPF4)

[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.

NPF4 also sets out Scottish Ministers' expectations for (LDPs) stating that 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.

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:

- Essential infrastructure where the location is required for operational reasons;
- Water compatible uses;
- Redevelopment of an existing building or site for an equal or less vulnerable use; or
- 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.

All the above exemptions are subject to 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

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 considered when preparing a LDP.

Guidance for Planning Authorities on Strategic Flood Risk Assessment

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 West Lothian Council in the preparation of the SFRA.

Flood Risk Management Plans

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.

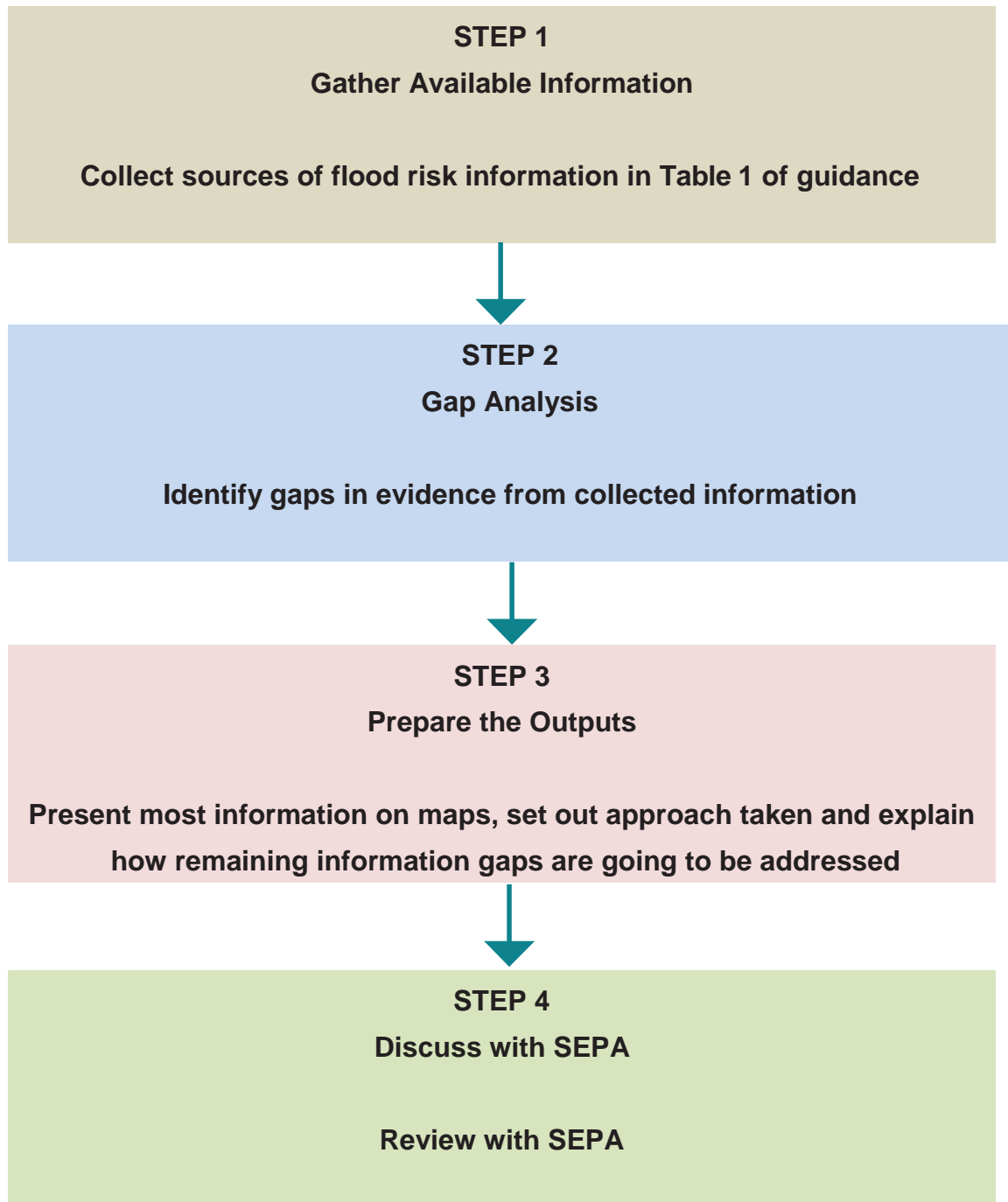
The [FRMP for the Forth Estuary Local Plan District](#) covers the vast majority of the LDP area. Local flood risk management plans (LFRMPs) complement FRMPs, providing additional local detail on how bodies will work together to reduce the effects of flooding in our communities. Edinburgh Council as Lead Local Authority for the Forth Estuary Local Plan District has published the local [Forth Estuary Flood Risk Management Plan](#). The FRMPs and LFRMPs are in their second cycle and cover the same six year period: 2022-28.

Approach Taken

West Lothian 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.



SEPA Flood Hazard Maps

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 (pluvial) flooding:

Definitions for high, medium and low likelihood of flooding from the SEPA flood maps are

Likelihood of Flooding	River (Fluvial) and Coastal Flooding	Surface Water Flooding
High	Each year this area has a 10% chance of flooding	Each year this area has a 10% chance of flooding
Medium	Each year this area has a 0.5% chance of flooding	Each year this area has a 0.5% chance of flooding
Low	Each year this area has a 0.1% chance of flooding	Each year this area has a 0.1% chance of flooding

The SEPA Future Flood Maps illustrate areas at risk of river and coastal flooding during a 0.5% Annual Exceedance Probability (AEP) event, incorporating projected impacts of climate change by the 2080s. These maps are based on UK Climate Projections (UKCP), specifically high-emission scenarios, assuming minimal global action to reduce greenhouse gas emissions. They account for anticipated changes in river flows and sea levels, providing a single future climate scenario to inform flood risk management and planning decisions.

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](#) on the difference between SEPA’s planning guidance and the future flood maps provides a fuller technical explanation of the Future Flood Maps.

The latest version of the SEPA Flood Hazard Maps (v2.1) was issued to West Lothian Council in late 2023.

Climate Change Allowances

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 12 river basin regions.

The vast majority of the West Lothian LDP area falls within the Forth Basin Region and you can find this region's allowances from the table below.

There are 3 small areas which are outwith the Forth Basin Region:

- a very small area to the west of Entryfoot which is within the Clyde Basin Region,
- a very small area to the north of the South Lanarkshire boundary which is within the Clyde Basin Region, and
- a very small area to the north of the Scottish Borders boundary which is within the Tweed Basin Region,

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

Flood Defences and Schemes

Existing

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 2 schemes in the West Lothian LDP2 area recorded on the database, these being:

Linlithgow Flood Prevention Scheme 2001

Broxburn Flood Prevention Scheme 2007

A short overview of the schemes are.

Existing Flood Defences and Schemes in the LDP2 area

Name of Scheme	Linlithgow Flood Prevention Scheme
Town	Linlithgow
Watercourse	Mains Burn
Scheme Reference	SFDAD 62SCH
Defence Asset Summary	The purpose of this scheme is to mitigate the flooding of up to 100 properties in the Braehead and the Maltings areas of Linlithgow from the Mains Burn. The scheme includes the conversion of the Cockleroy Reservoir to provide improve flood storage, flood diversion channels to convey flood flows to a storage area, high-capacity storm water drains and improved trash screens, the daylighting of culverts and works to the channel to improve conveyance. The scheme was designed to protect properties from a 1 in 200-year Return Period event (i.e. 0.5% Annual Chance of flooding in any one year).
Type of flooding mitigated	Fluvial (River)
Flood Protection Act	Flood Prevention (Scotland) 1961 Act
Year of Construction	2004

Name of Scheme	Broxburn Flood Prevention Scheme
Town	Broxburn
Watercourse	Brox Burn
Scheme Reference	SFDAD 100SCH
Defence Asset Summary	The purpose of this scheme is to mitigate the flooding of 90 residential and business properties in the Burnside Village, West Burnside, Blyth Road and Pyothall Court areas of Broxburn. The scheme includes the construction of floodwalls and embankments, replacement bridges in West Burnside and Burnside Village and new trash screens. The Standard of Protection when built was from a 1 in 200-year Return Period event at Blyth Rd (i.e. 0.5%

	Annual Chance of flooding in any one year); 1 in 100-year Return Period event at Burnside (1% Annual Chance); and a 1 in 75-year Return Period event at West Burnside (1.33% Annual Chance).
Type of flooding mitigated	Fluvial (River)
Flood Protection Act	Flood Prevention (Scotland) 1961 Act
Year of Construction	2013

Source: SFDAD

In addition to the 2 formal SFDAD schemes noted above there is 1 informal scheme

Name of Scheme	Boghead Burn and Bog Burn Flood Alleviation Schemes
Town	Bathgate
Watercourse	Boghead Burn and Bog Burn
Scheme Reference	N/A (not recorded on SFDAD)
Defence Asset Summary	The purpose of this scheme is to mitigate the flooding of up to 100 properties in the Braehead and the Maltings areas of Linlithgow from the Mains Burn. The scheme includes the conversion of the Cockleroy Reservoir to provide improve flood storage, flood diversion channels to convey flood flows to a storage area, high-capacity storm water drains and improved trash screens, the daylighting of culverts and works to the channel to improve conveyance. The scheme was designed to protect properties from a 1 in 200-year Return Period event (i.e. 0.5% Annual Chance of flooding in any one year).
Type of flooding mitigated	Fluvial (River)
Flood Protection Act	N/A (informal flood defenses)
Year of Construction	1986

Planned

There are 2 additional formal flood protection schemes currently in progress (for Broxburn & Linlithgow).

Name of Scheme	Liggat Syke Flood Protection Scheme
Town	Broxburn
Watercourse	Liggat Syke
Scheme Reference	N/A (not yet confirmed)
Defence Asset Summary	The purpose of this scheme is to mitigate the flooding of 40 residential properties in the Pyothall Court and Nicol Road area of Broxburn. The proposed scheme consists of a flood relief culvert with a downstream basin and is being designed to offer protection from up to a 1 in 200-year Return Period (0.5% Annual Chance of flooding in any one year). Additional information can be found at https://www.westlothian.gov.uk/article/80458/Liggat-Syke-Flood-Protection-Scheme
Type of flooding mitigated	Fluvial (River)
Flood Protection Act	Flood Risk Management (Scotland) Act 2009
Year of Construction	Due to be completed 2026/2027

Name of Scheme	Bell's Burn Flood Protection Scheme
Town	Linlithgow
Watercourse	Bell's Burn
Scheme Reference	N/A (not yet confirmed)
Defence Asset Summary	The purpose of this scheme is to mitigate the flooding of approx. 30 properties from the Bell's Burn. The proposed scheme consists of: <ul style="list-style-type: none"> • A flood bund to protect 15 residential properties in Springfield Road from a 1 in 200-year Return Period event (i.e. 0.5% Annual Chance of flooding in any one year) • Property Flood Resilience (PFR) measures for approx. 15 properties in the Low Port area of Linlithgow and around Edinburgh Road, offering protection from a 1 in 50-year Return Period event (2% Annual Chance).
Type of flooding mitigated	Fluvial (River)
Flood Protection Act	Flood Risk Management (Scotland) Act 2009
Year of Construction	Due to be completed 2027/2028 (No consultant appointed as yet)

Past Flooding Events

Flooding has occurred many times, and will continue to happen, in the area.

- November 2023 - Storm Ciaran have caused a number of flooding issues in West Lothian including road closures and property damage.
- August 2020 - Pyothall Court / Nicol Road Broxburn - 28 houses affected by surface water flooding following intense rainfall.
- February 2020 - Storm Ciara brought heavy rainfall and high winds, leading to localised flooding across West Lothian, including Broxburn and Linlithgow.
- 2017 - Dixon Terrace, Whitburn: Flooding at the Community Centre following sustained rainfall.
- February 2017 – Barbauchlaw Burn, Blackridge: Flooding at the Community Centre following sustained rainfall.
- December 2013 – Heavy rainfall resulted in multiple road closures due to surface water flooding.
- 2014 – White Burn, Whitburn: Several properties flooded due to river overflow after a significant event.
- July 2013 – West Calder: Intense rainfall causes flash flooding in parts of the town.
- 2012 – Broxburn: Significant flooding incidents occurred in both 2008 and 2012, affecting residential and commercial areas along the Brox Burn
- 2012 – Eldrick Avenue / Bridge Street / Greenburn Road Fauldhouse: Flooding caused damage to properties and infrastructure.
- May 2005 – East of Linlithgow: 12 homes affected by heavy rainfall and surface water flooding.
- 2005 – Near Community Centre, West Calder: Localised flooding impacted community services.
- July 2002 – West Calder: Flash flooding impacted homes and roads following a summer storm.
- July 1998 – Douglas Avenue / The Maltings Linlithgow: Approximately 100 homes flooded during an extreme rainfall event

Dynamic Coast

Dynamic Coast is a [set of online maps](#) identifying land potentially vulnerable to coastal erosion which take account of 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 possible loss of land by 2100, due to coastal erosion, could be between 50m to 70m along the current coastal boundary of West Lothian, which runs from the east of Blackness to beyond Society, Hopetoun. With the area of influence extending beyond this. Further information on Dynamic Coast can be found from [this website](#).

Reservoir Inundation

[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.

The table below lists the eight controlled reservoirs that pose a risk, albeit an unlikely risk, of flooding land in the West Lothian LDP area. Seven are located in the area, and the remaining one is situated in North Lanarkshire.

List of controlled reservoirs.

Name of Reservoir	Local Authority Area
Bangour Reservoir	West Lothian
Beebraigs	West Lothian
Cobbinshaw Reservoir	West Lothian
Crosswood Reservoir	West Lothian
Forrestburn	North Lanarkshire

Harperrig Reservoir	West Lothian
Gowanbank Reservoir	West Lothian
Loch Cote	West Lothian

Source: SEPA

Flood Risk Management Planning

Potentially Vulnerable Areas

Potentially Vulnerable Areas (PVAs) are where significant flood risk exists now or is likely to occur in the future. Identifying PVAs helps SEPA, West Lothian 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 (NFRA), Scottish Ministers designated a total of four PVAs covering land in the Wet Lothian LDP2 area. The four PVAs are:

PVA 02/10/12 - Linlithgow

PVA 02/10/13 - Livingston, Broxburn and Bathgate

PVA 02/10/14 – Whitburn (and Blackburn)

PVA 02/10/15 - West Calder and Fauldhouse

Further details can be found at [Update on Flood Risk Management - West Lothian Council](#)

All PVA's falls within 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 PVA's 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. The FRMP's and LFRMPs are in their second cycle and cover the same six-year period: 2022-2028.

Table XX - Number of people at risk of flooding identified through the NFRA.

Area	Number of homes / businesses at risk	Number of homes / businesses at risk by 2080
Linlithgow	250	
Armadale	230	320
Bathgate	150	
Broxburn	220	
Blackridge	40	70
Livingston and Mid Calder	260	
Blackburn	120	150
Whitburn	470	570
Fauldhouse	80	110
West Calder	110	120

Council Flood Studies

A flood study is a technical investigation of flood behaviour in an area that helps identify options to mitigate future flood risk.

Table XX provides a list of flood studies that have been completed or are programmed in a LFRMP for completion in the future.

Table XX: Council flood studies completed or programmed

<p>Bathgate</p> <ul style="list-style-type: none"> • Entec (2003) Bathgate Water Catchment Study (Volume 1&2) • Entec (2008) Boghead & Bogburn Flood Alleviation Scheme Review • Scottish Water (2019) Bathgate Integrated Catchment Study (ICS) • AECOM (Feb 2021) Bathgate Cemetery Flood Risk Review Report Dec 2020 FINAL • ARUP (2022) Bathgate Flood study (Bog Burn, Boghead Burn & Bathgate Water)
<p>Blackridge</p> <ul style="list-style-type: none"> • ARUP(2019) Flood Study
<p>Broxburn</p> <ul style="list-style-type: none"> • 2007 Brox Burn Flood Protection Scheme (FPSc) constructed by 2013. • outline design stage of the Liggat Syke FPSc (Flood storage basin and flood relief culvert) • BROXBURN – Scottish Executive (2007) List of Operations – 2007 Brox Burn FPSc • BROXBURN – Halcrow 2009 - Halcrow (2009) Broxburn Post Flood Review (20 Aug 2008) • BROXBURN - HALCROW 2011 - Halcrow (2011) Review of areas previously excluded from the 2007 FPSc • CH2MHill (2014) Liggat Syke NFM Assessment (Technical Memo) FINAL • CH2MHill (2016) Broxburn Hydraulic Report_v1.1 • Jacobs (2019) Broxburn Flood Mitigation_v2 Feasibility Document with CBA • WLC (2020) Broxburn Liggat Syke Flood Report, 27 August 2020 (Final) • Jacobs (2020 12) Broxburn Liggat Syke Review of 27 August 2020 flood incident_v1.0 • Jacobs (2022) Liggat Syke FPSc Hydro morphology Technical Note_v1.2
<p>Linlithgow</p> <ul style="list-style-type: none"> • 2001 Linlithgow Mains Burn FPSc constructed by 2003. • Sir Frederick Snow (1998) Mains Burn Linlithgow Flood Study Report • Sir Frederick Snow (1999) Mains Burn FPSc Feasibility Study (Part 1 & 2) • Sir Frederick Snow (2001) Mains Burn FPSc Draft Scheme Report • Scottish Executive (2002) List of Operations - 2001 Mains Burn FPSc • Scottish Executive (2005) 2001 Mains Burn FPSC - Condition Assessment and Database of Flood and Coastal Defences • JBA (2005) Mains Burn FPSc Inspection Report • Halcrow (2009) Mains Burn Catchment study & integrity of watercourse infrastructure (FINAL.Rev1) • SAC (2012) Soil and Drainage Investigation Linlithgow Rugby FC • Cycle 2 (C2) action to deliver a small FPSc for the Bell's Burn in Linlithgow (PFR & bund). A consultant is due to be appointed shortly. • Jarret (2006) Bell's Burn Flood Study, Linlithgow • Kaya (2021) Linlithgow Bell's Burn Flood Study FINAL • River Avon flood study at Linlithgow Bridge • Mott (2019) River Avon Flood Study at Linlithgow Bridge • Mott (2020) River Avon Structural Investigation - Revetment Assessment • Scottish Water (2019) Linlithgow ICS

<p>West Calder</p> <ul style="list-style-type: none"> • Halcrow (2006) West Calder Catchment Study
<p>Whitburn</p> <ul style="list-style-type: none"> • Entec (2008) North Reeves Place, Whitburn – Flood Review • Mott Macdonald (2018) White Burn Flood Study.
<p>Covering more than one urban area within WLC there is also:</p> <ul style="list-style-type: none"> • Mott (2015) Strategic Surface Water Management Plan (SWMP) • Reservoirs – WLC (2013) Reservoirs Act 1975 – Biennial Report

Surface Water Management Plans

To meet actions in the first cycle of FRMPs and LFRMPs, West Lothian Council commissioned a Strategic Surface Water Management Plan for the Council area.

Published in 2015, the plan covers the four areas identified by SEPA within the Forth Estuary Characterisation Report (SEPA, 2014):

- Bathgate;
- Broxburn;
- Linlithgow; and
- Livingston.

It also includes an Action Plan for the implementation of sustainable actions derived via a six phase approach as recommended within the published guidance on the preparation of SWMPs (SEPA, Scottish Water, Scottish Government, 2013):

The SWMP presents 10 surface water management objectives which are consistent with the objectives set for the management of surface water within the Forth Local Plan District. The objectives use the Avoid-Protect-Prepare philosophy used by SEPA when setting objectives for Local Plan Districts. These are:

Area description	Objective type	Source	Objective description
Bathgate	Avoid	Surface water	Avoid an overall increase in flood risk
Broxburn	Avoid	Surface water	Avoid an overall increase in flood risk
Linlithgow	Avoid	Surface water	Avoid an overall increase in flood risk
Livingston	Avoid	Surface water	Avoid an overall increase in flood risk
Bathgate	Protect	Surface water	Reduce residential and commercial surface water flood damages
Broxburn	Protect	Surface water	Reduce residential and commercial surface water flood damages
Linlithgow	Protect	Surface water	Reduce residential and commercial surface water flood damages
Livingston	Protect	Surface water	Reduce residential and commercial surface water flood damages

West Lothian	Prepare	Surface water	Reduce the disruption caused by surface water flooding by raising awareness of the risk of flooding
West Lothian	Avoid	Surface water	Improve the provision of maintenance to surface water management assets

Coastal Change Adaptation Plan

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.

The maps also help identify areas of the coast, where if erosion occurs, coastal flooding could get worse. The possible loss of land by 2100, due to coastal erosion, could be between 50m to 70m along the current coastal boundary of West Lothian, which runs from the east of Blackness to beyond Society, Hopetoun. With the area of influence extending beyond this.

West Lothian Council's Flood Risk ([2023 SEPA mapping](#)) indicates that there are 2-3 properties in the small hamlet of Society that are within the Future Coastal flood risk extent, and 3-4 houses that are near the Future Coastal flood risk extent. However Coastal accretion (net accumulation of sediment) has been identified at Society since the 1890's and there is no known flood risk to properties from coastal erosion within West Lothian's shoreline.

West Lothian Council has begun preparation of a Coastal Change Adaptation Plan.

Gap Analysis

A review of the collection of data sources for the SFRA has identified some evidence gaps. These gaps are summarised below under their information source along an action to address the issue during later stages of the LDP2 preparation.

SEPA Flood Hazard Maps

Evidence Gap

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.

The maps do not take account of river and coastal flooding happening simultaneously.

The Future Flood Maps underestimate future river and coastal flood risk in the LDP2 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).

Action

A site-specific flood risk assessment (FRA) will be required for candidate sites in locations known to be at risk of flooding to account for this gap

FRAs may be required on other candidate sites through the site assessment for LDP2 taking account of professional opinion at that time.

Updated FRA's will still be required at the planning application stage with the plan specifying the need for an updated FRA to take account of current data and to inform and accompany development proposals.

Generally, flood risk assessments are to be sought by the Council in one or a combination of the following situations:

- the site is close enough to a watercourse or drainage ditch that it poses a realistic risk of flooding,
- Historic instances of any form of flooding on the site are known,
- 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,
- The site is below the 6m AOD contour.

Any site-specific FRA will need to follow the Council's Planning Application Advice on Flood Risk and Surface Water Drainage and also run comparisons 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

(The current planning guidance is [SG Flooding and Drainage1.pdf \(westlothian.gov.uk\)](#) however this has to be reviewed for LDP2).

Climate Change Allowances

Evidence Gap

The climate change allowances and therefore the Future Flood Maps are mentioned under the SEPA Flood Risk Maps section.

Action

A site-specific FRA will be required in the circumstances described in the action for SEPA Flood Hazard Maps.

Natural Flood Management Maps

Evidence Gap

The maps are of a high-level nature and not detailed enough to be site specific therefore provide information of limited value.

Action

Site-specific opportunities for natural flood management will be identified through local knowledge, flood studies, river basin management plans, the strategic environmental assessment and site-specific flood risk assessments etc.

Dynamic Coast

Evidence Gap

The Council presently has no coastal adaptation plan in place.

Action:

Given the limited area of coastline alongside the very low level of development near the coast the Council has to determine whether:

- a specific coastal adaptation plan is required in the long term for natural or artificial defences; or
- 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.

Reservoir Inundation

Evidence Gap

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.

Action:

The Council will only consider the risk of reservoir inundation for a candidate site if it is appropriate given local circumstances.

Potentially Vulnerable Areas

Evidence Gap

Some actions identified for a PVA may not have commenced or be complete within the timescales of LDP2 preparation.

Action:

A site-specific FRA will be required in the circumstances described in the action for SEPA Flood Hazard Maps.

Council Flood Studies

Evidence Gap

Future flood studies are dependent on finding available funding and may not have commenced or be complete within the timescales of LDP2 preparation.

Action:

A site-specific FRA will be required in the circumstances described in the action for SEPA Flood Hazard Maps.

Surface Water Management Plans

Evidence Gap

If actions identified in any surface water management plan (SWMP) has not commenced or been published within the timescales of LDP3 preparation.

Action:

A site-specific FRA will be required in the circumstances described in the action for SEPA Flood Hazard Maps.

Coastal Change Adaptation Plan

Evidence Gap

Evidence Gap

The Council presently has no coastal adaptation plan in place.

Action:

Given the limited area of coastline alongside the very low level of development near the coast the Council has to determine whether:

- a specific coastal adaptation plan is required in the long term for natural or artificial defences; or
- 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.

SFRA Maps

The SFRA maps consist of all current flood risk information. Due to licencing agreements not all maps are viewable to the public and are therefore not provided within this document.