Edinburgh Strategic Flood Risk Assessment

Methodology Report

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Contents

1 Introduction

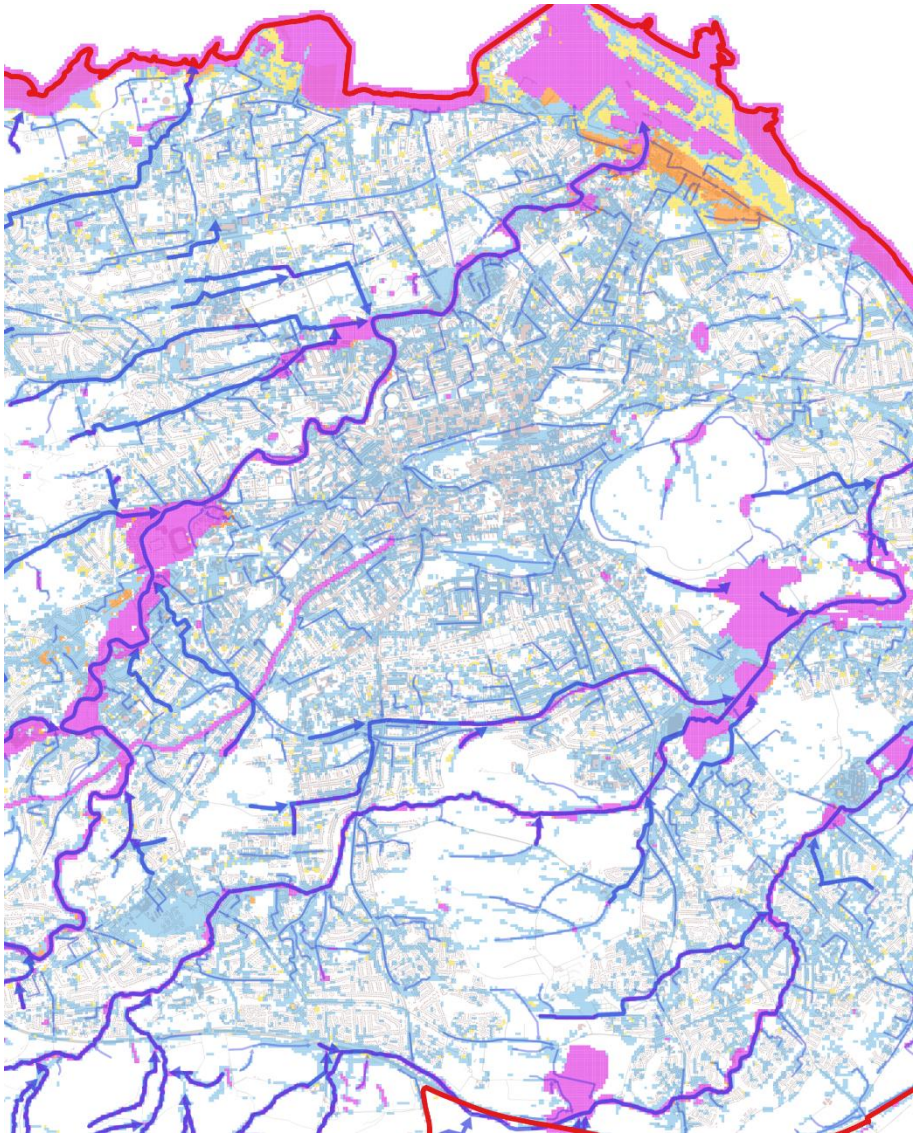
City of Edinburgh Council (CEC) commissioned Mott MacDonald to prepare a Strategic Flood Risk Assessment (SFRA) covering the local development plan area. The SFRA is primarily a map-based overview, which represents sources of flooding and will help inform development planning to avoid increasing overall flood risk.

The SFRA has been prepared based on the *Guidance for planning authorities on Strategic Flood Risk Assessment* (SEPA, 2023). The SFRA collates and utilises existing information about flood risk to help strengthen resilience by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding in line with the *National Planning Framework 4 (NPF4) Policy 22* (Scottish Government, 2023).

The SFRA should be used during the local development plan preparation to inform choices about appropriate locations for development.

This document outlines the methodology used to conduct the SFRA and should be read in conjunction with the supporting maps and GIS files to aid interpretation.

Figure 1 – Extract of the SFRA strategic flow paths and risk assessment outputs



Map contains OS data © Crown copyright and database rights 2023 OS 100023420.

2 Using the SFRA

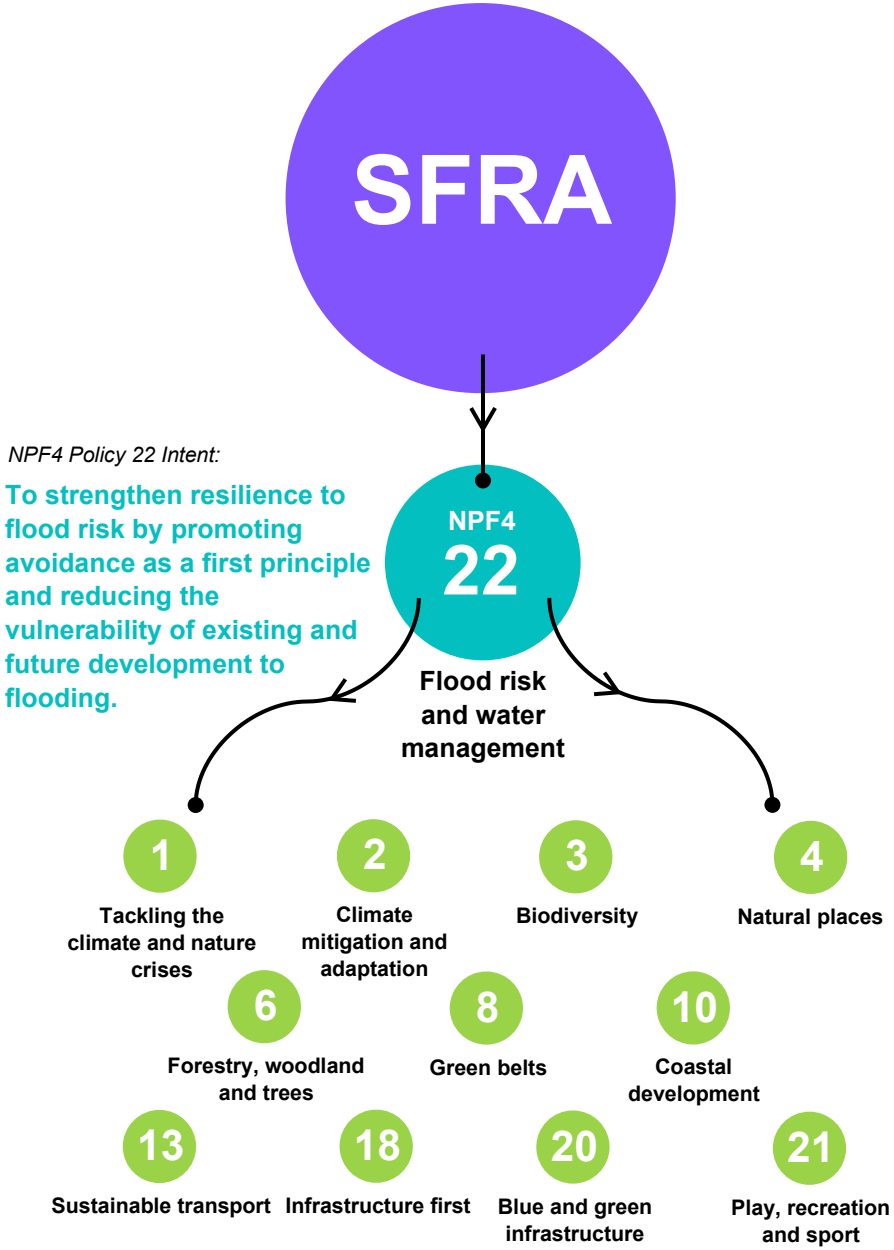
The SFRA should primarily be used to identify where flood risk exists and how this may impact the location of development proposals in the Local Development Plan.

Appendix B provides a description of the data fields in the SFRA output dataset. Using a 25m-by-25m grid across the whole City of Edinburgh Council boundary, the SFRA provides an assessment of flood risk using the following categories:

- **No risk** – the area is not identified as being at risk of flooding, from the various data sources considered.
- **Present-day risk** – the area is potentially at risk, when considering the present-day climate.
- **Future risk** – the area is not at risk during the present-day climate, but is estimated to become potentially at risk in a changing climate.
- **Critical present-day risk** – the area is potentially at risk from higher hazard flooding sources in the present-day climate and therefore the development constraints are more critical.
- **Critical future risk** – the area is potentially at risk from higher hazard flooding sources in the future climate and therefore the development constraints are more critical.

The SFRA is an indicative assessment that acts as a screening tool to help identify where further information is required to fully understand flood risk. More detailed flood risk assessments should be developed for specific sites, as they progress through the land use planning process.

Although the focus of the SFRA is on demonstrating the impact of NPF4 Policy 22 (Flood risk and water management), the SFRA provides evidence to help take other NPF4 policies into account and supports their delivery.



3 Flood risk assessment methodology

The SFRA assesses flood risk across the whole City of Edinburgh Council local authority boundary using a grid with 25m-by-25m resolution. The data register in Appendix A, provides a summary of the information used in the assessment. The SFRA considers the available flood risk information and maps potential flood risk during a present-day and future climate.

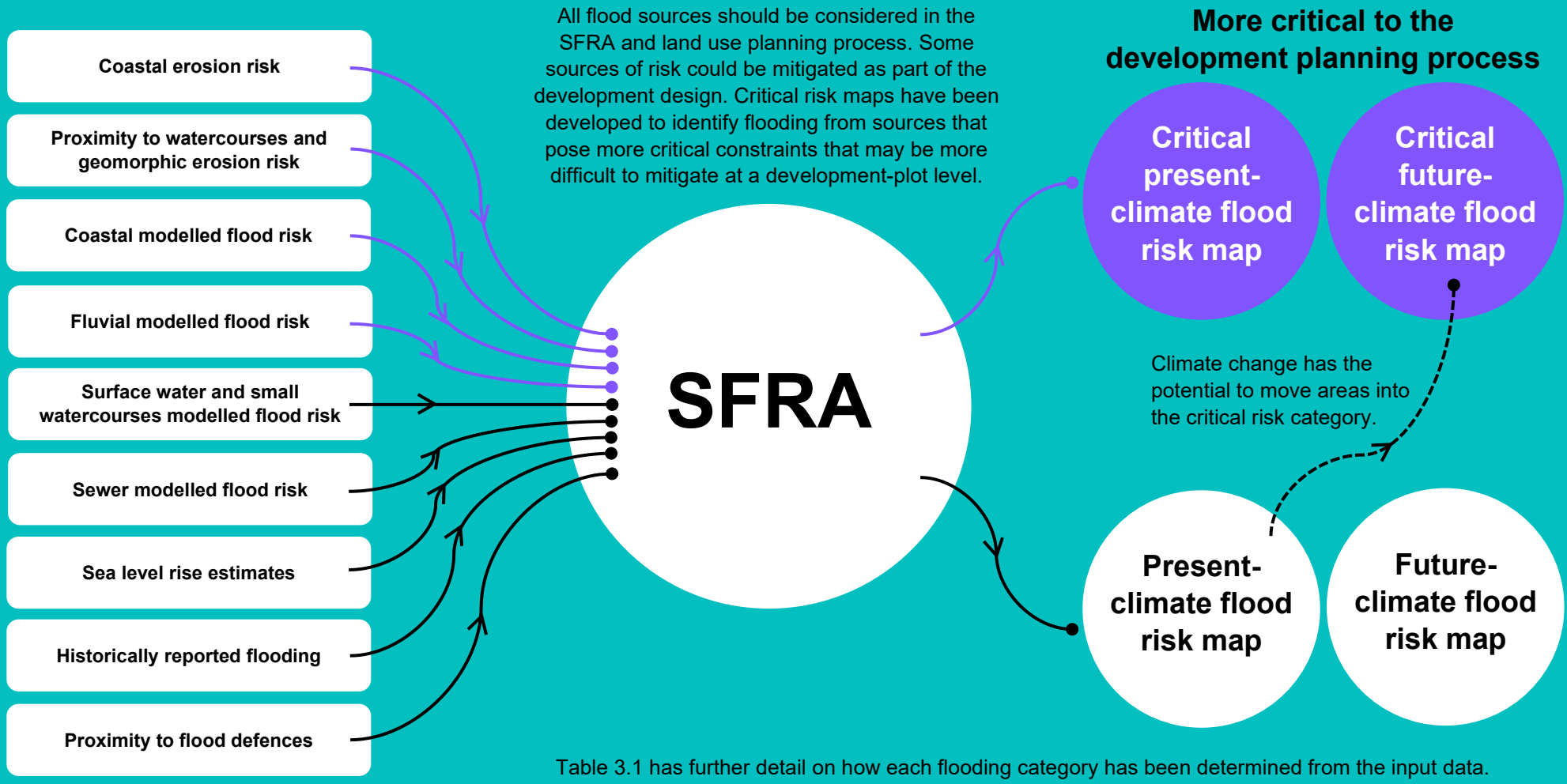
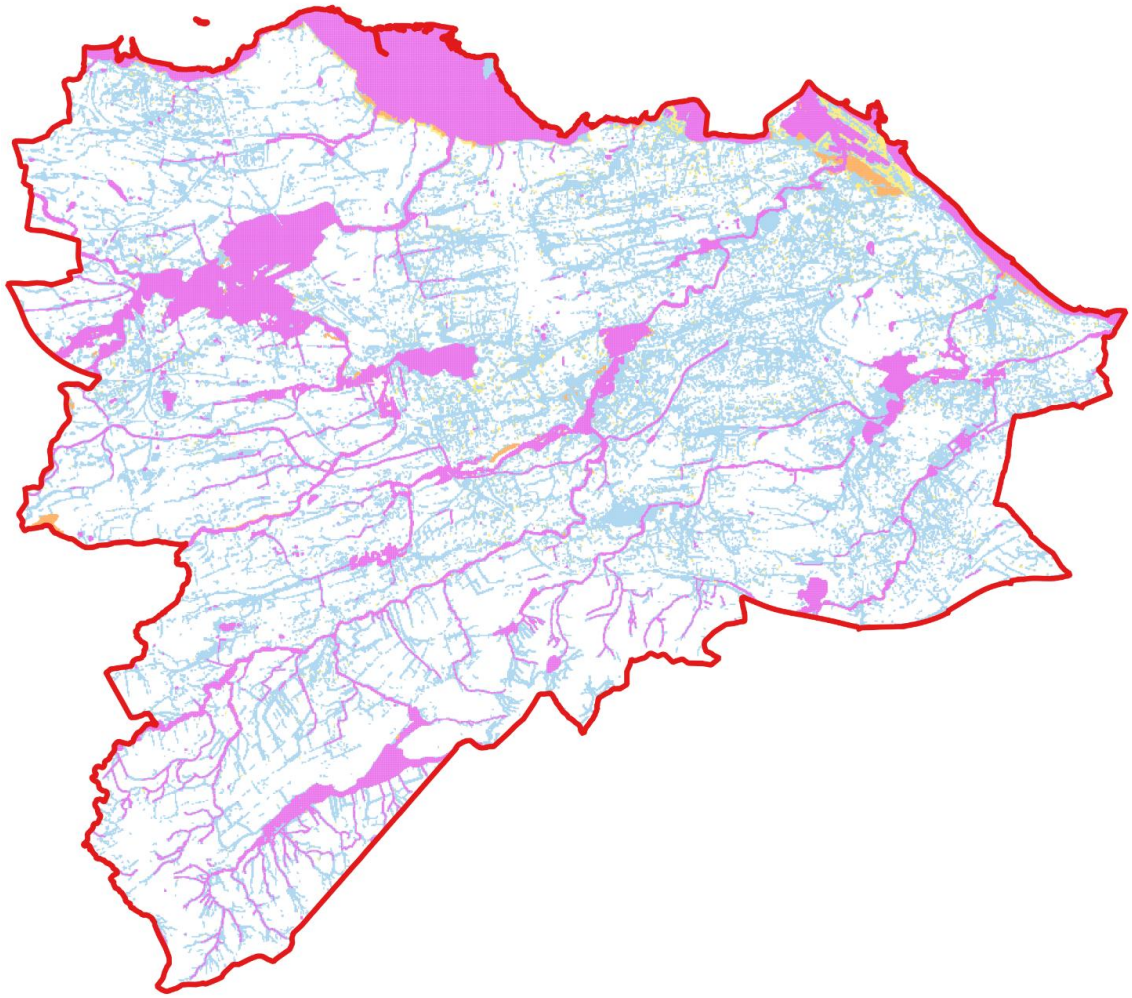


Table 3.1 has further detail on how each flooding category has been determined from the input data.

Figure 2 – Summary of the SFRA risk assessment outputs for the whole City of Edinburgh Council boundary



No risk – the area is not identified as being at risk of flooding, from the various data sources considered.

CRITICAL RISK CATEGORISATION:	Corresponding SEPA flood risk likelihood
Critical present-day risk – the area is potentially at risk from higher hazard flooding sources in the present-day climate and therefore the development constraints are more critical.	**Medium likelihood Fluvial and Coastal flood risk extents** *(1:200-year return period)*
Critical future risk – the area is potentially at risk from higher hazard flooding sources in the future climate and therefore the development constraints are more critical.	**Future Medium likelihood Fluvial and Coastal flood risk extents** *(1:200-year future return period)*
NON-CRITICAL RISK CATEGORISATION:	
Present-day risk – the area is potentially at risk, when considering the present-day climate.	**Low likelihood Fluvial, Coastal and Surface Water and Small Watercourses flood risk extents** *(1:1000-year return period)*
Future risk – the area is not at risk during the present-day climate, but is estimated to become potentially at risk in a changing climate.	**Future Medium likelihood Surface Water and Small Watercourses flood risk extents** *(1:200-year future return period)*

Table 3.1 presents how the supporting data has been used to identify risk in each SFRA flood risk category.

Table 3.1: SFRA risk category explanation

Data category	Critical present-day risk	Non-critical present-day risk	Critical future risk	Non-critical future risk
Fluvial flood risk	Intersects with the SEPA fluvial medium likelihood flood extents, present-day climate scenario (1:200-year flood extents).	Intersects with the SEPA fluvial low likelihood flood extents, present-day climate scenario. (1:1000-year flood extents).	Intersects with the SEPA fluvial medium likelihood flood extents, future climate scenario. (1:200-year future flood extents).	-
Coastal flood risk	Intersects with the SEPA coastal medium likelihood flood extents, present-day climate scenario. (1:200-year flood extents).	Intersects with the SEPA coastal low likelihood flood extents, present-day climate scenario. (1:1000-year flood extents).	Intersects with the SEPA coastal medium likelihood flood extents, future climate scenario. (1:200-year future flood extents).	-
Surface water flood risk	-	Intersects with the SEPA surface water and small watercourses low likelihood flood extents, present-day climate scenario. (1:1000-year flood extents).	-	Intersects with the SEPA surface water and small watercourses medium likelihood flood extents, future climate scenario. (1:200-year future flood extents).
Sewer flood risk	-	Intersects with the Section 16 sewer flood risk 1:200-year flood extents, present-day climate scenario.	-	Intersects with the Section 16 sewer flood risk 1:200-year flood extents, future climate scenario.
Sea level rise	-	Within the 1:1000-year present-day climate Coastal Flood Boundary (CFB) sea level flood extent.	-	Within the 1:1000-year future climate Coastal Flood Boundary (CFB) sea level flood extent.
Historically reported flooding	-	Within 25m of a historically reported flooding event.	-	-
Erosion	Intersects with the Dynamic Coast 2050 eroded area extents.	Intersects with the Dynamic Coast 2050 erosion influence or vicinity area extents.	Intersects with the Dynamic Coast 2100 eroded area extents.	Intersects with the Dynamic Coast 2100 erosion influence or vicinity area extents.
Watercourse corridor proximity	Within 2m of an open channel waterbody.	Within the SEPA 'Recommended Riparian Corridor' or 10m of a watercourse/waterbody.	-	-
Geomorphic risk	-	Within the SEPA 'Geomorphic Risk Buffer' dataset that identifies zones where significant watercourse channel erosion and deposition (i.e. leading to channel mobility and instability) is expected.	-	-
Flood defence proximity	-	Within 20m of a flood defence asset.	-	-

Further detail on the data inputs and SFRA methodology is presented below.

3.1 SEPA modelled flood risk

SEPA modelled surface water and small watercourse, fluvial and coastal mapping flood extents were considered in the SFRA by identifying where grid cells intersect with the high, medium or low likelihood flood risk extents.

The coastal and fluvial medium likelihood flood extents have been used to define the critical risk areas. The surface water and small watercourse risk maps have been excluded from the critical risk areas, as it is assumed this risk could be managed at a development level. Further investigation would be required to confirm this.

A medium risk future-climate flood extent is provided for the surface water and small watercourse, fluvial and coastal assessment. These maps were used to inform the future-climate SFRA flood risk map. The SEPA modelling uses the following future climate scenarios:

- Surface water and small watercourses – Representative Concentration Pathway 8.5 (RCP8.5) emissions, 50th percentile scenario for the year 2070 (UKCP18).
- Fluvial – High emissions, 67th percentile scenario for the year 2080 (UKCP09).
- Coastal – High emissions, 95th percentile scenario for the year 2080 (UKCP09).

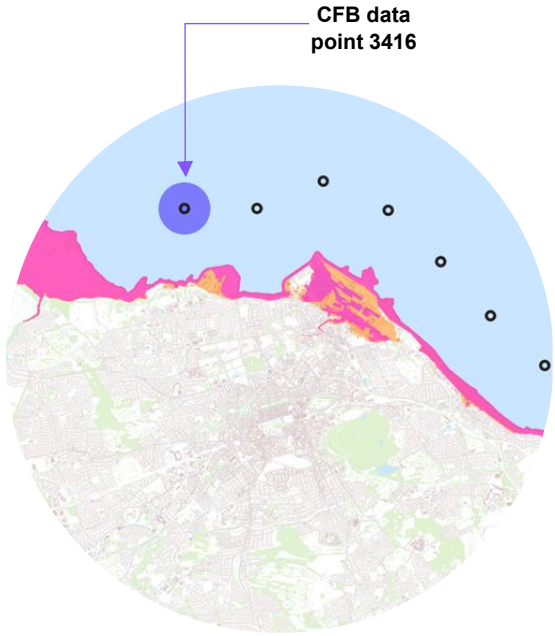
3.2 Sewer modelled flood risk

In accordance with Section 16 of the *Flood Risk Management (Scotland) Act 2009*, Scottish Water have conducted modelling to estimate flooding that may originate from the sewer system. The modelled flood extents have informed the SFRA. The SFRA identifies grid cells that intersect with the 1:200-year return period flood extents, with depths greater than 0.1m (considering both the 60 and 180-minute storm durations). The SFRA considers both the present-day and future climate scenarios. From the information provided, it is not clear what scenario the future-climate results represent. The sewer modelled flood extents are sensitive and should not be shared publicly or published externally to comply with Scottish Water's data sharing agreement with the Council. Similar to the SEPA surface water and small watercourse mapping, this risk has not been used to determine the critical risk mapping.

3.3 Sea level rise estimates

Extreme sea level data from the Coastal Flood Boundary (CFB) dataset developed in partnership with Environment Agency (EA) and SEPA was used to inform the SFRA. The data point in the Forth Estuary providing the highest flood level immediately offshore along Edinburgh's coastline was selected to inform the SFRA assessment. This data point is located at chainage 3416 (Environment Agency, 2018). The 1:1000-year return period event level (upper 97.5% confidence level), plus an additional 600mm freeboard, was used to identify a present-day still sea level to assess flood risk. The impact of sea level rise up to the year 2100 was considered in accordance with SEPA guidance on *Climate change allowances for flood risk assessment in land use planning* (SEPA, 2024). Existing ground levels, derived from LiDAR (Phase 5 Digital Terrain Model, available from the Scottish Remote Sensing Portal), were used to estimate the extent of land impacted by sea level rise. The SFRA identifies grid cells that are within this sea level extent for the present-day and future climate 1:1000-year return period event.

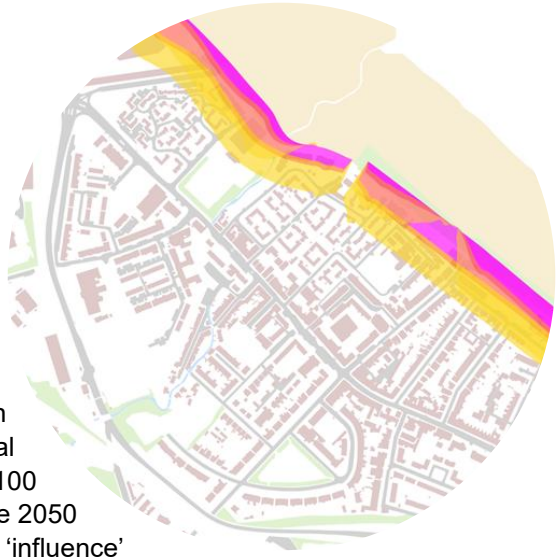
The assessment is indicative and does not consider the impact of wave action, storm surge, funnelling, local bathymetry or presence of defences. Due to the uncertainty in the assessment, this risk has not been used to determine the critical risk mapping. More detailed assessment would be required to identify risk to individual sites. The Council have commissioned Mott MacDonald to conduct a Coastal Change Adaptation Plan (CCAP), which will assess the impact of flooding and erosion along Edinburgh's coastline supported by further work currently being undertaken by SEPA reviewing flood risk in the Forth Estuary. This study is currently ongoing and the results have not yet been published. The outputs of this study should inform future iterations of the SFRA.



3.4 Historically reported flooding

Available historically reported flooding records from the Council and SEPA were used to inform the SFRA. The flooding records were available as georeferenced data points and as such did not represent the extents of previously observed flooding. The provenance and accuracy of the georeferenced data points is varied. The SFRA identifies grid cells that intersect with a 25m buffer on any reported flooding locations.

The reported flooding locations are indicative, and the datasets are incomplete – some flooding events are unreported. The results largely align with SEPA modelled flood risk extents. The dataset could be improved by mapping reported flooding extents, although this information is likely not consistently and reliably available. Due to the uncertainty in the assessment, this risk has not been used to determine the critical risk mapping.



3.5 Dynamic Coast erosion risk

The Dynamic Coast project provides an assessment of coastal erosion risk along Scotland's coastline and identifies parts of Edinburgh's coastline as susceptible to coastal erosion. The Dynamic Coast project maps anticipated erosion areas based on a high emission scenario sea level rise projection (RCP8.5, 95th percentile) and a 'Do Nothing' coastal management approach (Muir, Hurst, Rennie, & Hansom, 2021). Erosion areas are provided for up to the 2050 and 2100 climate scenarios. The SFRA identifies grid cells that intersect with 'eroded' areas as critical risk (considering both the 2050 and 2100 erosion scenarios). Areas identified as 'influence' (10m buffer on 'eroded' areas) or 'vicinity' (50m buffer on 'influence' areas) also inform the SFRA, although are not considered critical risk areas.

The Council have commissioned Mott MacDonald to conduct a Coastal Change Adaptation Plan (CCAP), which will assess the impact of flooding and erosion along Edinburgh's coastline supported by further work currently being undertaken by SEPA reviewing flood risk in the Forth Estuary. This study is currently ongoing and the results have not yet been published. The outputs of this study should inform future iterations of the SFRA.

3.6 Proximity to watercourses

SEPA have developed a 'Recommended Riparian Corridor' dataset that provides a buffer on natural watercourses across Scotland, based on estimated watercourse width. The Council maintain a record of watercourse open channels and culverts in Edinburgh. Ordnance Survey MasterMap data also contains information on the location of waterbodies in Edinburgh. These datasets have been used to identify the presence of watercourses that could impact flood risk. The SFRA identifies grid cells that are within the 'Recommended Riparian Corridor'. Some waterbodies, minor watercourses and culverts are not represented within the SEPA dataset and therefore a 10m buffer has been applied to these features, based on Council and Ordnance Survey records. If within 2m of an open watercourse, the areas are identified as critical risk areas. Buffer strips between watercourses and other land uses have the potential to conserve, enhance and protect the water environment by safeguarding corridors for blue-green infrastructure. The Council will typically accept no development within buffer strips (CEC, 2023). The buffer used in the SFRA is indicative and the recommended width and effectiveness of buffer strips is dependent on site conditions, that should be confirmed via survey. The buffer should be measured from the top of the watercourse bank.

SEPA have also developed a 'Geomorphic Risk Buffer' dataset that identifies zones where significant watercourse channel erosion and deposition (i.e. leading to channel mobility and instability) is expected. These areas have been used to supplement the watercourse proximity assessment. The data has been used in the SFRA to identify grid cells that intersect with the geomorphic risk buffer.

It is not advisable to develop land next to the geomorphic risk areas due to the increased risk of the channel adjusting within this zone. Watercourse erosion has the potential to impact existing infrastructure adjacent to the areas and this may impact future infrastructure provision and development.

In some cases there may be options to mitigate this risk. However, hard engineering techniques are not recommended unless completely necessary and may increase the risk of erosion in adjacent reaches. Development should consider a riparian corridor within these spaces to allow for watercourse erosion.

3.7 Proximity to flood defences

As part of the Coastal Change Adaptation Plan (CCAP), a survey was conducted to collect information of assets along the coast. This data includes walls, groynes and engineered high ground. This dataset is however not complete and does not include assets at Port of Leith and Granton Harbour, which are not included within the CCAP scope. This dataset has been used in the SFRA to identify grid cells that are within 20m of a coastal asset.

The Council also maintain a record of fluvial flood defences, although the dataset is not complete and does not include all private and informal flood defences throughout Edinburgh. The dataset covers the Braid Burn and Water of Leith Flood Prevention Schemes, the Gogar Burn flood defences at Edinburgh Airport and some embankments along the River Almond. It is understood that the River Almond embankments and the Gogar Burn walls and embankments at Edinburgh Airport are not part of a formal flood prevention scheme adopted by the Council. These have however been kept within the dataset. The SFRA identifies grid cells that are within 20m of a flood defence.

The Council should continue to update and maintain this record of flood defences and coastal assets to improve the accuracy and reliability. The Council could also collect data on property-level protection measures throughout the city, which is currently excluded from the SFRA.

The buffers used in this SFRA assessment are indicative and identify the presence of the flood defences and coastal assets to potential development and highlights the need to maintain access for maintenance, repairs, or ultimate replacement. The 20m buffer is deemed sufficient to identify the need to maintain access for maintenance and inspection of flood defence assets. This assessment has not been used in the critical risk area assessment.

3.8 Flood studies

Extract from Gogar Burn Flood Study Report (Mott MacDonald, 2023)

The Council have conducted the following flood studies that will be used to inform the SFRA.

- Water of Leith Flood Study (Arup, 2023)
- Gogar Burn Flood Study (Mott MacDonald, 2023)
- Niddrie Burn Flood Study (AECOM, 2021)

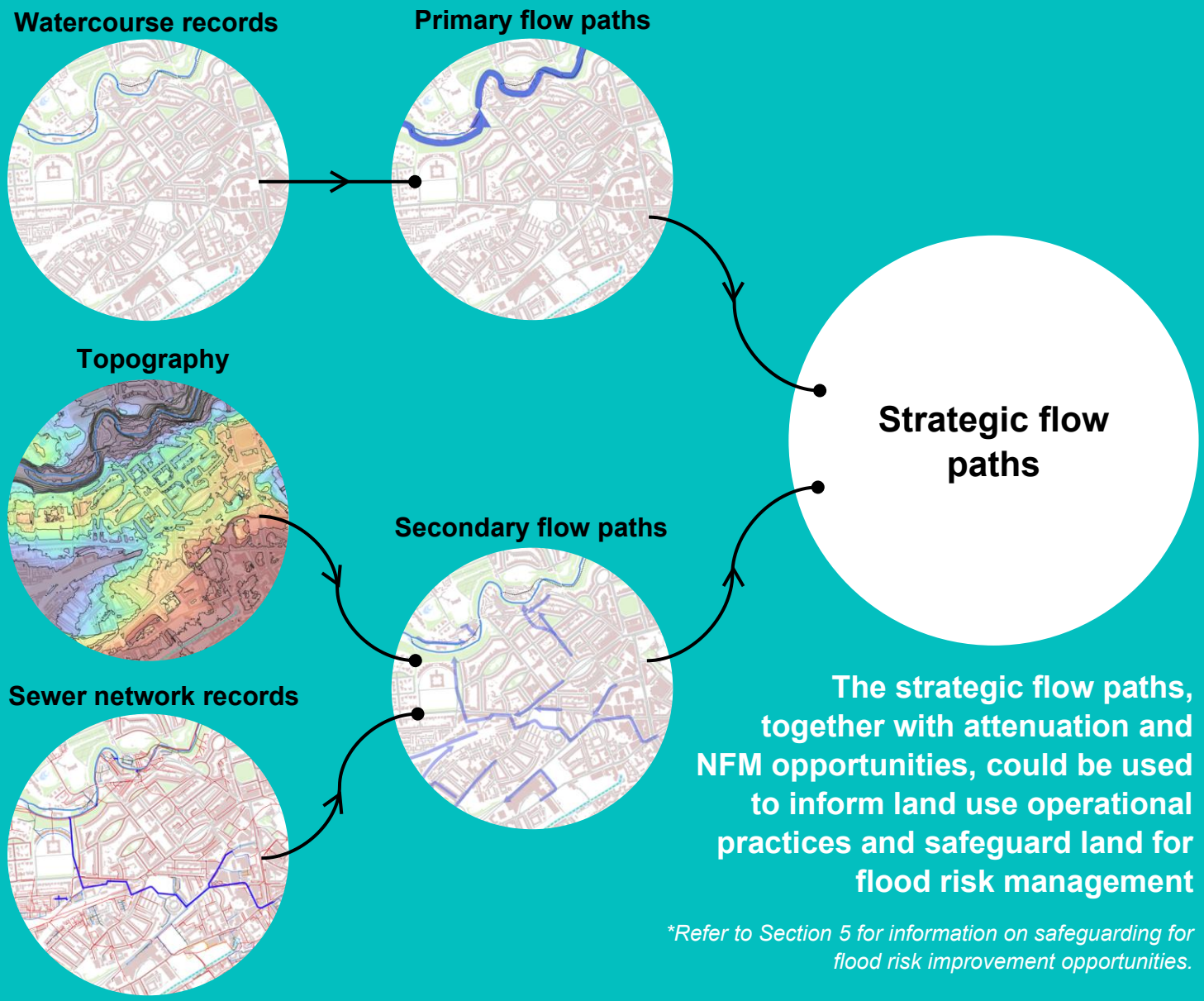
Although these flood studies have not been used to inform the SFRA grid cell flood risk categorisation, the outputs of the flood studies will be used to inform the assessment of potential sites in the local development plan in the next stage of the SFRA.

4 Strategic flow path methodology

In addition to the flood risk assessment, the SFRA also includes a dataset with strategic flow paths.

The strategic flow paths indicatively identify natural and artificial pathways where water is likely to accumulate and flow during storm events. The strategic flow paths provide an indicative illustration of how water flows through the city. They identify how water flows past potential LDP sites and can be used to identify potential discharge points and potential opportunities for improving flood risk management beyond the immediate site boundaries. The flow paths consider watercourses and culverts, overland flow and key underground sewer networks.

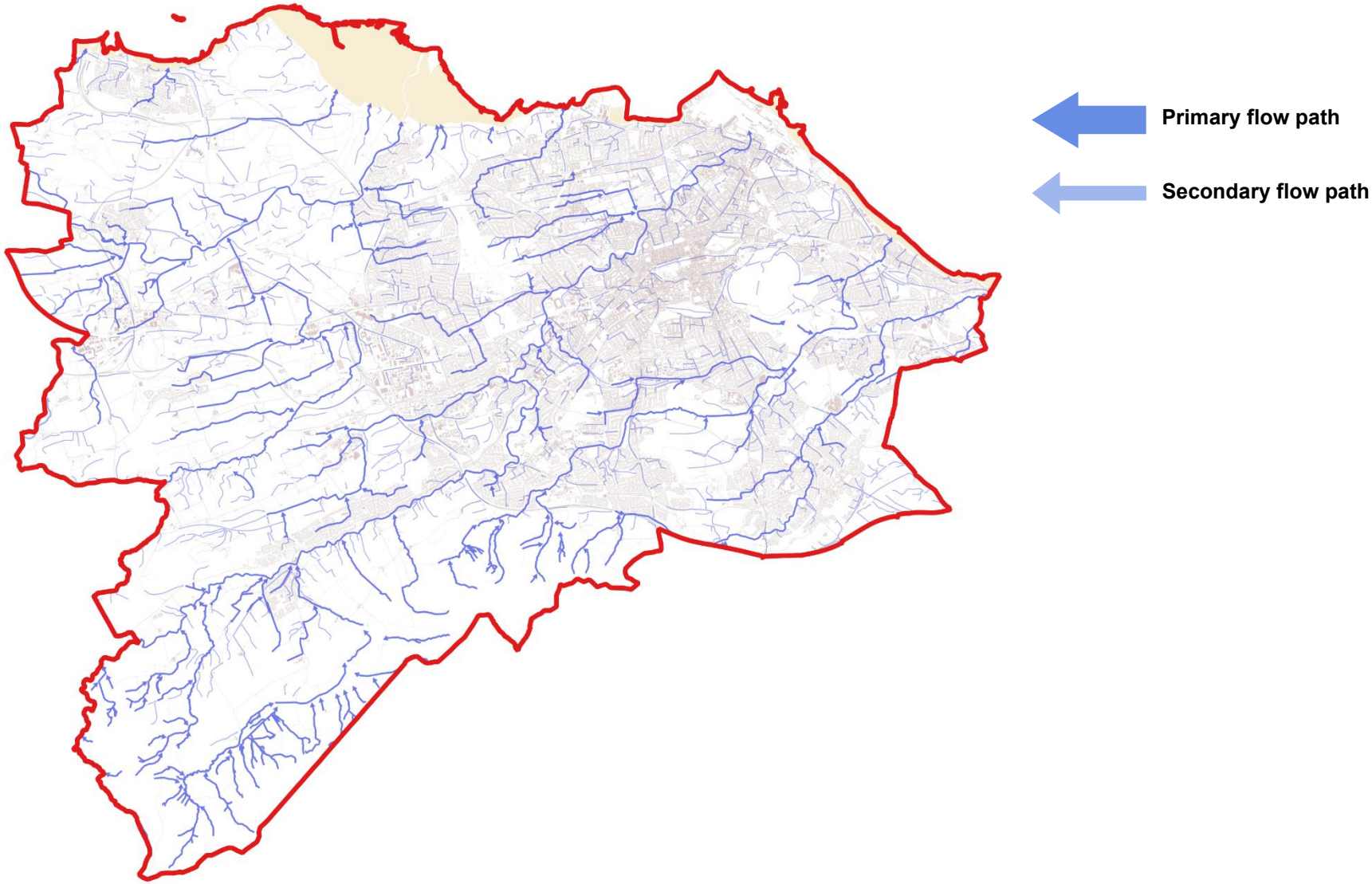
The flow paths are indicative and it is anticipated they will be periodically reviewed to reflect improved understanding, following stakeholder engagement and investigations.



The strategic flow paths, together with attenuation and NFM opportunities, could be used to inform land use operational practices and safeguard land for flood risk management

**Refer to Section 5 for information on safeguarding for flood risk improvement opportunities.*

Figure 3 – Summary of the SFRA strategic flow paths for the whole City of Edinburgh Council boundary



5 Limitations

The SFRA is indicative and requires review and updates to improve its accuracy and reliability. A review of the SFRA data inputs and results identified the following limitations that should be considered when using the outputs and when developing future iterations to the SFRA.

- **SFRA precision**
  - The SFRA provides an assessment of risk across Edinburgh using a 25m-by-25m grid. This grid size was considered appropriate for the strategic purpose of the SFRA, as it provides enough spatial breakdown to inform site screening purposes without being so detailed as to be disproportionate. Although the grid is approximately the same scale as an individual property plot, the SFRA does not provide a precise or site-specific assessment of flood risk to any individual property. The SFRA uses national and regional flood risk datasets that have not been developed to assess flood risk to individual properties. The SFRA should be used to identify whether a site sits within a surrounding area that is at risk of flooding and therefore if further detailed assessment is likely to be needed before progressing with the development of a site.
  - The 25m-by-25m grid would not be appropriate for a detailed risk assessment and does not replace the need for a site-specific flood risk assessment. Interpretation of the SFRA must acknowledge the uncertainty in any flood risk estimation. As the SFRA assessment and supporting data is indicative, some areas in proximity to flood risk identified grid cells may also be at flood risk, and may also require further flood risk assessment.
- **Site-specific flood risk assessments**
  - The SFRA provides an indicative assessment of flood risk across the whole Council boundary. The SFRA is not a substitute for a Flood Risk Assessment, but it is useful for indicating where flood risk may be a concern, and where further study may be required. More detailed flood risk assessments should be developed for specific sites, as they progress through the land use planning process.
- **Critical risk areas**
  - The SFRA categorises some risk areas as ‘critical’, based on assumptions about how effectively risk could be mitigated at a development level as part of the development design. All flood sources should however be considered in the SFRA and land use planning process. The critical risk maps have been developed to identify flooding from sources that pose more critical constraints that may be more difficult to mitigate at a development-plot level. There may however be flood risk areas not categorised as critical that cannot be effectively mitigated as part of the development design. This should be confirmed as part of site-specific flood risk assessments.
- **Safe access and egress**
  - The SFRA considers flood risk to individual grid cells, but does not consider whether sites are surrounded by flood risk and therefore inaccessible to enable safe access and egress. As part of site-specific flood risk assessments, safe access and egress must be demonstrated.
- **Reported flooding event uncertainty**
  - The reported historic flooding locations are indicative and do not represent the actual flood extents. The datasets are also incomplete with some flooding events going unreported. Flooding events should continue to be recorded to inform future iterations of the SFRA. The dataset could be improved by mapping reported flooding extents, although this information is likely not consistently and reliably available.

- **Coastal risk assessment uncertainty**
  - The SFRA uses the EA/SEPA Coastal Flood Boundary dataset to assess the impact of extreme coastal still water levels. This assessment does not however consider the impact of waves, or local meteorological or bathymetric conditions. It also does not consider the presence of existing defences.
  - Existing ground levels, derived from LiDAR (Phase 5 Digital Terrain Model, available from the Scottish Remote Sensing Portal), were used to estimate the extent of land impacted by sea level rise. There is some uncertainty in the LiDAR data used. The dataset is from 2020-2021 and may not consider more recent ground level changes – particularly at Granton Harbour and the Port of Leith, where relatively significant development and groundworks have been undertaken to alter ground levels. Topographical survey and consideration of local structures or defences, not captured in the LiDAR, could reduce this uncertainty.
  - The SFRA considers the impact of future sea level rise to the year 2100. However, given that sea level rise will continue well beyond the end of the 21st century, SEPA guidance suggests that an additional allowance of 0.15m per decade after the year 2100 be applied where the design life of a development is known to extend beyond that date (SEPA, 2024). This should be considered for site-specific flood risk assessments.
  - The Council have commissioned Mott MacDonald to conduct a Coastal Change Adaptation Plan (CCAP), which will assess the impact of flooding and erosion along Edinburgh's coastline. This study is currently ongoing and the results have not yet been published. The outputs of this study should inform future iterations of the SFRA.
- **Ground water flood risk assessment**
  - Ground water flood risk as not been considered in the SFRA. A review of ground water flood risk should be conducted at the site-specific flood risk assessment stage.
- **Infrastructure failure assessment**
  - Flooding due to the collapse/failure of man-made infrastructure including hydro-dams, water supply reservoirs, canals, flood defence structures, underground conduits such as sewers or water treatment tanks has not been considered in the SFRA. This should be conducted at the site-specific flood risk assessment stage.
- **Consideration of flood defences**
  - The extent to which the modelled flood risk considers existing flood defences is not clear. Some flood defences may not be represented and there is uncertainty in the standard of protection and residual risk associated with defences that have been represented. A precautionary approach has been applied as condition and maintenance of flood defences is required to safeguard intended function. More detailed flood risk assessments may reduce this uncertainty.
  - The Council's dataset of flood defences should be updated to include other flood defences throughout Edinburgh and to include the Granton Harbour and Port of Leith assets within the coastal asset dataset. The Council could also collect data on property-level flood protection measures, to consider this data in future iterations of the SFRA.
  - Further assessment is required to map areas of land that are protected by flood defence schemes and to confirm what new development, if any, is appropriate behind defences.
  - The SFRA does not consider potential flood prevention schemes that have not yet been delivered by the Council. For example, the Water of Leith Flood Prevention Scheme Phase 3 proposed fluvial flood walls at Gorgie/Stenhouse. These flood walls have not been constructed and further design development and appraisal would be required if the Council were to take this phase forward.

- **Consideration of flood risk management asset condition**
  - The Council are improving their database on flood risk management assets throughout Edinburgh, by collating data and conducting periodic inspection surveys. The asset management strategy and supporting inspection surveys should be used to inform future iterations of the SFRA, as changes to asset condition may influence flood risk.
- **Consideration of watercourses**
  - The Council maintain a dataset of watercourse open channels and culverts throughout Edinburgh. This dataset is however not complete and is periodically updated as information emerges on historic drainage features, minor watercourses and culverts. This dataset should continue to be maintained and used to update the SFRA.
  - The SFRA uses the SEPA 'Recommended Riparian Corridor' dataset and an indicative 10m buffer strip along minor watercourses not represented in the SEPA dataset. This should be reviewed for specific sites, as the recommended width and effectiveness of buffer strips is dependent on site conditions.
- **Consideration of geomorphic erosion risk**
  - The SFRA watercourse erosion risk assessment uses the SEPA 'Geomorphic Risk Buffer' dataset, which is based on data collected before 2017 and models run in 2013. The risk buffer areas are originally derived from the digital river network produced by the Centre for Ecology and Hydrology (CEH) (1:50,000 scale). This does not match the OS Mastermap and therefore the location is approximate.
  - Therefore, the data accuracy should be confirmed as changes may have occurred. The indicative assessment should be used to identify sites where further assessment would be required via a fluvial audit to identify new pressures and changes to be considered by development.
- **Considering climate change scenarios**
  - The SFRA future flood risk map highlights the impact of climate change. The climate change scenarios considered by the various data sources varies – different emissions scenarios and time horizons are used. Future iterations of the SFRA could reassess the impact of climate change by considering a consistent future climate scenario.
- **Strategic flow paths**
  - The strategic flow paths indicatively identify natural and artificial pathways where water is likely to flow during storm events. There is uncertainty in the identification of flow paths and it is likely that not all key overland flow paths and artificial drainage networks have been represented in the dataset. The strategic flow paths also do not consider groundwater flow directions. Stakeholder engagement and hydraulic modelling could be conducted to validate and improve the accuracy of the strategic flow paths.
- **Safeguarding for flood risk improvement opportunities**
  - The current SFRA does not consider safeguarding land for flood risk management improvement opportunities, although the strategic flow paths could be used to inform this. It is anticipated that safeguarding will be considered later in the preparation of the Local Development Plan (LDP), when potential LDP sites are being chosen. In addition to the strategic flow paths, opportunities for attenuation and natural flood management (NFM) could be considered – informed by SEPA's NFM opportunity maps on 'runoff reduction', 'floodplain storage', 'sediment management', 'estuarine surge attenuation' and 'wave energy dissipation', together with other sources such as NFM opportunities identified from previous flood studies.
  - Similarly, SEPA maintain datasets on 'riparian planting opportunities' and 'river recovery potential' that could be reviewed and integrated into future iterations of the SFRA.

- **Local Flood Risk Management Plan**
  - The *Local Flood Risk Management Plan (LFRMP) for the Forth Estuary Local Plan District 2022-28* (Falkirk Council, 2023) sets out actions to reduce flooding in the Forth. Some actions include conducting flood studies to promote new flood prevention schemes and reviewing the standard of protection of existing schemes. As the responsible Action Delivery Leads deliver the LFRMP actions, the SFRA should be updated to reflect the latest understanding of flood risk.
- **Stakeholder engagement**
  - To further develop the SFRA so that it is cognisant and aligned with other organisational priorities and focuses, the outputs should be reviewed and discussed with different Council departments and external organisations.
- **Updating the SFRA**
  - Due to improvements in flooding data or observed extreme flood events our understanding of flood hazards may change. Therefore, the SFRA may become out of date. As a minimum, SEPA advise updating at least every development plan cycle.
  - As the SFRA has uses beyond the Evidence Report stage of the Local Development Plan it will be useful to keep it under review and up to date. The exact frequency and extend shall be discussed with the Council at an appropriate time once the first iteration has been prepared.

6 Summary and conclusions

The SFRA is primarily a map-based overview, which represents sources of flooding and will help inform development planning to avoid increasing overall flood risk. The SFRA should be used during the local development plan preparation to inform choices about appropriate locations for development.

This document outlines the methodology used to conduct the SFRA and should be read in conjunction with the supporting maps and GIS files to aid interpretation. Appendix A provides a summary of the input data used in the SFRA. Appendix B provides a description of the data fields in the SFRA output dataset.

Using a 25m-by-25m grid across the whole City of Edinburgh Council boundary, the SFRA provides an assessment of flood risk using the following categories:

- **No risk** – the area is not identified as being at risk of flooding, from the various data sources considered.
- **Present-day risk** – the area is potentially at risk, when considering the present-day climate.
- **Future risk** – the area is not at risk during the present-day climate, but is estimated to become potentially at risk in a changing climate.
- **Critical present-day risk** – the area is potentially at risk from higher hazard flooding sources in the present-day climate and therefore the development constraints are more critical.
- **Critical future risk** – the area is potentially at risk from higher hazard flooding sources in the future climate and therefore the development constraints are more critical.

The SFRA also includes strategic flow paths that provide an indicative illustration of how water flows through the city – considering natural and artificial pathways where water is likely to accumulate and flow during storm events. These consider watercourses and culverts, overland flow and key underground sewer networks. These should be used to inform opportunities and constraints for potential LDP sites and should be used to inform the safeguarding of land for flood risk management measures.

The SFRA is an indicative assessment. More detailed flood risk assessments should be developed for specific sites, as they progress through the land use planning process.

Following stakeholder consultation, the initial version of the SFRA should be updated to reflect improving understanding of flood risk.

The SFRA will be used to inform the LDP site appraisal process and consider the degree of constraint posed by flood risk. At this stage, flood risk to sites will be reviewed in more detail – including considering the outputs from flood studies conducted by the Council. A ‘Red’, ‘Amber’, ‘Green’ (RAG) rating system will be applied to potential LDP sites to highlight potential flood risk. This second stage of the SFRA will identify which sites require more detailed flood risk assessments, if mitigation is required, and potential opportunities to reduce flood risk and improve water management. This may be to the benefit of sites themselves, as well as their surrounding areas.

7 References

AECOM. (2021). *Niddrie Burn Flood Study Modelling Report. Revision 2.* City of Edinburgh Council.

Arup. (2023). *Water of Leith Flood Protection Scheme - Hydrology and Hydraulic Model Update. Water of Leith Modelling Report. Issue 5.* City of Edinburgh Council.

CEC. (2023). *Development Control, Flood Risk and Surface Water Management Plan Requirements. Version 5.*

Environment Agency. (2018). *Coastal flood boundary conditions for the UK: update 2018. Technical Summary Report.*

Falkirk Council. (2023). *Local Flood Risk Management Plan Cycle 2, 2022-2028. Forth Estuary Local Plan District .*

Mott MacDonald. (2023). *Gogar Burn Flood Study Report. Document reference: 100103506-MMD-GOG-XX-RP-W-012 P2.* City of Edinburgh Counciol.

Muir, F., Hurst, M., Rennie, A., & Hansom, J. (2021). *Dynamic Coast: National Coastal Erosion Risk Assessment. CRW2017_08.* Scotland's Centre of Expertise for Waters (CREW).

Scottish Government. (2023). *National Planning Framework 4.*

SEPA. (2023). *Guidance for planning authorities on Strategic Flood Risk Assessment, Version 1.*

SEPA. (2024). *Climate change allowances for flood risk assessment in land use planning, Version 5.*

Appendices

A. Data register

Table A.1 summarises the datasets used to inform the SFRA. Any updates to the datasets should be used to inform future iterations of the SFRA. Future iterations of the SFRA should include a review of the data register and consultation with stakeholders to confirm the accuracy of datasets and whether any additional datasets should be used.

Table A.1: SFRA Data Register

Dataset	Description	Source	Date	Comments
City of Edinburgh Council Local Authority Boundary	Local authority boundary for the City of Edinburgh Council.	City of Edinburgh Council	2025	This data was used to determine the extent of the SFRA. A 25m-by-25m grid was generated for the full local authority extent.
Dynamic Coast Erosion Maps	The Dynamic Coast project provides an assessment of anticipated erosion areas for up to the 2050 and 2100 climate scenarios.	Dynamic Coast	2021	This data was used to identify land at risk of erosion. Available under the Open Government Licence v3.0.
Flood Defence Records	Record of fluvial flood defences maintained by City of Edinburgh Council.	City of Edinburgh Council	2025	The Council maintain a record of fluvial flood defences, although the dataset is not complete and does not include all private flood defences. This dataset was used to estimate land in proximity to flood defences.
Gogar Burn Flood Study results	City of Edinburgh Council commissioned Mott MacDonald to conduct the Gogar Burn flood study in 2023. The flood study outputs should be read in conjunction with the *Gogar Burn Flood Study Report* (Mott MacDonald, 2023).	City of Edinburgh Council	2023	This data has not been used to inform the SFRA grid cell flood risk categorisation, although the outputs of the flood study will be used to inform the assessment of potential sites in the local development plan in the next stage of the SFRA.
Historic Flooding Records – City of Edinburgh Council	Observed flooding events recorded by the Council in a georeferenced point dataset.	City of Edinburgh Council	2025	The dataset was used to identify land within 25m of an observed flooding event. The location of the observed flooding point dataset is indicative, does not represent the flood extents, and likely does not record all flood events.
Historic Flooding Records – SEPA	Observed flooding events recorded by SEPA in a georeferenced point dataset.	SEPA	2024	The dataset was used to identify land within 25m of an observed flooding event. The location of the observed flooding point dataset is indicative, does not represent the flood extents, and likely does not record all flood events.

Dataset	Description	Source	Date	Comments
LiDAR	Scottish Public Sector LiDAR (Phase 5) Digital Terrain Model (DTM). 50cm grid resolution.	Scottish Remote Sensing Portal	2020-2021	This dataset was used to estimate the extent of land impacted by extreme sea level and has been used to inform the strategic flow paths. Contains public sector information licensed under the Open Government Licence v3.0. Crown copyright Scottish Government and Fugro (2021).
Niddrie Burn Flood Study results	City of Edinburgh Council commissioned AECOM to conduct the Niddrie Burn flood study in 2021. The flood study outputs should be read in conjunction with the *Niddrie Burn Flood Study Modelling Report* (AECOM, 2021).	City of Edinburgh Council	2021	This data has not been used to inform the SFRA grid cell flood risk categorisation, although the outputs of the flood study will be used to inform the assessment of potential sites in the local development plan in the next stage of the SFRA.
OS MasterMap	Ordnance Survey MasterMap data	Ordnance Survey, via City of Edinburgh Council	2023	Ordnance Survey MasterMap data contains information on the location of waterbodies in Edinburgh, which was used to identify areas of land in proximity to watercourses. OS data © Crown copyright and database rights 2023 OS 100023420.
Scottish Water Section 16 Sewer Flood Risk Maps	Scottish Water have conducted modelling to estimate the extent of flooding that is likely to originate from the sewer system. The SFRA uses the present-day and future climate 1:200-year return period flood extents, with depths greater than 0.1m (considering both the 60-minute and 180-minute storm durations).	Scottish Water	2018	This dataset was used to estimate the extent of land impacted by sewer flooding. This mapping broadly aligns with the SEPA surface water flood mapping. The sewer modelled flood extents is sensitive and should not be shared publicly or published externally to comply with Scottish Water's data sharing agreement with the Council.
Scottish Water sewer network records	Scottish Water records of sewer networks, including surface water, foul water and combined networks.	Scottish Water	2024	This dataset was used to inform the strategic flow paths.
SEPA Climate Change Allowances	SEPA guidance on *Climate change allowances for flood risk assessment in land use planning, Version 5* (SEPA, 2024).	SEPA	2024	The cumulative sea level rise to the year 2100 for the Forth River Basin District was used to estimate the impact of climate change on extreme sea level.
SEPA Coastal Flood Maps	SEPA high, medium and low likelihood coastal flood extents, including a future climate medium likelihood coastal flood extent. Version 3.0 results.	SEPA	2025	This dataset was used to estimate the extent of land impacted by coastal flooding. © SEPA 2025. This SEPA product is licenced under the Open Government Licence v3.0

Dataset	Description	Source	Date	Comments
SEPA Fluvial Flood Maps	SEPA high, medium and low likelihood fluvial flood extents, including a future climate medium likelihood fluvial flood extent. Version 3.0 results.	SEPA	2025	This dataset was used to estimate the extent of land impacted by fluvial flooding. © SEPA 2025. This SEPA product is licenced under the Open Government Licence v3.0
SEPA Geomorphic Risk Buffer	This dataset that identifies zones where significant watercourse channel erosion and deposition (i.e. leading to channel mobility and instability) is expected.	SEPA	2013-2017	This dataset was used to estimate the extent of land impacted by watercourse erosion. © SEPA 2025. This SEPA product is licenced under the Open Government Licence v3.0
SEPA Recommended Riparian Corridor	This dataset provides a buffer on natural watercourses across Scotland, based on estimated watercourse width.	SEPA	2024	This dataset was used to identify areas of land in proximity to watercourses. The dataset is likely not complete and not all minor watercourses are be represented. © Scottish Environment Protection Agency. Contains OS data Copyright Crown copyright and database right (2025). This SEPA product is licenced under the Open Government Licence v3.0
SEPA Surface Water and Small Watercourse Flood Maps	SEPA high, medium and low likelihood surface water and small watercourse flood extents, including a future climate medium likelihood surface water and small watercourse flood extent. Version 3.0 results.	SEPA	2025	This dataset was used to estimate the extent of land impacted by surface water flooding. © SEPA 2025. This SEPA product is licenced under the Open Government Licence v3.0
Watercourse records	The Council maintain a dataset of the location of open channel and culverted watercourses.	City of Edinburgh Council	2025	This dataset was used to identify areas of land in proximity to watercourses. The dataset is likely not complete and not all culverts and minor watercourses are represented. This dataset was also used to inform the strategic flow paths.
Water of Leith Flood Study results	City of Edinburgh Council commissioned Arup to conduct the Water of Leith flood study in 2023. The flood study outputs should be read in conjunction with the *Water of Leith Flood Protection Scheme - Hydrology and Hydraulic Model Update Report* (Arup, 2023).	City of Edinburgh Council	2023	This data has not been used to inform the SFRA grid cell flood risk categorisation, although the outputs of the flood study will be used to inform the assessment of potential sites in the local development plan in the next stage of the SFRA.

B. Output data index

Table B.1 provides a description of the data fields in the SFRA risk assessment output file. The SFRA data output has the following file name in a feature class GIS file format within a geodatabase.

- FRM_CEC_SFRA_Ply_P01

Table B.1: Data index for the SFRA risk assessment output dataset, describing each data field

Data field	What it shows
ID	A unique numerical identifier for each grid cell.
NGR_Ref	The UK National Grid Reference of the centroid of each grid cell. This could also be used as a unique identifier for each grid cell.
Reported_risk	Identifies whether the grid cell is within 25m of a historically reported flooding event. Results are either 'No risk' or 'Reported risk'.
SEPA_coastal	Identifies whether the grid cell intersects with the SEPA modelled coastal flood risk extents results. Depending on which flooding extent map the grid cell intersects with, the results are either 'No risk' or one of the following risk categories in order of priority: 'High likelihood', 'Medium likelihood', 'Low likelihood' or 'Medium future likelihood'
SEPA_fluvial	Identifies whether the grid cell intersects with the SEPA modelled fluvial flood risk extents results. Depending on which flooding extent map the grid cell intersects with, the results are either 'No risk' or one of the following risk categories in order of priority: 'High likelihood', 'Medium likelihood', 'Low likelihood' or 'Medium future likelihood'.
SEPA_surfacewater	Identifies whether the grid cell intersects with the SEPA modelled surface water and small watercourse flood risk extents results. Depending on which flooding extent map the grid cell intersects with, the results are either 'No risk' or one of the following risk categories in order of priority: 'High likelihood', 'Medium likelihood', 'Low likelihood' or 'Medium future likelihood'.
Sewer_risk	Identifies whether the grid cell intersects with the Scottish Water Section 16 modelled sewer flood risk extents results. Results are either 'No risk', 'Sewer risk' or 'Future sewer risk' depending on whether the grid cell intersects with the present-day or future climate results.
Watercourse_proximity	Identifies whether the grid cell is within 2m of an open watercourse or waterbody (excluding culverts), or within the SEPA 'Recommended Riparian Corridor', or within 10m of culverts or waterbodies not included in the SEPA dataset. Results are either 'No risk', 'Critical watercourse risk' if within 2m of an open watercourse/waterbody or 'Watercourse risk' if within the SEPA 'Recommended Riparian Corridor' or 10m of a watercourse/waterbody.
Erosion_risk	Identifies whether the grid cell intersects with coastal 'eroded' areas, which are considered critical risk areas. The SFRA also highlights if the grid cell is within areas identified as 'influence' (10m buffer on 'eroded' areas) or 'vicinity' (50m buffer on 'influence' areas). The SFRA considers both the 2050 and 2100 erosion scenarios. Results are either 'No risk', '2050 erosion risk', '2100 erosion risk', '2050 erosion vicinity' or '2100 erosion vicinity'.
Sea_level	Identifies grid cells that intersect the sea level extent for the present-day and future climate 1:1000-year return period event. Results are either 'No risk', 'Sea level risk' or 'Future sea level risk'.
Flood_defence	Identifies whether the grid cell is within 20m of a flood defence. Results are either 'No risk' or 'Defences risk'.
Geomorphic_risk	Identifies whether the grid cell intersects with areas where significant watercourse channel erosion and deposition (i.e. leading to channel mobility and instability) is expected.

Data field	What it shows
Flood Risk Present	**This provides an overall summary of the flood risk at each grid cell and is the main attribute to be used for initially interpreting the SFRA results. This identifies whether any of the previous data fields notes a potential flood risk in either the present-day or future climate. Results are either 'No risk', 'Critical present-day risk', 'Critical future risk', 'Present-day risk' or 'Future risk'.**

In addition to the SFRA risk assessment output file, a feature class GIS file format within a geodatabase has also been provided for the strategic flow paths, with the following file name:

- FRM_CEC_Strategic_Flow_Paths_Ply_P01

Table B.2: Data index for the SFRA strategic flow path dataset, describing each data field

Data field	What it shows
ID	A unique numerical identifier for each flow path.
Category	Identifies whether the strategic flow path is a 'Primary' or 'Secondary' flow path.