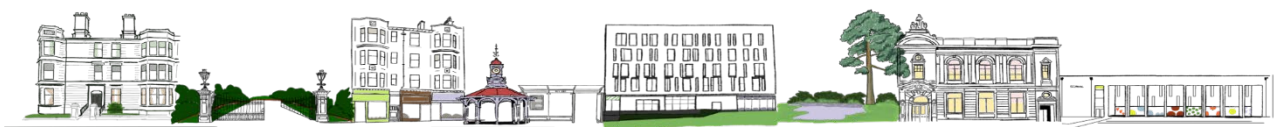




Glasgow City Council
City Development Plan 2
Evidence Report
Strategic
Flood Risk Assessment
February 2025



OFFICIAL

DOCUMENT STATUS

Ver	Date	Comment	Prepared by	Checked By	Approved By
0.1	11/12/24	Draft for comment	M. MacLeod	J. Murray	D. Hay
0.2	31/01/25	Working document to respond to SEPA feedback	M. MacLeod	n/a	n/a
0.3	14/02/25	Revised document incorporating SEPA feedback	D. Hay	J. Murray	
0.4	21/02/25	Document updated following discussion with SEPA	D. Hay		

OFFICIAL CONTENTS

1. INTRODUCTION	1
1.1 Glasgow.....	1
2. Information Gathering	2
2.1 Information Used	2
2.2 Information Not Used	3
3. Gap Analysis.....	4
4. Key Actions for SFRA Stage 2.....	5
APPENDICES	
Appendix A.....	
Glasgow Watercourses and Topography.....	
Appendix B	
SEPA Flood Hazard Maps v2.1, SEPA Future Flood Maps.....	
Appendix C	
Scottish Water Waste Water Treatment Works and Catchment Areas	
Appendix D.....	
Hydraulic Models	

ABBREVIATIONS

AEP	Annual Exceedance Probability
CaLL	Clyde and Loch Lomond
CDP	City Development Plan
DRF	District Regeneration Frameworks
FRMP	Flood Risk Management Plan
LDF	Local Development Frameworks
LFRMP	Local Flood Risk Management Plan
LPD	Local Plan District
MGSDP	Metropolitan Glasgow Strategic Drainage Partnership
NFM	Natural Flood Management
NPF4	National Planning Framework 4
RBMP	River Basin Management Plan
SDF	Strategic Development Frameworks
SEPA	Scottish Environment Protection Agency
SFRA	Strategic Flood Risk Assessment

1. INTRODUCTION

Glasgow City Council (GCC) is preparing City Development Plan 2 (CDP2). This Strategic Flood Risk Assessment (SFRA) will inform the development planning process, primarily, to avoid increasing the overall flood risk by avoiding areas of flood hazard. The SFRA will support CDP2 to respond to the spatial implications of [National Planning Framework 4](#) (NPF4) Policy 22 – Flood risk and water management and the implementation of related NPF4 policies.

The preparation of this SFRA has been informed by the [Guidance for planning authorities on Strategic Flood Risk Assessment](#), published by SEPA in October 2023.

The SFRA will be developed in the following two stages:

- Stage 1 – Collation of available information relating to all aspects of flood risk, gap analysis and preparation of a map-based assessment.
- Stage 2 – Assessment of candidate development sites against the planning principles established by NPF4 Policy 22.

This document presents Stage 1 of the SFRA.

1.1 Glasgow

The GCC administrative area sits at the heart of the Metropolitan Glasgow area in the West of Scotland. The [National Flood Risk Assessment 2018](#), published by SEPA, assessed that 45,000 residential and non-residential properties were at a 0.5% Annual Exceedance Probability (AEP) (1 in 200 yr) risk of flooding.

The primary sources of flooding in Glasgow are fluvial (river / watercourse) and pluvial (surface water) with an increasing risk of coastal (tidal) flooding along the Tidal Clyde corridor as sea levels rise. The urban environment results in complex flooding mechanisms due to the interaction between watercourses and the Scottish Water sewer network coupled with the overland flow of surface water.

Glasgow sits within river / watercourse catchments that extend upstream into the West Dunbartonshire, East Dunbartonshire, North Lanarkshire, South Lanarkshire, East Renfrewshire and Renfrewshire Council areas. The city is served by four sewage treatment works where the sewer catchments extend to a lesser and greater extent beyond the city boundary into neighbouring authorities.

Glasgow works in partnership with neighbouring authorities, Scottish Water, SEPA, Scottish Canals, Clyde Gateway and other partners to improve our understanding of flood risk and to mitigate the impacts of flood risk through the Metropolitan Glasgow Strategic Drainage Partnership ([MGSDP](#)) and the Clyde and Loch Lomond (CaLL) Local Plan District (LPD).

2. Information Gathering

This chapter summarises the data and information collated to inform the SFRA. Known datasets that were reviewed but not used are also documented including the reason why they have not been brought into the SFRA process.

2.1 Information Used

Table 1 lists the data and information reviewed and used to inform all stages of the SFRA. These datasets can be viewed on the CDP2 [Mapping Hub](#) unless otherwise stated below.

Table 1 - Datasets and information reviewed and used for the SFRA

Dataset / Information	Description	Data Holders
Flood Hazard Maps	<p>Flood hazard/extent maps for the 0.5% AEP (1 in 200 yr) return period for the primary sources of flooding (river, coastal and surface water) including ‘future’ flood maps incorporating climate change allowances where available. Reference will also be made to the 0.1% AEP (1 in 1,000 yr) return period flood extents for development sites proposed to be allocated for the Most Vulnerable category of land use. See output maps in Appendix B and the guidance on the SEPA website for further clarification and explanatory notes on these and the Future Flood Maps.</p> <p>Note – ‘future’ data is only available for fluvial and coastal sources only. A pluvial ‘future’ scenario is not currently available. An update to the pluvial dataset, including data for a ‘future’ dataset is expected to be published by SEPA in early 2025. Where available, this data will be utilised for the SFRA Stage 2.</p>	SEPA
Climate Change Allowances	SEPA guidance on Climate Change Allowances for Flood Risk Assessment in Land Use Planning , which provides regional uplift values for Scotland, indicating how much peak rainfall, river flows and sea levels are expected to rise – over the current understanding of flood causes – due to climate change.	SEPA
Detailed Flood Modelling	<p>Catchment specific models including river / watercourse, sewer and surface water modelling undertaken as part of Integrated Catchment Studies, Surface Water Management Plans, Flood Studies, etc to better understand risk within flood vulnerable communities.</p> <p>A list of models is provided in Appendix D. Model outputs held as GIS shapefiles can be viewed on the CDP2 Mapping Hub.</p>	GCC / Scottish Water
CaLL LPD Flood Risk Management Plan (FRMP) and CaLL LPD Local Flood Risk Management Plan (LFRMP)	<p>Provides an overview of hydrology, potentially vulnerable areas and flood risk for Glasgow. Identifies the watercourses, rivers and catchments where formal flood protection schemes and surface water management interventions have been constructed or are proposed. Sets out actions to maintain flood mitigation infrastructure, better understand and reduce flood risk.</p> <p>Clyde and Loch Lomond - Local Plan District - Local Flood Risk Management Plan 2022-2028 (Cycle 2) – GCC</p> <p>Flood Risk Management Plan - CaLL and LPD – SEPA, see LPD 11</p>	SEPA / GCC
Reservoir Inundation Maps	Establishes the flood impact zone associated with the catastrophic failure of a registered reservoir or formal flood storage area. The dataset used for the SFRA includes registered reservoirs upstream of the GCC administrative boundary where failure could impact properties within Glasgow. This dataset is relevant to proposed masterplan areas and can be found on the SEPA website – Reservoir Inundation Maps .	SEPA

OFFICIAL

Section 16 Assessment of risk from the sewer network.	It is recognised that these maps largely mirror the SEPA pluvial flood hazard maps (particularly for bigger return periods), and as such the data will only be used for an internal sense check to identify areas of misalignment, which could be worthy of further investigation. GCC does not have permission to make this information publicly available and therefore it will be excluded from the published SFRA dataset.	Scottish Water
Clyde Wetlands Opportunity Mapping	Identifies locations where the creation, restoration or management of wetlands across Glasgow City Region will help reverse habitat loss and restore wetland networks.	The Glasgow and Clyde Valley Green Network
Past Flood Events	<p>Past flood events can be used to verify predicted flood extents from hydraulic models including the following datasets:</p> <ul style="list-style-type: none"> • SEPA, OFE and Historic River Flood Extents • GCC, Report-A-Flood <p>During the preparation of the CaLL LPD FRMPs, the assessment of past flood event data confirmed that all flood events lay within the extent of the 0.5% AEP predicted flood extents. Due to the sensitivity of these datasets, they are unable to be made publicly available on the CDP2 Mapping Hub.</p>	

2.2 Information Not Used

The SFRA has focused on the key datasets that inform flood risk within the GCC administrative area. Table YY below sets out known datasets that have been reviewed but not been used in the preparation of the SFRA and the reason why.

Table 2 - Datasets and information reviewed but not used for the SFRA

Dataset / Information	Reason for Not Using
Flood Hazard Maps for other return periods	NPF4 Policy 22 refers to the 0.5% AEP (1 in 200 yr) + climate change flood maps as establishing the flood risk area and baseline flood risk to be considered by development control.
Natural Flood Management (NFM) Maps	Existing and candidate NFM flood storage areas have been submitted to the CDP2 Call for Sites process. Most catchment scale NFM opportunities are situated in the upper catchments out with the GCC administrative boundary. NFM actions have been identified in the CaLL FRMP. NFM will primarily mitigate the impacts of climate change and create capacity within the drainage network to facilitate redevelopment by diverting from sewer and / or attenuating surface water runoff rather than remove flood risk from a specific site. See the SEPA website for existing NFM data.
Scottish Flood Defence Asset Database (SFDAD)	The CaLL LFRMP provides a more comprehensive record of Flood Protection Schemes and other flood mitigation measures including surface water management plan interventions. The CaLL LFRMP assigns maintenance and climate adaptation actions.
Dynamic Coast 2	The Tidal Clyde within the GCC administrative area is not materially impacted by coastal erosion.

OFFICIAL

3. Gap Analysis

The analysis of the information collated to inform the SFRA has identified the following gaps:

Table 3 – Datasets and Information missing from knowledge base

Gap	Description
General understanding of Flood Risk	Our understanding of flood risk continues to evolve with the development of new models such as the National Pluvial Model being led by SEPA, updating models to reflect changing climate change allowances, data outputs from Scottish Water’s recently launched sewer monitoring array and the progressing of CaLL LFRMP actions. The latest and best understanding of flood risk will be used to inform all stages of the development planning process. It is recognised that the SFRA will only use a snapshot of flood risk management data. Models and mapping will have used the appropriate climate change allowance at the time of development, which may not reflect the currently recommended allowance.
Site Specific Flood Risk	Whilst the general understanding of flood risk from all sources across Glasgow is generally good, the complex flooding mechanisms that exist within the urban area means that flood risk at a site level needs to be assessed during the development control process. The scope of site-specific assessments will consider the actual level of protection provided by Flood Protection Schemes using current climate change allowances and the impact of channels / culverts becoming partially blocked. GCC has published supplementary planning guidance SG8 – Water Environment that requires planning applications to be supported by a Flood Risk Assessment and / or Drainage Impact Assessment. These assessments need to consider the risk of flooding within the red line planning boundary and the flood risk impact that the proposed development may have on neighbouring sites and the downstream catchment. SG08 is in the process of being updated to align with NPF4.
White Cart Water Flood Protection Scheme	The input rainfall dataset and climate change allowances have changed since the Flood Protection Scheme was designed. The CaLL LFRMP has set an action to review the future level of protection that will be provided and to develop a climate adaptation strategy for the White Cart Water urban corridor. This action is currently being scoped including the method of modelling to assess the impacts if the flood defences are over-topped.
Tidal Clyde Flood Risk	The 2001 Tidal Clyde Model update has recognised limitations including the statistical robustness of the downstream boundary conditions due to the relatively limited tidal record dataset available in 2021 and the representation of wind shear effects on peak water levels. An update to the current model is currently being scoped in partnership between SEPA and GCC. The peak water level uncertainties during the processing of development applications are currently being accounted for by applying an enhanced freeboard allowance.
Scottish Water Surface Water Policy	GCC supports Scottish Water’s Surface Water Policy position to restrict development sites connecting additional surface water drainage to the combined sewer network. This policy reduces pressure on the combined sewer network during period of heavy rain. An assessment has not been completed to determine development zones within Glasgow where reasonable alternatives for surface water drainage exist.
Forth & Clyde Canal Inundation Mapping	Sections of the Forth & Clyde Canal including the Glasgow branch extending to Spiers Wharf are elevated above the adjacent communities. If a catastrophic embankment failure occurred, this could result in significant flooding in the downstream catchment. GCC will continue the dialogue started with Scottish Canals after the embankment failure of the Union Canal near Polmont (August 2020) and will continue to better understand the potential impacts.
Revenue Funding for Flood Infrastructure Maintenance	As public sector revenue budgets continue to come under pressure, the flood risk impact of potentially reduced maintenance cycles on flood protection and drainage infrastructure is unknown. The business case for maintaining existing and future infrastructure will continue to be made.
Orphaned Drainage Infrastructure	The local increase in flood risk due to drainage assets not being vested by Scottish Water, adopted by GCC nor classified as a culvert is unknown. GCC will continue to participate in the Orphan Pipe Working Group to seek agreement on how these assets can be brought into a structured maintenance programme.

OFFICIAL

SEPA Fluvial Floods Maps	The fluvial maps do not show flooding from watercourses with a catchment area less than 3km ² though these small watercourses are a frequent cause of local flooding, particularly in urban areas.
--------------------------	---

4. Key Actions for SFRA Stage 2

The following key actions will form part of the SFRA Stage 2 process during the assessment of candidate sites:

- A. Consideration will be given to all the data listed in Table 1.
- B. All sites proposed for Water Vulnerable Land use, as defined by [Flood Risk and Land Use Vulnerability Guidance](#) and published by SEPA July 2024, will be screened using the 0.5% AEP (1 in 200 yr) + climate change flood extent dataset. (Note a pluvial 'future' dataset is not currently available. An update to the pluvial dataset, including data for a 'future' scenario is expected to be published by SEPA in early 2025. Where available, this data will be utilised for the SFRA Stage 2.)
- C. Highlighting sites where the maintenance of an existing formal flood protection scheme is required for the site to have the appropriate level of protection.
- D. Sites proposed to be allocated for a Most Vulnerable land use, as defined by [Flood Risk and Land Use Vulnerability Guidance](#) and published by SEPA July 2024, will be subject to site-specific flood risk screening for the 0.1% AEP (1 in 1,000 yr) return period event.
- E. Candidate sites will be assessed for the practicality of connecting surface water drainage to a surface water sewer or watercourse to support Scottish Water's surface water policy. This action may lead to the identification of strategic routes for new surface water conduits.
- F. Masterplan areas, where downstream, will be cross checked against Reservoir and potential canal failure inundation zones.
- G. The flood risk dataset used in the site screening process will be kept under review as our understanding of flood risk continues to improve.
- H. Candidate development sites in proximity to orphaned drainage infrastructure will be screened for the potential flood risk impacts if that drainage infrastructure fails due to a lack of maintenance, with no public sector body responsible for instigating remedial works.

OFFICIAL

APPENDICES

OFFICIAL

Appendix A

Glasgow Watercourses and Topography

OFFICIAL

OFFICIAL

Appendix B

SEPA Flood Hazard Maps v2.1, SEPA Future Flood Maps

OFFICIAL

OFFICIAL

Appendix C

Scottish Water Waste Water Treatment Works and Catchment Areas

OFFICIAL

OFFICIAL

Appendix D

Hydraulic Models

OFFICIAL