ORKNEY
ISLANDS COUNCIL

Strategic Flood Risk Assessment

Subtitle / Dates

www.orkney.gov.uk

Contents

Executive Summary

Orkney Islands Council has prepared a Strategic Flood Risk Assessment (SFRA) to support work for the region's next Local Development Plan (LDP) 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 SFRA will inform development planning processes; ensuring that flood risk is considered in the formulation of the Council's spatial strategy; in the identification of development allocations; and in the review of land use policies, whilst contributing towards satisfying the statutory duties the Council has under the Flood Risk Management (Scotland) Act 2009.

This report entails a Stage 1 SFRA which includes a high-level, map-based and strategic-level assessment used to inform the broad direction of the Spatial Strategy.

Appendix A includes high-level flood risk maps covering the whole of Orkney.

The key objectives of this Stage 1 SFRA include the following:

- Provision of a sound and up to date evidence base to inform the preparation of the LDP,
- Provision of a reference and policy document to advise and inform the public and private and commercial developers of their obligations under the latest planning guidance,
- Provision of a strategic assessment of the risk to Orkney of flooding from all sources including from rivers (fluvial) and the coast (including for the designation of functional floodplain), coastal erosion and geomorphic change, pluvial (surface water), and residual risk from reservoirs (available online), whilst accounting for the impacts of climate change,
- Identification of 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),
- Identification of natural flood management techniques and the use of blue / green infrastructure and open space for flood storage and amenity use,
- Consideration of Property Flood Resilience (PFR) measures, emergency planning capability, and ensuring safe access and egress from potential development sites,
- Assessment of flood defence infrastructure, including defence types, Standards of Protection, condition, and associated residual risks,
- Documentation of current or planned flood risk management schemes, strategies, and plans,
- Identification of the requirements for site-specific flood risk assessments in high risk locations.

1 Introduction

Orkney Islands Council's Planning Service requires a Strategic Flood Risk Assessment (SFRA) to support work for the region's next Local Development Plan (LDP) by delivering the intention of National Planning Framework 4 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 Orkney SFRA will inform development planning processes; ensuring that flood risk is considered in the formulation of the Council's spatial strategy; in the identification of development allocations; and in the review of land use policies, whilst contributing towards satisfying the statutory duties the Council has under the Flood Risk Management (Scotland) Act 2009.

The Scottish Environment Protection Agency (SEPA) has stated that SFRAs could take the form of a staged approach whereby Stage 1 includes a high-level, map-based and strategic-level assessment used to inform the broad direction of the Spatial Strategy. Stage 2 would involve a more detailed site-by-site assessment of risk.

Both stages of the SFRA should be prepared in line with the following guidance and best practice documents:

- Policy 10 and Policy 22 of the National Planning Framework 4 (NPF4), the revised draft of which was approved by Scottish Ministers on 11 January 2023 with adoption and publication on 13 February 2023
- Local Development Planning Guidance, May 2023
- Updated Climate change allowances for flood risk assessment in land use planning (March 2022)
- National Flood Risk Assessment (2018) Scotland
- Strategic Flood Risk Assessment: SEPA technical guidance to support

1.1 Stage 1 SFRA

Stage 1 of the Orkney SFRA includes this report together with the SFRA Maps provided in Appendix A. This Stage 1 SFRA is a high level strategic assessment designed to be included as part of the Evidence Report. Stage 2 will include an assessment of flood risk on specific LDP sites and a consideration of cumulative flood risk prepared to support the Proposed Plan.

1.1.1 Stage 1 objectives

The key objectives of this Stage 1 SFRA, considering Council's requirements and the aforementioned guidance documents, include the following:

- Provision of a sound and up to date evidence base to inform the preparation of the LDP
- Provision of a reference and policy document to advise and inform the public, private and commercial developers of their obligations under the latest planning guidance,
- Provision of a strategic assessment of the risk to Orkney of flooding from all sources including from rivers (fluvial) and the coast (including for the designation of functional floodplain), coastal erosion and geomorphic change, pluvial (surface water), sewer, groundwater, and residual risk from reservoirs, whilst accounting for the impacts of climate change.
- Identification of 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) and areas of critical drainage, including retrofitting SUDS for existing communities and formulating policy for surface water management from new development (i.e. restrictions to greenfield rates, percentage betterments on current, etc)
- Identification of natural flood management techniques and the use of blue / green infrastructure and open space for flood storage and amenity use,
- Consideration of Property Flood Resilience (PFR) measures, emergency planning capability, and ensuring safe access and egress from potential development sites
- Assessment of flood defence infrastructure, including defence types, Standards of Protection, condition, and associated residual risks,
- Documentation of current or planned flood risk management schemes, strategies, and plans,
- Identification of the requirements for site-specific flood risk assessments in high risk locations.

2 Study area

The Orkney Islands covers an area of around 1,000km² and has a population of approximately 23,000 people. It includes all the Orkney Islands, 20 of which are inhabited. The majority of the islands comprise low-lying flat ground with hills on the Mainland, Rousay and Hoy. Land cover is dominated by agricultural land (predominantly improved grassland) with heather and wetlands also significant.

There are a number of large inland lochs in the area including Loch of Harray and Loch of Stenness. The coastline has a total length of approximately 860km, much of it soft and easy to erode. The main risk of flooding in Orkney is from coastal flooding. Orkney has been affected by several floods, notably widespread coastal flooding in January 2005. Heavy rain caused significant surface water and river flooding across Orkney in October 2006 with Kirkwall particularly badly affected. The Churchill Barriers, which are vital transport links between islands, are frequently disrupted by wave overtopping. Erosion of the soft coastline around Orkney is also of significance.

3 Planning policy, flood risk guidance, plans, and strategies

This chapter summarises the relevant planning policy and flood risk documents, ranging from Government guidance to national and local strategies and plans that may influence planning and flood risk in Orkney.

3.1 Legislation and guidance summary

Table 1 summarises the planning policy, flood risk guidance, plans, and strategies discussed in Section 3.

Table 1 Legislation and guidance summary table

Legislation / Guidance	Summary
National Planning Framework 4 (NPF4), 2023	NPF4 includes the national spatial strategy for Scotland, adopted and published on 13 February 2023, replacing NPF3 and Scottish Planning Policy.
Orkney Local Development Plan	The new Local Development Plan will replace the existing Orkney LDP approved in 2017 and will set out planning policies and proposals for the use and development of land across Orkney.
Orkney Flood Risk Management Plan, 2022-28	The Local Flood Risk Management Plan for Orkney outlines Scotland's route map for reducing the effects of flooding on local communities in Orkney.
The River Basin Management Plan for Scotland, 2021	The River Basin Management Plan (RBMP) for Scotland sets out a framework for protecting and improving the benefits provided by the water environment in Scotland.
Orkney Coastal Adaptation Plan	During 2025 we will take forward a Coastal Change Adaptation Plan to improve understanding of the risks associated with coastal erosion and flooding, and the

	actions that are required now and into the future
SEPA Planning Background Paper Flood Risk, 2018	This paper provides SEPA guidance on land use policy and flood risk, based on national planning policies and duties and requirements under relevant legislation.
SEPA Flood Risk and Land Use Vulnerability Guidance, 2024	This guidance provides an understanding of the vulnerability to flooding of different land uses and assists in the interpretation of SEPA's Flood Risk Planning Guidance.
SEPA Development Plan Guidance on Flood Risk, 2018	The aim of this guidance document is to provide advice to planning authorities regarding flood risk in the development plan process, promoting safe and resilient communities and businesses through sustainable flood risk management.
SEPA Development Management Guidance on Flood Risk, 2018	This guidance document provides information on the role of development management in delivering sustainable flood risk management.
SEPA Planning Information Note 4, 2018	This guidance note outlines the role of SEPA on proposed development protected by a Flood Protection Scheme.
SEPA Standing Advice for Planning Authorities and Developers for lower risk applications, 2024	This guidance document simplifies SEPA's engagement with the planning system, by highlighting the types of developments they should be consulted on, set out in the Advice for planning authorities on how and when to consult SEPA.
SEPA – Planning Authority Protocol (Policy 41) Development at Risk of Flooding: Advice and Consultations, 2016	This document provides principles to be followed by both SEPA and planning authorities regarding advice and consultation on flood risk issues.
SEPA Flood Modelling Guidance for Responsible Authorities, 2016	*This technical flood modelling guidance supports those in Responsible Authorities who develop and commission flood studies in respect of flood risk management planning.*
Technical Flood Risk Guidance for Stakeholders - SEPA requirements for undertaking a Flood Risk Assessment, 2022	This document provides guidance on carrying out a Flood Risk Assessment.

3.2 Legislation

3.2.1 National Planning Framework 4

The National Planning Framework 4 (NPF4) includes the national spatial strategy for Scotland, adopted and published on 13 February 2023, replacing NPF3 and Scottish Planning Policy.

Policy 22 of NPF4 relates to flood risk and water management with the purpose of increasing resilience to flood risk in place making. Avoiding new development in areas of flood risk should be the first approach followed by the reduction of the vulnerability of new and existing development to flooding.

Policy 10 relates to development in coastal areas with the policy intent being to protect coastal communities and assets and support resilience to the impacts of climate change so coastal areas can be developed sustainably.

3.3 Development plans

Development plans set out how places will change into the future, including where development should and shouldn't happen. Development plans show where new homes and workplaces will be built, how services and facilities such as schools and travel will be provided, and identify the places and buildings we value and want to protect. Plans bring together many different sectors and interests to achieve the desired change for places and communities. (Local Development Planning Guidance, May 2023. Scottish Government).

The 'statutory development plan' covers the whole of Scotland and is made up of the NPF4 and the LDPs.

3.4 Local Development Plans

Planning authorities must prepare one or more LDP considering the statutory development plan and the NPF4, including for any relevant registered local place plans. As with the statutory development plan, the LDP must show how local places will change into the future, including where development should and should not happen. The LDP, must have regard to the planning authority's adopted Regional Spatial Strategy (RSS) and any local outcomes improvement plan (LOIP) (within the meaning of section 6 of the Community Empowerment (Scotland) Act 2015) for the area.

The NPF4 content relating to LDPs can be summarised as follows:

- LDPs should consider the ambitions and outcomes for an area, looking 20 years ahead,
- LDPs should be place-based, visual, and tell a clear and compelling story about the future of local places,
- LDPs should encourage, promote and facilitate development that addresses the global climate emergency and nature crisis, in order to reflect the significant weight that this carries within NPF4,
- LDPs should implement national planning policies by setting out a spatial strategy that shows what they mean for change and development in a particular place,
- LDPs should be people-centred and be prepared to best meet the needs and aspirations of the different people who have an interest in a local place,

- The LDP should support decisions to invest in a place, identifying priorities and making strong links with the local authority's Delivery Programme,
- LDPs must be kept under review by the planning authority, considering any changes in legislation and the impacts of the LDP policies and proposals.

Following legislation changes, Planning (Scotland) Act 2019 states that planning authorities are now required to prepare an evidence report before preparing the LDP. The purpose of the evidence report is to set out the planning authority's view on a range of matters for land within the LDP area. The evidence (data and information) collated and presented in the evidence report will inform the policies and proposals in the LDP.

The Local Development Planning Guidance, 2023 states that an SFRA should have regard to the SEPA flood maps, support the implementation of relevant actions and objectives listed in the Flood Risk Management Plan and the River Basin Management Plan for Scotland (RBMP).

3.4.1 Orkney Local Development Plan

The council is preparing a new LDP to be shaped by the views and aspirations of communities across Orkney. The plan will replace the existing Orkney approved in 2017 and will set out planning policies and proposals for the use and development of land across Orkney. It is anticipated that the new LDP will be adopted in 2027. A Stage 2 SFRA will be prepared alongside the new LDP to help understand the flood risk associated with specific sites.

3.5 Flood studies, strategies and plans

Flood Risk Management Plans and Local Flood Risk Management Plans are developed on a six-yearly cycle. Cycle One was from 2016-2022 and Cycle 2 will be from 2022-2028. SEPA are responsible for the development of Flood Risk Management Plans and Orkney are a Lead Local Authority who are responsible for the development of the Local Flood Risk Management Plan. Scotland has been separated into 14 Local Plan Districts to produce the Flood Risk Management Plans.

3.5.1 Flood Risk Management Plan, Orkney Local Plan District

Flood Risk Management Plans are Scotland's route map for reducing the effects of flooding on local communities. They are designed such that efforts to reduce flood risk are coordinated between key organisations. Each Local Plan District across Scotland have a Flood Risk Management Plan to set out the long-term ambition for flood risk management.
Across the Local Plan District, there are areas at risk of river, surface water and coastal flood risk. The main risk of flooding in Orkney is from coastal flooding. Orkney has been affected by several floods, notably widespread coastal flooding in January 2005. Heavy rain caused significant surface water and river flooding across Orkney in October 2006 with Kirkwall particularly badly affected. The Churchill Barriers, which are vital transport links between islands, are frequently disrupted by wave overtopping. Erosion of the soft coastline around Orkney is also of significance.

Currently it is estimated that there are 2,300 people and 1,900 homes and businesses at risk from flooding. This is estimated to increase to 2,700 people and 2,200 homes and businesses by the 2080s due to climate change. The annual cost of flooding is approximately £4.8 million.

Note however that flooding from wave overtopping is not fully represented in the assessment of flood risk and the impact of coastal flooding may be underestimated.

SEPA and responsible authorities carry out actions in all areas of the Local Plan District which help to manage current and future flooding. These actions are scheduled to take place over the 6 years following the publication of the latest Flood Risk Management Plan and are carried out on an ongoing basis. The actions cover a wide range of themes, including:

- Awareness raising
- Data to support climate resilience
- Emergency plans
- Flood forecasting
- Flood warning development framework
- Future flood risk management planning
- Guidance development
- Hazard mapping updates
- Land use planning
- Maintenance
- Natural flood management mapping
- National flood risk assessment
- National surface water mapping
- Reservoirs
- Scottish Flood Defence Asset Database, and
- Self help

The Flood Risk Management Plan has identified a number of Potentially Vulnerable Areas (PVA) across the based on the potential current and future flood risk shown on Figure 1 below.

Figure 1 - Map showing location of Potential Vulnerable Areas in the Orkney Local Plan District

The Flood Risk Management Plan details current and future flood risk to each PVA and identifies specific objectives to tackle the impacts of flooding. Potentially Vulnerable Areas and flood risks within the Council are outlined in *Table 2*.

Table 2

Potentially Vulnerable Areas and Target areas	**Main source of flood risk**	**Number of people / properties at risk from flooding or impact of flooding (present day)**	**Number of people / properties at risk from flooding (2080s climate change)**
Sanday	The main source of flooding is coastal flooding	Approximately 150 people and 180 homes and businesses currently at risk of flooding	increase to 170 people and 210 homes and businesses
Stronsay	risk of coastal flooding in Whitehall	Approximately 70 people and 60 homes and businesses currently at risk of flooding	increase to 100 people and 80 homes and businesses

Westray (Pierowall)	The main risk in Pierowall is from coastal flooding	40 people and 40 homes and businesses currently at risk from flooding	likely to increase to 70 people and 70 homes
Stromness and Stenness	risk of coastal flooding	approximately 190 people and 160 homes and businesses currently at risk of flooding	increase to 270 people and 210 homes
Kirkwall	flood risk in Kirkwall is currently surface water flooding and risk of coastal flooding	approximately 1,300 people and 990 homes and businesses currently at risk from flooding.	increase to 1,500 people and 1,100 homes
St Marys	Risk of coastal flooding	approximately 30 people and 20 homes and businesses currently at risk from flooding	increase to 50 people and 30 homes and businesses
Graemeshall	Risk of coastal flooding	less than 10 people, homes and businesses	Likely to remain the same
St Margaret's Hope	Risk of coastal flooding	approximately 40 people and 30 homes and businesses	increase to 60 people and 40 homes and businesses
Burray Village	Risk of coastal flooding	approximately 40 people and 30 homes and businesses	increase to 50 people and 40 homes
A960 Deerness	risk from erosion and coastal flooding	When the road floods or erodes, Deerness is cut off from vital services.	Coastal flooding from waves and erosion are likely to worsen due to sea level rise and increased storminess caused by climate change
Little Ayre	coastal flooding of the B9047	The road links communities in Longhope and South Walls to the rest of the island the Ro-Ro ferry terminal at Lyness which may be affected by	Climate change may lead to the road being closed more often due to sea level rise and changes in storminess

		flooding or damage from wave action	
Churchill Barriers	coastal flooding, specifically wave overtopping	Road infrastructure is the main receptor at flood risk. This is the only road from Mainland to the islands south of Mainland. There is 1 business located on Lamb Holm that is also at risk of coastal flooding.	Further studies needed to develop understanding of the impacts of climate change and sea level rise on the safe operation of the causeways carried by the Churchill Barriers.

3.5.2 The River Basin Management Plan for Scotland 2021 - 2027

The River Basin Management Plan (RBMP) for Scotland sets out a framework for protecting and improving the benefits provided by the water environment in Scotland. It provides a set of actions to ensure that Scotland's rivers, lochs, estuaries, coastal areas and groundwater bodies can continue to supply drinking water, support fisheries, offer an essential resource for businesses and agriculture and serve as a source of recreation.

The actions within the RBMP cover four main themes: to create healthier and more resilient communities; water supply and wastewater; sustainable and resilient rural land use; and removing barriers to fish migration.

Action to create healthier and more resilient communities

The RBMP aims to protect and improve the water environment by restoring rivers and improving how surface water is managed during storms. By achieving this, attractive and accessible blue-green river corridors can be created within communities to be used for active travel and recreation.

SEPA are aiming to deliver up to 51 new restoration projects that have the potential to improve the ecological condition of rivers in Scotland's towns and cities. The potential projects are highlighted in the Water Environment Hub.

Water supply and wastewater

Climate change and population growth are affecting demand on water, water quality, raw water quality and risk of sewer and surface water flooding in towns. There are three key aims outlined within the RBMP to create a circular economy for water supply and wastewater:

•Water is being used wisely and efficiently to ensure Scotland can meet its water need in a changing climate

•Towns and cities incorporate nature based solutions to absorb and safely convey rainwater in new developments, and where feasible, older developments

•Minimise use of energy and materials and convert sewage and other wastes into valuable resources.

SEPA are aiming to deliver improvements to wastewater treatment works and sewage discharges, publish a route-map setting out steps to reduce sewage litter and spills from CSOs,

and develop guidance for developers and households to help them install more sustainable water supplies and wastewater treatment.

Sustainable and resilient rural land use and management

The way land is managed contributes to producing food, timber and offering recreation opportunities. The RBMP aims to ensure land is used and managed in a way that secures sustainable and long-term improvements to the water environment and supports the response to the climate emergency. Climate change could mean a reduction in crop yields and an increase in the frequency and severity of flooding. Land management that uses resources more efficiently; adapts and is more resilient to climate change; reduces its carbon footprint; and restores natural capital will contribute to protecting and improving the water environment.

Actions being taken to tackle this theme include:

- Working with land managers to ensure compliance with legislation
- Take a spatial approach to prioritising action
- Promote the sustainable use of water

Removing man-made barriers to fish migration

Migratory fish species are iconic species for Scotland, providing a valuable cultural and recreational amenity and are an important part of the rural economy. Migratory fish are facing significant challenge from a number of pressures, including the effects of climate change, with higher temperatures and droughts having an impact on their survival. Man-made barriers to fish migration are now the main factor preventing recovery of migratory fish populations. Barrier removal or easement can be achieved by removal of structures or installations of fish passes or other means of easement.

A catchment approach is needed on river systems with multiple barriers and delivery mechanisms, which requires planning and engagement with stakeholders and owners. SEPA are aiming to remove or ease 244 impassable man-made barriers during the RBMP plan period. These include weirs, bridges and culverts.

Orkney Coastal Adaptation Plan 2025

A shoreline management plan for Orkney is to be developed which will set the strategic policy direction for coastal management and identify the most sustainable approaches for managing coastal flood and erosion risk in the short term (0 to 20 years), medium term (20 to 50 years) and long term (50 to 100 years)

Flood risk and planning guidance

There are several online guidance documents listed below available from SEPA for plan making and development management in relation to flood risk.

SEPA Planning Background Paper Flood Risk

This paper provides SEPA guidance on land use policy and flood risk, based on national planning policies and duties and requirements under relevant legislation. It summarises the requirements and recommendations relating to flood risk that should be incorporated into strategic and local development plans. It also highlights SEPA's approach to development management, including:

- Development in fluvial or coastal flood risk areas;
- Flood impacts elsewhere as a result of development;

- Access and egress;
- Freeboard;
- Climate change;
- Flood resilient design; and
- Pluvial flooding.

SEPA Flood Risk and Land Use Vulnerability Guidance
This guidance provides an understanding of the vulnerability to flooding of different land uses and assists in the interpretation of SEPA's Flood Risk Planning Guidance. It classifies land use according to how they are impacted by flooding, including:

- Most Vulnerable Uses - civil infrastructure, nurseries, residential institutions, basements and caravans
- Highly Vulnerable Uses - residential properties, social services homes, hotels, student residences, landfill and hazardous waste sites
- Least Vulnerable Uses - shops, professional services, restaurants, cafes, offices, general industry, land used for agriculture and forestry etc.
- Essential Infrastructure - essential transport infrastructure and essential utility infrastructure
- Water compatible uses - flood control infrastructure, environmental monitoring stations, pumping stations, navigation facilities etc.

The guidance provides development constraints based on flood risk depending on which vulnerability category the proposed land use type falls within.

SEPA Development Plan Guidance on Flood Risk

The aim of this guidance document is to provide advice to planning authorities regarding flood risk in the development plan process, promoting safe and resilient communities and businesses through sustainable flood risk management. The guidance outlines the requirements of Local Development Plans, including advice on policies and strategic allocations.

SEPA Development Management Guidance on Flood Risk

This guidance document provides information on the role of development management in delivering sustainable flood risk management. It summarises SEPA's hierarchy of development management requirements and recommendations as set out in the SEPA Planning Background Paper Flood Risk document.

SEPA Planning Information Note 4

This guidance note outlines the role of SEPA on proposed development protected by a Flood Protection Scheme. It summarises what categories of development would be when protected by an existing or planned formal flood protection scheme in a built up area. It is recommended that any development protected by a formal scheme is built to a water resilient design and has adequate evacuation procedures in place that are appropriate to the level of risk and use.

SEPA standing advice for planning authorities and developers on development management consultations

This guidance document simplifies SEPA's engagement with the planning system, by highlighting the types of developments they should be consulted on, set out in the Advice for planning authorities on how and when to consult SEPA. It provides standing guidance on circumstances where SEPA should not be consulted, including:

- Waste water drainage;
- Swimming pool drainage;
- Surface water drainage;
- Engineering activities;
- Space for waste management provision;
- Oil storage;
- Contaminated land;
- Air quality and noise;
- Agricultural developments;
- Pollution prevention;
- Groundwater abstractions; and
- Shellfish applications.

SEPA – Planning Authority Protocol (Policy 41) Development at Risk of Flooding: Advice and Consultations

This document provides principles to be followed by both SEPA and planning authorities regarding advice and consultation on flood risk issues. The Protocol is intended to enable planning authorities and SEPA to work together on planning matters where there is considered to be flood risk. The Protocol comprises three sections:

- The framework for consultation: the statutory position, the roles of SEPA and planning authorities and consultation arrangements;
- Information source for screening and flood risk assessment; and
- SEPA's formal comments to planning authorities on planning applications.

SEPA Flood Modelling Guidance for Responsible Authorities
This technical flood modelling guidance supports those in Responsible Authorities who develop and commission flood studies in respect of flood risk management planning. It summarises where uncertainty may arise in flood modelling and how it may be managed through the modelling process so that it can inform appropriate decisions.

Technical Flood Risk Guidance for Stakeholders - SEPA requirements for undertaking a Flood Risk Assessment
This document provides guidance on carrying out a Flood Risk Assessment, including:

- How to use the SEPA Flood Maps
- Minimum and detailed requirements for an FRA
- Fluvial design flow estimation
- Hydraulic flood modelling
- Coastal FRAs
- Consideration of surface water flooding and modelling
- Consideration of mitigation measures for land raising and compensatory flood storage

4 Information gathering

This chapter summarises the data and information required for the Stage 1 SFRA including what was available, what has been used, and what was not available to inform Stage 1

4.1 Data and information requested and received

Table 3 lists the data and information which the council holds

Dataset / information	Description	Data owner
Flood Maps v3.0	Flood hazard/extent maps for all sources of flooding including: - River - Surface Water & Small Watercourses - Coastal - Future Flood Maps	SEPA
Natural Flood Management Maps	Runoff reduction map, Floodplain storage map, Sediment management map, Estuarine surge attenuation map, Wave energy dissipation map	SEPA
Dynamic Coast 2	Coastal change GIS datasets (including future erosion high emission scenarios) and Artificial Flood Defences	Scottish Government
Flood Risk Management Plans and River Basin Management Plans	Orkney Flood Risk Management Plan and the River Basin Management Plan for Scotland	SEPA
Section 16 assessments	Section 16 assessments for catchments within Orkney	Scottish Water

Table 4 datasets and information not available for the SFRA

Dataset / information	Reason not available
Reservoir flood maps	Only available to view online
Housing Land Audit	Received data, although to be used in the Stage 2 assessment only
Candidate sites to be assessed	Only required for the Stage 2 assessment
St Margaret's Hope Flood Study	The 2020 St Margaret's Hope flood study mapped outputs are available in .dwg format for various return periods (1:10, 1:25, 1:50, 1:100, 1:200), but they don't add significant value to the existing SEPA GIS mapping.

The Local Planning Authority must ensure it is satisfied this Stage 1 SFRA contains sufficient information to inform the Evidence Report to guarantee the Evidence Report is acceptable for the Gate Check.

It may be necessary to carry out a further update of this Stage 1 SFRA if the Planning Authority consider any of the missing datasets to compromise the robustness of the Evidence Report. The Development Planning guidance states:

"*To assist in the Gate Check process, the planning authority should identify where there are any potential gaps in the evidence gathered or uncertainty in data and evidence within the Evidence Report together with an explanation of the authority's reasoning for accepting this evidence and including it in the Report. This should be clearly set out under the 'Summary of Evidence' heading within the template*".

5 Flood hazards in Orkney

This chapter summarises the flood risk across Orkney, based on available flood risk datasets. The SFRA Maps in Appendix A present this information spatially.

5.1 Historical flooding on Orkney

The main risk of flooding in different areas of Orkney is from coastal flooding. Orkney has been affected by several floods, notably widespread coastal flooding in January 2005. One particular area susceptible to flooding is Stromness which has a long history of flooding with notable coastal flooding in 1953 and 2005 other areas include Kirkwall, St Margarets Hope, Burray and St Marys and on some of the islands such as Sanday, Stronsay and Longhope.

Heavy rain caused significant surface water and river flooding across Orkney in October 2006 with Kirkwall particularly badly affected. The Churchill Barriers, which are vital transport links between islands, are frequently disrupted by wave overtopping. Erosion of the soft coastline around Orkney is also of significance SEPA's Observed Flood Event (OFE) data will be used internally for site screening to identify areas that have historically experienced multiple flood events. This data is restricted by licence, meaning it could not be published externally in the SFRA map. Initial analysis shows that the primary risk of flooding in Orkney is from coastal flooding, with significant events recorded in several areas. Kirkwall has experienced the highest number of OFE's (124 events), followed by St Margarets Hope (25), Burray (9 events), St Mary's (15 events), Sanday (13 events), Stronsay (14 events), and Longhope (9 events). These areas, along with others in Orkney, have a notable history of coastal flooding, with incidents such as the widespread event in January 2005 affecting many locations.

5.2 Sources of flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport, and public service infrastructure (including vulnerable services such as hospitals and schools), commercial and industrial enterprises, agricultural land, and environmental and cultural heritage. Flooding in Orkney can occur from many different and combined sources such as rivers (fluvial), coastal, surface water, groundwater, sewers or indirectly from infrastructure failure.

Although flooding is a natural process, it can be exacerbated by manmade interventions, whether that be to watercourses or increasing the impermeable area through development.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern, and severity of flooding are expected to change and become more damaging.

5.2.1 Rivers (fluvial)

River flooding is the inundation of floodplains from rivers and watercourses; the inundation of areas outside the floodplain due to the influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; and blockages of culverts or flood channels/corridors.

River flooding is associated with the exceedance of channel capacity during higher flows or because of blockage (residual risk). The process of flooding from a watercourse depends on several characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain; and infiltration and rate of runoff associated with urban and rural catchments.

The SFRA Interactive Maps in Appendix A present SEPA's River Flood Hazard maps. The flood hazard maps provide the flood extents for the 1 in 10 year (10% AP), 1 in 200 year (0.5% AP), and 1 in 1000 year (0.1% AP) flood events. These are categorised into high, medium and low likelihood of flooding respectively. The River Flood Hazard maps also provide an indicative medium risk plus climate change scenario. Given the indicative and strategic nature of the flood maps, it is inappropriate for them to be used to assess flood risk to an individual property.

5.2.2 Coastal (tidal) including erosion

Tidal flooding is caused in times of high astronomical tides and can also be caused by storm surge and wave action. Coastal regions and areas along tidal estuaries are at risk from tidal flooding.

SEPA's Coastal Flood Hazard maps provide the flood extents for the 1 in 10 year (10% AP), 1 in 200 year (0.5% AP), and 1 in 1000 year (0.1% AP) flood events. These are categorised into high, medium and low likelihood of flooding respectively. The Coastal Flood Hazard maps also provide an indicative medium risk plus climate change scenario. Given the indicative

and strategic nature of the flood maps, it is inappropriate for them to be used to assess flood risk to an individual property.

There are a number of areas across Orkney that are shown to be at high risk of coastal flooding and considering an appropriate management of these areas will be part of the brief of the planning coastal adaptation plan.

5.2.2.1 Dynamic Coast

The Dynamic Coast project was commissioned by Scottish Government to provide evidence on the extent of coastal erosion in Scotland. This was used to indicate the areas at the highest risk of coastal erosion, and points to where a more detailed investigation is needed. The project modelled anticipated coastal erosion where recent coastal changes are considered alongside relative sea level rise, projecting this forward to identify areas at risk of future coastal erosion for a number of emissions scenarios. Coastal erosion has the potential to contribute to a loss of coastal transport infrastructure, development and habitat and with many parts of the Orkney coastline having soft clay geology then coastal erosion is an increasing problem.

5.2.3 Surface water (pluvial)

Surface water or pluvial flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. In these instances, the volume of water from rural land can exceed infiltration rates in a short amount of time, resulting in the flow of water over land. Within urban areas, this intensity can be too great for the urban drainage network resulting in excess water flowing along roads, through properties and ponding in lower areas or natural depressions. Areas at risk of pluvial flooding can, therefore, lie outside of the fluvial flood zones.

There are certain locations, generally within the more build up areas of Orkney, where the probability and consequence of pluvial flooding are more prominent due to the complex hydraulic interactions that exist in the urban environment. Urban watercourse connectivity, surface water or combined sewer capacity and the location and condition of highway gullies all have a major role to play in surface water flood risk.

Surface water flood risk should be afforded equal standing in importance and consideration as fluvial and groundwater flood risk, given the increase in rainfall intensities due to climate change and the increase in impermeable land use due to development. It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site-specific and detailed investigations.

Guidance on how the Surface Water Flood Hazard Maps have been produced can be accessed via the SEPA website. At the time of writing, the pluvial flood maps for Scotland are in the process of being updated and will be available from mid-2024.

5.2.4 Functional floodplain or flood risk area

SEPAs Technical Flood Risk Guidance for Stakeholders identifies the functional floodplain as land where there is a 0.5% or greater annual probability of flooding from any source in any year. However, NPF4 states that a flood risk area (also known as the functional floodplain) must also include an appropriate allowance for climate change.

SEPAs Technical Flood Risk guidance also indicates that modelled 0.5% structure blockage scenario should be considered as the functional floodplain in locations where this is applicable. In keeping with NPF4, this should also account for an allowance for climate change.

5.2.5 Sewers

Flooding from the sewer network can occur when flow entering the system, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse.

Scottish Water (SW) is the organisation responsible for the management of the public sewer drainage network across Scotland. SW have produced Section 16 flood risk assessment reports and mapping, which assesses the possible risk of flooding from sewerage systems in areas of Orkney designated as potentially vulnerable by SEPA such as in Kirkwall and Stromness. These haven't been included on the map due to licencing issues but will be used internally when reviewing sites.

5.2.7 Reservoirs

A reservoir can usually be described as an artificial or non-natural lake where water is stored for use. The risk of flooding associated with reservoirs is residual and is associated with failure of reservoir outfalls or dam breaching. This risk is reduced through regular inspection and maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

SEPA are the single regulatory authority for reservoir safety within Scotland, under the Reservoirs (Scotland) Act 2011, which supersedes the Reservoirs Act 1975. Reservoirs with a volume of greater than 25,000m3 must be registered with SEPA and have an appointed approved panel engineer depending on the reservoirs risk designation. The risk designation is assigned by SEPA based on the consequences of an uncontrolled release of water from the reservoir.

SEPA have produced reservoir inundation maps showing the area of land likely to be flooded in the event of an uncontrolled release of water. They show the extent, depth and velocity of water in the flooded area. Reservoir maps can be viewed online via the Controlled Reservoirs Register at: Reservoirs Map

SEPA do not consider that the reservoir inundation maps should be used for land use planning purposes.

5.3 Climate change

The Stage 1 SFRA should be the starting point for any local authority to assess the effects of climate change on flood risk across the local plan area.

5.3.1 Climate change allowances

Climate change is not only contributing to more extreme weather events but is also increasing the frequency of both minor and major floods. It is raising the likelihood of all types of flooding, not just the most severe. NPF4 requires the integration of future climate change allowances into flood planning, as outlined in SEPA's 'Future Flood Maps', which have been used in this SFRA. While these maps primarily address future risks, they indicate that, by the end of the century, the likelihood of major floods could approach that of the smaller floods we experience today. These projected changes are expected to have occurred by the century's end, rather than at a later time.

The inclusion of climate change in national planning policy ensures that the risk thresholds established in Scotland—defining what is considered acceptable versus unacceptable risk—remain consistent in real terms, rather than eroding over time. This is particularly significant when making long-term land use planning decisions, as developments may last for 50, 75, or even 100 years, depending on their nature.

The SFRA therefore must account for the changes in fluvial flows, rainfall intensities, and sea level rise, and also coastal erosion as a result of climate change. Version 3.0 is the most up to date SEPA flood hazard mapping available that is used and presented in this SFRA.

Table 5 showing Orkney climate change uplifts

Type of allowance	Applicable climate change uplift value
Peak river flow (total change to the year 2100)	use peak rainfall intensity allowance
Peak rainfall intensity (total change to the year 2080)	40%
Sea level rise (cumulative rise in metres from 2017 to 2100)	0.93 m

5.4 Cumulative boundary flood risk

When allocating land for development, consideration will be given to the potential cumulative impact of the loss of storage volume, as well as the impact of increased flows on flood risk downstream. Whilst the loss of storage for individual developments may only have a minimal impact on flood risk, the cumulative effect of multiple developments may be more severe.

All developments are required to demonstrate they will not increase flood risk elsewhere. Therefore, providing all new development complies with the latest guidance and legislation relating to flood risk and sustainable drainage, in theory there should not be any increase in flood risk downstream.

Strategic solutions may include upstream flood storage, integrated major infrastructure/Flood Risk Management schemes, new defences, and watercourse improvements as part of

regeneration and enhancing green infrastructure, with opportunities for Natural Flood Management and retrofitting of SUDS to existing development.

Through the Local Development Plan (LDP), there will be consideration of the following strategic solutions:

- Use of sustainable flood storage and mitigation schemes to store water and manage surface water runoff in locations that provide overall flood risk reduction as well as environmental benefits;
- In areas where flood risk is being managed effectively, there will be a need in the future to keep pace with increasing flood risk as a result of climate change;
- Assessment of long-term opportunities to move development away from the floodplain and to create blue/green river corridors throughout Orkney area;
- Identification of opportunities to use areas of floodplain to store water during high flows, to reduce long-term dependence on engineered flood defences
- Safeguarding the natural floodplain from inappropriate development;
- Where possible, changes in land management should look to reduce runoff rates from development whilst maintaining or enhancing the capacity of the natural floodplain to retain water. Land management and uses that reduce runoff rates in upland areas should be supported;
- Use of this SFRA to inform future development and minimise flood risk from all sources; and
- Implementation of upstream catchment management i.e., slow the flow and flood storage schemes could be implemented in upper catchments to reduce risk downstream

5.5 Flood Risk Management

The aim of this section of the SFRA is to identify existing Flood Risk Management (FRM) assets and proposed FRM schemes. The location, condition and design standard of existing assets will have a significant impact on actual flood risk mechanisms. Whilst future schemes in high flood risk areas carry the possibility of reducing the probability of flood events and reducing the overall level of risk. Both existing assets and future schemes will have a further impact on the type, form and location of new development or regeneration.

Table of Flood Defence Assets in Orkney

Area benefitting	Defence type
Kirkwall	flood wall

5.5.2 Kirkwall Harbour Flood Protection Scheme (KHFPS)

The KHFPS was designed to safeguard the low-laying areas of central Kirkwall from sea flooding. It features a stone wall, reinforced with stone gates that can be deployed during flood risk events, forming a 1.1m high barrier that spans approximately half a mile.

Factual information regarding the crest height of the KHFPS defence relative to predicted still water levels is currently unavailable. This issue will be addressed in the upcoming Coastal Change Adaptation Plan, scheduled for completion in 2026. Development planning will stay informed about the progress of this plan and will continue to collaborate with the Flood Engineers to ensure its effective development.

5.5.1 Natural flood management

The Flood Risk Management (Scotland) Act 2009 (FRM Act) focusses on an integrated and sustainable approach to flood risk management in Scotland. SEPA is required to consider whether techniques that work with natural features and characteristics can contribute to managing flood risk, referred to as natural flood management (NFM). NFM is a type of nature-based flood risk management used to protect, restore and re-naturalise the function of catchments and rivers to reduce flood and coastal erosion risk.

NFM has the potential to provide environmentally sensitive approaches to minimising flood risk, to reduce flood risk in areas where hard flood defences are not feasible and to increase the lifespan of existing flood defences.

A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down floodwaters before they can damage flood risk receptors (e.g. people, property, infrastructure, etc.). NFM involves taking action to manage flood and coastal erosion risk by protecting, restoring and emulating the natural regulating functions of catchments, rivers, floodplains and coasts.

SEPA have produced a set of strategic, high-level maps which provide guidance on where NFM techniques would be most effective within Scotland. They should be interpreted with other key datasets such as flood risk information, land cover, flood protection and water bodies. The maps show areas where there are opportunities for:

- Runoff reduction;
- Floodplain storage;
- Sediment management;
- Estuarine surge attenuation; and
- Wave energy dissipation.

6 Development and flood risk

This chapter summarises the NPF4 planning guidance that planners and developers should refer to when plan making and considering flood risk in planning applications.
When defining flood risk for planning purposes, the NPF4 refers to 'flood risk areas' or 'areas of flood risk'. The existing suite of SEPA guidance documents refer to functional floodplain. Each term refers to the same thing i.e. an area at risk of flooding in a 0.5% or greater annual probability event plus an allowance for climate change.

6.1 NPF4 flood risk area or area at risk of flooding

NPF4 identifies areas at flood risk for planning purposes as:

'land or built form with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for future climate change.'

SEPA's Flood Hazard Maps, should be consulted as to whether an area is considered to be at risk of flooding. NPF4 states that the determination of flood risk to an area can account for defence infrastructure. Where the risk of flooding to an area is less than the defence threshold, the site will not be considered at risk of flooding for planning purposes. However, this does not mean the area is risk free, only that the risk is sufficiently low to be acceptable for the purpose of planning. This includes areas where the risk of flooding is reduced below this threshold due to a formal flood protection scheme.

6.2 NPF4 Policy 22

The intention of Policy 22 is to increase resilience to flood risk through avoidance first followed by reducing the vulnerability of new and existing development to flooding. Policy 22 will be a key policy in the production of the proposed plan and also by developers for specific developments.

In relation to new and existing development, Policy 22 states:
a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:
i) essential infrastructure where the location is required for operational reasons;
ii) water compatible uses;
iii) redevelopment of an existing building or site for an equal or less vulnerable use; or
iv) 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.
The protection offered by an existing formal flood protection scheme or one under construction can be taken into account when determining flood risk.
In such cases, it will be demonstrated by the applicant that:
- *all risks of flooding are understood and addressed;*
- *there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;*
- *the development remains safe and operational during floods;*
- *flood resistant and resilient materials and construction methods are used; and*
- *future adaptations can be made to accommodate the effects of climate change.*

Additionally, for development proposals meeting criteria part 4), where flood risk is managed at the site rather than avoided these will also require:
- *the first occupied / utilised floor, and the underside of the development if relevant, to be above the flood risk level and have an additional allowance for freeboard; and*
- *that the proposal does not create an island of development and that safe access / egress can be achieved.*

b) Small scale extensions and alterations to existing buildings will only be supported where they will not significantly increase flood risk.
c) Development proposals will:
i) not increase the risk of surface water flooding to others, or itself be at risk;

ii) manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue green infrastructure. All proposals should presume no surface water connection to the combined sewer;
iii) seek to minimise the area of impermeable surface.
e) Development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported.

6.3 NPF4 Policy 10

The intention of Policy 10 is to protect coastal communities and assets and support resilience to the impacts of climate change. Policy 10 will be used as part of the LDP in plan making process and should be referred to by developers for specific developments in coastal areas. In relation to new and existing development, Policy 10 states:
a) Development proposals in developed coastal areas will only be supported where the proposal:
i) does not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and
ii) is anticipated to be supportable in the long term, taking into account projected climate change.
b) Development proposals in undeveloped coastal areas will only be supported where they:
i) are necessary to support the blue economy, net zero emissions or to contribute to the economy or wellbeing of communities whose livelihood depend on marine or coastal activities, or is for essential infrastructure, where there is a specific locational need and no other suitable site;
ii) do not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and
iii) are anticipated to be supportable in the long-term, taking into account projected climate change; or
iv) are designed to have a very short lifespan.
c) Development proposals for coastal defence measures will be supported if:
i) they are consistent with relevant coastal or marine plans;
ii) nature-based solutions are utilised and allow for managed future coastal change wherever practical; and
iii) any in-perpetuity hard defence measures can be demonstrated to be necessary to protect essential assets.
d) Where a design statement is submitted with any planning application that may impact on the coast it will take into account, as appropriate, long-term coastal vulnerability and resilience.

6.4 Flood Risk Assessments

The latest SEPA guidance on Flood Risk Assessments (FRA) is available online and was published in June 2022, in advance of the latest NPF4 published in February 2023. This guidance document is therefore, at the time of writing, being reviewed and updated to reflect new policies. SEPA states that its responses to planning applications may therefore be different to what is included in this guidance document.

A flood risk area or functional floodplain should be based on the 0.5% or greater Annual Probability event plus an allowance for climate change. According to SEPA's Land use vulnerability guidance, the 0.5% or greater annual probability event is considered to be a medium to high risk event. Generally, development in this flood risk area / functional floodplain is not considered suitable, depending on site use vulnerability.

Stage 2 of this SFRA will assess potential LDP sites against the flood risk areas using the matrix contained in the latest SEPA Guidance

An FRA should be undertaken where, for LDP sites, the SFRA shows flood risk to the site or where development may increase flood risk elsewhere. This will be informed by Stage 2 of this SFRA. The FRA must include sufficient information to provide a robust assessment of flood risk. more detailed assessments will be required where flood risk is greater or more complex. The LDP will set out any requirements for an FRA to be undertaken. However, the primary aim in the first instance is to avoid development in flood risk areas, using the most up to date SEPA maps available.

6.5 Mitigation measures

Ideally, there would be no allocations for development in flood risk areas. Any exceptions must meet the criteria in NPF4 and be supported by an appropriately detailed FRA. Whilst Policy 22 of NPF4 promotes avoidance, there may be cases where flood risk can be managed onsite for certain sites within flood risk areas, depending on certain criteria as detailed in Section 6.2. However, best practice would be to locate proposed development outside of the functional floodplain, including for climate change.

7 Conclusions and recommendations

Stage 1 SFRA
A high-level strategic assessment designed to be included as part of the Evidence Report. The data and information used throughout the SFRA process is the most up-to-date data available at the time of writing.

Stage 2 SFRA
The Stage 2 SFRA will be undertaken alongside the Proposed Local Development Plan. It will:

- Provide an assessment of the potential flood risk from all sources on proposed development sites and consider the potential cumulative impact of proposed development and possible growth pressures,
- Consider the cumulative impact on surface water flood risk, proximity of sites to surface water features
- Provide a high-level assessment of the potential to reduce runoff rates to greenfield or less-than greenfield levels,
- Assess the impacts of climate change on flood risk using the latest allowances,
- Provide a more detailed assessment of flood risk management infrastructure and potential opportunities for natural flood management.

Appendix 1

Flood Data Orkney
SFRA _March 2025_